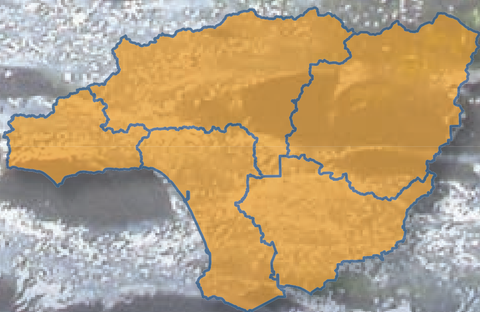
ATTACHMENT "D"

CITY COUNCIL
AGENDA ITEM NO. 3
ATTACHMENT "D"

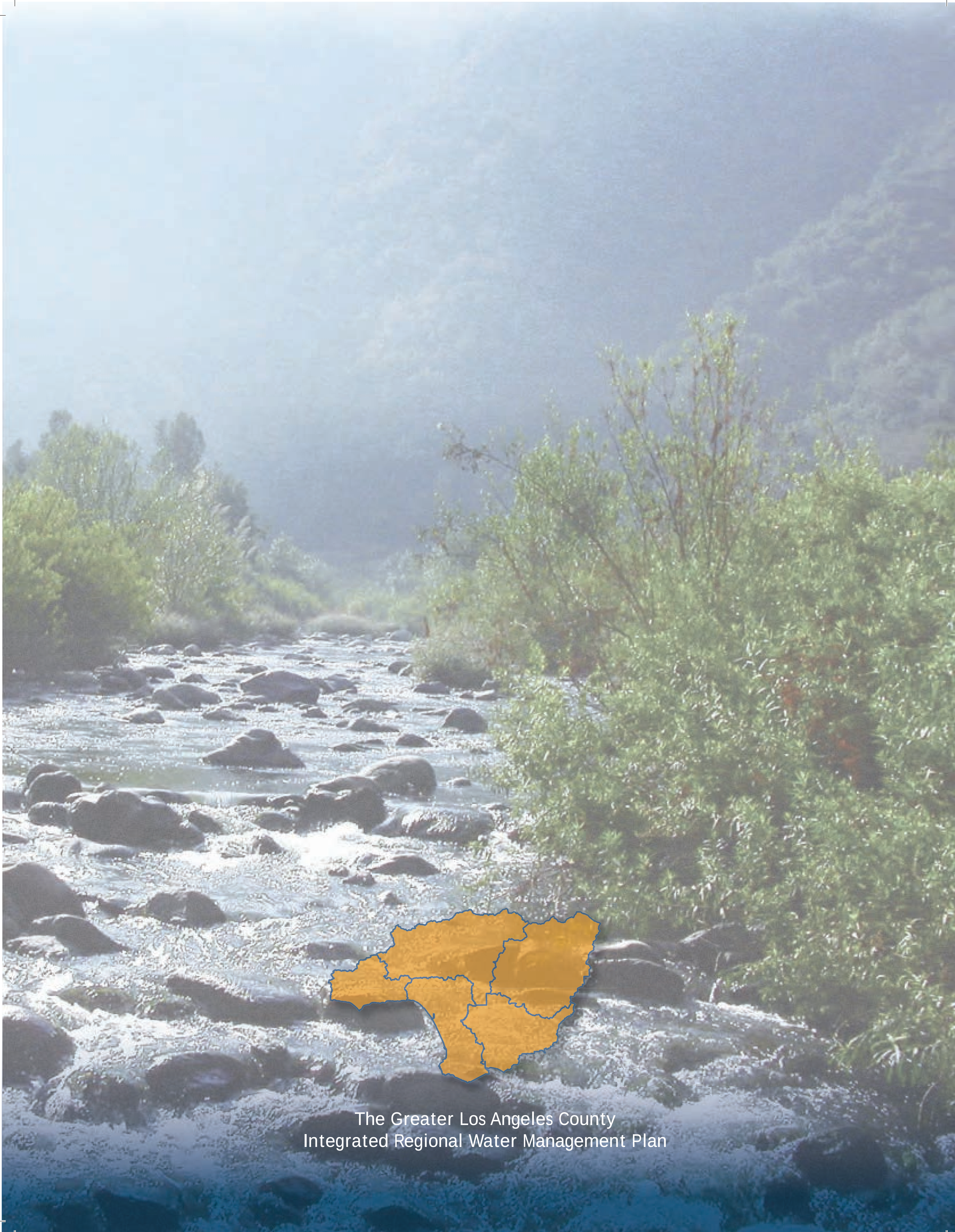
# The Greater Los Angeles County

# Integrated Regional Water Management Plan



2013 UPDATE
(Approved February 2014)

Prepared by the Leadership Committee of the Greater Los Angeles County Integrated Regional Water Management Region



The Greater Los Angeles County
Integrated Regional Water Management Plan

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# LIST OF ACRONYMS

| | |
|---|---|
| ACS | American Community Survey |
| AF | acre-feet |
| AFY | acre-feet per year |
| Army Corps | United States Army Corps of Engineers |
| ASBS | Area of Special Biological Significance |
| AV | Antelope Valley |
| BDCP | Bay-Delta Conservation Plan |
| BMP | Best Management Practice |
| Caltrans | California Department of Transportation |
| CASGEM | California Statewide Groundwater Elevation Monitoring |
| CCA | Critical Coastal Area |
| CCL | Contaminant Candidate List |
| CDPH | California Department of Public Health |
| CEQA | California Environmental Quality Act |
| CEDEN | California Environmental Data Exchange Network |
| CEIC | California Environmental Information Catalog |
| CERES | California Environmental Resource Evaluation System |
| cfs | cubic feet per second |
| COG | Council of Governments |
| Council | Council for Watershed Health |
| CRA | Colorado River Aqueduct |
| CREST | Cleaner Rivers through Effective Stakeholder-led TMDLs |
| CSMP | Coordinated Shoreline Monitoring Plan |
| CUWCC | California Urban Water Conservation Council |
| DAC | Disadvantaged Community |
| DDT | Dichloro-diphenyl-trichloroethane |
| DMS | Data Management System |
| DWR | California Department of Water Resources |
| DWSAP | Drinking Water Source Assessment and Protection |
| EJ | Environmental Justice |
| EPA | United States Environmental Protection Agency |
| ESHA | Environmentally Sensitive Habitat Area |
| FEMA | Federal Emergency Management Agency |
| FoLAR | Friends of the Los Angeles River |
| GAMA | Groundwater Ambient Monitoring and Assessment |
| GHG | Greenhouse gas emissions |
| GLAC | Greater Los Angeles County |
| GOPR | Governor's Office of Planning and Research |
| GWMP | Groundwater Management Plan |
| HOSP | Habitat and Open Space |
| IRP | Integrated Resources Plan |
| IRWM | Integrated Regional Water Management |
| IRWMP | Integrated Regional Water Management Plan |

| | |
|---|---|
| JPA | Joint Powers Authority |
| LA | Los Angeles |
| LAA | Los Angeles Aqueduct |
| LACDPW | Los Angeles County Department of Public Works |
| LACFCD | Los Angeles County Flood Control District |
| LACSD | Sanitation Districts of Los Angeles County |
| LADWP | City of Los Angeles Department of Water and Power |
| LARWQCB | Los Angeles Regional Water Quality Control Board |
| LC | Leadership Committee |
| LID | Low impact development |
| Lower SG & LA | Lower San Gabriel and Los Angeles Rivers Subregion |
| MCL | Maximum Contaminant Level |
| mgd | million gallons per day |
| MHI | Median Household Income |
| MOU | Memorandum of Understanding |
| MS4 | Municipal Separate Storm Sewer Systems |
| MSG | Main San Gabriel Basin |
| MTBE | Methyl Tertiary Butyl Ether |
| MWD | Metropolitan Water District of Southern California |
| NAHC | Native American Heritage Council |
| NDMA | Nitrosodimethylamine |
| NGO | Non-governmental organization |
| NOAA | National Oceanic and Atmospheric Administration |
| North SM Bay | North Santa Monica Bay Subregion |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | Nonpoint Source |
| NWI | National Wetland Inventory |
| O&M | Operations and Maintenance |
| OPR | Governor's Office of Planning and Research |
| OSHARP | Open Space for Habitat and Recreation Plan |
| OWTS | Onsite wastewater treatment systems |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PCB | Polychlorinated Biphenyl |
| PCE | Perchloroethylene |
| Plan | Integrated Regional Water Management Plan |
| PPIC | Public Policy Institute of California |
| Prop 84 | Proposition 84 |
| QA/QC | Quality Assurance/Quality Control |
| QSA | Quantification Settlement Agreement |
| RAP | Regional Acceptance Process |
| Region | Greater Los Angeles County Region |
| RH | Rio Hondo |
| RMC | San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy |
| RMS | Resource Management Strategies |
| RTP | Regional Transportation Plan |
| RWMG | Regional Water Management Group |
| RWMP | Recycled Water Master Plan |

| | |
|---|---|
| RWQCB | Regional Water Quality Control Board |
| SAWPA | Santa Ana Watershed Project Authority |
| SC | Steering Committee |
| SCAG | Southern California Association of Governments |
| SCCWRP | Southern California Coastal Water Research Project |
| SCMI | Southern California Marine Institute |
| SDWA | Safe Drinking Water Act |
| SEA | Significant Ecological Area |
| SEATAC | Significant Ecological Area Technical Advisory Committee |
| SG | San Gabriel |
| SLR | Sea Level Rise |
| SMBRC | Santa Monica Bay Restoration Commission |
| SMBRP | Santa Monica Bay Restoration Project |
| SNMP | Salt and Nutrient Management Plan |
| South Bay | South Bay Subregion |
| SSMP | Sewer System Management Plan |
| SUSMP | Standard Urban Stormwater Mitigation Plan |
| SQMP | Stormwater Quality Management Plan |
| SWAMP | Surface Water Ambient Monitoring Program |
| SWAP | Source Water Assessment Program |
| SWP | State Water Project |
| SWRCB | State Water Resources Control Board |
| TCE | Trichloroethylene |
| TDS | Total Dissolved Solids |
| TM | Technical Memorandum |
| TMDL | Total Maximum Daily Load |
| UCLA | University of California, Los Angeles |
| Upper LA | Upper Los Angeles River Subregion |
| Upper SG & RH | Upper San Gabriel and Rio Hondo Subregion |
| USBR | United States Bureau of Reclamation |
| USCR | Upper Santa Clara River |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| UWMP | Urban Water Management Plan |
| UV | Ultraviolet (Light) |
| VC | Ventura County |
| VOC | Volatile Organic Compounds |
| VOS | Volunteer Observing Ship |
| WCA | Watershed Conservation Authority |
| WCVC | Watersheds Coalition of Ventura County |
| WEF | Water Environment Foundation |
| WMA | Watershed Management Area |
| WPD | Watershed Protection Division (City of Los Angeles Bureau of Sanitation) |
| WRAMP | Wetland and Riparian Area Monitoring Program |
| WRD | Water Replenishment District of Southern California |
| WQA | Water Quality Authority |

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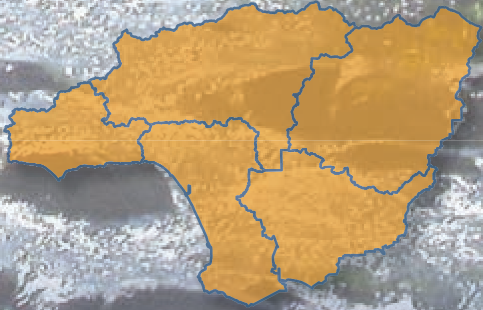
Prepared by the Leadership Committee of Greater Los Angeles County Integrated Regional Water Management Region

*With the assistance of:*
RMC Water and Environment

*In association with:*
Geosyntec Consultants
2M Associates
GreenInfo Network
Solution Strategies International Inc.
Dr. Richard Ambrose

# The Greater Los Angeles County
# Integrated Regional Water Management Plan



2013 UPDATE
(Approved February 2014)

Photo: Headwaters of the San Gabriel River

# ACKNOWLEDGEMENTS

The Leadership Committee acknowledges the many steering committee members, representatives of agencies, non-governmental organizations, and community members for their participation in the development of this document. We specifically acknowledge the Department of Water Resources for their guidance and financial assistance in preparing this Plan.

# PREFACE

*San Gabriel River*

**The 2013 Integrated Regional Water Management Plan Update provides a 20-year pathway for the Greater Los Angeles County Region to facilitate and conduct collaborative planning.**

The purpose of the 2013 Integrated Regional Water Management (IRWM) Plan is to define a clear vision and direction for the sustainable management of water resources in the Greater Los Angeles County (GLAC) Region for the next 20 years, to present the basic information regarding possible solutions and the costs and benefits of those solutions, and to inspire the Region and potential funding partners outside this Region. Moreover, it is to present sensible, economically feasible solutions that benefit communities.

The IRWM Plan identifies a comprehensive set of solutions to achieve the following objectives over the 25 year planning horizon: reduce the Region's reliance on imported water; comply with water quality regulations by improving the quality of urban runoff, stormwater and wastewater; protect, restore and enhance natural processes and habitats; increase watershed friendly recreational space for all communities; reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches; and adapt to and mitigate against climate change vulnerabilities.

Since 2006, the GLAC Region has supported the development and implementation of projects that reduce the Region's reliance on imported water, provide improved water quality and protect natural resources, including 40 projects that were awarded over $74 million of IRWM implementation grant funding. These projects are listed in the table on the following pages.

| Project Proponent | Project Name | Grant Funds | Grant Program |
|---|---|---|---|
| North Santa Monica Bay Subregion | | | |
| National Park Service | Solstice Creek Restoration | $78,366 | Prop. 50, Round 1 |
| City of Calabasas | Las Virgenes Creek Restoration | $515,000 | Prop. 50, Round 1 |
| Las Virgenes Municipal Water District/ Westlake Village | Malibu Creek Restoration | $426,000 | Prop. 50, Round 1 |
| City of Calabasas | Citywide Smart Irrigation Control Park Water Replacement | $620,000 | Prop. 84, Round 1 |
| West Basin Municipal Water District | Water and Energy Efficiency in the Multi-Family and Hotel Sectors | $452,880 | Prop. 84, Round 1 |
| City of Calabasas | Citywide Storm Drain Catch Basin Curb Screens | $1,100,000 | Prop. 84, Round 2 (Proposed) |
| Cities of Agoura Hills & Calabasas | Upper Malibu Creek Watershed Restoration Projects | $1,361,000 | Prop. 84, Round 2 (Proposed) |
| South Bay Subregion | | | |
| County Sanitation Districts of Los Angeles County | Joint Water Pollution Control Plant Marshland Enhancement | $400,000 | Prop. 50, Round 1 |
| West Basin Municipal Water District | Large Landscape Conservation | $1,200,000 | Prop. 50, Round 1 |
| City of Los Angeles, Bureau of Sanitation | Wilmington Drain Restoration | $4,500,000 | Prop. 50, Round 1 |
| City of Los Angeles, Bureau of Sanitation | Penmar Water Quality Improvement and Runoff Reuse Project | $2,112,985 | Prop. 84, Round 1 |
| City of Santa Monica | 16th St. Watershed Runoff Use Demonstration Project | $1,013,085 | Prop. 84, Round 1 |
| City of Rolling Hills Estates | Model Equestrian Center | $1,012,985 | Prop. 84, Round 1 |
| City of Hawthorne | Storm Drain Improvements & Installation of Infiltration Chambers on Hawthorne Blvd. | $1,112,985 | Prop. 84, Round 1 |
| Los Angeles County Flood Control District | Oxford Retention Basin multi-Use Enhancement Project | $1,500,000 | Prop. 84, Round 2 (Proposed) |
| City of Carson | Dominguez Channel Trash Reduction | $1,500,000 | Prop. 84, Round 2 (Proposed) |
| West Basin Municipal Water District/City of Los Angeles Dept. of Water & Power/City of Gardena | South Gardena Recycled Water Pipeline Project | $1,000,000 | Prop. 84, Round 2 (Proposed) |
| City of Los Angeles, Bureau of Sanitation/ Heal the Bay | Vermont Ave Storm Water Capture & Green St. Beautification Project | $620,000 | Prop. 84, Round 2 (Proposed) |
| Upper Los Angeles River Subregion | | | |
| City of Los Angeles, Bureau of Sanitation | South Los Angeles Wetlands | $3,300,000 | Prop. 50, Round 1 |
| City of Los Angeles, Bureau of Sanitation | North Atwater Creek Restoration | $2,250,000 | Prop. 50, Round 1 |
| Mountains Recreation & Conservation Authority | Pacoima Wash/8th Street Park | $587,000 | Prop. 50, Round 1 |
| City of Los Angeles Dept. of Water & Power | Tujunga Spreading Grounds Enhancement Project | $3,000,000 | Prop. 84, Round 1 |

| Project Proponent | Project Name | Grant Funds | Grant Program |
|---|---|---|---|
| City of Los Angeles Dept. of Water & Power | Griffith Park South-Central Los Angeles County Regional Water Recycling Program | $2,500,000 | Prop. 84, Round 1 |
| City of Pasadena | Hahamonga Basin Multi-Use Project | $3,271,000 | Prop. 84, Round 1 |
| Foothill Municipal Water District | Foothill Municipal Water District Recycled Water Project | $1,467,650 | Prop. 84, Round 2 (Proposed) |
| Mountains Recreation & Conservation Authority | Marsh Park, Phase II | $907,812 | Prop. 84, Round 2 (Proposed) |
| Los Angeles County Flood Control District | Pacoima Spreading Grounds Improvement Project | $3,000,000 | Prop. 84, Round 2 (Proposed) |
| Upper San Gabriel River & Rio Hondo Subregion | | | |
| Council for Watershed Health | San Gabriel Valley Arundo Removal | $178,000 | Prop. 50, Round 1 |
| Los Angeles County Flood Control District | Morris Dam Water Supply | $5,135,634 | Prop. 50, Round 1 |
| Covina Irrigating Company | Covina Irrigating Company Surface Water Treatment Plant Improvements | $2,376,020 | Prop. 84, Round 1 |
| Three Valleys Municipal Water District | San Antonio Spreading Grounds Improvements | $2,876,020 | Prop. 84, Round 1 |
| Los Angeles County Flood Control District | Peck Water Conservation Improvement Project | $4,777,500 | Prop. 84, Round 2 (Proposed) |
| Los Angeles County Flood Control District | Walnut Creek Spreading Basin Improvements Project | $1,200,000 | Prop. 84, Round 2 (Proposed) |
| Lower San Gabriel & Los Angeles Rivers Subregion | | | |
| County Sanitation Districts of Los Angeles County | Whittier Narrows Water Reclamation Plant Ultra Violet Disinfection | $2,000,000 | Prop. 50, Round 1 |
| Central Basin Municipal Water District | Large Landscape Conservation | $900,000 | Prop. 50, Round 1 |
| Central Basin Municipal Water District | Southeast Water Reliability Project (*discontinued*) | $3,530,000 | Prop. 50, Round 1 |
| Water Replenishment District | Leo J. Vander Lans Advanced Water Treatment Plant Expansion | $4,676,040 | Prop. 84, Round 1 |
| Water Replenishment District | Whittier Narrows Conservation Pool Project | $576,000 | Prop. 84, Round 1 |
| County Sanitation Districts of Los Angeles County | San Jose Creek Water Reclamation Plant East Process Optimization Project | $3,000,000 | Prop. 84, Round 2 (Proposed) |
| Los Angeles County Flood Control District | Dominguez Gap Spreading Grounds – West Basin Percolation Enhancements | $2,000,000 | Prop. 84, Round 2 (Proposed) |
| | TOTAL: | $74,033,962 | |

In 2011, the GLAC Region received funding to update the 2006 Plan to meet new IRWM Program Guidelines, and to enhance the Region's ability to conduct further integrated and regional planning efforts that would benefit the overall GLAC IRWM Program process. This resulting 2013 GLAC IRWM Plan Update was prepared in keeping with requirements of the Department of Water Resource's (DWR) Planning Grant Award and November 2012 IRWM Proposition 84 and 1E Program Guidelines. The 2013 Plan Update documents the current IRWM Program and processes that have evolved over the past six years since the 2006 Plan was developed, and is organized according to the following table.

| DWR Plan Standard | 2013 Plan Update Chapter |
|---|---|
| Governance | Chapter 1: Governance and Participation |
| Region Description | Chapter 2: Regional Description |
| Objectives | Chapter 3: Objectives and Priorities |
| Resources Management Strategies | Chapter 4: Regional Water Management |
| Integration | Chapter 5: Integrated Regional Projects |
| Project Review Process | Chapter 5: Integrated Regional Projects |
| **Impact and Benefit** | Chapter 6: Benefits and Impacts |
| Plan Performance and Monitoring | Chapter 7: Plan Implementation |
| Data Management | Chapter 7: Plan Implementation |
| Finance | Chapter 7: Plan Implementation |
| Technical Analysis | Chapter 1: Governance and Participation |
| Relation to Local Water Planning | Chapter 1: Governance and Participation |
| Relation to Local Land Use Planning | Chapter 1: Governance and Participation<br>Chapter 2: Regional Description |
| Stakeholder Involvement | Chapter 1: Governance and Participation |
| Coordination | Chapter 1: Governance and Participation<br>Chapter 2: Regional Description |
| Climate Change | Chapter 1: Governance and Participation<br>Chapter 2: Regional Description<br>Chapter 3: Objectives and Priorities<br>Chapter 4: Regional Water Management<br>Chapter 5: Integrated Regional Projects |

A number of outcomes resulted from the 2013 Plan Update process. These efforts built upon the foundation developed and described in the 2006 Plan to accomplish the following:

- Refine objectives and targets reflecting existing regional and subregional planning and new flood control objectives
- Increase subregional detail and focus
- Improve outreach to DACs and other stakeholders
- Increase understanding of habitat, recreation and open space needs and opportunities
- Develop new tools to determine water quality and open space benefits and support integration
- Improve project database, user interface and review process
- Create a comprehensive assessment of potential climate change impacts, vulnerabilities and strategies

As a result of these planning efforts, outside funding sources, such as the state and federal government, are more likely to support activities identified in this Plan because it demonstrates intent to solve local problems, rather than simply look for others to solve those problems. Quantitative goals for measurable progress and accountability are included in the Plan, which will lead to easier identification of solutions and formation of partnerships to implement these shared projects.

Many of the stakeholders that have participated in the Region's IRWM Process recognize that today's challenges require an alternative to the historical approach of addressing water resource management from a single-purpose perspective. For decades, this Region has operated and maintained one of the most effective flood control systems in the world that protects millions of people from the impacts of flooding in the Region. This system routes much of the stormwater runoff into the ocean, water that historically recharged local groundwater basins, making this Region even more dependent on imported water supplies. As regulatory pressure to clean up polluted dry and wet weather stormwater runoff continues and imported water resources diminish, this source of water supply is becoming more and more attractive.

Water resources must be planned in concert with the other activities that make up the urban context. Therefore, the Plan's recommendations and strategies have been developed so they can be integrated into the strategic planning for other important urban issues such as transportation, public education, land use, economic development, and health and safety. Because these things are important in every community, many opportunities for win-win relationships that will help create more functionally integrated neighborhoods and improve quality of life as the population of the Region continues to grow.

The Region's management strategies and projects developed within the IRWM context respond to statewide priorities, allow for local variation and flexibility, while also providing a coordinated approach toward achieving multiple benefits across the Region.

This Plan is an important tool, or guide, for the development of solutions that will help achieve regional planning targets and will help improve the sustainability of water resources and the ecological health of local watersheds. This IRWMP is a feasibility or planning study which identifies possible future actions that the members of the Regional Water Management Group (RWMG) have not approved, adopted, or funded. Consistent with Section 15262 of the CEQA Guidelines, a project involving only feasibility or planning studies does not require the preparation of an Environmental Impact Report or Negative Declaration but does require consideration of environmental factors. The residents, institutions and business owners in this Region will benefit when new projects and programs are implemented because more sustainable management of water resources can improve the quality of life for all communities. New and enhanced partnerships have developed since 2006 and during the Plan update process and, building on those models, many more partnerships are expected to develop and grow. This Plan is a living document which contains the vision, ideas and project concepts that will only become a reality if stakeholders remain engaged as this process continues.

However, the Plan is subject to change based on the changing needs of the Region, new technologies, future legislation and regulations, the continued cooperation of participating entities, and the availability of state, federal, and other long-term stable funding sources. The Plan is intended to set forth objectives and goals, identify potential conflicts and problem areas, and provide general direction as to how planning targets and objectives may be achieved. Nothing in this Plan should be construed as a commitment by any participating local agency to fund the implementation of any project or program identified herein. (See Water Code, § 10540(d).)

# 1. GOVERNANCE AND PARTICIPATION

*San Gabriel Mountains*

**The San Gabriel Mountains are a significant source of water supply for the Region.**

## 1.1 Background

This Integrated Regional Water Management Plan (IRWMP or Plan) reflects the Greater Los Angeles County (GLAC) Region's collaborative efforts to ensure a sustainable water supply through the more efficient use of water, the protection and improvement of water quality, and environmental stewardship. Ensuring the delivery of clean and reliable water in this century, agencies and jurisdictions in the Region will benefit from a visionary plan that integrates water supply, water quality, flood management and open space strategies; and maximizes the utilization of local water resources.

To meet the demand for water in the Region, (as depicted in Map 1-1) over the last century, federal, state, and local agencies developed creative plans and implemented large projects to move vast quantities of water great distances. Therefore, the Region is now reliant on supplies that vary with the climate fluctuations across numerous states. At the same time, the quantity and quality of local supplies are threatened with degradation over time. The need to protect lives and property from flooding resulted in extensive channelization and modification of the rivers and streams on the coastal plain and inland valleys. The flood protection system was designed to efficiently convey storm runoff away from urban areas and into the ocean. Unfortunately, this efficient flood protection system is also very efficient in conveying pollutants generated as a result of urbanization which has over time degraded the quality of the region's surface water resources.

Historically, water agencies in the Region have tapped a variety of sources, implemented new technologies, responded to evolving regulatory requirements, and navigated changing political conditions to deliver ample supplies. As a result, the Region has one of the broadest and most diverse water supply portfolios in California. However, the long-term sustainability of the Region's water supply faces increasing challenges.

As noted in the California Water Plan Update 2009 (Bulletin No. 160-09):

> *"The watersheds of the Metropolitan Los Angeles Planning Area have been subjected to some of the densest urbanization in California and have issues associated with urban runoff, groundwater contamination, and the loss of major historical ecosystems."*

This Plan also provides an opportunity to include information on the Region's needs and future at a scale that can contribute to the California Water Plan.

## 1.2 Context

Cooperation at a regional scale is not new. Flood control districts, sanitation districts, and wholesale water agencies have a long tradition of working across jurisdictional boundaries to implement projects that have multiple benefits. However, most resource management agencies were originally formed with single-purpose missions, which limit their ability to develop and implement multipurpose programs and projects. Yet, in recent years, the potential for a transformation of the watersheds in this Region has emerged, beginning with visions of restoring the Los Angeles and San Gabriel Rivers, development of watershed management plans on most of the major tributaries and creeks, and the preparation of Integrated Resources Plans (IRPs) by local agencies. These plans promote integrated efforts to manage resources and recognize that water and watershed resources are interconnected. Thus, the concept of integrated regional water management in this Region is not new.

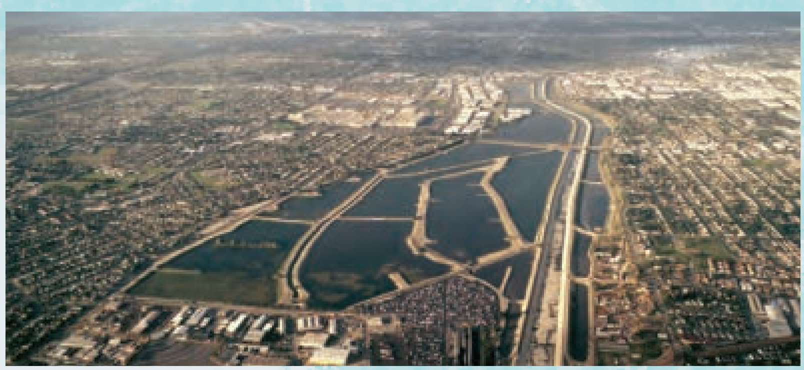
This IRWMP is an outgrowth of ongoing efforts to develop plans, projects, and programs at regional levels, and utilize an integrated approach to water and other resource management issues and acknowledges that for the Region to meet its future needs, water supply planning must be integrated with other water resource strategies. These strategies consist of water conservation and urban stormwater runoff management, wastewater quality improvements and expanded use of recycled water, maintenance of flood protection, and other environmental needs including habitat and open space conservation and the provision of sufficient park space. In a region facing significant urban


*Map 1-1. Greater Los Angeles County Integrated Regional Water Management Region*

# PAST AND PRESENT

*Historic illustrated map of the Los Angeles Basin*

*"The River" (courtesy of the San Gabriel Mountains Regional Conservancy)*



*Local stormwater runoff is collected in a comprehensive set of groundwater recharge basins throughout the Region.*

*Figure 1-1. Region History. While the Region's rivers historically provided ample water supply, exponential population growth over the last century has required creative solutions to meet demands.*

challenges such as population growth, densification, traffic congestion and poor air quality, water resource management also must be integrated with other urban planning issues. This IRWMP suggests a proactive approach to addressing the Region's water resource needs, based on a vision established through extensive stakeholder input that is consistent with planning principles identified in regional planning documents such as the SCAG Compass Growth Vision Report (SCAG, 2004).

To define benchmarks for a more sustainable water future, the GLAC Region has established objectives supported by quantifiable planning targets for water supply, water quality, flood management, habitat, and open space. These targets identify the magnitude of the Region's major water resource management issues and also provide a basis for estimating the need for implementing projects and programs to meet these targets.

In the coming decades, water supply and conservation projects and programs will compete for limited fiscal resources with concurrent efforts to improve urban and stormwater runoff quality. With the cost of compliance with surface water quality regulations estimated to range from $43 to $284 billion (Brown and Caldwell, 1989 and Gordon, et al, 2002), jurisdictions and agencies in the Region face difficult funding choices. The integration of multiple water management strategies via multipurpose projects creates opportunities to meet regional water resource needs, efficiently use fiscal resources, and provide the public with tangible community benefits. It is within this context that the following Plan is presented.

## 1.3 Mission and Purpose

The mission of this IRWM Plan is to address the water resources needs of the Region in an integrated and collaborative manner to improve water supplies, enhance water supply reliability, improve surface water quality, preserve flood protection, conserve habitat, and expand recreational access in the Region. This Plan is also intended to define a comprehensive vision for the Region which will generate local funding, position the Region for future state bonds, and create opportunities for federal funding.

## 1.4 IRWMP Process

The GLAC IRWM Region boundaries include approximately 10 million residents, portions of four counties, 84 cities, and hundreds of agencies and districts. To make governance and stakeholder involvement manageable, the Region was organized into five Subregions (depicted on Map 1-2) which acknowledges both geographic and demographic variations over the 2,058 square mile area. These Subregions are listed below.

- Lower San Gabriel and Los Angeles Rivers (Lower SG & LA)
- North Santa Monica Bay (North SM Bay)
- South Bay
- Upper Los Angeles River (Upper LA)
- Upper San Gabriel and Rio Hondo Rivers (Upper SG & RH)

The organizational structure for the Region is defined by an overall Regional Leadership Committee (LC) and five Subregional Steering Committees (SC). This structure provides oppor-

**The mission** of The Greater Los Angeles County Integrated Regional Water Management Plan is **"to address the water resources needs of the Region in an integrated and collaborative manner."**

tunities for coordination, integration of decision-making, and stakeholder input from both regional and local perspectives.

## Leadership Committee

Consistent with Sections 10530 - 10546 of the Water Code, preparation of an IRWMP must be guided by a Regional Water Management Group (RWMG) composed of three or more local public agencies, at least two of which have statutory authority over water supply, formed by means of a joint powers agreement, memorandum of understanding (MOU), or other written agreement that is approved by the governing bodies of the local public agencies. Consistent with the IRWMP guidelines, the GLAC Region's RWMG is the LC which is composed of signatories to a MOU (see Appendix A).

The GLAC Region's LC has 16 voting members, as shown in Figure 1-2, including the LC Chair; Chairs and Vice-Chairs of the five Subregional Steering Committees; and five stakeholder agencies representing the following Water Management Areas: Groundwater, Surface Water, Sanitation, Open Space, and Stormwater.

Each of the ten Subregional SC representatives to the LC are elected by the SCs as Chairs and Vice-Chairs of their SCs. The alternate representatives to the LC for each of the five Subregions, also serve as alternates to the Chairs and Vice-Chairs on the SCs. Both the Subregional Chair and Vice-Chair representatives are elected by a majority vote of each Subregional SC according to the Operating Guidelines. The Operating Guidelines define the structure of the Region's LC and SCs, including how the LC and SCs are formed, roles and responsibilities of members, and guidelines for transparency and funding contributions, and rules defined by each SC. The five Water Management Area LC members are elected from nominations provided by SCs and must meet certain professional requirements outlined in the Operating Guidelines. All LC member terms are reviewed at least every three years.

The Leadership Committee also includes five ex-officio (non-voting members), including: California State Coastal Conservancy, United States Bureau of Reclamation (USBR), United States Department of Agriculture (USDA) Forest Service: Angeles National Forest, United States Department of the Interior, National Park Service, United States Army Corps of Engineers (Army Corps): Los Angeles District.

The LC holds monthly publically noticed meetings to provide overall program guidance, address regional issues and provide collaboration and coordination between the Subregions. LC meeting agendas and minutes are posted on the GLAC IRWM website (www.lawaterplan.org), on the project database website and are made available to those without computer access by contacting Los Angeles County Flood Control District (LACFCD) staff.

The specific management responsibilities of the LC voting members as relates to water management are summarized below.

### Chair

**Los Angeles County Flood Control District.** The LACFCD chairs the LC. LACFCD provides for the control and conservation of the flood, storm, and other waste waters of the LACFCD. It also conserves such waters for beneficial and useful purposes by spreading, storing, retaining or allowing them to percolate into the soil within the LACFCD. The LACFCD also protects the harbors, waterways, public highways and property in the LACFCD from damage from such waters and may provide for recreational use of LACFCD facilities. The LACFCD was created in 1915 and now operates and owns 14 major dams, 18 rubber dams, 481 miles of open channels, 3,200 miles of underground storm drains, 81,526 catch basins, 48 stormwater pumping plants, 162 sediment entrapment basins, 257 concrete crib check dams, 27 groundwater recharge facilities (operated but not necessarily owned), 36 sediment placement sites, and three seawater intrusion barriers composed of over 290 injection wells.

In January 1985, the LACFCD consolidated with the County Engineer and the County Road Department to form the Department of Public Works. The Director of the Department of Public Works is therefore the Chief Engineer of the District, the County Engineer, and the Road Commissioner.

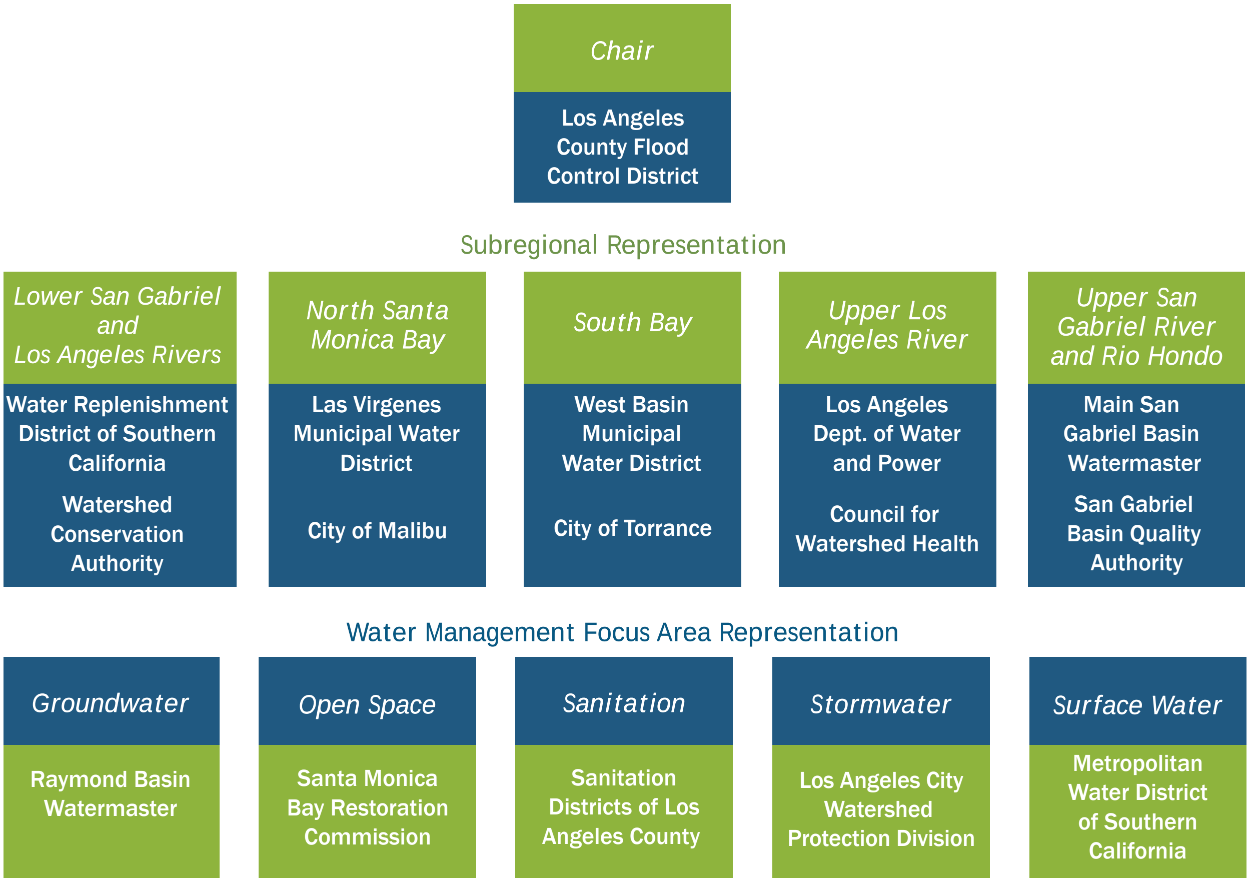



*Figure 1-2. Leadership Committee Representation. The Leadership Committee consists of representatives from each Steering Committee and each Water Management Area.*

### Lower San Gabriel and Los Angeles Rivers Subregion

**Water Replenishment District of Southern California (WRD).** WRD is the Chair of the Lower SG & LA SC. WRD manages groundwater for nearly four million residents in 43 cities of Southern Los Angeles County and is the official Groundwater Level Monitoring Entity for the Central Basin and West Coast Basin.

**Watershed Conservation Authority (WCA).** The WCA is the Vice-Chair of the Lower SG & LA SC. WCA is a joint powers entity between the San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy (RMC) and LACFCD whose focus is to provide multiple benefits such as open space, habitat restoration, and recreational opportunities in the San Gabriel and Lower Los Angeles Watersheds.

### North Santa Monica Bay Subregion

**Las Virgenes Municipal Water District (Las Virgenes MWD).** Las Virgenes MWD is the Chair of the North SM Bay SC. Las Virgenes MWD provides potable water, wastewater treatment, recycled water and biosolids composting to more than 65,000 residents in the cities of Agoura Hills, Calabasas, Hidden Hills, Westlake Village, and unincorporated areas of western Los Angeles County. Las Virgenes MWD maximizes water resources by bringing water full circle. Wastewater is treated to be beneficially used as recycled water and biosolids converted to compost.

**City of Malibu.** The City of Malibu serves as the Vice-Chair of the North SM Bay on the LC. Malibu was incorporated on March 28, 1991 and is located in Northwest Los Angeles County. The City has 21 miles of coastline along the Pacific Ocean and has a population of 12,645 (2010 U.S. Census).

### South Bay Subregion

**West Basin Municipal Water District (West Basin MWD).** West Basin MWD is the Chair of the South Bay SC. West Basin MWD is a public agency that wholesales imported water to cities, investor-owned utilities and private companies in the South Bay and unincorporated areas of Los Angeles County, serving a population of more than 851,000. In addition, West Basin MWD provides recycled water for municipal, commercial, and industrial uses. West Basin MWD owns the Edward C. Little Water Recycling Facility in El Segundo, where approximately 32,000 acre-feet per year (AFY) of secondary treated wastewater from Hyperion Treatment Plant is additionally treated and distributed throughout the Region. Formed in 1947, West Basin MWD is committed to ensuring a safe and reliable water supply for the Region.

**City of Torrance.** City of Torrance is the Vice-Chair of the South Bay SC. Torrance was incorporated in 1921 and has a population of 145,438 at the 2010 census. This residential and light high-tech industries city is also home to the one of the country's few urban wetlands, the Madrona Marsh.

### Upper Los Angeles River Subregion

**City of Los Angeles Department of Water and Power (LADWP).** LADWP is Chair of the Upper LA SC. LADWP is responsible for delivering water to 640,000 customers (including households, multi-family dwellings, and businesses) and electricity to 1.4 million customers in the City of Los Angeles.

**Council for Watershed Health (Council).** The Council is Vice-Chair of the Upper LA SC The Council is a non-profit regional hub for watershed research and analysis. Its mission is to facilitate an inclusive consensus process to enhance the economic, social, and ecological health of the Region's watersheds through education, research, and planning. The Council manages the Water Augmentation Study, initiated in 2000 to determine the feasibility of stormwater recharge for water supply and quality improvement, conducts watershed-wide monitoring programs for the Los Angeles and San Gabriel Rivers, and provides a robust program of trainings, symposia, and conferences on topics ranging from designing sustainable landscapes to adapting to climate change.

### Upper San Gabriel and Rio Hondo Rivers Subregion

**Main San Gabriel Basin Watermaster (MSG Watermaster).** The MSG Watermaster is the Chair of the Upper San Gabriel and Rio Hondo SC. The MSG Watermaster is the agency charged with administering adjudicated water rights within the watershed and managing groundwater resources in the Main San Gabriel Basin.

**San Gabriel Basin Water Quality Authority (WQA).** The WQA represents the Upper SG & RH SC on the LC. The WQA was created by the state in 1993 to address the problem of groundwater contamination in the San Gabriel Valley. The WQA is empowered to address the problem of the migration of contaminated groundwater within the San Gabriel Basin and, in particular, the migration of contaminated water through the Whittier Narrows into the Central Basin. The WQA currently operates groundwater cleanup projects for beneficial uses in the San Gabriel Valley that are actively intercepting contaminated groundwater flowing toward the Whittier narrows.

### Groundwater Management Area

**Raymond Basin Management Board (Raymond Basin).** The Raymond Basin represents the Groundwater Management Area on the LC. The Raymond Basin is the agency charged with administering adjudicated water rights within the watershed and managing groundwater resources in the Raymond Basin.

### Open Space Management Area

**Santa Monica Bay Restoration Commission (SMBRC).** The SMBRC represents the Habitat/ Open Space Water Management Area on the LC. The State of California and the U.S. Environmental Protection Agency (USEPA) established the Santa Monica Bay Restoration Project as a National Estuary Program in December 1988. The Project was formed to develop a plan that would ensure the long-term health of the 266 square mile Santa Monica Bay and its 400 square mile watershed, located in the second most populous region in the United States. That plan, known as the Santa Monica Bay Restoration Plan, won state and federal approval in 1995. On January 1, 2003, the Santa Monica Bay Restoration Project formally

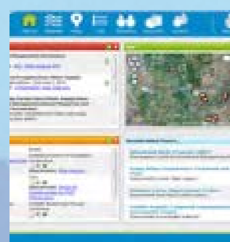
## IRWMP LEADERSHIP COMMITTEE

Leadership Committee members are actively engaged in monthly meetings. Membership includes director- level staff from a large number of local agencies. Subcommittees of the Leadership Committee include Legislative, Disadvantaged Community (DAC), Plan and Project Development, Water Supply, Water Quality, Habitat & Open Space and Climate Change.

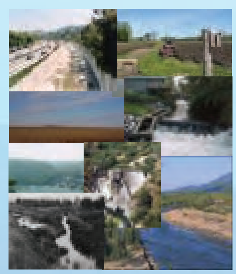
## MILESTONE ACCOMPLISHMENTS

Demonstrated cooperative efforts between Regional and Subregional groups:

**Hold monthly meetings in each subregion to update plan objectives, comment on planning studies, review potential projects and collaborate on regional interests.**



**Provide administration and proponent support of newly developed project database that balances public access and program vetting for including projects in the IRWM Plan.**



**Support project development and integration through project presentation workshops**

**Conduct specialized outreach to encourage continued and increased participation from DAC and new participants.**

*Figure 1-3. Leadership and Subregional Steering Committees. The GLAC Region has an IRWM process that is developed regionally and implemented locally.*

became an independent state organization and is now known as the Santa Monica Bay Restoration Commission. The SMBRC continues the mission of the Bay Restoration Project and the collaborative approach of the National Estuary Program but with a greater ability to accelerate the pace and effectiveness of Bay restoration efforts.

### Sanitation Management Area

**Sanitation Districts of Los Angeles County (LACSD).** The LACSD represents the Sanitation Water Management Area on the LC. The LACSD is a confederation of independent special districts serving about 5.4 million people in Los Angeles County. Its service area covers approximately 815 square miles and encompasses 78 cities and unincorporated territory within the County. LACSD constructs, operates, and maintains facilities to collect and treat approximately 430 million gallons per day (mgd) of municipal wastewater. Approximately 39 percent of the wastewater is reclaimed by LACSD, of which one half is beneficially reused. LACSD also provides the management of solid wastes including disposal, transfer operations, and materials recovery.

### Stormwater Management Area

**City of Los Angeles Bureau of Sanitation, Watershed Protection Division (WPD).** The WPD represents the Stormwater Water Management Area on the LC. The WPD, founded in 1990, is responsible for the development and implementation of stormwater pollution abatement projects within the City of Los Angeles, which covers approximately 23 percent of the Region.

### Surface Water Management Area

**Metropolitan Water District of Southern California (MWD).** MWD represents the Surface Water Management Area on the LC. MWD imports and distributes water from the State Water Project and Colorado River Aqueduct for 26 member agencies throughout Southern California (including those in the GLAC Region) and also develops other water resource and conservation projects throughout the state.

The composition of the LC achieves a cross sectional representation of all water management issues: Las Virgenes MWD, LADWP, West Basin MWD and MWD are involved in water supply, conservation and water recycling issues; the MSG and Raymond Basin Watermasters and the WQA are focused on groundwater supply and groundwater quality issues, respectively; LACFCD deals extensively with stormwater quality, flood protection, and the conservation of stormwater runoff; the cities of Los Angeles WPD, Torrance and Malibu provide the perspective of local cities on water issues; LACSD is the main agency for wastewater treatment, as well as a leader in water recycling; and the Council, WCA and SMBRC are proponents for open space, habitat and water quality issues. Collectively, the members of the Leadership Committee represent Regional leadership in all water management areas.

## Leadership Committee Subcommittees

In order to provide overall guidance during the Plan update process and other regional activities, the LC has created both standing and ad-hoc Subcommittees. The Subcommittees can be composed of LC or SC members as well as other stakeholders with expertise relevant to the Subcommittee goals. Current LC Subcommittees include those listed below:

**Legislative Committee** is a standing Subcommittee that tracks IRWMP-related legislation and performs as-needed outreach.

**Disadvantaged Community (DAC) Subcommittee** is a standing Subcommittee that provides direction and oversight to DAC outreach activities related to the IRWMP including the DAC Outreach Evaluation Program funded through Department of Water Resources (DWR).

**Plan & Projects Subcommittee** is an ad-hoc Subcommittee that provides direction on the project development and review process for the Plan and grant applications as well as preliminary review of draft Plan update chapters.

**Climate Change Subcommittee** is an ad-hoc Subcommittee that is composed of individuals involved with regional climate change activities and planning efforts as well as stakeholders from each Subregion across all water management areas. Participants provide input and direction on the climate change component of the Plan update.

**Water Supply, Water Quality and Habitat & Open Space Subcommittees** are ad-hoc Subcommittees that provide technical input and document direction and review of all Plan Update related deliverables and content. These Subcommittees are composed of LC or other recommended members with water supply, water quality or habitat & open space expertise to help develop methodologies, provide recommendations to LC and review and resolve issues.

## Subregional Steering Committees

To better accommodate the multitude of GLAC stakeholders, the Region is divided into five geographically distinct Subregions (as seen in Map 1-2) with separate governing bodies called Steering Committees. Each of the SCs includes agency, city, non-governmental organizations and other stakeholder representatives from within the Subregion. A current listing of each of the five Subregional SC members is shown in Table 1-1. The SCs operate according to the guidance provided in the Operating Guidelines but may also adopt additional rules for participation and formation.

The SCs meet monthly, or as-needed, within the Subregion to provide opportunities for direct input into the IRWMP process by stakeholders. The format and agendas of SC meetings are flexible to allow for collaboration and input on a variety of IRWM related topics and activities. Examples include workshops to discuss Plan Update topics and comment on drafts materials; presentation sessions for project proponents in advance of grant applications or to facilitate integration; formal voting sessions on governance; and information sharing on related regional planning efforts, funding opportunities, meetings and activities.

Each Subregion elects or re-elects a SC Chair and Vice-Chair as-needed. Stakeholders interested in joining a SC can submit a written request to the SC Chair for consideration by the SC. Membership is largely dependent upon the ability and interest of


*Map 1-2. IRWMP Subregions, GLAC Region.*

an entity to regularly participate in SC meetings. Regular participation by a consistent voting body is desired to ensure that an educated voting quorum is in attendance at each meeting. Although the SC membership are the only stakeholders that can vote on motions, any stakeholder attending SC meetings is able to participate in all other agenda items and discussions at the same level as Committee members.

Each SC also informally selects a Subregional administrator to manage the project database as well as posting of meeting agenda and minutes and other relevant announcements to the Region's website (at www. lawaterplan.org). This project process and database are discussed in greater detail in Chapter 5. Like the LC Meetings, SC meetings are open to the public through the posting of agendas and minutes on the Region's website and also made available to those without computer access by contacting either the LC or SC Chairs.

## 1.5 Stakeholder Involvement

The relationship between the LC, its Subcommittees and the five SC's relative to stakeholder involvement is shown in Figure 1-4.

### Regional Stakeholder and Public Outreach

The majority of stakeholder input to the IRWMP is conducted at the Subregional level which is then reported to the LC through the Subregional representatives during a standing LC meeting agenda items called "Subregional Reports." Since Subregional SC meetings are held locally, they increase the ability and time allowed for individual stakeholder participation. All GLAC stakeholders and general public are also invited to attend the monthly LC meetings and can speak during the public comment period.

As the Chair of the LC, the LACFCD maintains the LC and overall GLAC Region distribution list. Any interested party can be added to the distribution list by contacting LACFCD staff as indicated on agendas and minutes or through the SC Chairs. The LC distribution list receives notification and agendas/hand-outs of upcoming LC meetings, minutes from previous meetings, relevant announcements and requests for information or input. While distribution to the list is primarily done via email, stakeholders and interested parties can request that materials be distributed in other formats to accommodate their needs. IRWM Plan information is also posted on the GLAC website at www.lawaterplan.org.

Subregional SCs maintain individual subregional interested party and stakeholder lists. SC Chairs use these lists to disseminate information on upcoming SC meetings, project proponent announcements (such as call for projects) and to forward relevant LC items as well. While distribution to the list is primarily done via email, stakeholders and interested parties can request that materials be distributed in other formats to accommodate their needs by contacting the either SC or LC Chair listed on the GLAC Website. IRWMP information is also posted on the GLAC website and project database accessible at www.lawaterplan.org.

Various stakeholder groups (e.g., the Ballona Creek Watershed Task Force and regional Councils of Government (COGs)) forward IRWMP messages to their constituencies, thereby extending the reach to additional stakeholders. Initially, written communications in the form of letters to cities and press releases to the media were utilized to expand awareness of, and participation in, the IRWMP.

With this structure, and under the guidance of the SCs, stakeholders are provided an opportunity to participate in the IRWM process including activities specific to the Plan Update such as creating subregional objectives and targets, developing and reviewing projects and updating both the regional and subregional descriptions. Section 1.7 describes the Plan Update process in greater detail.

Both the LC and SC distribution lists are updated regularly to ensure that all interested parties and stakeholders will receive notifications on current and upcoming IRWM activities and information. Each Subregion reviews these distribution lists and meeting attendance records to identify any participation gaps and how further outreach can be done. Current distribution lists may include hundreds of cities, agencies, districts, and organizations.

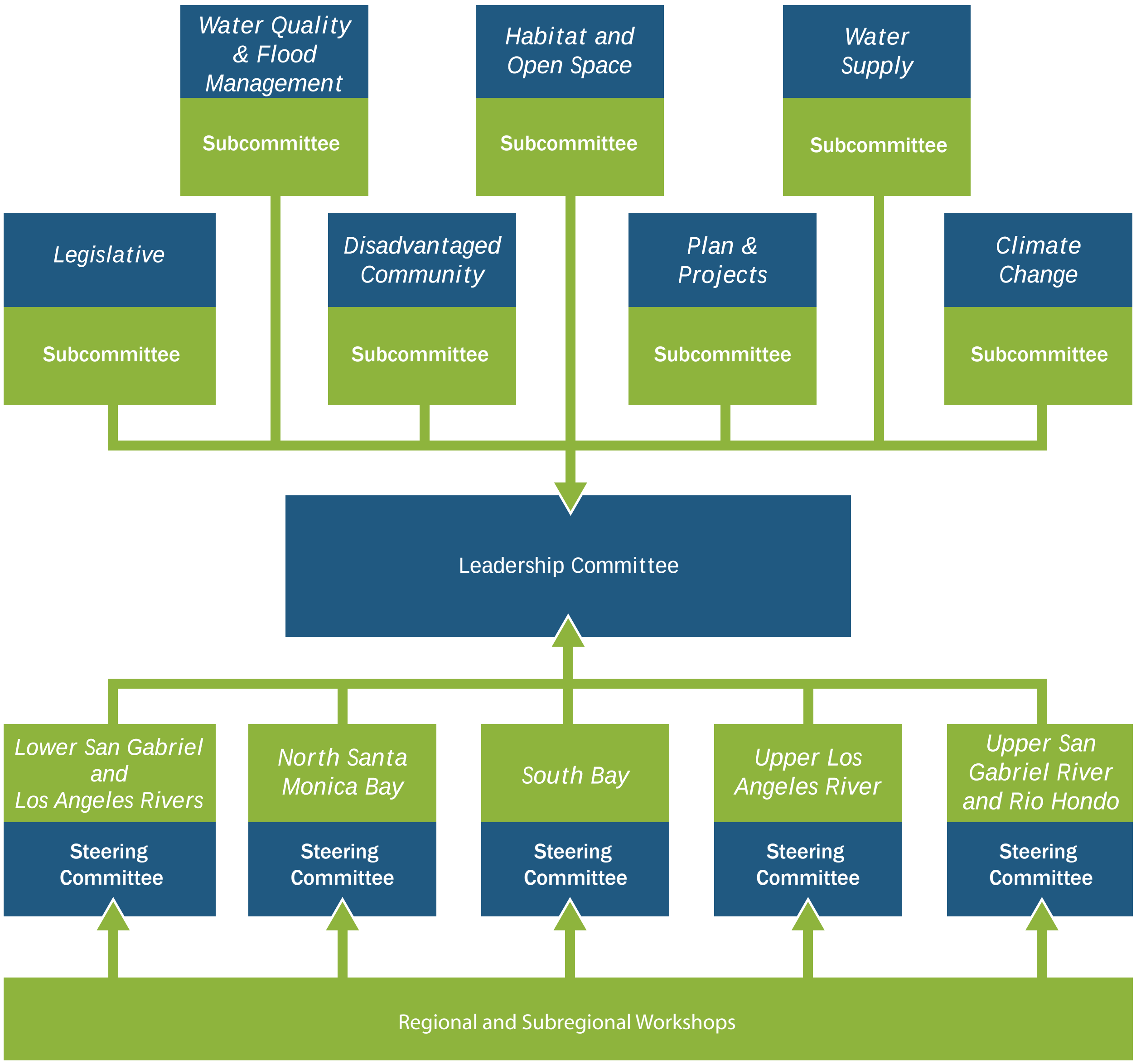



*Figure 1-4. Stakeholder Participation in GLAC Governance Structure*

**Federal Agencies.** Army Corps of Engineers, Bureau of Reclamation, Forest Service, National Park Service, Natural Resources Conservation Service.

**State Departments and Agencies.** Caltrans, Parks and Recreation, Water Resources Control Board, Regional Water Quality Control Boards, University of California, California State University, Water Resources.

**State Conservancies.** San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy, Santa Monica Mountains Conservancy, Coastal Conservancy.

**Special Districts.** County Sanitation Districts of Los Angeles County, Los Angeles County Flood Control District and Resource Conservation District of the Santa Monica Mountains.

**Los Angeles County Departments.** Public Works, Parks and Recreation, Regional Planning, Fire and Beaches and Harbors.

**Cities in Los Angeles County.** Agoura Hills, Alhambra, Arcadia, Artesia, Azusa, Baldwin Park, Bell, Bellflower, Bell Gardens, Beverly Hills, Bradbury, Burbank, Calabasas, Carson, Cerritos, Claremont, Commerce, Compton, Covina, Cudahy, Culver City, Diamond Bar, Downey, Duarte, El Monte, El Segundo, Gardena, Glendale, Glendora, Hawaiian Gardens, Hawthorne, Hermosa Beach, Huntington Park, Industry, Inglewood, La Cañada Flintridge, La Habra Heights, Lakewood, La Mirada, La Puente, La Verne, Lawndale, Long Beach, Los Angeles, Lomita, Lynwood, Malibu, Manhattan Beach, Maywood, Monrovia, Montebello, Monterey Park, Norwalk, PalosVerdes Estates, Paramount, Pasadena, Pico Rivera, Pomona, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, Rosemead, San Dimas, San Fernando, San Gabriel, San Marino, Santa Fe Springs, Santa Monica, Sierra Madre, Signal Hill, South El Monte, South Gate, South Pasadena, Temple City, Torrance, Vernon, Walnut, West Covina, West Hollywood, Westlake Village, and Whittier.

**Other Entities.** County of Orange and individual cities within Orange County; COGs; non-profit organizations (trusts, foundations, conservancies, associations, societies, coalitions, alliances, councils); joint powers authorities, businesses, property owners; financial institutions; businesses and industry associations; Chambers of Commerce; educational institutions; civic organizations; environmental groups; environmental justice organizations; watershed councils; homeowner associations, and interested individuals.

**Water Agencies and Districts.** All major water wholesalers and regional water agencies have been invited to participate in the IRWMP process, as listed in Table 1-2. Because each of the Region's water districts, wholesalers and authorities are participants in the IRWMP process, the cities served by these water supply agencies are indirectly represented. With this participation, all entities that are party to groundwater basin adjudications in the Region are also represented. In addition, the Upper Los Angeles River Area Watermaster and the Main San Gabriel Basin and Raymond Basin Watermaster are participants in the process.

OPPORTUNITIES AND WORKSHOPS

*Figure 1-5. Opportunities for Stakeholders and Agencies. Subregional and Regional workshops have provided opportunities for project collaboration and integration.*

**Table 1-1. Subregional Steering Committee Members**

| Lower San Gabriel and Los Angeles Rivers | North Santa Monica Bay | South Bay | Upper Los Angeles River | Upper San Gabriel and Rio Hondo Rivers |
|---|---|---|---|---|
| • California Coastal Conservancy<br>• Central Basin Municipal Water District<br>• Council for Watershed Health<br>• Los Angeles County Department of Public Works<br>• Orange County Resources and Development Management Department<br>• County Sanitation Districts of Los Angeles County<br>• Water Replenishment District<br>• Watershed Conservation Authority | • California Department of Transportation<br>• City of Agoura Hills<br>• City of Calabasas<br>• City of Malibu<br>• City of Westlake Village<br>• Los Angeles County Flood Control District<br>• Las Virgenes Municipal Water District<br>• Los Angeles County Board of Supervisors, 3rd District<br>• Malibou Lake Mountain Club<br>• Mountains Restoration Trust<br>• Resource Conservation District of the Santa Monica Mountains<br>• Water District # 29 Los Angeles County Department of Public Works<br>• West Basin Municipal Water District<br>• Westlake Lake Management Association<br>Non-Voting Members<br>• California Department of Parks and Recreation<br>• Los Angeles County Beaches & Harbors<br>• Los Angeles County Regional Planning<br>• National Park Service-Santa Monica Mountains NRA<br>• Santa Monica Bay Restoration Commission<br>• Santa Monica Baykeeper<br>• Santa Monica Mountains Conservancy<br>• Triunfo Sanitation District | • City of Los Angeles Bureau of Sanitation<br>• City of Torrance<br>• Heal the Bay<br>• Los Angeles County Flood Control District<br>• Los Angeles Department of Water and Power<br>• County Sanitation Districts of Los Angeles County<br>• Santa Monica Bay Restoration Commission<br>• South Bay Cities COG<br>• Water Replenishment District<br>• West Basin Municipal Water District<br>• Westside Cities COG<br>Non-Voting Members<br>• Los Angeles County Beaches and Harbors<br>• Los Angeles Regional Water Quality Control Board | • Arroyo Seco Foundation<br>• Burbank Water and Power<br>• City of Calabasas<br>• City of Los Angeles Department of Water and Power<br>• City of Los Angeles Department of Recreation & Parks<br>• City of Los Angeles Department of Public Works, Bureau of Sanitation<br>• City of Pasadena<br>• City of South Pasadena<br>• Council District 9<br>• Council for Watershed Health<br>• Foothill Municipal Water District<br>• Glendale Water and Power<br>• Los Angeles County Flood Control District<br>• Mountains Recreation and Conservation Authority<br>• Tree People<br>• Tujunga Watershed Area | • City of La Verne<br>• City of Monrovia<br>• City of Arcadia<br>• Council for Watershed Health<br>• County Sanitation Districts of<br>• Los Angeles County<br>• Los Angeles County Flood Control District<br>• Main San Gabriel Basin Watermaster<br>• Raymond Basin Management Board<br>• Rivers and Mountains Conservancy<br>• San Gabriel Basin Water Quality Authority<br>• San Gabriel Mountains Regional Conservancy<br>• San Gabriel Valley Municipal Water District<br>• San Gabriel Valley Water Association<br>• Three Valleys Municipal Water District<br>• Upper San Gabriel Valley Municipal Water District<br>Non-Voting Members<br>• California Department of Water Resources<br>• Los Angeles County Department of Public Works |

| Table 1-2. Water Districts, Agencies, and Authorities in Greater Los Angeles IRWMP Region | |
|---|---|
| Regional District or Authority | GLAC Region Cities and Communities Served |
| Central Basin MWD* | Artesia, Bell, Bellflower, Bell Gardens, Cerritos, Commerce, Cudahy, Downey, East Los Angeles, Florence, Hawaiian Gardens, Huntington Park, La Habra Heights, Lakewood, La Mirada, Lynwood, Maywood, Montebello, Norwalk, Paramount, Pico Rivera, Santa Fe Springs, Signal Hill, South Gate, South Whittier, Vernon, Whittier |
| Foothill MWD* | Altadena, La Cañada Flintridge, La Crescenta, Montrose |
| Las Virgenes MWD* | Agoura Hills, Calabasas, Chatsworth, Lake Manor, Hidden Hills, Malibou Lake, Monte Nido, Westlake Village, West Hills |
| Metropolitan Water District of Southern California | Anaheim, Beverly Hills, Burbank, Compton, Fullerton, Glendale, Long Beach, Los Angeles, Pasadena, San Fernando, San Marino, Santa Ana, Santa Monica, Torrance |
| Municipal Water District of Orange County* | Brea, Buena Park, Cypress, La Habra, La Palma, Los Alamitos, Placentia, Seal Beach |
| San Gabriel Basin Water Quality Authority | Alhambra, Arcadia, Azusa, Baldwin Park, Bradbury, Covina, Duarte, El Monte, Glendora, Industry, Irwindale, La Puente, La Verne, Monrovia, Monterey Park, Rosemead, San Dimas, San Gabriel, San Marino, Sierra Madre, South El Monte, South Pasadena, Temple City, West Covina, Whittier |
| San Gabriel Valley MWD | Alhambra, Azusa, Monterey Park, Sierra Madre |
| Southeast Water Coalition Joint Powers Authority | Cerritos, Commerce, Downey, Huntington Park, Lakewood, Norwalk, Paramount, Pico Rivera, Santa Fe Springs, South Gate, Vernon, Whittier |
| Three Valleys MWD* | Azusa, Charter Oak, Claremont, Covina, Covina Knolls, Diamond Bar, Glendora, Industry, La Verne, Pomona, Rowland Heights, San Dimas, South San Jose Hills, Walnut, West Covina |
| Upper San Gabriel Valley MWD* | Avocado Heights, Arcadia, Baldwin Park, Bradbury, Citrus, Covina, Duarte, El Monte, Glendora, Hacienda Heights, Industry, Irwindale, La Puente, Mayflower Village, Monrovia, Rosemead, San Gabriel, South El Monte, South Pasadena, South San Gabriel, Temple City, Valinda, West Covina, West Puente Valley |
| Water Replenishment District of Southern California | Artesia, Bell, Bellflower, Bell Gardens, Carson, Cerritos, City of Commerce, Compton, Cudahy, Downey, El Segundo, Gardena, Hawaiian Gardens, Hawthorne, Hermosa Beach, Huntington Park, Inglewood, La Habra Heights, La Mirada, Lakewood, Lawndale, Lomita, Long Beach, Los Angeles, Lynwood, Manhattan Beach, Maywood, Montebello, Monterey Park, Norwalk, Palos Verdes Estates, Paramount, Pico Rivera, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, Santa Fe Springs, Signal Hill, South Gate, Torrance, Vernon, Whittier |
| West Basin MWD* | Alondra Park, Carson, Culver City, El Segundo, Gardena, Hawthorne, Hermosa Beach, Inglewood, Ladera Heights, Lawndale, Lennox, Lomita, Malibu, Manhattan Beach, Marina Del Rey, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, Ross- Sexton, Topanga Canyon, Torrance, West Athens, West Hollywood |

** Also served by the Metropolitan Water District of Southern California*
*Sources: Metropolitan Water District of Southern California, San Gabriel Valley MWD, San Gabriel Basin Water Quality Authority, Southeast Water Coalition, and Water Replenishment District of Southern California*

## Program Website and Project Database

The GLAC Region maintains a website at www.lawaterplan.org to facilitate the accessibility of IRWMP information to stakeholders. The website provides overall program information and all public documents produced by the Region including the Plan and Plan Update, reports and Technical Memoranda (TM), grant applications, DWR notifications, and meeting agendas and minutes.

The newly developed GLAC IRWM project database has a web access user interface that is linked to the GLAC website as a means to provide a more dynamic and interactive interface for posting current and temporal information regarding upcoming meetings, announcements and is the main tool used for documenting and viewing both conceptual and IRWM projects and information. Figure 1-6 shows the project database user interface.

The project database is accessible at all times to anyone that registers with a name and password as a user. The project database has a straightforward and easy web-based user interface and allows users to:

- View LC and SC meeting agendas and minutes
- See recent announcements including links to documents available for review
- Upload and modify project information for review by SCs
- View maps with locations of current conceptual and approved IRWM projects
- View conceptual and approved IRWM Project lists and details

The SCs are the main bodies responsible for the outreach necessary to implement the project development and review process described in Chapter 6. The Chairs and administrators of each SC serve as the primary contacts for project proponents to receive information and provide support for project uploading and during project review. This often requires individual user emails or phone calls to facilitate successful participation by those with or without computer access.

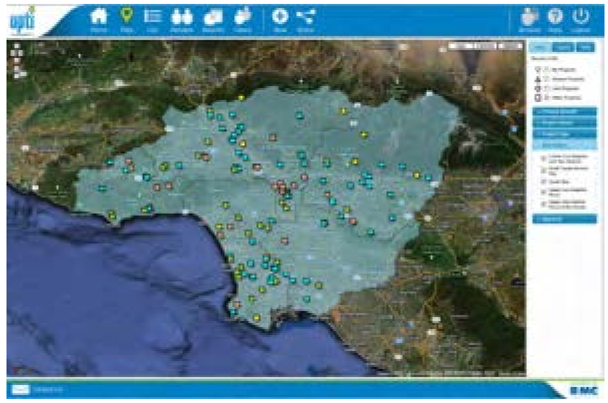


*Figure 1-6: Project database: The GLAC project database provides stakeholders through the Region equal and immediate access to project and program information including the results of the project review process and integration opportunities.*

## Disadvantaged Community Outreach

The 2006 IRWM Plan focused efforts to identify and encourage participation from members of disadvantaged communities (DAC)s and other stakeholders. That effort mapped DACs in each Subregion and generated meetings, individual phone conversations, and presentations with local community coalitions connected to DAC representative groups (such as the Environmental Justice Coalition for Water, the Los Angeles Working Group on the Environment, and the Los Angeles Department of Neighborhood Empowerment).

In 2008, the Region prepared an interim DAC Outreach Plan that identified a basic (Subregion-focused) process for conducting DAC outreach. At the direction of the LC and with direct input by the five subregional steering committees, a DAC Subcommittee was formed to oversee and review the creation of the DAC Outreach Plan. Outreach was defined as a meaningful exchange between project initiators, project implementers and members of DAC. The DAC Subcommittee recommended approval of the interim Outreach Plan recognizing that a significant information gap remained about the needs of DAC relative to the IRWMP. As the Outreach Plan was being implemented, it became clear that given the geographic size and large population within each Subregion and the Region as a whole, identifying representatives that could speak to the issues faced by members of DAC relative to water management was incredibly challenging.

The DAC Subcommittee facilitated and supported several efforts to help meet these challenges. These efforts are described below.

### DAC Coordinator

The GLAC IRWM DAC Coordinator position was developed in order to ensure that outreach to disadvantaged communities was given priority status by the GLAC Region. These efforts have included the creation and coordination of an outreach process that produces authentic engagement of the disadvantaged communities in the water resources planning efforts by the region. The DAC Coordinator is charged with creating increased access to the resources and funding available for multi-benefit projects that help improve the quality of life for the residents in the Region's disadvantaged communities. The Coordinator also helps engage members of disadvantaged communities to provide input into the project development process to produce sound IRWM projects that meet priority needs in their communities.

An important role for the GLAC Region DAC Coordinator is to serve as a liaison between public agencies participating in the IRWM activities (e.g. on the Steering Committees and Leadership Committee), not-for-profit organizations and the residents of disadvantaged communities. The DAC Coordinator also works closely with project proponents to assist with project development so that residents of the disadvantaged communities can be beneficiaries of the IRWM funding especially designated for these communities. The DAC Coordinator gathers and analyzes information that is put forth by DWR to ensure that the agency's guidelines are adhered to with regard to disadvantaged communities.

The DAC Coordinator also monitors and collaborates on efforts between the various stakeholders throughout the GLAC Region who conduct outreach in disadvantaged communities. The DAC Coordinator has also participated in outreach efforts conducted by the Council for Watershed Health, as well as Alcanza outreach efforts, as described further below.

In order to promote stakeholder participation, the DAC Coordinator also coordinates monthly meetings with stakeholders regarding disadvantaged community issues in the GLAC Region. These stakeholders include a variety of community and non-profit organizations, and public agencies that participate in IRWMP activities.

The DAC Coordinator also collaborates with contractors and consultants to ensure consistency in the various planning efforts and to ensure that the regional objectives are met. This is accomplished through the coordination of site visits with project proponents to ensure that benefits to disadvantaged communities are delivered in each of the Region's projects identified as having a potential to benefit DACs.

The GLAC IRWMP recognizes that as the IRWM Region with the largest population, it would be helpful to develop policy proposals to ensure that the urban disadvantaged communities in the GLAC Region are better served. The DAC Coordinator and Subcommittee are working with the LC to identify policy changes that would be beneficial for the Region. This effort ensures that the GLAC Region places a priority emphasis on participation by, and delivering benefits to, DACs.

### DAC Outreach Evaluation Program

It was the GLAC Region's understanding that in order to conduct effective outreach to DACs and receive meaningful input for the IRWM process, a more robust and rigorous outreach process should be developed and tested. As a result, the GLAC Region applied for and received specialized funding from the Army Corps of Engineers Technical Assistance to the States Program and DWR to develop a draft outreach process and to implement the process as a pilot program that could then be used to revise the engagement process based on lessons learned. Funding of the GLAC DAC Outreach Evaluation Program (Outreach Program) also allowed for implementation of this revised process in five other pilot DAC areas. The results of this project will be fully described in a report titled "Disadvantaged Community Outreach Evaluation Study Report" which will be finalized in late 2013 (Council for Watershed Health, 2013).

The Outreach Program, implemented by the Council for Watershed Health, sought to understand what types of changes should be made in traditional methods of outreach to produce more effective engagement with members of DACs. Beyond performing outreach and technical assistance to develop project concepts, the Outreach Program sought to develop a more robust technique for identifying the challenges faced by DACs in the Region, and to produce a framework for facilitating engagement with existing community networks.

Because California statutes describe DACs with a single-indicator (median household income), and because median household income is data reported by the US Census, DACs are traditionally identified using US Census unit boundaries. However, these boundaries often fail to properly encompass communities in the dense urban spaces of the GLAC IRWM Region. To overcome this challenge, researchers and local experts sought to better describe DAC boundaries throughout the GLAC Region. This effort included desktop mapping to identify distinct clusters of DAC census units and field visits and conversations with members of the communities in question to verify and define DAC regions based on community members' sense of affiliations. Properly understanding the extent of each community, from the perspective of the community members, is a critical first step for engaging with that community.

After the community boundaries were identified, the Outreach Program team hired firms or individuals with experience performing outreach and engaging with particular communities. Using this type of expertise is critical in identifying with whom and where in the community the engagement process should focus. These local experts were also able to customize engagement approaches to the community where they worked, providing the program a wide variety of outreach techniques from which to draw conclusions and develop ideas for future efforts in the Region.

Lastly, a broad and open-ended engagement effort was pursued. By expressing IRWM in general terms, the community was free to describe their most significant needs without feeling constrained, or overwhelmed, with the complexity of the water management system. The Outreach Program team then worked to link the needs expressed by the community with appropriate IRWM capacity, and engaged proper technical or administrative resources to develop project concepts and identify project proponents

Five communities were selected by the Outreach Program team, in consultation with the DAC Coordinator and DAC Subcommittee, in which to perform and analyze outreach efforts:

- City of Maywood
- Northeast Gardena/North Harbor Gateway
- Northern North Hollywood
- Portions of El Monte and South El Monte
- Eastside neighborhood of Central Long Beach

Using technical consultants supported by DWR and the US Army Corps of Engineers Technical Assistance to the States funding, five project concepts, situated in the outreach communities, were produced, four of which were identified for consideration during the Region's November 2012 Proposition 84 Round 2 Implementation Grant Application project selection process.

The conclusion of the Outreach Program includes three engagement models, described for use to improve the interaction of IRWM efforts and members of DAC:

**1 – Notification:** This model is the most commonly practiced. In this model, an agency or institution has a project that is funded and moving forward. The community is notified of the project, and comments are sought.

**2 – Outreach Engagement:** This model represents the activity of the DAC Coordinator, the Outreach Evaluation Study, and the Alcanza project (below). In this model, the institutions or agencies use outreach or engagement specialists to work with communities to identify projects that are needed. The institutions and agencies initiate this activity, and use their capacity to solve problems or pursue project that result.

**3 – Community-led Engagement:** This model represents when a non-technical "grass-roots" effort approaches institutions or agencies for help with a problem or a project concept. In this case, members of a DAC initiate the engagement. This model is not common in the GLAC Region. Under this model, institutions and agencies are encouraged to become more accessible to community members, for instance by appointing and publicizing dedicated staff contacts, providing guidance materials, implementing a social media or online presence, or conducting listening sessions.

These efforts identified priority DAC needs in these pilot communities such as additional local parks and open space, urban greening for stormwater management and climate change adaptation, flood risk management, and replacement of aging water infrastructure.

No one of these engagement models is necessarily superior to the others, and in many cases some combination will likely result from engagement activities. For the GLAC-IRWM Region, with a large and dense population it is vital that agencies and institutions consider how to engage DACs with techniques described in each of these models.

A final Report regarding this project is expected to be completed in late 2013, and will be available on the GLAC Region's website (www.lawaterplan.org).

Outreach efforts will continue in the disadvantaged communities to support and build on the projects and programs that have been developed through these aforementioned efforts. The extensive work that has been completed in planning is the first step to prepare the disadvantaged communities in the GLAC Region to compete for future IRWMP funding to address their water supply, water quality and habitat and open space needs.

### Alcanza Outreach Project

There are over 60 identified DACs within the Region. One goal of the DAC Subcommittee is to improve the potential for DACs to receive implementation funding for their projects. As the Chair of the DAC Subcommittee, the Rivers and Mountains Conservancy has been working with community organizations to improve that potential through increased involvement and support. In 2011, the Rivers and Mountains Conservancy authorized grant for the Alcanza Project. The Alcanza Project is focused on enhancing the ability for DACs to develop and submit projects into the IRWM Program. The communities of Compton and Lynwood were selected as two DACs with significant and critical water needs that could benefit from the Alcanza Project.

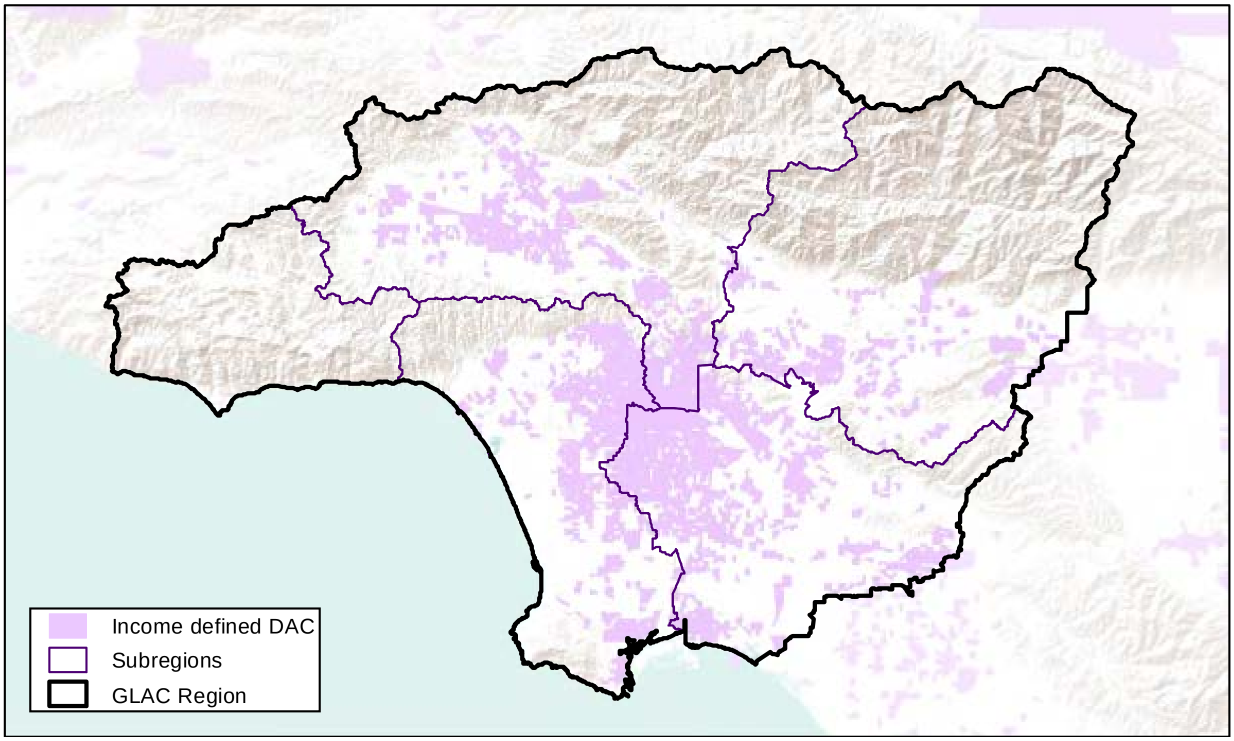
Local community groups within Compton and Lynwood were identified and partnerships formed between those with project ideas and those that could provide technical support to develop project concepts. The Alcanza Project generated two project concepts that have been further developed and introduced into the IRWM process. Aside from the IRWM projects developed, the Alcanza Project improved the knowledge and education for community members participating in this process. Alcanza found that these community members retained the principles of water education obtained and were highly satisfied with the planning process. The results of this outreach process will lay out recommendations for future engagement of disadvantaged communities in the IRWM planning process, particularly in these kinds of urban communities within the GLAC Region.

Beyond these specific disadvantaged community outreach and involvement efforts, many entities that represent or provide benefits to disadvantaged communities attend and participate in the LC, DAC Subcommittee and SC meetings. This attendance is encouraged through regular emails from the IRWM Program Administrator (LACFCD), the DAC Coordinator and SC Chairs announcing meetings and other IRWM announcements to their distribution lists. These distribution lists are reviewed by the SCs to look for participation gaps based upon an ever increasing understanding of both DAC and other potential stakeholders in the GLAC Region. Action items to address those gaps may be identified and assigned as appropriate to SC members or other meeting stakeholders.

DAC areas within each GLAC Subregions are identified in the maps provided as part of Chapter 2 of this Plan update. Map 1-3 provides the DACs throughout the region.

## Tribal Outreach

A specialized task was conducted as part of the Plan Update to determine tribal stakeholders and interests in the Region and then conduct outreach




*Map 1-3: Disadvantaged communities in the GLAC region.*

to these interests in an effort to encourage participation in ongoing IRWM activities including the Plan Update.

The GLAC Region contacted the Native American Heritage Commission (NAHC) to determine if the Region was home to any federally-recognized tribes or tribal interests. The response from the NAHC indicated that the Region is not home to any current tribes or tribal lands but provided the contact name and information of several individuals listed as having tribal interests that reside within the GLAC Region. A letter was sent by the LC to each of the individuals on the listing to explain the IRWM Plan Update process, provide contact and Website information and encourage participation.

## Local Planning Outreach

The stakeholder process allows for interactive feedback to occur between local planning and regional IRWMP planning. Local planning is conducted by counties, cities, and local agencies and districts.

Many of the water agencies, and most of the cities in the Region have participated in the IRWMP process. Through the stakeholder workshops, the water agencies, cities, COGs and municipal agencies have had the opportunity to participate and advocate for their respective local planning needs and issues, which in many cases have been incorporated into the IRWMP.

Subsequently, the outcomes from the IRWM planning process have been disseminated by the representatives back to their local governments and planning agencies, allowing the IRWM priorities and plans to be considered in local planning where appropriate. In addition, water agencies can factor IRWM programs and priorities into their individual plans. As future updates of the IRWM occur, local entities that use that update to further refine or adapt these local plans.

## Outreach to other IRWM Regions

The GLAC Region is part of DWR's IRWM Los Angeles Funding Area. Other Los Angeles Funding Area Regions include Watershed Coalition of Ventura County, Upper Santa Clara River and Los Angeles Gateway Water Management Authority. Although not in the same Funding Area as the GLAC Region, the Santa Ana Watershed Project Authority and Antelope Valley regions are adjacent

## LOCAL PLANNING


*Figure 1-7. Pacoima Spreading Grounds, Tujunga Watershed. Local planning efforts like the Tujunga Watershed Project illustrates the importance of local planning in meeting regional IRWMP goals.*

to GLAC. Outreach and communication takes place between the GLAC and these overlapping and adjacent IRWM regions through shared stakeholders and planning and project interests. This outreach and communication is generally conducted through the appropriate Subregional SC or LC.

**Watersheds Coalition of Ventura County Region (WCVC).** A portion of GLAC's North SM Bay Subregion is within Ventura County. Therefore, WCVC representatives are on North SM Bay and LC distribution lists and have attended North SM Bay SC meetings to share project information, look for intra-regional integration opportunities and learn about the GLAC Plan Update. North SM Bay Committee members are also on the VC Region distribution lists and have attended meetings.

**Santa Ana Watershed Project Authority Region (SAWPA).** A portion of the SAWPA Region overlaps GLAC's Lower SG & LA Subregion. Overlapping stakeholders are on the Lower SG & LA and LC distribution list and are encouraged to and have attended meetings.

**Los Angeles Gateway Region IRWMP JPA (Gateway Region).** The GLAC IRWM Region boundary wholly contains the Gateway Region. During the IRWM Program Regional Acceptance Process (RAP), no changes to the GLAC IRWM

*Torrance Detention Basin. Enhancement of detention basins in the Dominguez Channel watershed could improve water quality, create habitat, and provide passive recreation opportunities.*

*Compton Creek. Restoration of the natural bottom section of Compton Creek could improve water quality, facilitate recharge, and restore habitat.*

Region boundaries were suggested by DWR. Given the physical connection between the Gateway and the GLAC regions, DWR maintains that in order to effectively plan and address regional concerns, such as stormwater management, wastewater treatment and recycling, and aging infrastructure, cooperation between the GLAC and Gateway regions is imperative. In keeping with DWR's directive, the GLAC Region is fostering collaboration with Gateway Region. GLAC includes Gateway in correspondence to stakeholders and attends Gateway meetings to provide updates on GLAC activities and areas of focus.

**Antelope Valley (AV) and Upper Santa Clara River (USCR) Regions.** These regions are both within Los Angeles County, however, there is no overlapping area with the GLAC region. Both the AV and USCR regions are adjacent to the north of the GLAC's Upper LA and Upper SG & RH Subregions. All three of these regions share the County of Los Angeles as a major stakeholder and member of their respective RWMGs. Therefore collaboration is facilitated through LA County's consistent participation.

Chapter 2 Regional Description provides both maps and other information regarding synergies between GLAC and its neighboring regions.

## 1.6 2006 Plan Development

In response to the release of DWR's 2004 IRWM Grant Program Guidelines, six regional groups within Los Angeles County submitted grant applications (in May 2005) to support development of an IRWMP, including the Santa Monica Bay Restoration Commission, the City of Los Angeles, the Watershed Conservation Authority, the Upper San Gabriel Municipal Water District, the West Basin MWD, and the City of Downey. Although DWR initially recommended funding only one application, DWR ultimately expanded the funding pool and proposed a single planning grant of $1.5 million, on the condition that the six original applicants prepare a single plan for the Region.

In December 2005, the six regional groups consolidated efforts and developed a single plan. This Plan was adopted by the Region in December 2006 and served as the basis for the Region's successful Prop 50 and Prop 84, Round 1 implementation grant applications which awarded the GLAC Region two grants totaling $50.6 Million for IRWM project implementation.

## 1.7 2013 Plan Update Process

As mentioned above, in July 2012, the GLAC Region received a DWR Proposition 84 (Prop 84) Round 1 Planning Grant to update the 2006 Plan. In accordance with Section 6066 of the government Code, a public notice of intent to update the Plan was published in May 2013 (Appendix C).

This resulting 2013 GLAC IRWM Plan Update was prepared in keeping with requirements of DWR's Planning Grant Award and November 2012 IRWM Prop 84 and 1E Program Guidelines. This 2013 Plan Update documents the current IRWM Program and processes that have evolved over the past six years since the initial 2006 Plan was developed.

The specific activities necessary to update the 2006 Plan began in August 2012 and were completed in July 2013. The plan update process used the existing IRWM Program governance, outreach and coordination standards and practices described in this Chapter 1 to generate the stakeholder input and review necessary to meet DWR and GLAC Region IRWM Plan Update requirements.

Since the Plan update required input on many topics with varying stakeholders, several individual draft Water Management Target Technical Memoranda (TMs) and Subregional Plans were produced in advance of drafting Plan updates. These documents were developed from initial input provided during workshop style discussions held during special ad-hoc committee meetings, as well as during regularly scheduled Subregional SC and LC Subcommittee meetings and then distributed for review as shown in Figure 1-8. The majority of comments received were able to be addressed at the subregional level, however any conflicting comments or more regional issues were resolved during LC meetings.

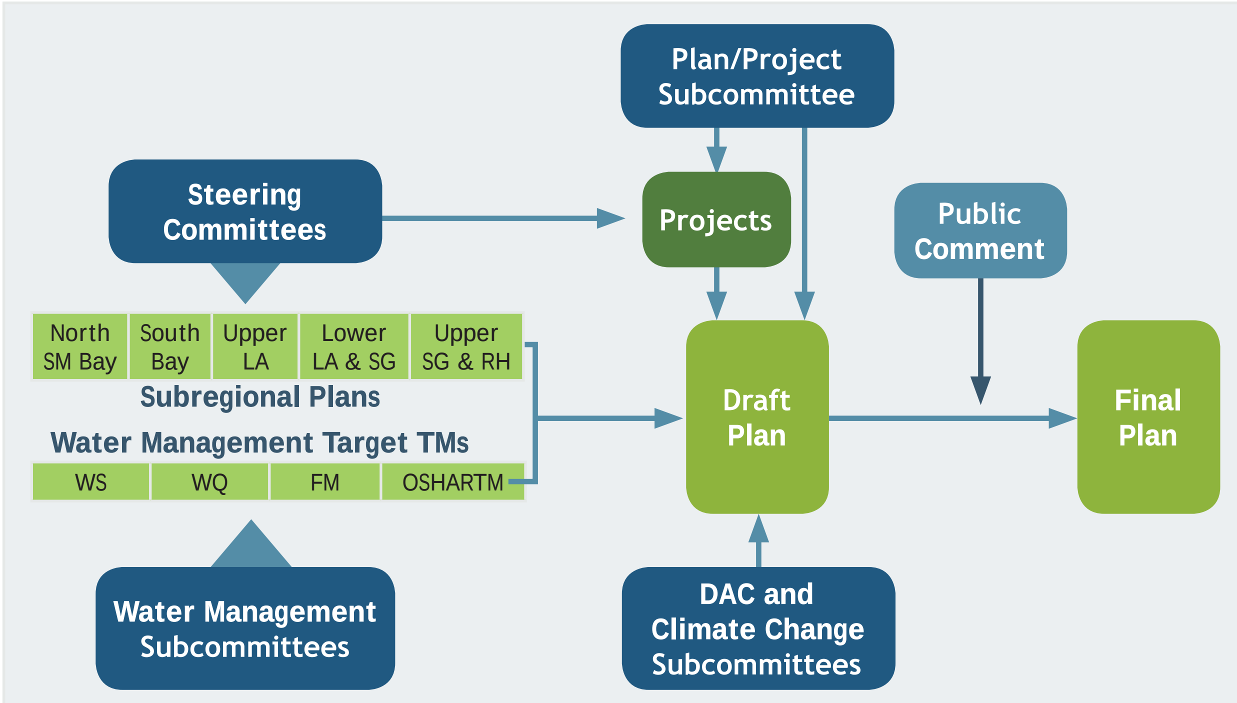



*Figure 1-8: 2013 Plan Update Deliverables and Development Process*

## Water Management Target TMs

Objectives and targets were identified as one of the main updates to be completed for the 2013 Plan. The Region wanted to improve upon the existing regional targets by creating subregional targets, where possible, for some planning objectives areas that could then be combined to reflect the regional objectives. In order to provide some consistency between Subregions on the style, format and method for generating targets, ad hoc subcommittees of the LC were formed in order to determine methods and format that could be used by SCs to develop numeric targets and then to review and approve the resulting regional "rolled up" objectives and targets. These subcommittees included representatives from the Subregions with the particular expertise needed. The result of these subcommittee efforts were the following TMs:

- Water Supply Targets (Appendix E)
- Water Quality Targets (Appendix F)
- Flood Management Targets (Appendix G)
- Open Space, Habitat and Recreation (Appendix H)

The objectives and targets developed for these TMs were based upon the data and information found in recent and/or relevant local and regional existing planning documents. These documents (cited in the TMs) were used to benefit and build upon previous work done within the Region as well as to enhance consistency in regional planning efforts.

Participants in these subcommittees provided the input to assure that the IRWM objectives are congruent with local planning and that the Plan includes current, relevant elements of local water planning and water management strategies and issues common to multiple local entities in the Region. These topics included groundwater management, urban water management, water supply assessments and other resource management planning such as flood protection and watershed management. Because of the size and complexity of the GLAC Region, modifications to objectives based on changing urban water management plans and other local and regional plans must be handled through updates to the IRWM Plan. On the other hand, the IRWM Plan will be fed back to local planning efforts through wide spread dissemination of the Plan and by the requirement that the Plan be adopted by agencies proposing projects included in a grant application. If inconsistencies between local and regional plans are identified in the future, the LC will work with agencies to identify the differences and address them in a future Plan Update.

These TMs also were reviewed by subregional stakeholders to prepare the targets included in each of the Subregional Plans described below. The actual revised objectives and the process used to update them are described in greater detail in Chapter 3.

It is important to note that, with the encouragement of members of the LC, significant progress was made on integrating stormwater quality management and water supply strategies with land use planning in the adoption of the November 2012 Municipal Separate Storm Sewer System (MS4) Permit by the LA Regional Water Quality Control Board (RWQCB). For the first time, incentives were included in the permit to encourage the development of "enhanced" watershed management plans which, in turn, encourage projects with multiple benefits to be developed by municipalities within a watershed. It should be further noted that municipal stormwater managers and water managers work closely with their planning departments in the review of development proposals.

The Region determined that a much more robust planning effort was needed to develop similar objectives and targets for open space, habitat and recreational goals. The resulting Open Space, Habitat and Recreation TM (OSHARTM) was developed to define open space, habitat and recreation needs within the Region that could be met through the implementation of integrated water management planning and projects. This TM was developed under the direction of the Habitat and Open Space (HOSP) Subcommittee and reviewed by subregional stakeholders. The HOSP Subcommittee began meeting in September of 2011 to discuss an approach to target setting for habitat and open space in the Region. Meetings continued through December 2011 when the Subcommittee finalized targets. A report was drafted in April 2012 and the Subcommittee provided comments on two drafts through June 2012. The report was then presented to Subregions and presentations were given to each Subregion in August 2012. The LC gave direction for the final TM in November 2012, and further revisions were made in response to comments in early 2013.

For this Plan Update effort, the OSHARTM represents a significant compilation of knowledge and expertise from both land use and water resource managers. And while regional open space and habitat targets were developed through this process, full vetting by the Subregions was not possible and further development of targets at the local level is necessary to reflect local land use policies and General Plans. Therefore, subregional targets are not included in the subregional appendices to this Plan. Because the IRWMP process is on-going there will be future opportunities to build upon these efforts. More dialogue between municipal land use planners, councils of governments and outdoor resource planners will be needed in the refinement of targets and objectives at the local level in the next Plan Update.

The OSHARTM and the resulting objectives are described in greater detail in Chapter 3 and the TM is provided as Appendix H.

## Subregional Plans

Given the unique and varied nature of each of the Region's five Subregions, the GLAC Region developed five Subregional Plans to better detail the Regional Description (Chapter 2); identify subregional needs, objectives and targets (Chapter 3); identify management strategies and integration opportunities (Chapters 4 and 5) as well as to facilitate stakeholder input on these topics.

The five draft Subregional Plans were developed from input received from stakeholders at regularly scheduled Subregional Steering Committee meetings held from 2011 through 2012. They were reviewed by SC members and stakeholders and the finalized Subregional Plans are provided as Appendices I-M to this Plan Update.

As Figure 1-8 shows, LC Subcommittees also provided input on the climate change analysis presented in Chapters 2, 3 and 4 as well as the project review process developed, implemented and described in Chapter 5.

## Draft and Final Plan Update

Chapters of the Draft 2013 Plan Update were drafted and reviewed by the Projects & Plan Update Subcommittee. A Revised Draft Plan

Update was then prepared and noticed for a 45-day public review. The Projects & Plan Update Subcommittee considered and responded to all comments received, and made edits as appropriate. The LC then reviewed the subcommittee's edits before taking the document to their governing body for approval. The Final Plan will be adopted at the publically noticed February 2014 Regional Water Management Group LC meeting. The Regional Water Management Group will also adopt the Plan before submittal to DWR on or before February 2014.

## 1.8 Future Plan Updates or Amendments

The Region has and will continue to evolve as a result of new regulatory requirements and planning needs as well as progress on achieving Plan objectives and targets through successful project implementation. Therefore, the GLAC Region is taking an adaptive management approach to ensuring that the IRWM Plan is a dynamic and relevant document.

There are, however, on-going IRWM processes that are described in this Plan Update that could result in constant changes - such as new and modified Plan projects and prioritization and progress on Plan performance and meeting objectives and targets. Because of the dynamic nature of these IRWM processes, this Plan Update documents the process used to allow for these changes. These project development and review processes and information on how to access current project listings and prioritizations are detailed in Chapter 5. The GLAC IRWM process for documenting plan performance and data management are included as part of Chapter 7. As part of the normal plan management activities, the benefits and impacts will be reviewed with each IRWM Plan Update.

Given the amount of resources and time necessary for full Plan updates (such as this 2013 Update) future updates will be dependent upon the need to meet changing DWR requirements and the funding available but will occur no less frequent than every five years.

## 1.9 Technical Analysis

An extensive list of existing plans, studies, and other documents and information sources were reviewed to prepare the TMs and the Plan Update. These documents and data sources were compiled from the Region's stakeholders and vetted during the review of the Plan Update documents.

Table 1-3 on the following page provides a summary of the documents and data sources used, their method of analysis, the results derived and how they were used in the Plan Update.

These documents, along with input from the stakeholder workshops, provide a basis for the mission, objectives, and planning targets articulated in this Plan. The documents also inform the Region's short-term and long-term priorities and the water management strategies that are relevant.

In general, the discussion of water supply relies upon water supply and demand information from recently completed 2010 Urban Water Management Plans (UWMPs) from water agencies in the Region and any affiliated Groundwater Management Plans (GWMP), Recycled Water Master Plans (RWMP), and Integrated Resources Plans (IRP) including the 2010 MWD IRP. The regional description and discussion of water quality issues is derived from local watershed plans/databases and existing and proposed total maximum daily load (TMDL) requirements. Flood management information was collected from Federal Emergency Management Agency (FEMA) sources as well as LACFCD regarding both recent flood and sedimentation information and studies.

## 1.10 Plan Update Outcomes

A number of outcomes resulted from stakeholder involvement during the 2013 Plan Update process. These efforts built upon the foundation developed and described in the 2006 Plan to accomplish the following:

- Improve outreach to DAC and other stakeholders
- Refine objectives and targets reflecting existing regional and subregional planning
- Increase subregional detail and focus

- Increase understanding of habitat, recreation and open space needs and opportunities
- Develop new tools to determine water quality and open space benefits and support integration
- Improve project database, user interface and review process
- Create a comprehensive assessment of potential climate change impacts, vulnerabilities and strategies

## Improved Outreach

As described in the Stakeholder Outreach Section 1.5, the Region engaged in the development of the DAC Outreach Evaluation Program which developed and tested methodologies to increase DAC outreach, engage and receive input from DACs on water issues and needs, and facilitate DAC project development. Ongoing review of participation and distribution list gaps by Subregions as well as the creation of the Region's web-interface project database further contributed to the ability to outreach to DAC and other stakeholders.

## Refined Objectives and Targets

The 2006 Plan objectives were developed to provide overarching targets that related to other regional planning assumptions. As part of the 2013 Plan Update, the GLAC Region determined that further refining of both objectives and targets were necessary to achieve better consistency with local planning efforts and strike a balance between those that could be easily achievable and those that inspire the Region to do more.

A grass-roots process was implemented to create subregional targets that would roll up into overall regional targets. The quantitative subregional targets that were developed allowed local stakeholders to better participate in the process through vetting them against current planning efforts by both water and land use management agencies and groups.

The process resulted in quantified targets for each Subregion that provided the basis for being able to measure progress toward the objectives developed for the region. These objectives and targets are further detailed in Chapter 3.

## Increased Subregional Detail and Focus

The idea to develop individual stand-alone Subregional Plans was born from requests made by stakeholders to have a document that could clearly articulate the area in which they function as it relates to the needs and opportunities available for further planning and project implementation efforts. The Subregional Plans form the basis for the overall regional description provided as Chapter 2, but also are available in their entirety as appendices to this Plan Update (Appendices I-M).

## Increased Understanding of Habitat, Recreation and Open Space

In developing the objectives and targets for the 2006 Plan, it was clear that the level of information available to assess Region's needs for additional open space, habitat and recreation opportunities was limited relative to other management areas like water supply and quality. Stakeholders with interests in enhancing, protecting and creating open space, habitat and recreation opportunities saw a need for in-depth analysis in order to develop a plan that could correlate these needs with the other water management strategies to identify opportunities for truly integrated projects.

As part of the 2013 Plan Update, the Region developed the OSHARTM. The analysis and findings of this TM have been incorporated into the 2013 Plan Update by enhancing the regional description in Chapter 2, providing refined regional habitat and recreation objectives and targets in Chapter 3, contributing management strategies in Chapter 4 and providing tools for project development and integration as described in Chapters 5 and 6.

## New Needs, Benefits, and Integration Tools

As part of developing the Subregional Plans, Objective and Target TMs and the OSHARTM, new tools were created to facilitate the analysis.

For the water quality objective and target development, a tool that can facilitate prioritization of local catchments based upon the number and severity of impaired water bodies downstream was developed for each Subregion from existing data sources. A companion tool was also created

Table 1-3: Technical Analysis

| Data or Study | Analysis Method | Results/Derived Information | Use in IRWM Plan | Reference or Source |
|---|---|---|---|---|
| Population Projections | • Extracted 2010 populations using 2010 Census block group data<br>• Projected population increase using SCAG population projected increases for Los Angeles County. | • Presented 2010 population<br>• Projected 2035 population | • Used to describe Regional characteristics, estimate park needs | • Census Bureau, 2010. US Census 2010 statistics.<br>• Southern California Association of Governments, 2008. Adopted 2008 RTP Growth Forecast, by City. |
| Water Supply Targets TM | • Reviewed local water resource plan- ning documents to obtain 2010 and 2035 local water supply projections<br>• Conducted Water Supply Subcommittee meetings to review results of water resource planning document analysis, and to determine methodology to be used to create targets<br>• Calculated difference between 2035 and 2010 supplies to determine water supply targets | • Established 2010 water supplies and calculated 2035 projected supplies<br>• Developed targets for improvement of local supplies including ground- water, recycled water, stormwater, desalinated ocean water, conservation, and imported water | • Used to describe current water supplies and to identify targets for increases in local supplies. | • 2010 Urban Water Management Plans (various)<br>• Main San Gabriel Basin Watermaster, 2010. Annual Reports<br>• Raymond Basin Management Board, 2010. Annual Report.<br>• Upper Los Angeles Area Watermaster, 2010. Annual Report.<br>• Water Replenishment District, 2012. Groundwater Basins Master Plan.<br>• Pasadena Water and Power Recycled Water Master Plan.<br>• LADWP Recycled Water Master Plan. |
| Stormwater Quality Targets TM | • Used the Structural BMP Prioritization and Analysis Tool (SBPAT) to prioritize catchments based on: Approved TMDLs,<br>• 303(d) listings, and Areas of Special<br>• Biological Significance (ASBS)<br>• Conducted Water Quality Subcommittee meetings to review results of SBPAT analysis, and determine method to be used in creating stormwater quality targets<br>• Stormwater quality targets calculated based on catchment area, assuming capture of 0.75-inch storm | • Established high, medium and low priority watershed catchments for water quality improvement needs | • Used to identify catch- ments of higher priority for improving surface water quality, and to quantify the acre-feet of avail- able capture capacity neces- sary to treat low, medium and high priority catchment runoff | • Geosyntec Consultants, 2008. A User's Guide for the Structural BMP Prioritization and Analysis Tool (SBPAT v1.0).<br>• Los Angeles Regional Water Quality Control Board (LARWQCB), 2002. Municipal Stormwater Q&A.<br>• State Water Resources Control Board (SWRCB), 2010. 2010 Integrated Report (Clean Water Act Section 303(3 List / 305(b) Report) - Statewide. |

Table 1-3: Technical Analysis

| Data or Study | Analysis Method | Results/Derived Information | Use in IRWM Plan | Reference or Source |
|---|---|---|---|---|
| Flood Management Targets TM | • Conducted GIS analysis to overlay FEMA Special Flood Hazard Areas with parcels to determine area at risk of flooding<br>• Calculated historical sediment accumulation at reservoirs and debris basins to estimate 20 year sediment removal requirements | • Calculated area (in acres) of parcels lying within the 100-year flood zone<br>• Developed volume of sediment that will accumulate at reservoirs and debris basins over 20 years | • Used to identify flood manage- ment targets | • Los Angeles County Flood Control District, 2012. Coastal Regional Sediment Management Plan – Los Angeles County. Draft Version.<br>• Los Angeles County Flood Control District, 2012. Los Angeles County Sediment Management Strategic Plan 2012-2032.<br>• U.S. Army Corps of Engineers, 2012. Planning Guidance Notebook.<br>• Los Angeles County and Southern California Association of Governments, 2006. GIS shapefile of land use. |
| **Open Space, Habitat and Recreation TM** | • GIS analysis conducted to assess:<br>  • Existing versus historical aquatic habitat area<br>  • Buffer areas that provide connection between aquatic habitat and upland habitat<br>  • Open space area available for passive and active recreation<br>• Subcommittee meetings conducted to review results of GIS analysis and determine methodology for creating targets<br>• Applied percentage to calculate area targets for restoration, enhancement and preservation<br>• Determined standards for recreational area per capita based on State and County recreation standards<br>• Calculated recreational open space area per capita using population projections | • Established need for open space areas in support of water resources issues<br>• Developed maps and area of existing versus historic aquatic habitat<br>• Developed maps of existing open space areas for recreation and areas that do not meet minimum standards for open space area per capita<br>• Developed targets for restoration, enhancement and preservation of aquatic habitat<br>• Developed targets for passive and active recreation | • Used to define existing aquatic habitat area, and existing parks and recreation areas<br>• Used to define objectives and targets for aquatic habitat preservation, enhancement and restoration<br>• Used to define objectives and targets to increase open space for passive and active recreation | • Rairdan, C. 1998. Regional restoration goals for wetland resources in the Greater Los Angeles Drainage Area: A landscape-level comparison of recent historic and current conditions using Geographical Information Systems. Dissertation. University of California, Los Angeles.NWI<br>• Center for Watershed Protection, 2005. Wetlands and Watersheds: Adapting Watershed Tools to Protect Wetlands Bond.<br>• California Protected Area Database (CPAD) USFWS, 2012. Endangered and Threatened Species for Los Angeles County.<br>• USFWS, 2011. Critical Habitat for the County of Los<br>• Angeles.<br>• Los Angeles County Department of Regional Planning, 2011. Los Angeles County General Plan 2035. Public Review Draft. Los Angeles, CA: LA County DRP.<br>• Greeninfo Network, 2012. Parks and recreation sites shapefiles.<br>• Stein, E., S. et al. 2010. Historical Ecology as a Tool for Assessing Landscape Change and Informing Wetland Restoration Priorities.<br>• Dark, Shawna, et al. "Historical Ecology of the Ballona Creek Watershed." Southern California Coastal Water Research Project Technical Publication.<br>• Lilien, J.P., 2001. Cumulative impacts to riparian habitat in the Malibu Creek watershed. D. Env. Dissertation, University of California, Los Angeles.<br>• State of California Governor's Office of Planning and Research, 2003. State of California General Plan Guidelines. Sacramento, CA: Governor's OPR. |

to assess the potential water quality benefits of projects implemented in these catchments. These tools are further described in the Water Quality Objectives and Targets TM (Appendix F) and Chapter 3.

To further foster the development of integrated projects with regional partners, a geodatabase was created and formatted from existing data sources. Each layer in the GLAC Region's Potential Benefits Geodatabase was formatted to highlight areas where certain water management area benefits could be achieved based upon their geographic conditions. By overlaying these layers and viewing them together the viewer can determine places where the potential for multiple benefits could be achieved if projects were implemented. This tool, and some initial analysis, are further described subregionally within each of the Subregional Plans (Appendices I-M) and in Chapters 6 and 7.

## Improved Project Database and Review Process

The 2006 Plan referred to an initial project listing that was developed from hundreds of proponents uploading projects to a central database. The analysis provided as part of Chapter 5 of the 2006 Plan focused on a discussion of that static list relative to the Region's goals and objectives. For the 2013 Plan Update, the Region chose to focus on creating a more dynamic process for project development and vetting. This process included the development of the project database and website which improved the ability for proponents to upload project information, GLAC Steering Committees to review and vet this information, and interested parties to view and use this information. This process and a link to the current project list is fully described in the greatly updated Chapter 5, which now focuses on process instead of an assessment of the current list.

## Climate Change

The DWR November 2012 Guidelines for IRWM Plans requires that all Plans contain an analysis of potential climate change impacts, vulnerabilities, and both adaptation and mitigation strategies to be used in addressing those vulnerabilities. In response, the GLAC Region created a Climate Change Subcommittee to provide the input necessary to prepare this analysis. The Climate Change Subcommittee met to discuss the information available on both state, regional and local climate change impact analysis; the vulnerabilities associated with those impacts; prioritization of vulnerabilities and both mitigation and adaptation strategies that could be used to address those vulnerabilities.

The full description of the process used as well as the results is provided in Chapter 2. Climate change related objectives were included in Chapter 3 and management strategies in Chapter 4.

# 2. REGIONAL DESCRIPTION

*Los Cerritos Wetland*

**More than 90 percent of coastal wetlands have been eliminated in the Region. The Los Cerritos wetlands is one of the remaning few.**

## 2.1 Introduction

The purpose of this chapter is to discuss why preparation of an IRMWP for this Region is appropriate, describe the physical characteristics of the Region, describe the sources of water and estimate water demand, identify water quality issues, and describe social trends and concerns in the Region.

## 2.2 Overview

### Greater Los Angeles County Region

The GLAC Region, an area of approximately 2,058 square miles, is located in coastal Southern California. The Region contains portions of four counties—Los Angeles, Orange, Ventura, and San Bernardino—and is primarily defined by the coastal watersheds within the area that drain to Santa Monica Bay and San Pedro Bay. Thus, the regional boundary reflects watershed areas, which are defined by topography and include the floodplains, surface water bodies, and impaired water bodies located within those watersheds. The regional boundary is not based on 1) political or jurisdictional boundaries; 2) water, conservation, irrigation, or flood district boundaries; 3) groundwater basins; 4) the boundary of the Los Angeles Regional Water Quality Control Board; 5) major water related infrastructure; 6) population; 7) biological significant units or other biological features (critical habitat areas); or 8) disadvantaged communities with median household income demographics. Although each of those factors is relevant to the development of an integrated plan, they did not form the basis for determining the regional boundary.

The Los Angeles and San Gabriel rivers watersheds drain approximately 1,513 square miles of the Region and discharge to San Pedro Bay. These two watersheds are connected via the Rio Hondo, which transfers flood waters during large storm events from the San Gabriel to the Los Angeles River. Other major watersheds in the Region include Malibu Creek, Topanga Creek, Ballona Creek (which drain to Santa Monica Bay), and the Dominguez Channel (which drains to San Pedro Bay). Dozens of smaller watersheds drain directly to Santa Monica or San Pedro Bays. The boundaries of the GLAC Region reflect the combined area of five Watershed Management Areas (WMA) identified in the Watershed Management Initiative chapter of the Basin Plan for Los Angeles and Ventura Counties, prepared by the Los Angeles Regional Water Quality Control Board. These are the Los Angeles River Watershed, the San Gabriel River Watershed, the Santa Monica Bay WMA, the Los Cerritos Channel/Alamitos Bay WMA, and the Dominguez Channel WMA.

## How the Boundary Facilitates Integrated Water Management

Given the Region's substantial reliance on local surface water supplies (and the groundwater recharge that results) and the extensive range of surface water quality impairments, the aggregation of coastal watersheds to form the GLAC Region is logical and an appropriate scale for integrated water management. These coastal watersheds share many of the same water resource management issues, including substantial dependence on imported water, significant opportunities to further expand water conservation, and substantial utilization of recycled water. Water resource management planning at this scale provides an opportunity to optimize use of local water resources including stormwater runoff, recycled water, and groundwater to reduce dependence on imported water and concurrently enhance water supply reliability. Thus, the selection of a regional boundary based on coastal watershed boundaries facilitates the development of an integrated water supply portfolio that relies on multipurpose projects and programs to address similar water management issues. With so many agencies and jurisdictions responsible for water management in the GLAC Region, the development of an IRWM Plan has not resolved or eliminated every potential conflict in a region of more than 2,000 square miles. However, the development of the IRWM Plan, ongoing meetings to discuss common issues and concerns, identification and integration of multi-purpose projects, and

*Steep mountain slopes and adjacent flatlands create both challenges and opportunities for water resource management .*

collaborative efforts to increase opportunities to fund those projects, has greatly enhanced the willingness of these entities to seek mutually beneficial solutions to problems that historically were a source of conflict.

## Subregional Characteristics

Given the size and complexity of the GLAC Region and the number of stakeholders and agencies that could participate in Plan development and other planning activities, to manage stakeholder input and acknowledge geographic variation, five subregional planning areas were established, as discussed in Chapter 1.

### Lower San Gabriel and Los Angeles Rivers Subregion

The Lower SG & LA is comprised of 37 cities, 27 in the Gateway IRWM Region and 10 in the Santa Ana Watershed Project Authority IRWM Region (which includes the Orange County portion of the Coyote Creek watershed). Dozens of water agencies/companies and other entities which have an interest in a variety of water management issues serve the Lower SG & LA's three million residents. The Lower SG & LA faces significant ground and surface water quality challenges, as well as flood control issues, due to its location in the lower reaches of two major watersheds and intense urban development changes.

It has the greatest water recharge capacity in the GLAC Region due to the recharge basins in the vicinity of the Whittier Narrows. Further, it has the most densely developed commercial and industrial land uses coupled with the least amount of open space on a per acre basis in the GLAC Region; notably several cities in the Lower SG & LA are over 100 years old. Further, the Lower SG & LA is in the lower reaches of a vast metropolitan area and, therefore has significant water quality issues along with tremendous opportunities for conjunctive use, recycled and reclaimed water use, desalination and wetlands restoration in the estuaries of the San Gabriel River and Los Angeles River. The cities in the Lower SG & LA face many competing financial needs, including complying with stormwater regulations, replacing aging infrastructure, providing affordable housing and increasing public safety. A considerable number of the cities have experienced and will continue to experience severe funding shortages for infrastructure repair, maintenance and installation along with high household poverty rates.

*The Los Angeles River is fed by the largest drainage area in the Region.*

### North Santa Monica Bay Subregion

The North SM Bay differs substantially from the other Subregions with respect to land use, water supply, groundwater and surface water quality, aquatic resources, open space and recreation. Over 85 percent of the North SM Bay is still undeveloped open space; remaining land uses in the area are primarily residential and concentrated along the coastline and interior valleys where its 107,000 residents reside. There is little heavy industry. The North SM Bay depends almost entirely on imported water due to naturally-poor groundwater quality and limited surface storage opportunities. Per capita recycled water use is among the highest in the nation, but further expansion is limited to areas that are difficult to reach due to steep mountain slopes. Aquatic habitat protection and restoration is a special priority, as the North SM Bay includes the Santa Monica Mountains National Recreation Area, several State Parks, a state designated ASBS, and Malibu Lagoon, all heavily used for recreation. The North SM Bay is also home to over a dozen endangered and threatened species, including the southernmost Steelhead Trout population in the state.

### South Bay Subregion

The South Bay consists of three defining characteristics—its coastline, its population and its industry. More than 30 miles of coastline in the South Bay attract tens of millions of visitors to Southern California every year, serve as an important recreation area for the area's residents both rich and poor, and in a few remaining pockets such as the Palos Verdes Peninsula, Madrona Marsh, Ballona Wetlands, portions of the Santa Monica Mountains and Baldwin Hills, support a diverse population of birds and other wildlife. With over 2.6 million residents, the South Bay is one of the most dense and economically diverse urban areas of the Region, creating both challenges to preserve and enhance local water resources and the natural environment as well as unique opportunities for collaboration. The South Bay's industries--oil refining, power generation, and transportation via the Port of Los Angeles, Los Angeles International Airport and major freeways—provide similar challenges and opportunities.

### Upper Los Angeles River Subregion

The Upper LA Subregion is home to approximately 2.3 million residents, mostly in development concentrated in the interior valleys and the foothills, which are generally surrounded by large expanses of open space in the San Gabriel, Verdugo, Santa Monica, and Santa Susanna Mountains. In most years, the mountains generate substantial runoff, much of which can be recharged into the underlying groundwater basins via favorable soils along the major channels and on the valley floors. The large expanses of urban and suburban development on the valley floors, and significant residential development in canyons and associated hillsides, have resulted in the channelization of most of the major river and stream channels and contributed to degraded surface water quality in those channels. Restoration or enhancement of several major channels, including the Los Angeles River, provides opportunities to improve water quality, enhance water supplies and restore habitat.

### Upper San Gabriel and Rio Hondo Subregion

The Upper SG & RH Subregion contains large expanses of open space in the San Gabriel Mountains (including much of the Angeles National Forest) and the Puente, and San Juan Hills, with development concentrated in the interior valleys and the surrounding foothills. Several groundwater basins, including the vast San Gabriel basin, and runoff from the San Gabriel Mountains provide significant water supplies, although groundwater contamination from industrial sources and prior land uses poses a significant challenge in some locations. The large expanses of urban and suburban development on the valley floors are home to approximately 1.5 million residents. Although most of the major river and stream channels on the valley floors have been subject to channelization, several of these, including the San Gabriel River, have natural bottoms, which promote in-stream percolation of runoff.

## Neighboring/Overlapping IRWM Efforts

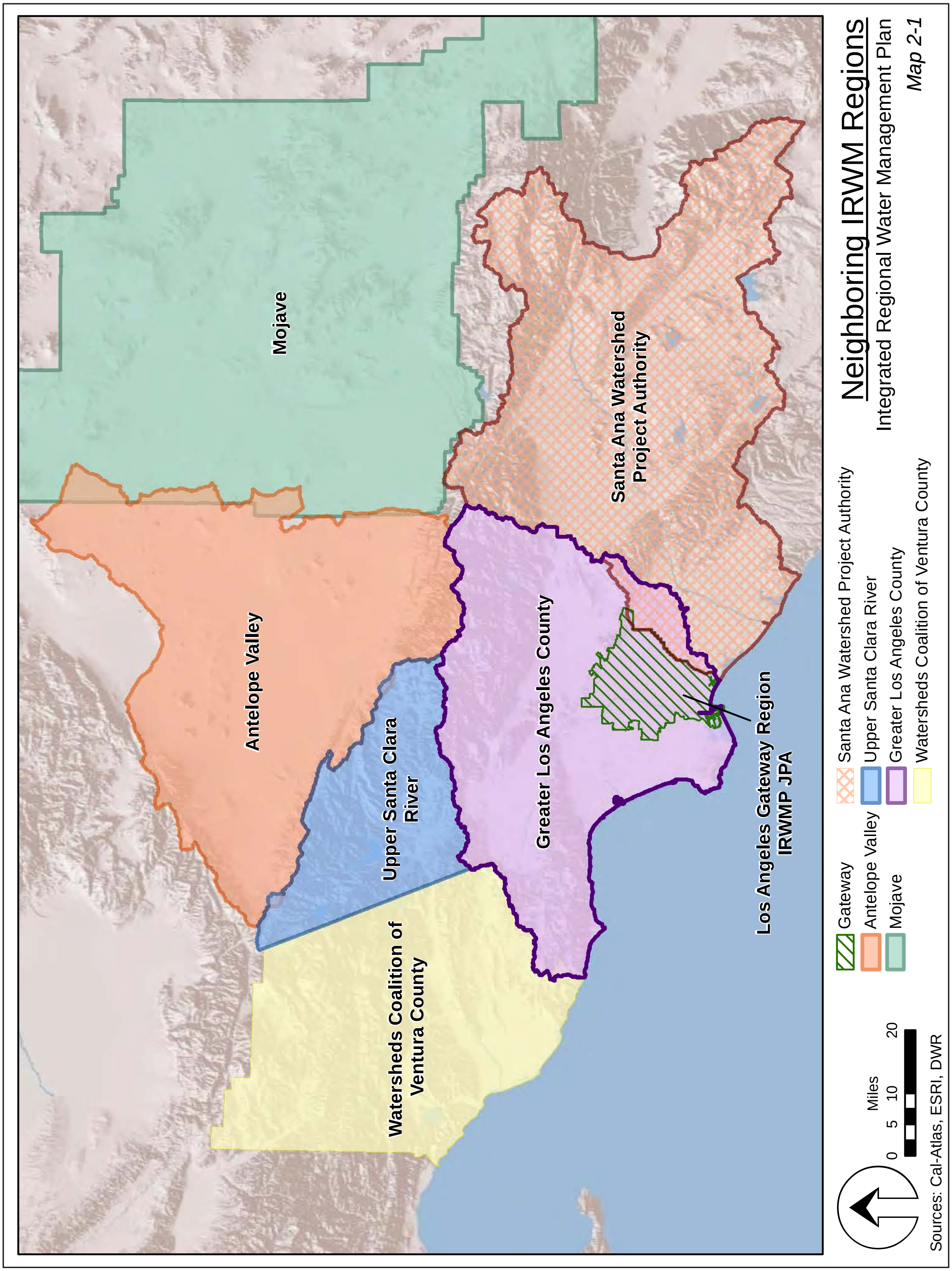
As shown in Map 2-1, the Region is bordered and/or overlapped by six other IRWM Planning Regions:

- Watersheds Coalitions of Ventura County (which consolidated the Ventura County and Calleguas Creek Watershed efforts) on the west
- Santa Ana Watershed Project Authority to the south
- Upper Santa Clara River to the northwest and Antelope Valley to the northeast
- Mojave Water Agency's Regional Water Management Planning Area is located to the northeast of the Region
- Los Angeles Gateway Water Management Authority Region (Gateway Region) overlaps the southern portion of the Region (portions of the Lower SG & LA Subregion)

During the development of the 2006 adopted Plan and throughout the first two years of the IRWM planning activities in the GLAC Region, each of the Subregions benefited from the widespread participation of agencies, jurisdictions, organizations, and many individuals from within those subregions. In 2008, several jurisdictions in the Lower SG & LA Subregion elected to form a Joint Powers Authority (JPA) for the purposes of establishing the Los Angeles Gateway Region, out of a concern about the appropriate scale for regional planning. This effort resulted in a decline in participation by members of the JPA and other cities represented by the Gateway Cities COG, although the remaining steering committee members have continued to meet and be engaged. In response, the LACFCD and members of the LC and the SC of the Lower SG & LA Rivers Subregion engaged in various efforts to encourage members of the Gateway Cities COG and the Los Angeles Gateway Region IRWM JPA to more fully engage in ongoing planning activities in the GLAC Region, including the potential for expanded planning at a subregional scale.

In June 2008, in a letter from DWR Director Lester Snow, DWR encouraged the GLAC Region and members of the Gateway Region JPA to work together to resolve issues and concerns. Subsequently, the Chair and members of the Steering Committee for the Lower SG & LA Subregion, along with the LACFCD, redoubled their efforts to engage participants in the Gateway Region JPA effort to encourage their continued participation in the GLAC planning process. Since that time, participation in the Steering Committee has improved, but has not entirely rebounded to the level prior to the Gateway Region JPA efforts. It is hoped that these entities will continue to participate in the GLAC planning process and that their participation will continue to expand.

There is an overlap between the GLAC and the SAWPA Regions. Thus, projects located within the overlap area could appear in either region's list of projects, as deemed appropriate. In addition, it has been acknowledged that the inclusion of any projects (in the overlap area) in an implementation grant application would require close coordination to assure that a duplicate project submission does not occur. The LACFCD and members of the LC and the SC of Lower SG & LA Subregion have been engaged in various efforts to encourage members of the Gateway Cities COG and the Gateway Region JPA to more fully participate in ongoing planning activities in the GLAC Region.



Neighboring IRWM Regions
Integrated Regional Water Management Plan
Map 2-1
Mojave
Santa Ana Watershed Project Authority
Antelope Valley
Upper Santa Clara River
Greater Los Angeles County
Los Angeles Gateway Region IRWMP JPA
Watersheds Coalition of Ventura County
Gateway
Antelope Valley
Mojave
Santa Ana Watershed Project Authority
Upper Santa Clara River
Greater Los Angeles County
Watersheds Coalition of Ventura County
Miles
0 5 10 20
Sources: Cal-Atlas, ESRI, DWR

## 2.3 Physical Setting

### Geology and Geomorphology

The geography of the Region can generally be divided into four distinct types: the coastal plain, inland valleys (e.g., San Fernando, San Gabriel, Pomona, and Walnut), foothills that generally surround the valleys, and two mountain ranges (the Santa Monica and San Gabriel Mountains). These mountains are part of the Transverse Ranges, which extend 350 miles east to west from the Eagle Mountains in San Bernardino County to the Pacific Ocean. To the north, the San Gabriel Mountains separate the Los Angeles basin from the Mojave Desert. To the west, the Santa Monica Mountains separate the Los Angeles basin from the Ventura basin. Topography in the Region ranges from sea level to over 10,000 feet in the San Gabriel Mountains. Most of the coastal plain is less than 1,000 feet in elevation. The foothills reach 3,000 to 4,000 feet before rising rapidly into the San Gabriel Mountains, to a height of 10,064 feet at Mount San Antonio (or Mount Baldy). The grade of the mountain slopes in the San Gabriel Mountains average 65 to 70 percent, some of the steepest slopes in the world.

Geology varies from Precambrian metamorphic rocks (1.7 billion years old) to alluvial deposits washed down from mountain canyons. The San Gabriel Mountains are young mountains, geologically speaking, and continue to rise at a rate of nearly three-quarters of an inch per year. Because of this instability, they are also eroding at a rapid rate. Alluvial deposits of sand, gravel, clay and silt in the coastal plain are thousands of feet thick in some areas, due in part to the erosive nature of the San Gabriel and Santa Monica Mountains.

The Region is extensively faulted, with the San Andreas Fault bordering the north side of the San Gabriels and the Sierra Madre–Cucamonga fault zone on the south side. Throughout the Region are hundreds of lesser fault systems, such as the Newport-Inglewood fault that runs from Newport Beach to Beverly Hills via Long Beach and Signal Hill. The most notorious are those that have been the cause of major earthquakes during the past few decades, known not by name but by the area in which they struck: Sylmar in 1971, Whittier Narrows in 1987, and Northridge in 1994.

### Climate

The Region is within the Mediterranean climate zone, which extends from Central California to San Diego and is characterized by winter precipitation followed by dry summers.

The geography of the Los Angeles Region results in a great deal of spatial variation in the local climate. The abrupt rise of the mountains from the coast creates a barrier that traps moist ocean air against the southerly slopes and partially blocks the desert summer heat and winter cold from the interior northeast. The common perception of the Region as desert is misleading. The coastal plain may be more appropriately termed "semi-arid," although portions of the San Gabriel Mountains receive considerable snow and rainfall most years.

Summers are dry, with most precipitation falling in a few major storm events between November and March. Long-term annual rainfall averages vary from 12.2 inches along the coast, 15.5 inches in downtown Los Angeles to 27.5 inches in the mountains. The maximum-recorded 24-hour rainfall in the Region is 34 inches in the mountains and 9 inches in the coastal plain.

*The Region is a Mediterranean climate with winter precipitation followed by dry summers.*

## 2.4 Internal Boundaries

The Region has a variety of internal boundaries that have been defined for different purposes. In many cases, these boundaries overlap. This section describes the different sets of internal boundaries: subregional (described previously), watersheds, political jurisdictional, water supply, wastewater service, flood control districts, and land use agencies.

### Subregional Boundaries

As previously described, the Region is composed of five subregions based on Watershed boundaries (refer to Map 2-2):

- Lower San Gabriel and Los Angeles Rivers;
- North Santa Monica Bay;
- South Bay;
- Upper Los Angeles River; and
- Upper San Gabriel River and Rio Hondo River.

### Watershed Boundaries

Within the Region, there are over one hundred institutions that provide water services or manage groundwater resources. The general boundaries of each Subregions' retail water districts and city-operated water agencies are shown on Maps 2-3(a) through 2-3(e), while the boundaries for wholesale water suppliers are shown in Maps 2-4(a) through 2-4(e). Small retail water suppliers are not shown.

### Political Jurisdictional Boundaries

The Region includes portions of 4 counties and 92 cities. Maps 2-5(a) through 2-5(e) depict the county and city boundaries within each of the five Subregions.

### Land Use Agency Boundaries

Land use policy within the Region is established by cities, and, where unincorporated areas exist, by counties. Each city and county establishes its own General Plan to establish the uses of land for housing, business, industry, open space, and other uses. City and county boundaries are depicted in Maps 2-5(a) through 2-5(e).

### Wastewater Service Boundaries

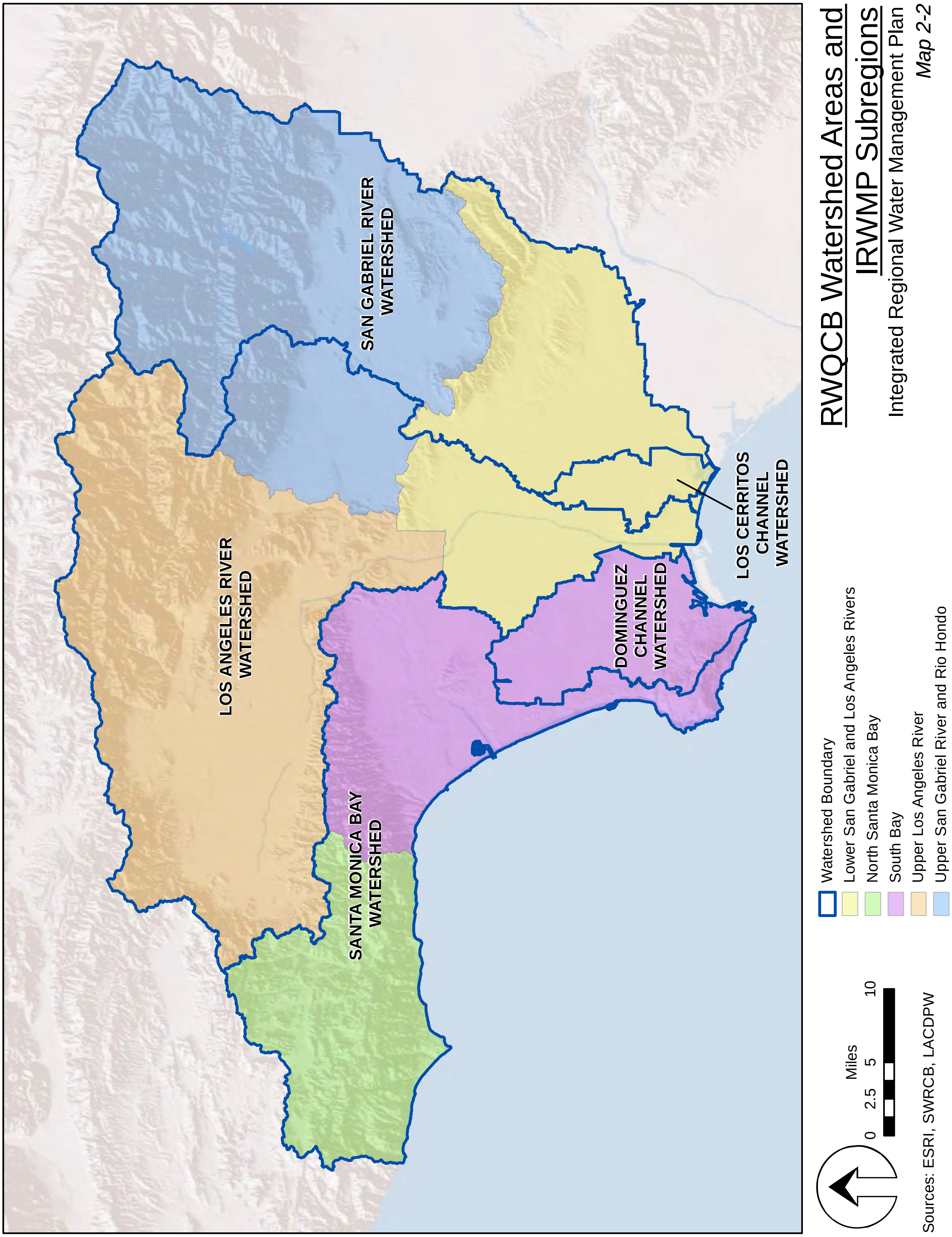
Wastewater service in the Region is provided by a number of entities which include sanitation districts, water districts and cities. A vast majority of the Region's wastewater service is collected and treated by those entities shown in Map 2-6. It should be noted that while the entities shown in the map cover a majority of the Region, the cities and water districts within the larger service areas may collect and treat their own wastewater, then utilize the outfall systems of the larger entities. Very few areas in the Region (where septic systems are in use) do not utilize wastewater service providers.

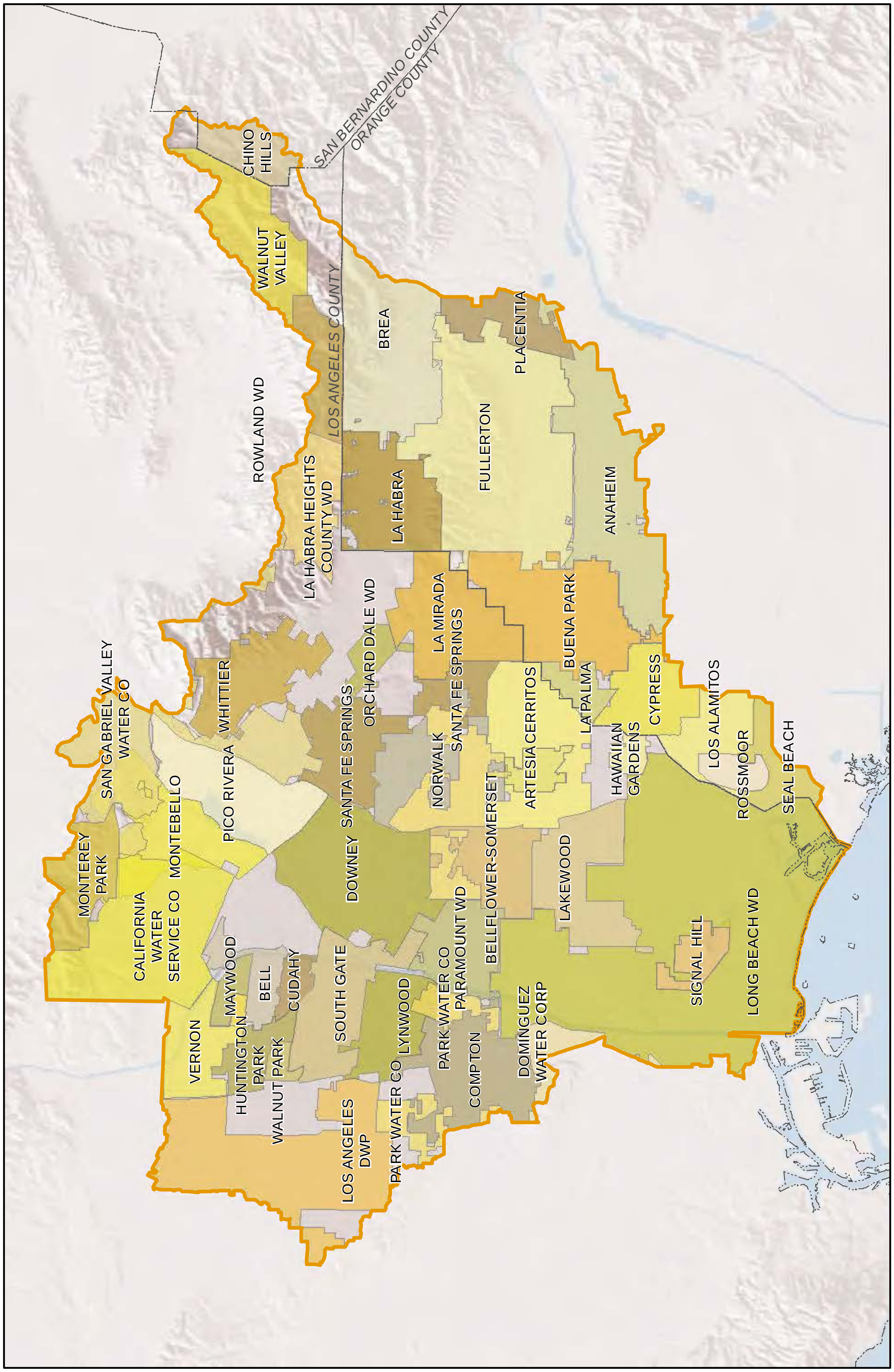
### Flood Control District Boundaries

Flood control is primarily managed by county agencies within the Region, and includes flood control districts for Los Angeles County, Ventura County, Orange County and San Bernardino County. These agencies, in association with the Army Corps, construct, manage and maintain the Region's flood infrastructure, such as debris basins, storm drains, culverts, dams, reservoirs, spreading basins, and flood control channels. Map 2-7 depicts flood control district and subregional boundaries.

### Groundwater Basin Boundaries

Groundwater basins within the Region are defined both geologically and along political boundaries. Geological boundaries are generally defined by fault lines or surface features such as mountains, while political boundaries are typically county lines. Map 2-8 depicts groundwater basins within the Region.


RWQCB Watershed Areas and IRWMP Subregions
Integrated Regional Water Management Plan
Map 2-2
SAN GABRIEL RIVER WATERSHED
LOS ANGELES RIVER WATERSHED
SANTA MONICA BAY WATERSHED
DOMINGUEZ CHANNEL WATERSHED
LOS CERRITOS CHANNEL WATERSHED
Watershed Boundary
Lower San Gabriel and Los Angeles Rivers
North Santa Monica Bay
South Bay
Upper Los Angeles River
Upper San Gabriel River and Rio Hondo
Miles
0
2.5
5
10
Sources: ESRI, SWRCB, LACDPW



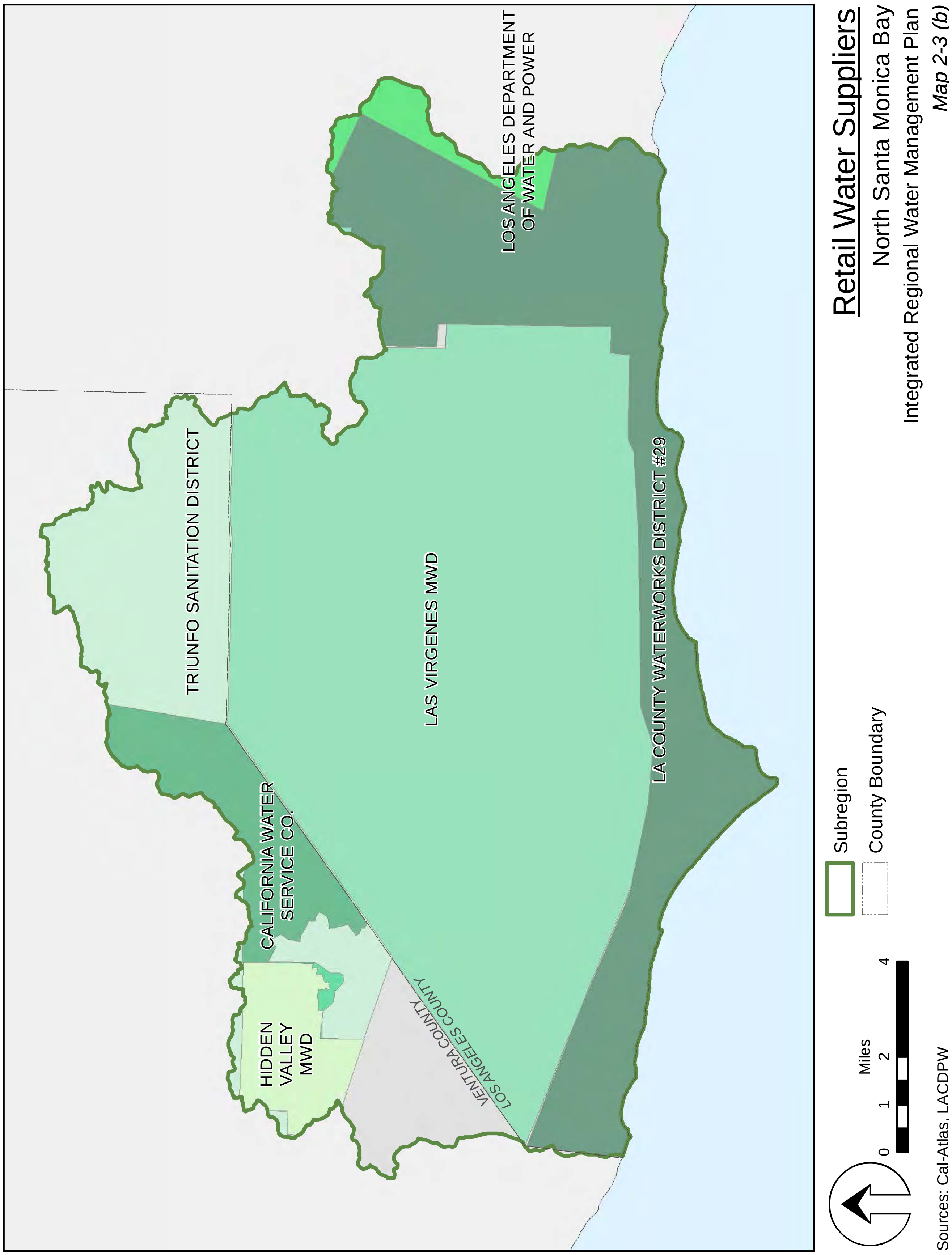

# Retail Water Suppliers

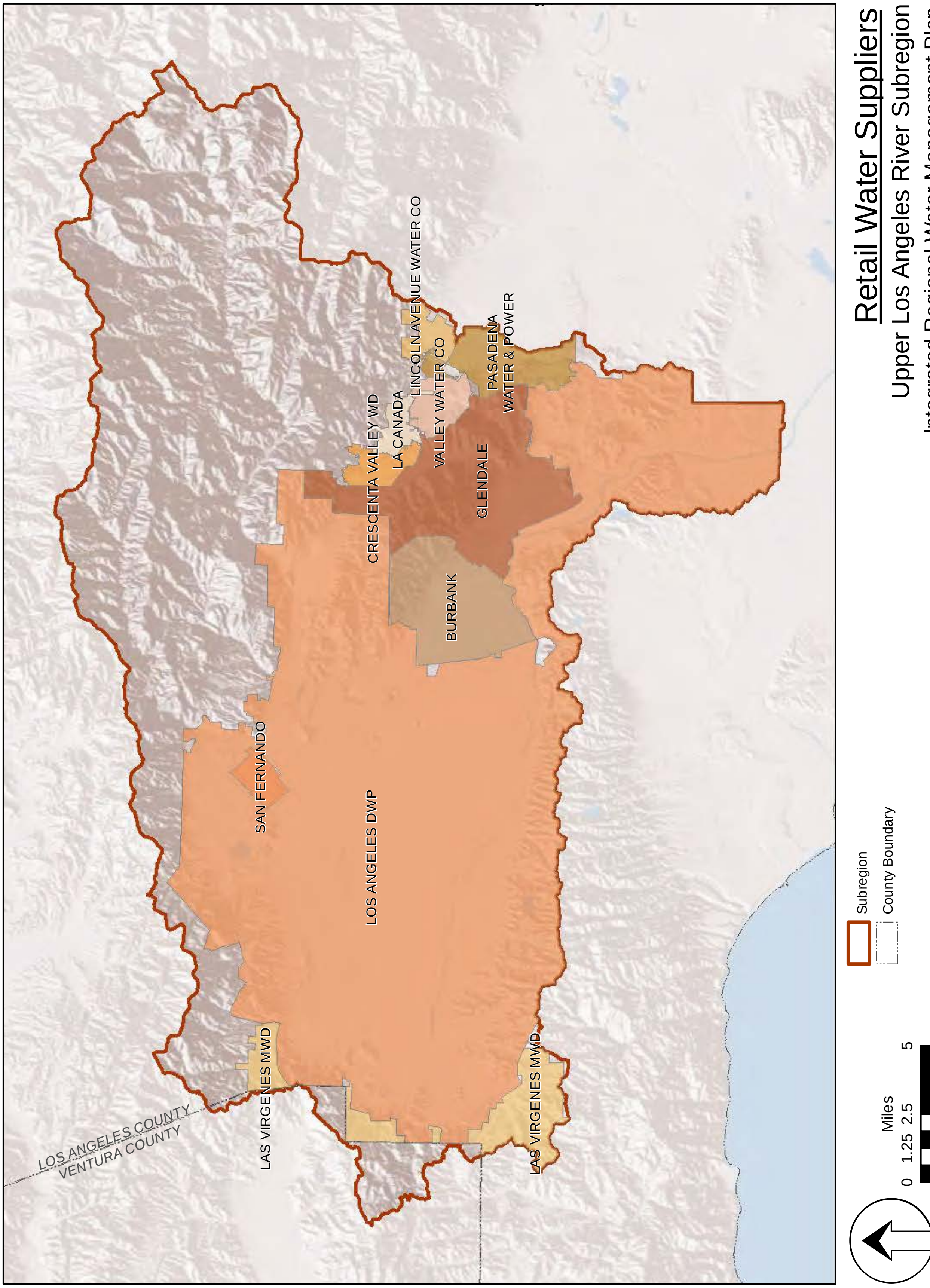
Lower San Gabriel & Lower Los Angeles Rivers Subregion

Integrated Regional Water Management Plan

*Map 2-3 (a)*

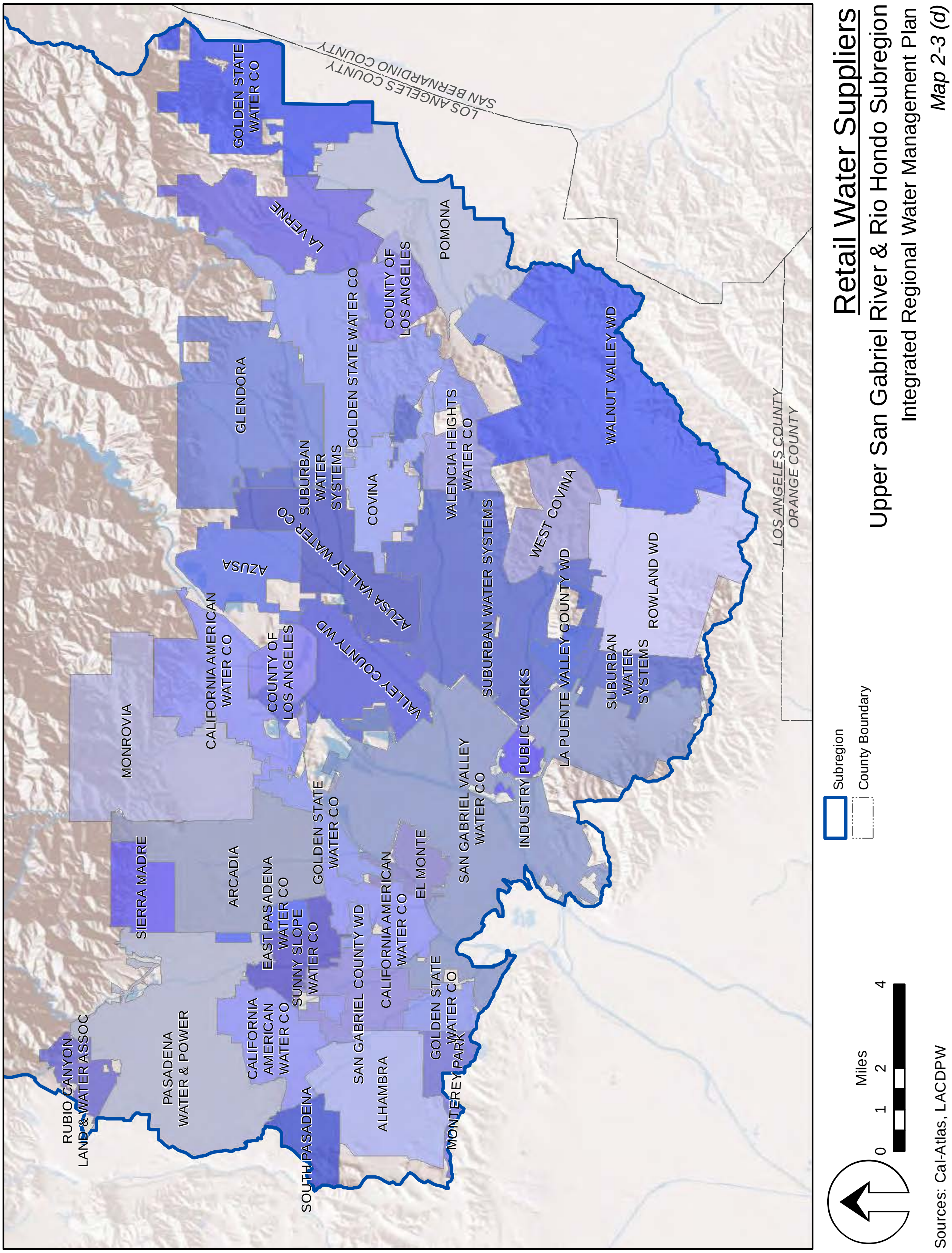
Sources: Cal-Atlas, LACDPW

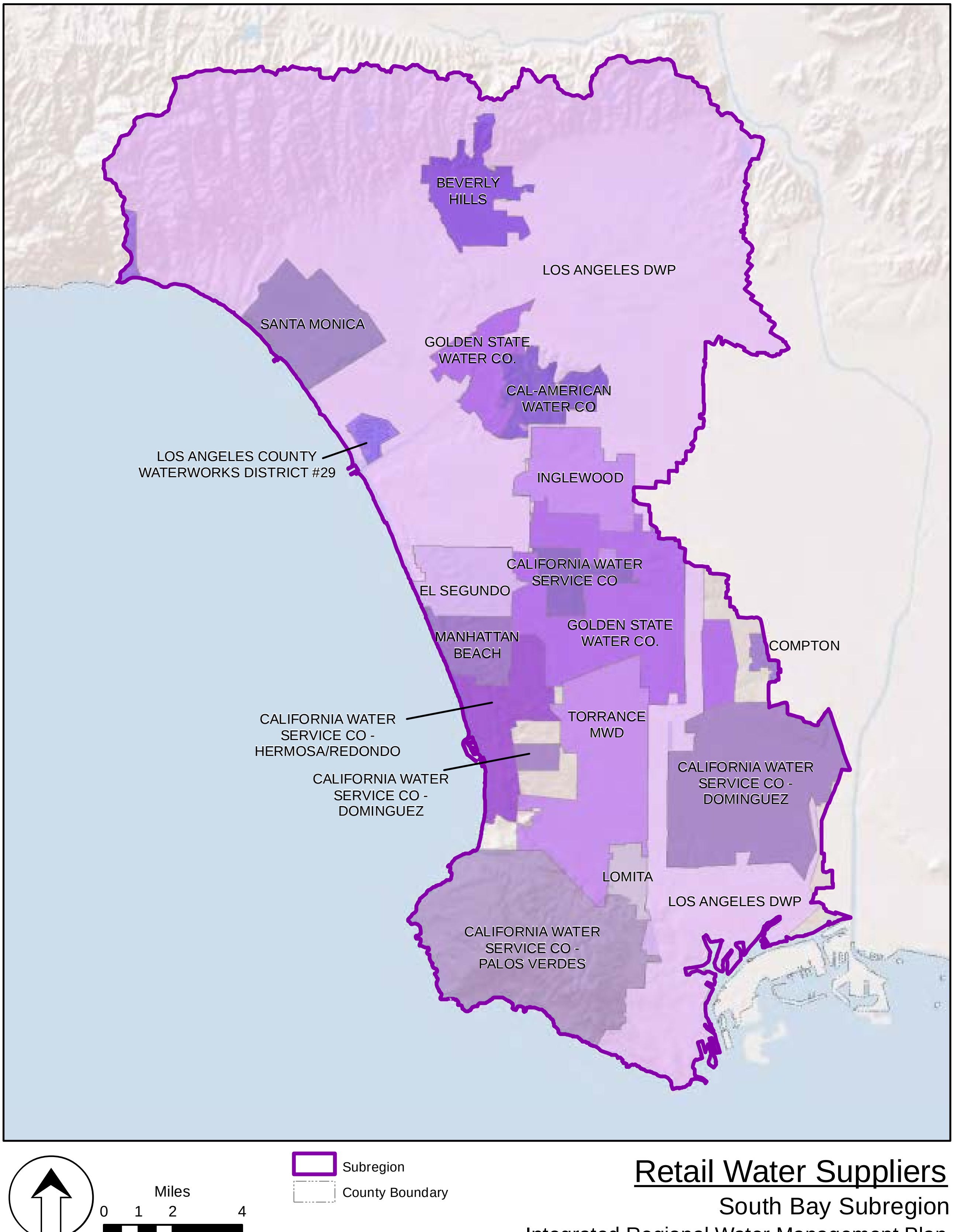

Retail Water Suppliers
North Santa Monica Bay
Integrated Regional Water Management Plan
Map 2-3 (b)
LOS ANGELES DEPARTMENT OF WATER AND POWER
LA COUNTY WATERWORKS DISTRICT #29
LAS VIRGENES MWD
TRIUNFO SANITATION DISTRICT
CALIFORNIA WATER SERVICE CO.
HIDDEN VALLEY MWD
VENTURA COUNTY
LOS ANGELES COUNTY
Subregion
County Boundary
Miles
0
1
2
4
Sources: Cal-Atlas, LACDPW




Retail Water Suppliers
Upper Los Angeles River Subregion
Integrated Regional Water Management Plan
*Map 2-3 (c)*

Sources: Cal-Atlas, LACDPW


Retail Water Suppliers
Upper San Gabriel River & Rio Hondo Subregion
Integrated Regional Water Management Plan
Map 2-3 (d)
Subregion
County Boundary
Miles
0 1 2 4
Sources: Cal-Atlas, LACDPW
SAN BERNARDINO COUNTY
LOS ANGELES COUNTY
ORANGE COUNTY
GOLDEN STATE WATER CO
LA VERNE
POMONA
COUNTY OF LOS ANGELES
GLENDORA
SUBURBAN WATER SYSTEMS
COVINA
VALENCIA HEIGHTS WATER CO
WALNUT VALLEY WD
AZUSA
AZUSA VALLEY WATER CO
WEST COVINA
ROWLAND WD
CALIFORNIA AMERICAN WATER CO
VALLEY COUNTY WD
SUBURBAN WATER SYSTEMS
MONROVIA
INDUSTRY PUBLIC WORKS
LA PUENTE VALLEY COUNTY WD
SAN GABRIEL VALLEY WATER CO
SIERRA MADRE
ARCADIA
EAST PASADENA WATER CO
SUNNY SLOPE WATER CO
EL MONTE
SAN GABRIEL COUNTY WD
RUBIO CANYON LAND & WATER ASSOC
PASADENA WATER & POWER
ALHAMBRA
MONTEREY PARK
SOUTH PASADENA



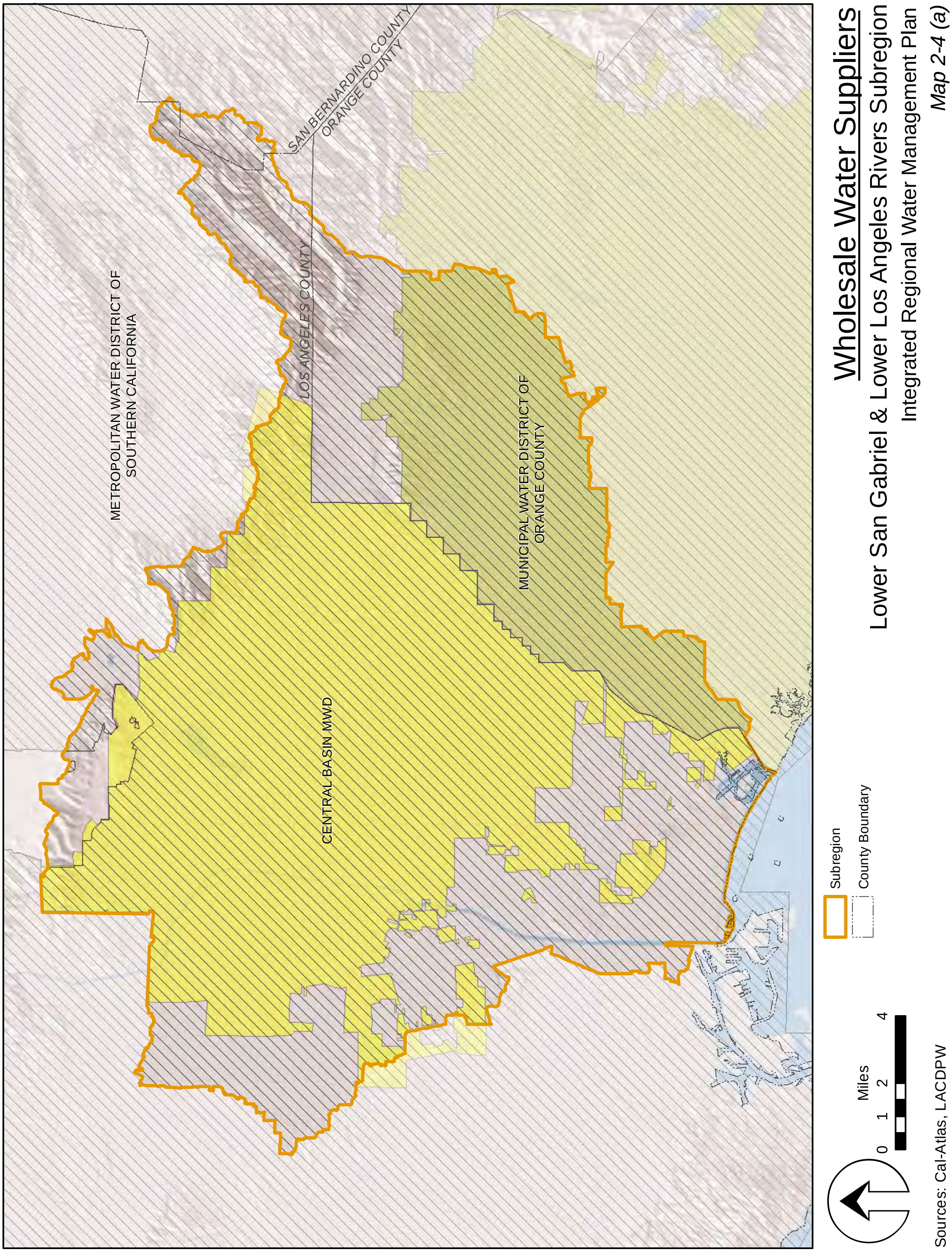

Sources: Cal-Atlas, LACDPW
West Basin MWD

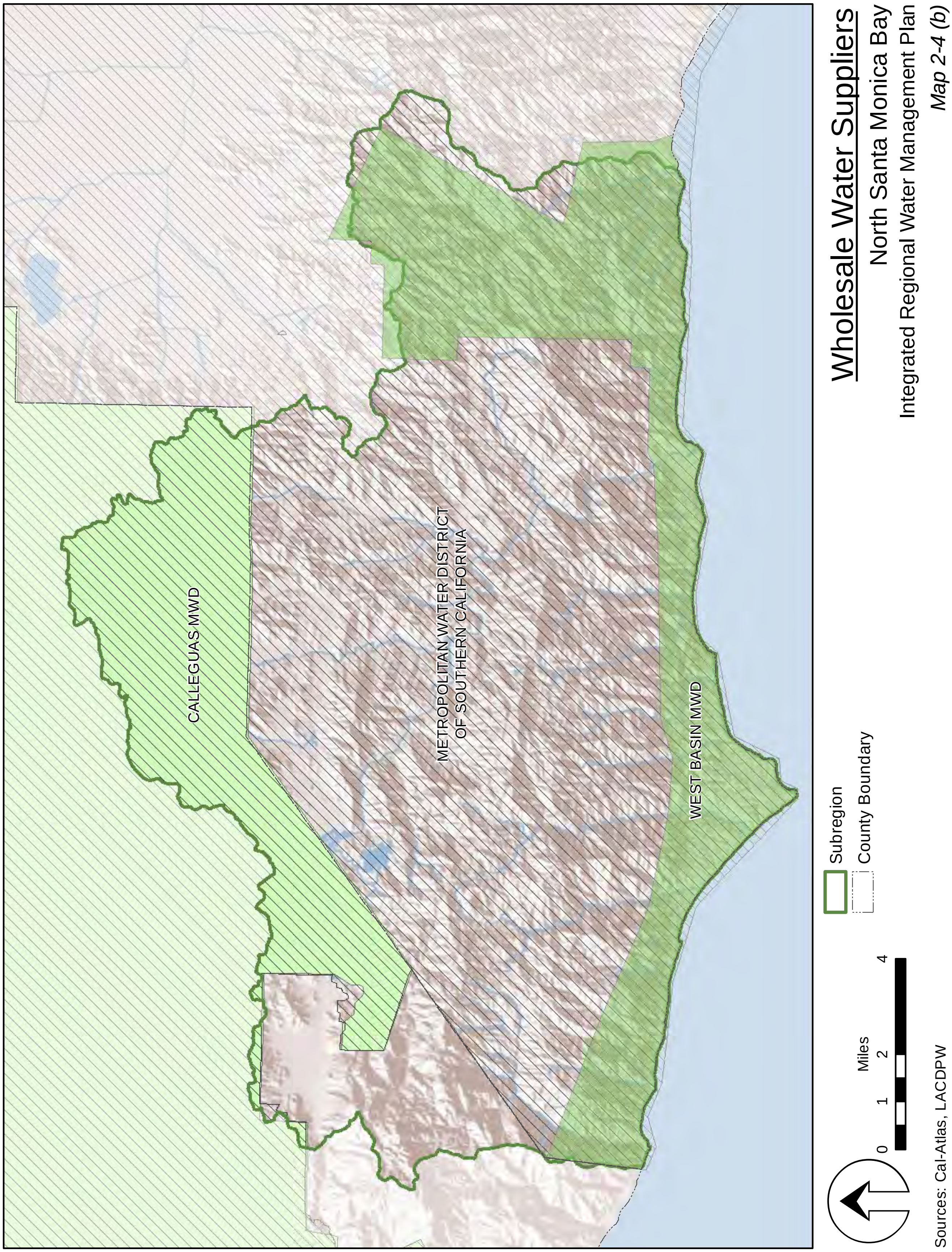
<u>Retail Water Suppliers</u>

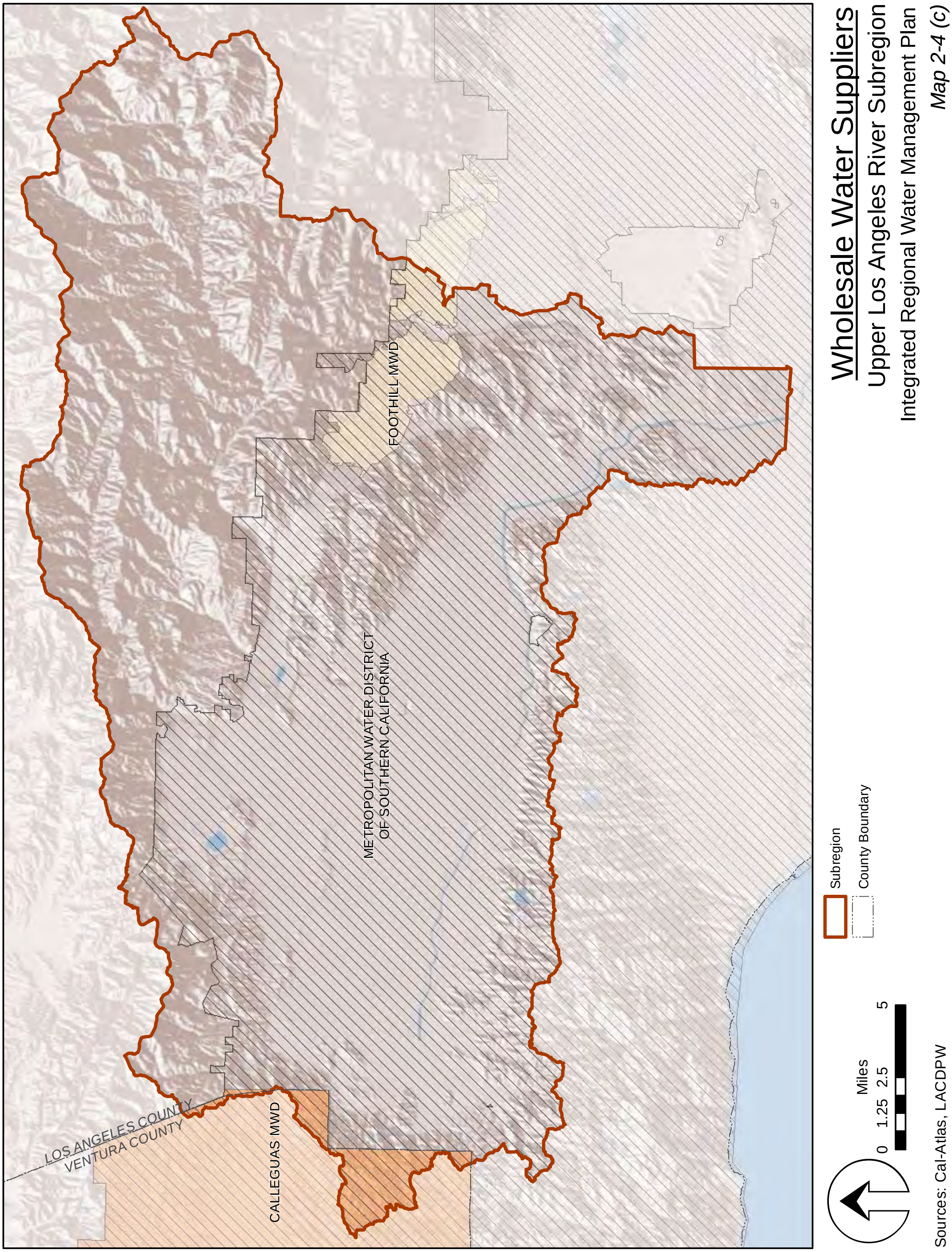
South Bay Subregion

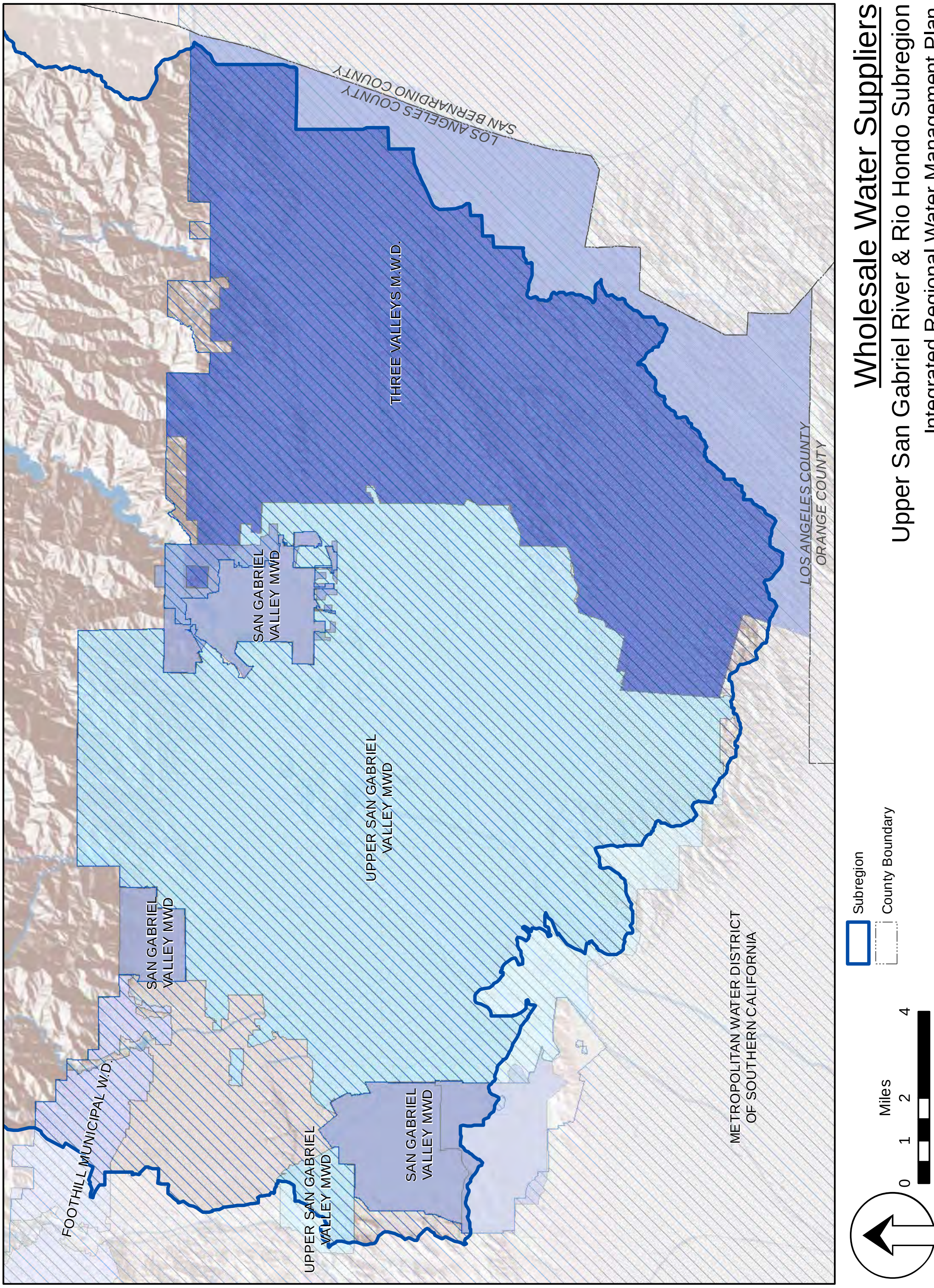
Integrated Regional Water Management Plan

*Map 2-3 (e)*


Wholesale Water Suppliers
Lower San Gabriel & Lower Los Angeles Rivers Subregion
Integrated Regional Water Management Plan
Map 2-4 (a)
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
CENTRAL BASIN MWD
MUNICIPAL WATER DISTRICT OF ORANGE COUNTY
LOS ANGELES COUNTY
SAN BERNARDINO COUNTY
ORANGE COUNTY
Subregion
County Boundary
Miles
0 1 2 4
Sources: Cal-Atlas, LACDPW


Wholesale Water Suppliers
North Santa Monica Bay
Integrated Regional Water Management Plan
Map 2-4 (b)
CALLEGUAS MWD
METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
WEST BASIN MWD
Subregion
County Boundary
Miles
0
1
2
4
Sources: Cal-Atlas, LACDPW


Wholesale Water Suppliers
Upper Los Angeles River Subregion
Integrated Regional Water Management Plan
Map 2-4 (c)
METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
FOOTHILL MWD
CALLEGUAS MWD
LOS ANGELES COUNTY
VENTURA COUNTY
Subregion
County Boundary
Miles
0 1.25 2.5 5
Sources: Cal-Atlas, LACDPW



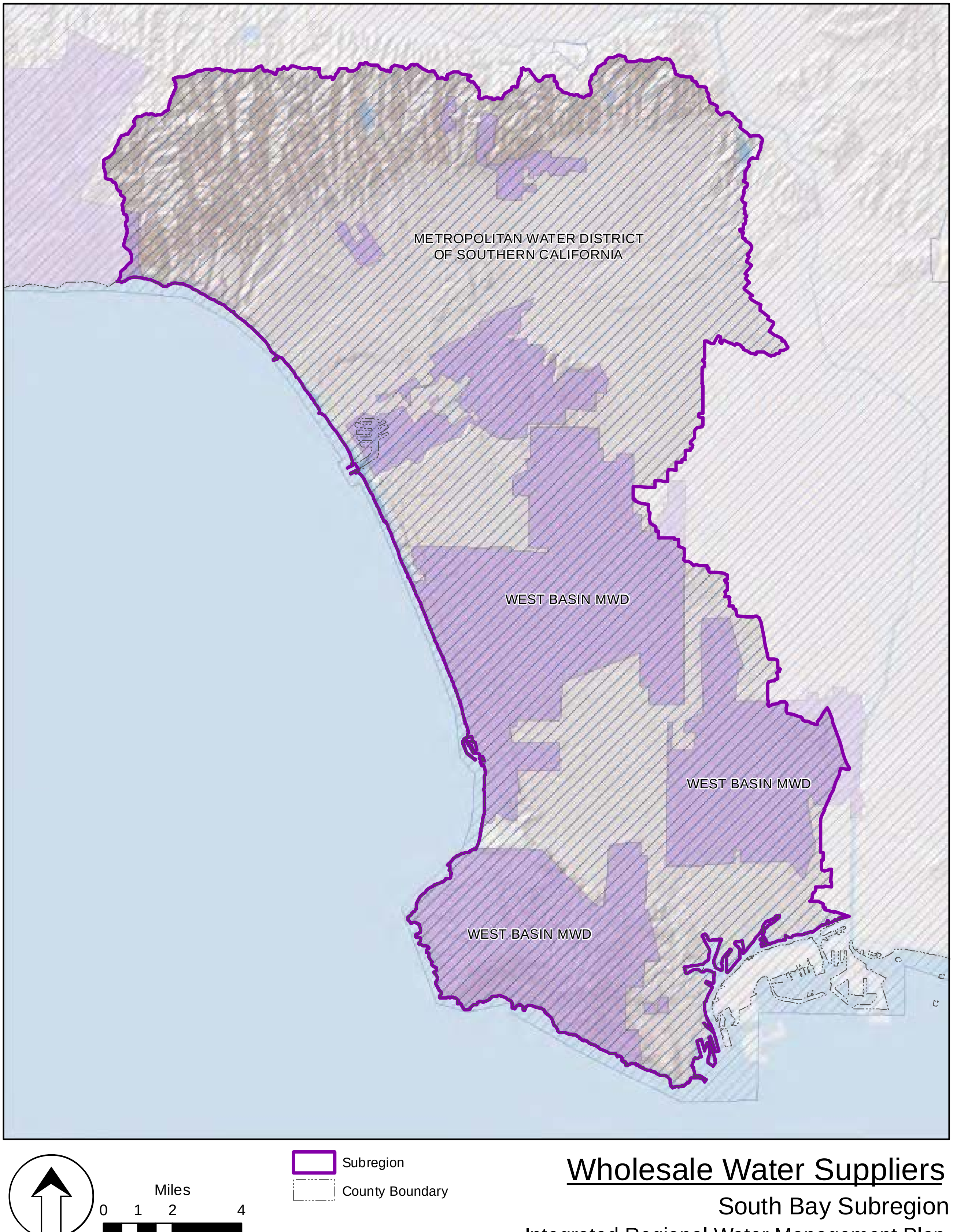

**Wholesale Water Suppliers**

Upper San Gabriel River & Rio Hondo Subregion

Integrated Regional Water Management Plan

*Map 2-4 (d)*

Sources: Cal-Atlas, LACDPW



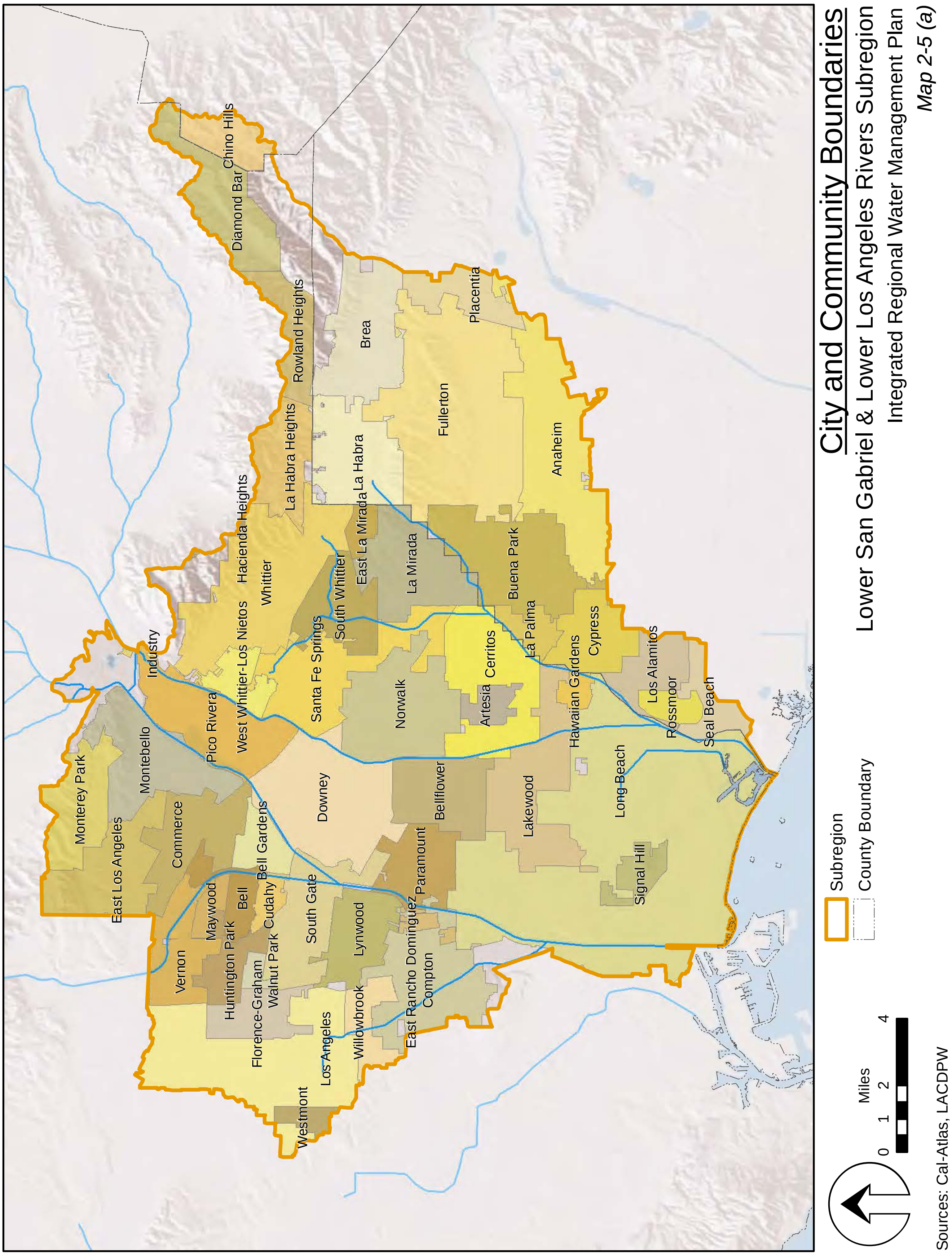

# Wholesale Water Suppliers

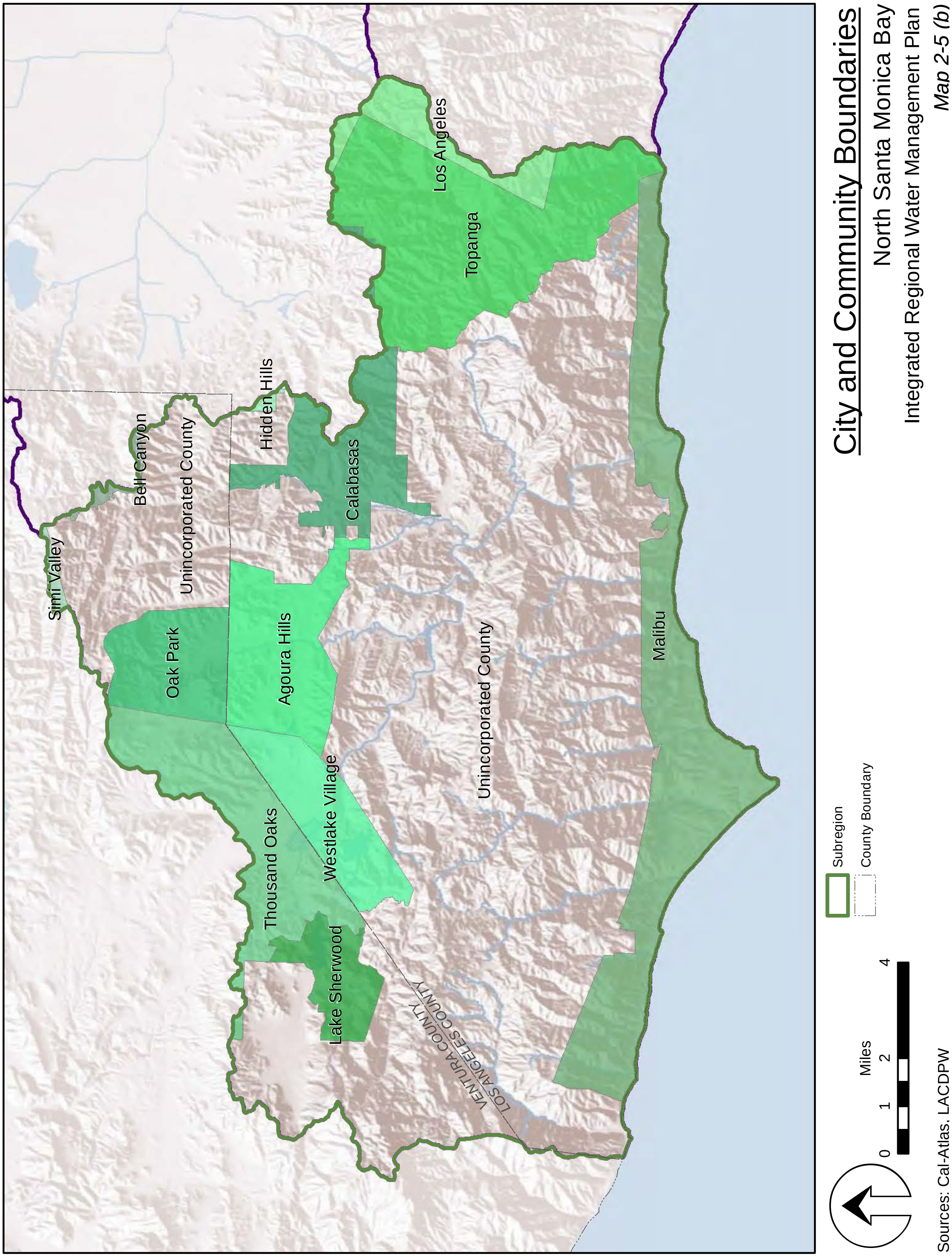
South Bay Subregion

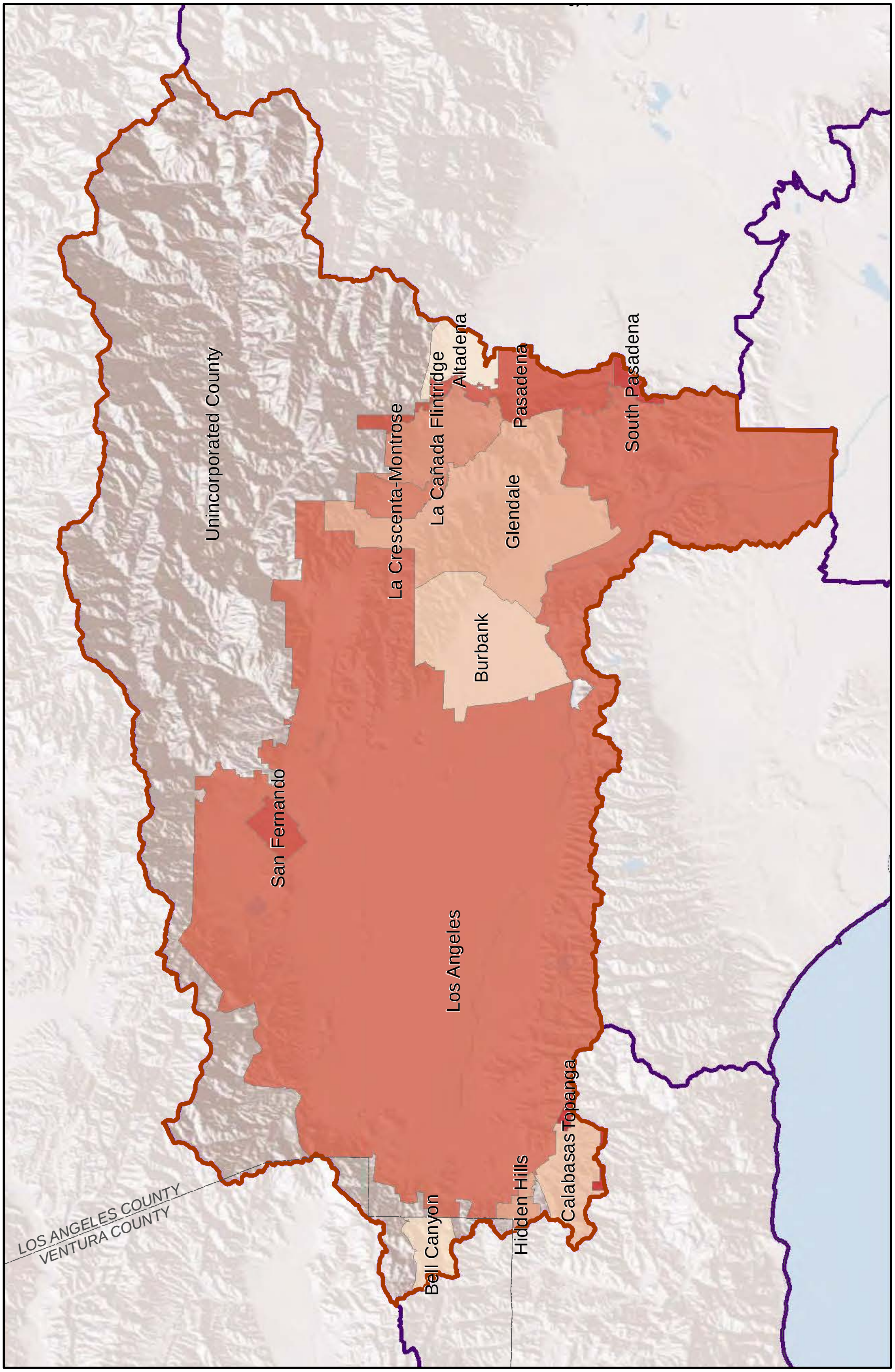
Integrated Regional Water Management Plan

*Map 2-4 (e)*

Sources: Cal-Atlas, LACDPW


City and Community Boundaries
Lower San Gabriel & Lower Los Angeles Rivers Subregion
Integrated Regional Water Management Plan
Map 2-5 (a)
Subregion
County Boundary
Miles
0 1 2 4
Sources: Cal-Atlas, LACDPW
Chino Hills
Diamond Bar
Rowland Heights
Brea
Placentia
Fullerton
La Habra Heights
La Habra
Anaheim
Hacienda Heights
Whittier
East La Mirada
La Mirada
Buena Park
South Whittier
Industry
West Whittier-Los Nietos
Santa Fe Springs
La Palma
Cypress
Cerritos
Hawaiian Gardens
Los Alamitos
Rossmoor
Seal Beach
Artesia
Norwalk
Pico Rivera
Montebello
Monterey Park
East Los Angeles
Commerce
Downey
Bellflower
Lakewood
Long Beach
Signal Hill
Bell Gardens
Paramount
Bell
Cudahy
Maywood
South Gate
Lynwood
East Rancho Dominguez
Compton
Huntington Park
Vernon
Walnut Park
Florence-Graham
Willowbrook
Los Angeles
Westmont


City and Community Boundaries
North Santa Monica Bay
Integrated Regional Water Management Plan
Map 2-5 (b)
Subregion
County Boundary
Miles
0 1 2 4
Sources: Cal-Atlas, LACDPW
Simi Valley
Bell Canyon
Unincorporated County
Hidden Hills
Calabasas
Oak Park
Agoura Hills
Westlake Village
Thousand Oaks
Lake Sherwood
Unincorporated County
Malibu
Topanga
Los Angeles
VENTURA COUNTY
LOS ANGELES COUNTY

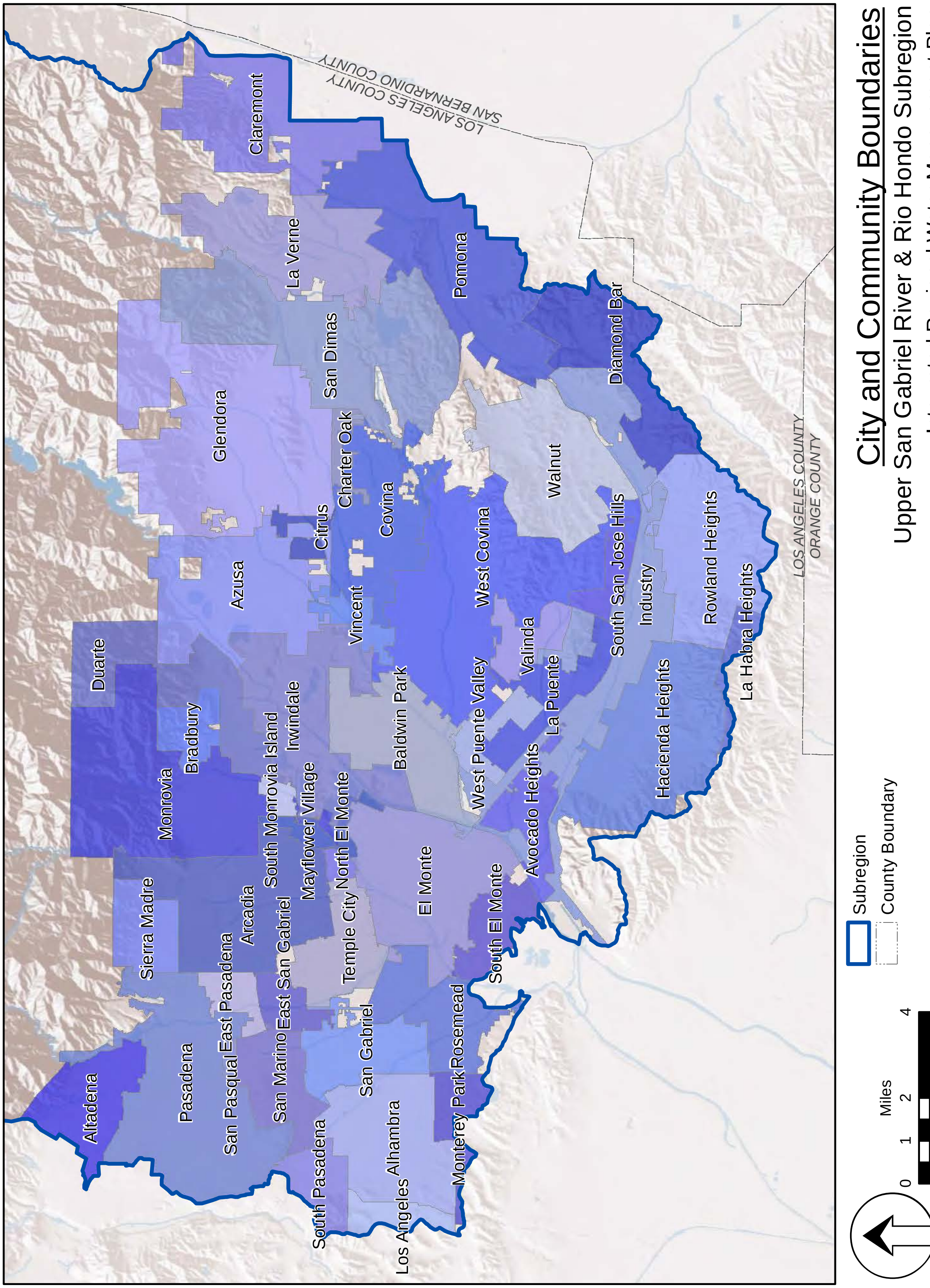



Miles
0 1.25 2.5 5

Subregion
County Boundary

Sources: Cal-Atlas, LACDPW

City and Community Boundaries
Upper Los Angeles River Subregion
Integrated Regional Water Management Plan
*Map 2-5 (c)*



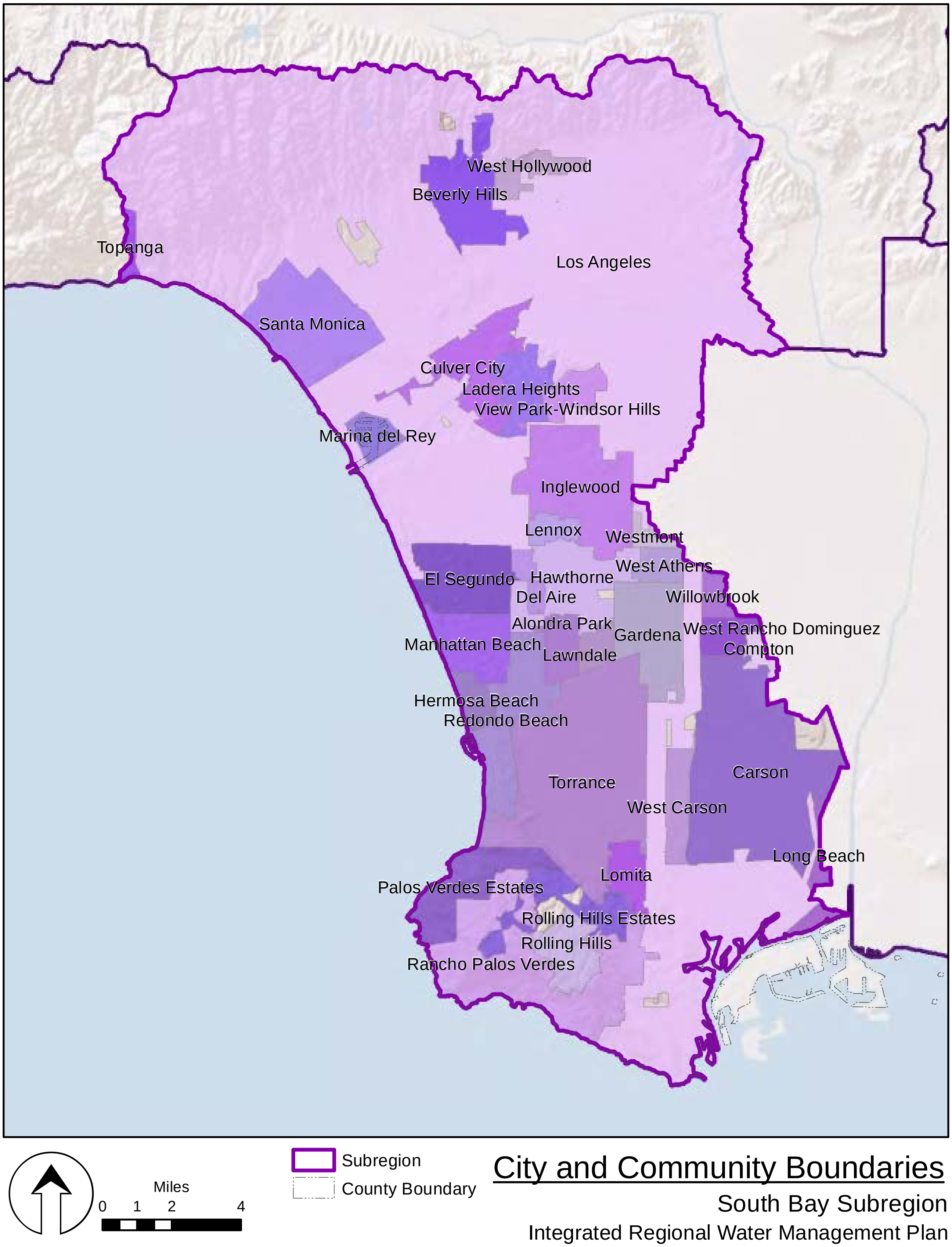

## City and Community Boundaries

Upper San Gabriel River & Rio Hondo Subregion

Integrated Regional Water Management Plan

*Map 2-5 (d)*

Sources: Cal-Atlas, LACDPW



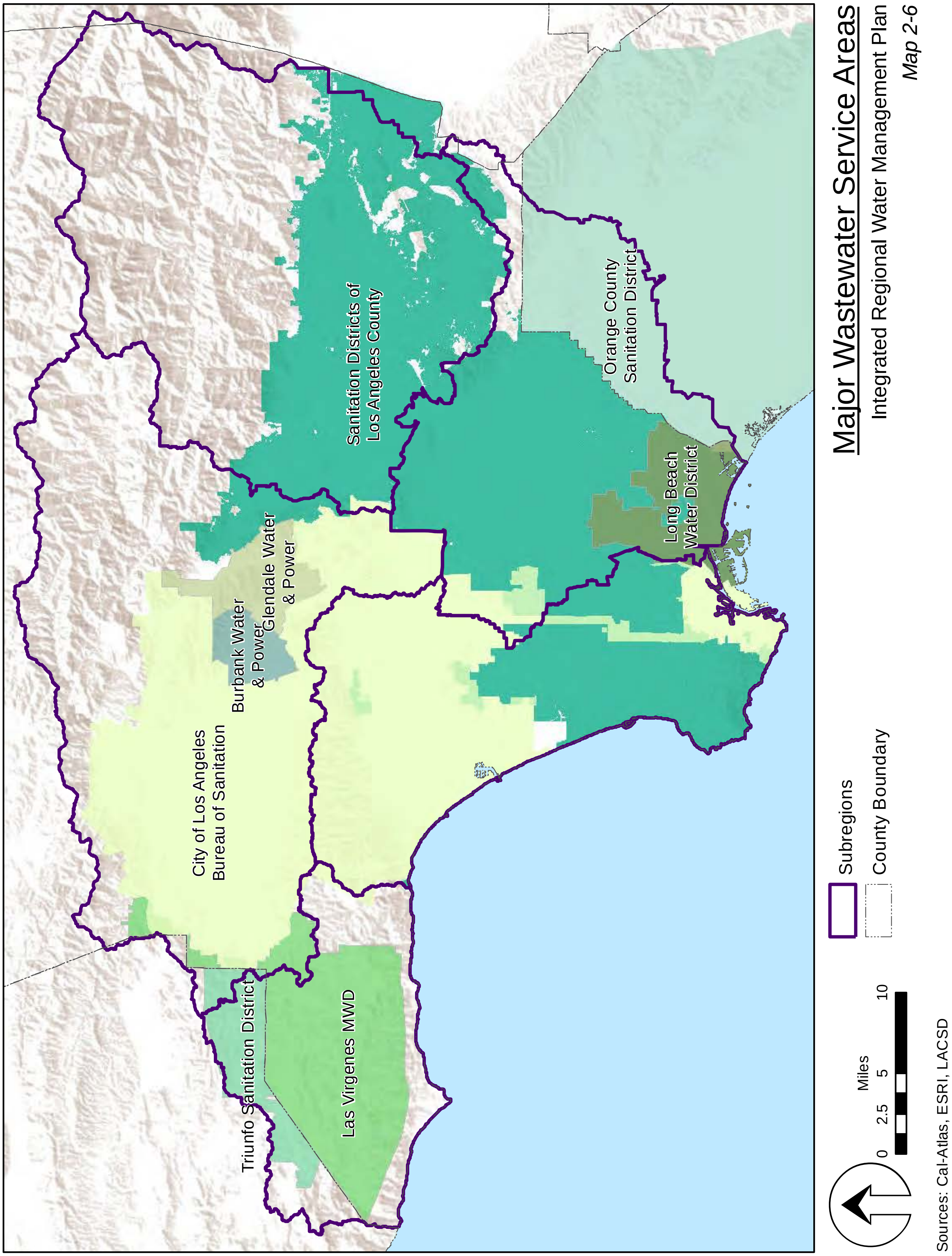

City and Community Boundaries

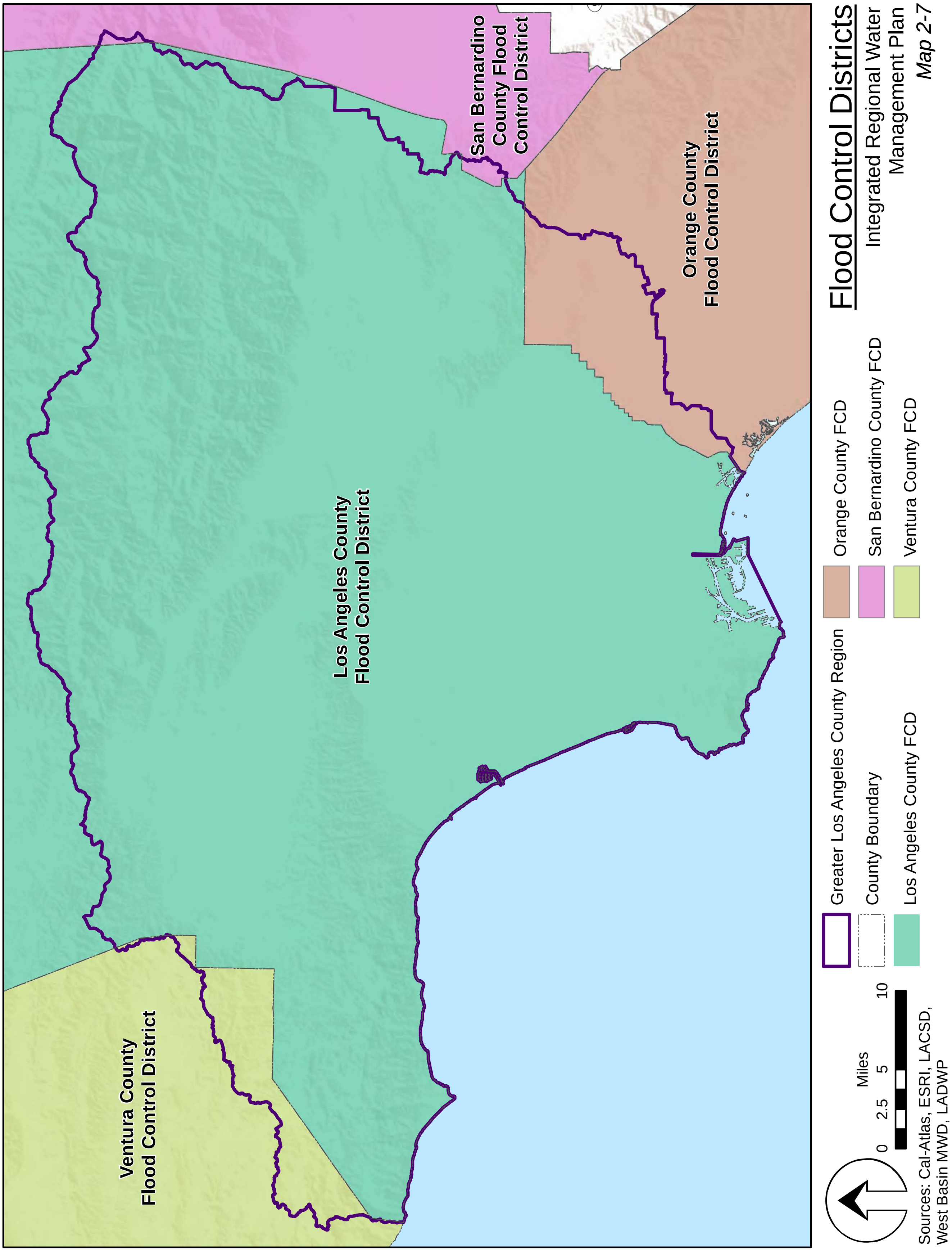
South Bay Subregion

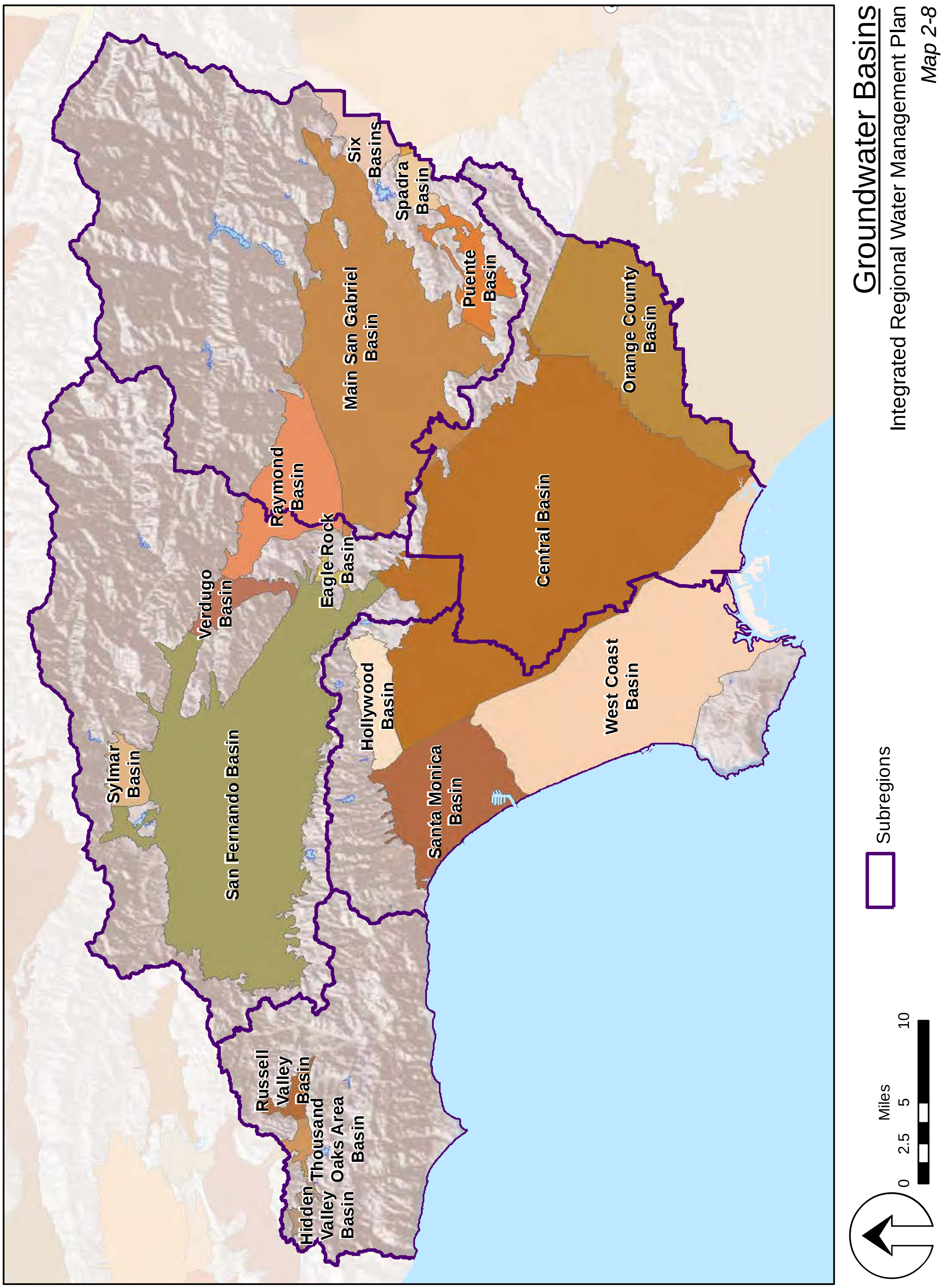
Integrated Regional Water Management Plan

*Map 2-5 (e)*

Sources: Cal-Atlas, LACDPW


Major Wastewater Service Areas
Integrated Regional Water Management Plan
Map 2-6
Sanitation Districts of
Los Angeles County
Orange County
Sanitation District
Long Beach
Water District
Glendale Water
& Power
Burbank Water
& Power
City of Los Angeles
Bureau of Sanitation
Triunfo Sanitation District
Las Virgenes MWD
Subregions
County Boundary
Miles
0 2.5 5 10
Sources: Cal-Atlas, ESRI, LACSD


Flood Control Districts
Integrated Regional Water Management Plan
Map 2-7
Los Angeles County Flood Control District
Ventura County Flood Control District
San Bernardino County Flood Control District
Orange County Flood Control District
Greater Los Angeles County Region
County Boundary
Los Angeles County FCD
Orange County FCD
San Bernardino County FCD
Ventura County FCD
Miles
0 2.5 5 10
Sources: Cal-Atlas, ESRI, LACSD, West Basin MWD, LADWP


Groundwater Basins
Integrated Regional Water Management Plan
Map 2-8
Subregions
Miles
0 2.5 5 10
Six Basins
Spadra Basin
Puente Basin
Main San Gabriel Basin
Orange County Basin
Raymond Basin
Central Basin
Eagle Rock Basin
Verdugo Basin
Hollywood Basin
West Coast Basin
Sylmar Basin
San Fernando Basin
Santa Monica Basin
Russell Valley Basin
Thousand Oaks Area Basin
Hidden Valley Basin

## 2.5 Sources of Water Supply and Infrastructure

The Region has developed a diverse mix of local and imported water supply sources and its associated infrastructure. Local water resources include groundwater, local surface water, recycled water, stormwater capture and use, water transfers, storage, and water use efficiency. Water is imported through the California State Water Project (SWP), the Colorado River Aqueduct, and the Los Angeles Aqueducts. Major water supply sources are described below.

### Groundwater

Groundwater represents a significant portion of local supplies in the Region, approximately 35 percent of the Region's entire supply in 2010. Most groundwater basins in the Region are adjudicated (via a court decision) and producers within these basins follow management guidelines established by their respective adjudications. Exceptions are the Orange County Basin, Santa Monica Basin, Hollywood Basin, and Puente Basin. The City of Santa Monica has implemented a groundwater management plan for the Santa Monica Basin. The Orange County Basin (which extends outside the southern boundary of the Region) is managed by Orange County Water District, which was established in 1933.

Groundwater basin recharge can occur via existing and restored natural channel bottoms or percolation of rainwater (natural recharge), however natural recharge is typically insufficient to maintain basin water levels and current pumping levels due to the extent of impervious surfaces and the presence of clay soils in parts of the Region. Many agencies rely on artificial recharge, by diverting local supplies from rivers or creeks when flow conditions are optimal, to spreading grounds (or basins) which typically contain sandy soils that promote infiltration. In some locations, spreading is limited because of the capacity limitations of the spreading facilities rather than being limited by water supply. Historical concerns about the presence of urban contaminants in stormwater may also limit the amount of local water that can be recharged, although the Water Augmentation Study conducted by the Council for Watershed Health monitored several sites and determined that stormwater pollutants do not degrade groundwater quality. In addition, recycled water is infiltrated in spreading grounds and injected (along with imported water) along the coast to form barriers to seawater intrusion at three locations (the Alamitos, Dominguez Gap, and West Coast Basin Barriers). This water augments and blends with groundwater, which is eventually extracted for potable use.

Conjunctive use programs may also be implemented to recharge basins, where imported water is recharged via spreading grounds or injection wells. Recharge can also occur "in-lieu," when an agency suspends production from its wells and uses other supplies. The reduction in pumping permits groundwater levels in the basin to recover. The amount of water that can be recharged in the basin may be limited by local runoff, recharge capacity, overlying groundwater demands, and water rights. Most of the time, it is more cost effective for agencies to supply groundwater rather than purchase imported water. Thus, the strategy of most groundwater agencies is to maximize groundwater production, up to estimated annual yield limits without significantly impacting groundwater levels, and meet the balance of the customer demand through imported or local water.

Groundwater basin water quality is a significant issue in the Region, as natural conditions result in high dissolved salt levels. In some aquifers, salt levels are so high the water is termed "brackish," which either requires desalination or advanced treatment to make the supply usable or blending the treated water with other supplies that have a lower salt content. In addition, land use practices and production practices have deteriorated water quality in portions of certain groundwater basins.

Many factors have contributed to the deterioration of water quality including historic overdrafting of groundwater basins (sometimes resulting in seawater intrusion), industrial discharges, agricultural chemical usage, livestock operations, contaminants in urban runoff, and naturally occurring constituents. The cost of treating these contaminants is often significant, and for some improperly disposed chemicals, effective treatment has not yet been identified.

Various agencies, including the San Gabriel Basin Water Quality Authority and the WRD have implemented programs to assess treatment options and treat the contaminated groundwater.

## Local Surface Water

### Los Angeles River

The Los Angeles River flows 51 miles from the union of Bell Creek and Arroyo Calabasas in the San Fernando Valley, then southeast through the City of Burbank and eventually southward to Long Beach. Originally, the Los Angeles River was the primary water source for the City of Los Angeles. Following several catastrophic floods, the Army Corps encased most of the river bed and banks in concrete, effectively eliminating interaction between groundwater and surface water in certain areas. Today, the river is primarily fed from stormwater, effluent from wastewater treatment plants, urban runoff, base flow from the Santa Monica and San Gabriel Mountains, and groundwater inflow in the Glendale Narrows.

Water agencies that have water diversion rights within the Los Angeles River watershed include the City of Pasadena and the City of Los Angeles. The City of Pasadena has rights up to 25 cubic feet per second (cfs) of Arroyo Seco runoff, though the yield of the Arroyo Seco is highly variable depending on weather and rain patterns, and uses its diversions for both direct use and groundwater recharge. Pasadena uses its rights for recharge of the local groundwater basin and treats for direct use. The City of Los Angeles has full rights to flows in the Los Angeles River and uses its diversion rights for groundwater recharge at various locations in the San Fernando Valley.

### San Gabriel River

The San Gabriel River flows 75 miles southwest from the San Gabriel Mountains, then southward from the Whittier Narrows to its ocean discharge at the City of Seal Beach. Unlike the Los Angeles River, due to more favorable soil conditions the San Gabriel River has a natural bed for most of its length, although the banks are armored with rip rap and concrete for flood control purposes. The river is fed by stormwater, base flow from the San Gabriel Mountains, dry weather urban runoff and effluent from wastewater treatment plants.

The San Gabriel River has been fully appropriated by the State Water Resources Control Board, with surface water rights belonging to two entities: the San Gabriel River Water Committee and the San Gabriel Valley Protective Association, which then distribute the water for either direct use or for groundwater recharge. Significant quantities of surface water naturally recharge groundwater via the permeable bottom in the San Gabriel River and are also used for groundwater recharge in several locations. During the dry season, the presence of dams and other diversions results in river flow that is sometimes discontinuous, as some river reaches are dry, while other reaches have flow.

## Imported Water

### State Water Project

The SWP is a system of reservoirs, pumps and aqueducts that carries water from Lake Oroville and other facilities north of Sacramento to the Sacramento-San Joaquin Delta and then transports that water to central and southern California. Environmental concerns in the Sacramento-San Joaquin Delta have limited the volume of water that can be pumped from the SWP. The potential impact of further declines in ecological indicators in the Bay-Delta system on SWP water deliveries is unclear. Uncertainty about the long-term stability of the levee system surrounding the Delta system raises concerns about the ability to transfer water via the Bay-Delta to the SWP.

The MWD contract with the DWR, operator of the SWP, is for 1,911,500 AFY. However, MWD projects a minimum dry year supply from the SWP of 370,000 AFY, and average annual deliveries of 1.4 million AFY. These amounts do not include water which may become available from transfer and storage programs, or Delta improvements. The San Gabriel Valley MWD's contract with DWR is for 28,800 AFY. San Gabriel Valley MWD uses this water to replenish the Main San Gabriel Basin as needed by its member agencies and the Main San Gabriel Basin Watermaster and is generally able to balance demands during dry years with water stored in the groundwater basin.

The infrastructure built for the project has become an important water management tool for moving not only annual deliveries from the SWP but also transfer water from other entities. MWD, among others, has agreements in place to store water at a number of groundwater basins along the aqueduct, primarily in Kern County. When needed, the project facilities can be used to move stored water to southern California. However, there are certain obstacles that must be overcome, including substantive limitations on the movement of water across the Bay-Delta system, court ordered pumping restrictions, constraints related to the quality of water, and the cost of the water. Generally speaking, DWR will not allow water in their aqueduct that is of lower quality than its own water.

### Colorado River

California water agencies are entitled to 4.4 million AFY of Colorado River water. Of this amount, the first three priorities totaling 3.85 million AFY are assigned in aggregate to the agricultural agencies along the river. MWD's fourth priority entitlement is 550,000 AFY. Until recently, MWD routinely had access to 1.2 million AFY because Arizona and Nevada had not been using their full entitlement and the Colorado River flow was often adequate enough to yield surplus water to MWD.

*Possible future drought year reductions in water supply from the Colorado River highlight the need for less dependence on imported water in the Region.*

MWD delivers the available water via the 242-mile Colorado River Aqueduct, completed in 1941, which has a capacity of 1.2 million AFY.

The Quantification Settlement Agreement (QSA), executed in 2003, affirms the state's right to 4.4 million AFY, though water allotments to California from the Colorado River could be reduced during future droughts along the Colorado River watershed as other states increase their diversions in accord with their authorized entitlements. California's Colorado River Water Use Plan and the QSA provide the numeric baseline to measure conservation (such as the lining of existing earthen canals) and water transfer programs (such as shifts from water from agricultural use to urban use). Such transfers between willing sellers and willing buyers would offset potential reductions in future deliveries of urban water made available by the Colorado River.

The QSA and several other related agreements were executed in October 2003, provide the numeric baseline to measure conservation and transfer programs by which unused agricultural priority water would be made available for diversion by MWD. They also allow for implementation of agricultural conservation, land management, canal lining and other programs. Since the signing of the QSA, water conservation measures have been implemented including the agriculture-to-urban transfer of conserved water from Imperial Valley to San Diego, agricultural land fallowing with Palo Verde, and the lining of the All-American Canal. By 2020, the QSA programs are expected to allow delivery to full capacity of the Colorado River Aqueduct at 1.25 million AFY, if needed.

### Los Angeles Aqueducts

High-quality water from the Mono Basin and Owens Valley is delivered through the Los Angeles Aqueducts to the City of Los Angeles. Construction of the original 233-mile Los Angeles Aqueduct from the Owens Valley was completed in 1913. In 1940 the aqueduct was extended 105 miles north to Mono Basin. A second aqueduct from Owens Valley was completed in 1970 to further increase capacity. Approximately 480,000 AFY of water can be delivered to the City of Los Angeles each year; however the amount the aqueducts deliver varies from year to year due to fluctuating precipitation in the Sierra Nevada Mountains and mandatory in-stream flow requirements. In addition, the diversion of water from Mono Lake has been reduced following a decision of the SWRCB and exportation of water from the Owens Valley is limited by the Inyo-Los Angeles Long Term Water Agreement (and related MOU) and an additional MOU between the Great Basin Air Pollution Control District and the City of Los Angeles (to reduce particulate matter air pollution from the Owens Lake bed). Additionally, water quality concerns such as disinfection byproducts may require future treatment of Los Angeles Aqueduct water. As a result of these restrictions on water transfers, future deliveries are expected to be reduced to an average of 254,000 AFY over the next 20 years.

## Recycled Water

Current average annual recycled water production in the Region is approximately 232,000 AFY, which represents approximately 20 percent of the current average annual effluent flows. Of the 232,000 AFY of recycled water produced, approximately 125,000 AFY is currently reused for urban landscape and agricultural irrigation, industrial process applications, environmental uses, groundwater replenishment, for maintenance of seawater barriers in groundwater basins along the coast. The remainder is currently discharged to creeks and rivers, often in concrete-lined channels but supporting riparian habitat in some locations with soft bottoms, or directly to the ocean. The Region's recycled water systems are owned and operated by numerous agencies. The primary producers/suppliers of recycled water include the Sanitation Districts of Los Angeles County, West Basin MWD, Las Virgenes MWD/Triunfo Sanitation District JPA, and the City of Los Angeles. Supplies are conveyed to the local wholesale, retail water purveyors or in certain cases directly to customers for delivery to the end users located in their respective service areas.

## Stormwater Capture and Use

The capture and use of stormwater runoff (runoff from urban areas that has not yet reached streams and rivers) is a potential source of supply that is currently underutilized. A majority of stormwater runoff from urban areas is currently directed to storm drains and is ultimately channeled into the ocean. Solutions such as rain barrels and cisterns would allow for the collection of stormwater for either direct use or infiltration. Water purveyors in the Region do not currently capture stormwater for direct use, but according to 2010 Urban Water Management Plans, expect to implement projects to equal 25,000 AFY. According to 2010 Urban Water Management Plans, the water purveyors in the Region plan on increasing stormwater recharge from 190,000 AFY to 215,000 AFY by the year 2035.

## Water Transfers

Prior to 1991, water transfers within the Region had been limited to transfers of annual groundwater basin rights (which continue to occur). In addition, agencies sometimes transferred water to enhance operational flexibility. MWD's facilities generally have not been used to transfer local water from one agency to another mainly because of water quality issues and potential downstream impacts. Sometimes, there is a restriction to export groundwater outside basin boundaries as a result of adjudication of the basin.

In response to the 1991 drought, the Governor's Water Bank was developed. MWD and other SWP contractors took advantage of the program to augment supplies and lessen the severity of drought impacts. Since that time, MWD has participated in water transfers as a water management strategy to augment supplies. The City of Los Angeles plans to develop water transfers as part of its supply strategy to replace a portion of the City's Los Angeles Aqueduct water that has been dedicated for environmental enhancement uses in the Eastern Sierra Nevada. The City of Los Angeles plans on up to 40,000 AFY of transfers through a future interconnection between the Los Angeles Aqueduct and the California Aqueduct. Should the costs of purchasing and wheeling (or moving) water from outside the Region be lower than purchasing MWD water, other agencies would likely be interested in implementing water transfers as a supply strategy.

## Storage

The water supply in the Region is heavily dependent on imported surface water; therefore various surface reservoirs (managed by MWD and the SWP) located outside the Region (such as Diamond Valley Lake) are used to facilitate water delivery to local water agencies and districts. Several smaller reservoirs have also been developed within the Region to assist in the management of water supplies. However, most of these local reservoirs are limited in their ability to capture local runoff. Most of the remaining dams in the Region have been developed for flood management purposes and are typically not used for long-term (e.g., multi-year) surface water storage.

The Army Corps oversees Hansen, Lopez and Sepulveda dams in the Los Angeles River watershed and Santa Fe and Whittier Narrows Dams in the San Gabriel River watershed. They are operated based on various constraints and operational priorities including flood protection, recreation, habitat preservation, and water conservation. Enhanced storage behind dams and better coordination between the Army Corps and local flood management entities regarding the timing of release of waters is a topic of discussion.

LACFCD oversees several surface water storage facilities, which were created to improve flood protection and store runoff for subsequent release and diversion to several spreading grounds for groundwater recharge. Additional spreading grounds are owned and operated by non-LACFCD entities in the Region.

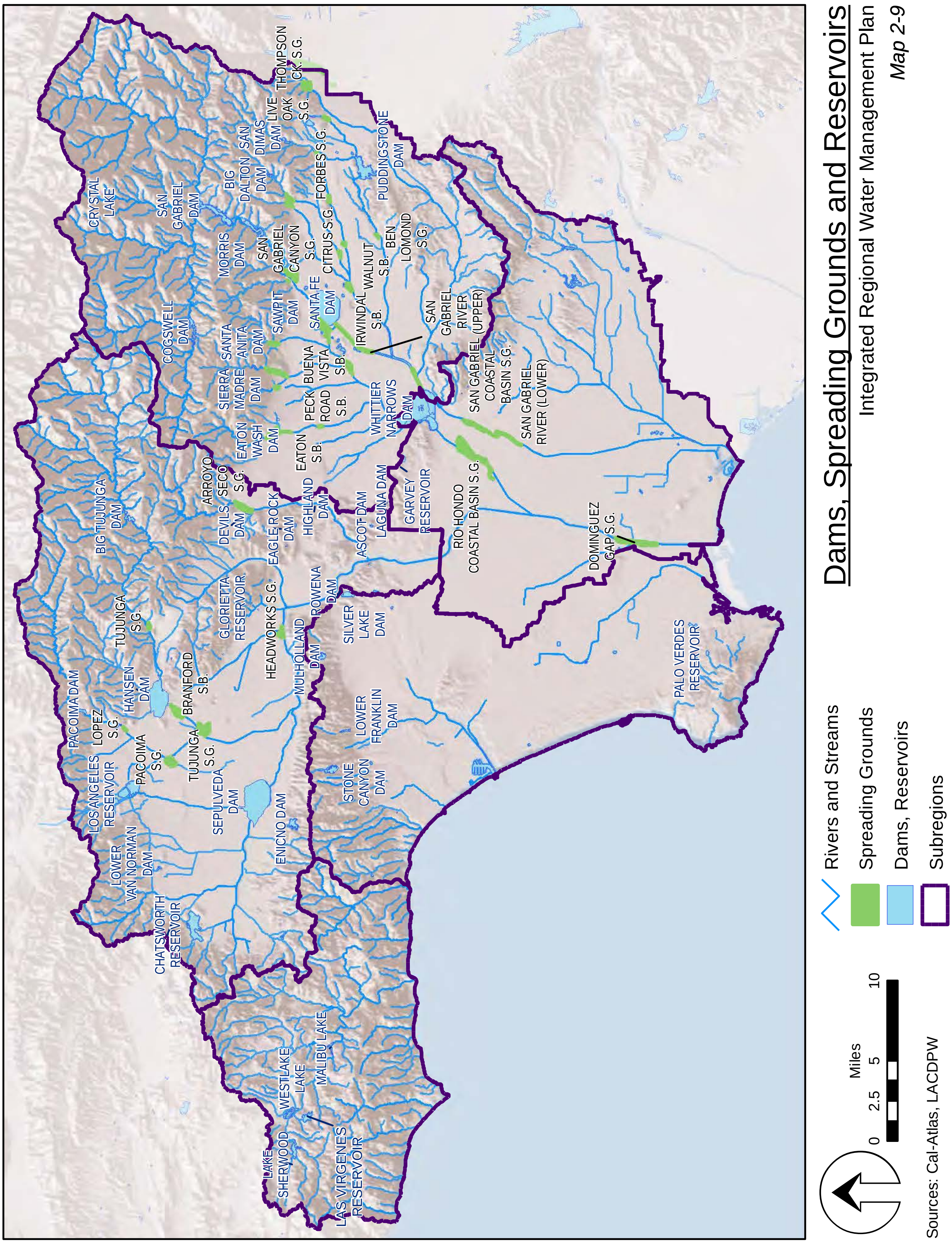
Eleven dams were constructed as part of the San Gabriel River and Montebello Forebay water conservation system to impound runoff from the San Gabriel Mountains prior to release for downstream spreading and groundwater recharge. Runoff in the San Gabriel River is captured by three dams in San Gabriel Canyon: Cogswell Dam on the West Fork, San Gabriel Dam below the confluence of the East and West Forks of the San Gabriel River, and Morris Dam, a few miles downstream of San Gabriel Dam. Once released from the upper canyon facilities, runoff flows to Santa Fe Dam and may be diverted to the Santa Fe spreading grounds, located off-river along the northern boundary of the dam, or conveyed downstream to the Rio Hondo and San Gabriel Coastal Basin Spreading Grounds.

On tributaries to the Los Angeles River, the Big Tujunga and Pacoima dams provide similar functions. LACFCD also oversees 17 inflatable rubber dams throughout the Los Angeles River basin. Most are used to divert flows into the spreading grounds, although several rubber dams in the San Gabriel watershed also promote short-term groundwater recharge through the stream bottom. Dams, spreading grounds and surface storage in the Region are depicted in Map 2-9.

The Region's spreading grounds are used to recharge local surface water in addition to imported water and recycled water. LACFCD has estimated that current recharge of local surface water is 220,000 AFY, and could potentially be increased by another 340,000 AFY during very wet years to offset imported water recharge.

Las Virgenes MWD purchases treated water from MWD and stores it in Las Virgenes Reservoir, in the City of Westlake Village. The reservoir also provides seasonal water storage allowing Las Virgenes MWD to purchase supplies off-season and deliver at times of peak demand to meet high summer irrigation needs.

The in-city water distribution systems of the City of Los Angeles once included 15 open-air reservoirs. Due to concerns from California Department of Public Health (CDPH) about open water storage, nine of these reservoirs have been bypassed, replaced, or covered. Los Angeles Reservoir is one of the last remaining open reservoirs. It has a capacity of 10,000 AF and is a primary water source of the San Fernando Valley area. LADWP does not consider removal of the Los Angeles Reservoir a viable option. To protect its water quality, a floating cover was proposed.




Dams, Spreading Grounds and Reservoirs

Integrated Regional Water Management Plan

*Map 2-9*

## Water Use Efficiency

Water use efficiency, though by definition the implementation of measures that reduce water demand, is addressed in greater detail in the supply discussion. Water purveyors in the Region have implemented a large number of programs that encourage the use of best management practices to reduce demand. In 2010 Urban Water Management Plans, urban water suppliers were required to comply with conservation targets laid out in the Water Conservation Bill of 2009 which sets water conservation targets for 2015 and 2020 to support an overall State goal of reducing urban potable per capita water use by 20% by 2020. As part of this work, the Region's suppliers have estimated current water use efficiency to save 50,000 AFY of water supply, and estimates that this can increase to 125,000 AFY.

# 2.6 Water Supply and Demand

As water agency boundaries are not aligned with the Region's boundaries, an estimate of the Region's water supply and demand was not readily available for this Plan. Instead, water supply and demand for the Region were estimated based on review of 2010 UWMPs, groundwater basin master plans, and meetings with water agencies' staff. The 2010 UWMPs, which are used as the primary source of water supply and demand projections, were prepared by urban water suppliers to support long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands over a 20-year planning horizon.

A representative group of urban water suppliers in the Region were chosen based on service area coverage of the Region, and their supplies and demands as listed in their planning documents were totaled to determine the 2010 supplies and demands for the Region. Retail supply and demand is shown in Table 2-1, while replenishment supply is shown in Table 2-2. Detailed information on supply and demand by water supplier may be found in Appendix E.

There are currently no environmental flow requirements in the Region's waterways, and therefore not included in the below supply and demand totals.

Table 2-1: Retail Water Supply and Demand (AFY)[1]

| Water Category | 2010 |
|---|---|
| Imported Water | 935,000 |
| Groundwater Pumping | 570,000 |
| Local Surface Water Diversions | 15,000 |
| Recycled Water (non-potable reuse) | 75,000 |
| Stormwater Capture and Direct Use | 0 |
| Desalinated Ocean Water | 0 |
| Water Use Efficiency/Conservation[2] | 50,000 |
| Total Retail Supply | 1,645,000 |
| Total Retail Demand | 1,515,000 |

*1. Values have been rounded up to the nearest 5,000 AFY.*
*2. Not all agencies reported conservation as a form of supply in 2010 UWMPs. Some agencies included as a reduction in demand.*

| Table 2-2: Replenishment Water (AFY)[1] | |
|---|---|
| Water Category | 2010 |
| Imported Water | 75,000 |
| Local Surface Water Diversions | 190,000 |
| Recycled Water | 50,000 |
| Total Replenishment Water | 325,000 |

*1. Values have been rounded up to the nearest 5,000 AFY.*

## 2.7 Water Quality

More than two centuries of agricultural, industrial, and residential development and the widespread use of chemicals, fertilizers, industrial solvents, and household products, has resulted in water quality degradation of varying degrees in both surface water and groundwater in the Region. These sources of degradation can be classified as either point or nonpoint sources. Point sources are the discrete (or known) discharge of water and/or wastes to the soil, groundwater, or surface waters. Common examples include wastewater treatment plants, industrial discharges and leaking underground storage tanks. Nonpoint sources are area-wide discharges to soil, groundwater, and surface waters, such as the application of fertilizers, atmospheric deposition of contaminants, and litter such as trash and plant materials. Point sources can be traced back to a single source, such as the end of a pipe, while nonpoint sources have widespread origins. Although many stormwater contaminants come from nonpoint sources, as the discharge of stormwater typically occurs via an individual storm drain or channel, stormwater discharge is regulated as a point source.

### Water Quality Issues

Growing public awareness and concern for controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. Amended in 1977, this law, commonly known as the Clean Water Act, established the basic structure for regulating discharges of pollutants into the waters of the United States and gave the USEPA the authority to implement pollution control programs. In California, per the Porter Cologne Water Quality Control Act of 1969, responsibility for protecting water quality rests with the SWRCB and the RWQCBs.

The SWRCB sets statewide policies and develops regulations for the implementation of water quality control programs mandated by state and federal statutes and regulations. The RWQCBs develop and implement Basin Plans designed to preserve and enhance water quality. The determination of whether water quality is impaired is based on the designated beneficial uses of individual water bodies and associated water quality criteria, which are established in the Basin Plan. As mandated by Section 303(d) of the Federal Clean Water Act, the SWRCB maintains and updates a list of "impaired" water bodies that exceed state and federal water quality standards. To address these impairments, the RWQCBs develop total maximum daily loads, or TMDLs, which would establish a maximum pollutant budget that can be discharged without impairing the designated beneficial uses. In addition to development of the TMDLs, the RWQCBs develop and implement the National Pollutant Discharge Elimination System (NPDES) permits for wastewater treatment plants and other point source dischargers to surface water bodies in the Region (shown in Map 2-10).

Even though agencies and cities in the Region have significantly reduced pollutants that are discharged to water bodies from individual point sources since the Clean Water Act was established, many of the major rivers and water bodies are still considered impaired due to trash, bacteria, nutrients, metals, and/or toxic pollutants. The quality of many water bodies continues to be degraded from pollutants discharged from diffuse and diverse nonpoint sources, and from the cumulative impacts of multiple point sources. As a result, many of the Region's creeks, rivers, and water bodies are


*Figure 2-1. Water Quality Issues. Volunteers on creek clean up duty. Dry weather and stormwater runoff creates significant water quality problems in the Region.*

included on the most recent 2010 update of the 303(d) list of impaired water bodies, as depicted on Maps 2-11(a) through 2-11(d). A number of TMDLs were adopted over the last decade and various water quality improvement projects and programs are being implemented by point source and non-point source dischargers including the counties and the cities in the Region.

Residential use of potable water, the importation of water, the use of recycled water, among other activities, all have the potential to increase the level of total dissolved solids (TDS) in surface water, wastewater, and groundwater. With naturally occurring elevated levels of TDS already present in both local surface water and groundwater, the need to manage salt levels has been recognized for some time.

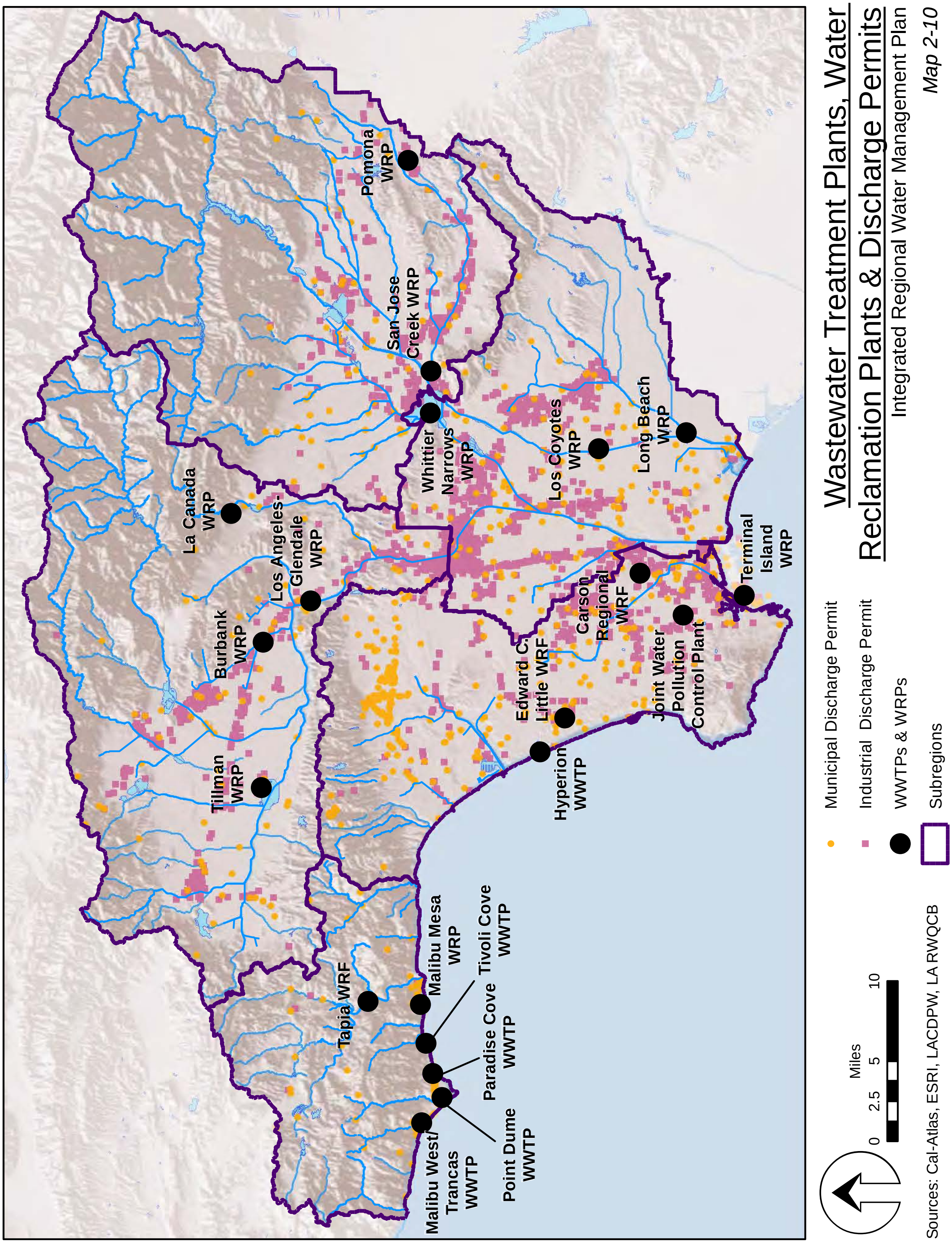
The transfer of water within the Region and the recharge of imported water have both been limited due to concerns about potential water quality impacts which include high salinity levels. Higher TDS source water also poses a problem for water recycling facilities because conventional treatment processes are typically designed to remove suspended, but not dissolved, particles and thus more advanced treatment methods may be required. Several water and wastewater agencies in the Region are members of the Southern California Salinity Coalition, which in conjunction with the National Water Research Institute, seeks to coordinate efforts to address the critical need to remove salt from water supplies and preserve water resources. In addition, the State Water Resources Control Board adopted a Recycled Water Policy in February 2009 that requires Salt and Nutrient Management Plans be completed by 2014 to facilitate management of salts and nutrients from all sources in order to protect beneficial uses.[1]

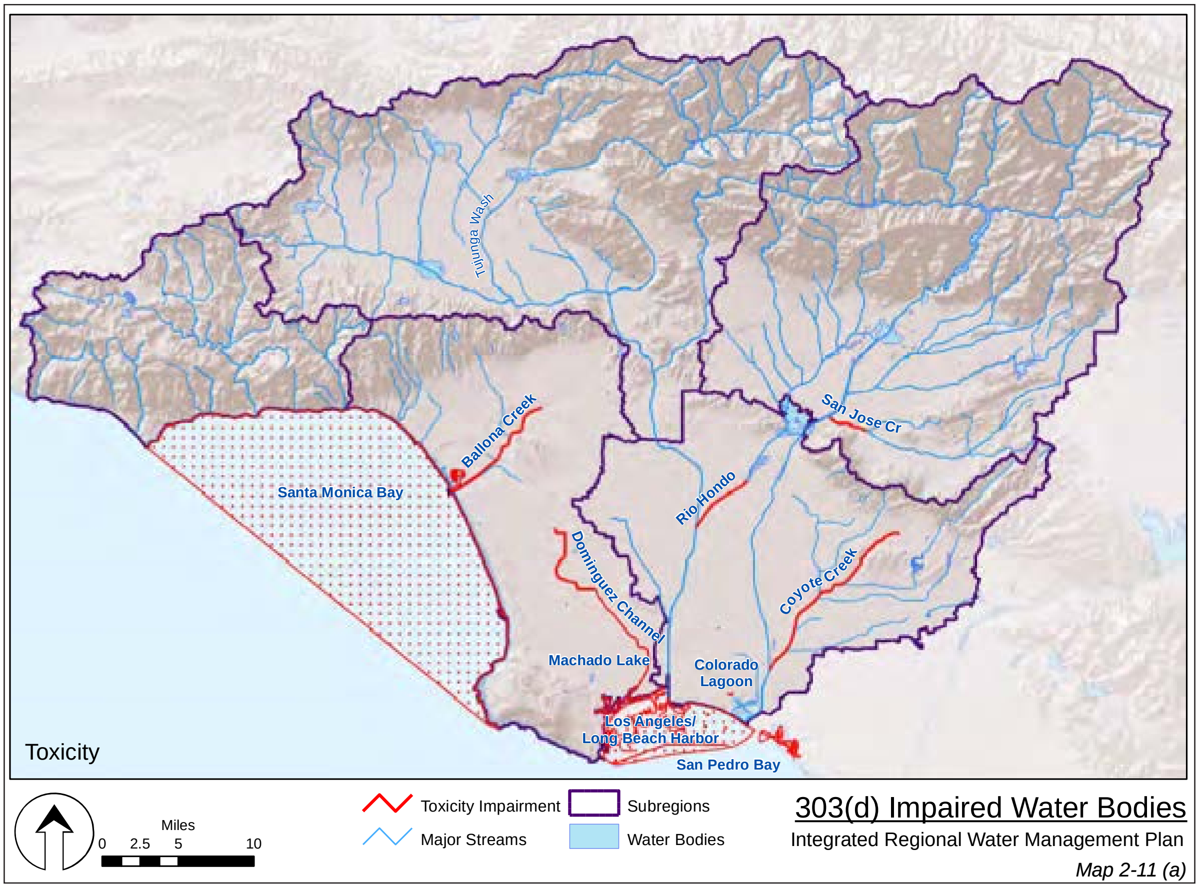
## Local Surface Water Quality

Throughout the Region's watersheds, surface water quality is typically better in the upper reaches and headwaters and declines as it receives urban and stormwater runoff in the lower watershed before discharging into the Pacific Ocean. Common contaminants in urban and stormwater runoff in the Region are described below.

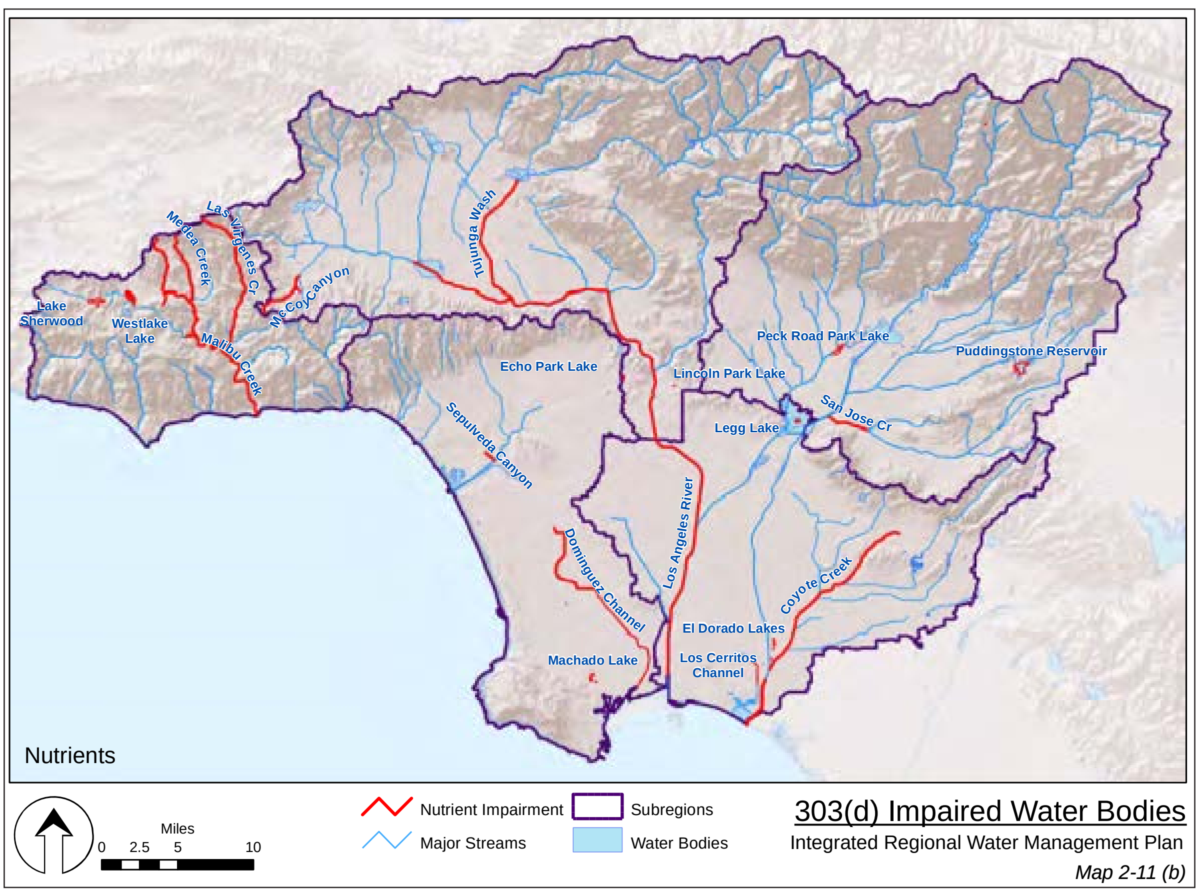
**Sediment** is a common component of stormwater, and can be a pollutant at certain levels. Sediment can be detrimental to aquatic life by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange in water bodies. Sediment can also transport other pollutants that are attached to it including nutrients, trace metals, and hydrocar-

1. *State Water Resources Control Board (SWRCB), 2012. Salt and Nutrient Management Program. http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/index.shtml*

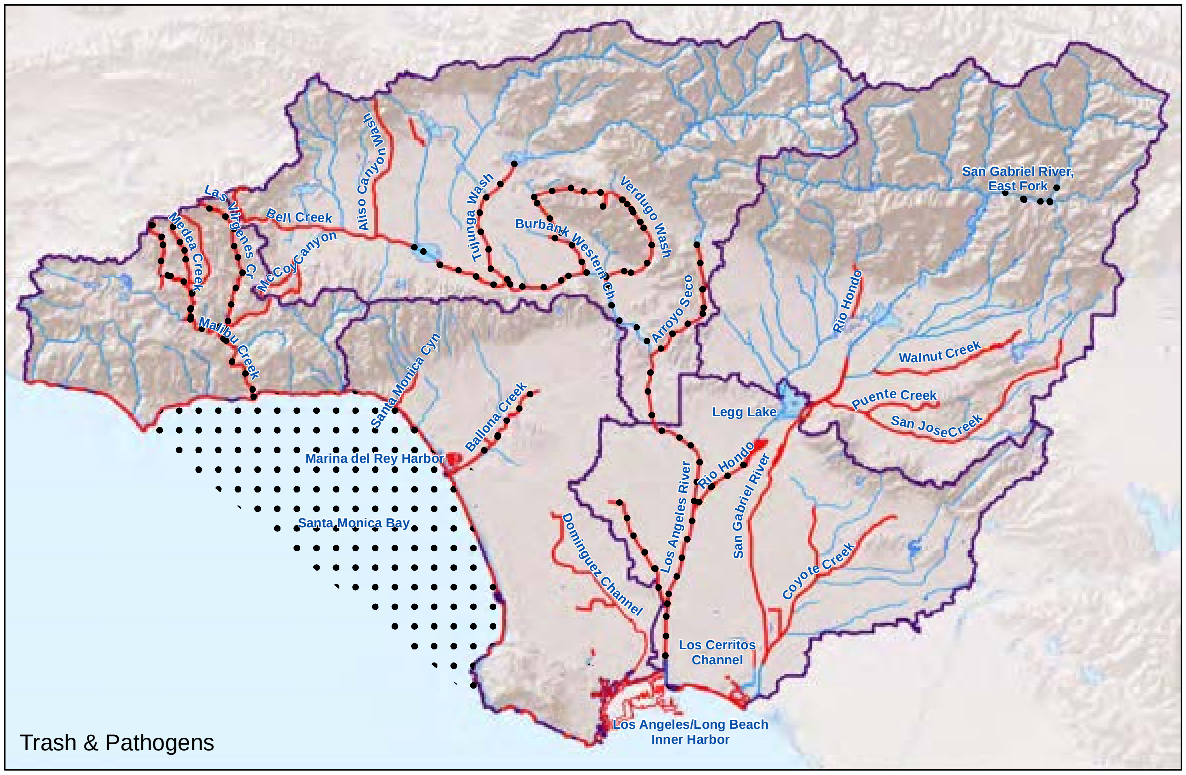

Wastewater Treatment Plants, Water Reclamation Plants & Discharge Permits
Integrated Regional Water Management Plan
Map 2-10
Municipal Discharge Permit
Industrial Discharge Permit
WWTPs & WRPs
Subregions
Miles
0 2.5 5 10
Sources: Cal-Atlas, ESRI, LACDPW, LA RWQCB
Pomona WRP
San Jose Creek WRP
Whittier Narrows WRP
Los Coyotes WRP
Long Beach WRP
La Canada WRP
Los Angeles-Glendale WRP
Burbank WRP
Tillman WRP
Terminal Island WRP
Carson Regional WRF
Joint Water Pollution Control Plant
Edward C. Little WRF
Hyperion WWTP
Malibu Mesa WRP
Tivoli Cove WWTP
Tapia WRF
Paradise Cove WWTP
Point Dume WWTP
Malibu West/ Trancas WWTP



Tujunga Wash
San Jose Cr
Ballona Creek
Santa Monica Bay
Rio Hondo
Dominguez Channel
Coyote Creek
Machado Lake
Colorado Lagoon
Los Angeles/ Long Beach Harbor
San Pedro Bay
Toxicity
Miles
0 2.5 5 10
Toxicity Impairment
Major Streams
Subregions
Water Bodies
303(d) Impaired Water Bodies
Integrated Regional Water Management Plan
Map 2-11 (a)

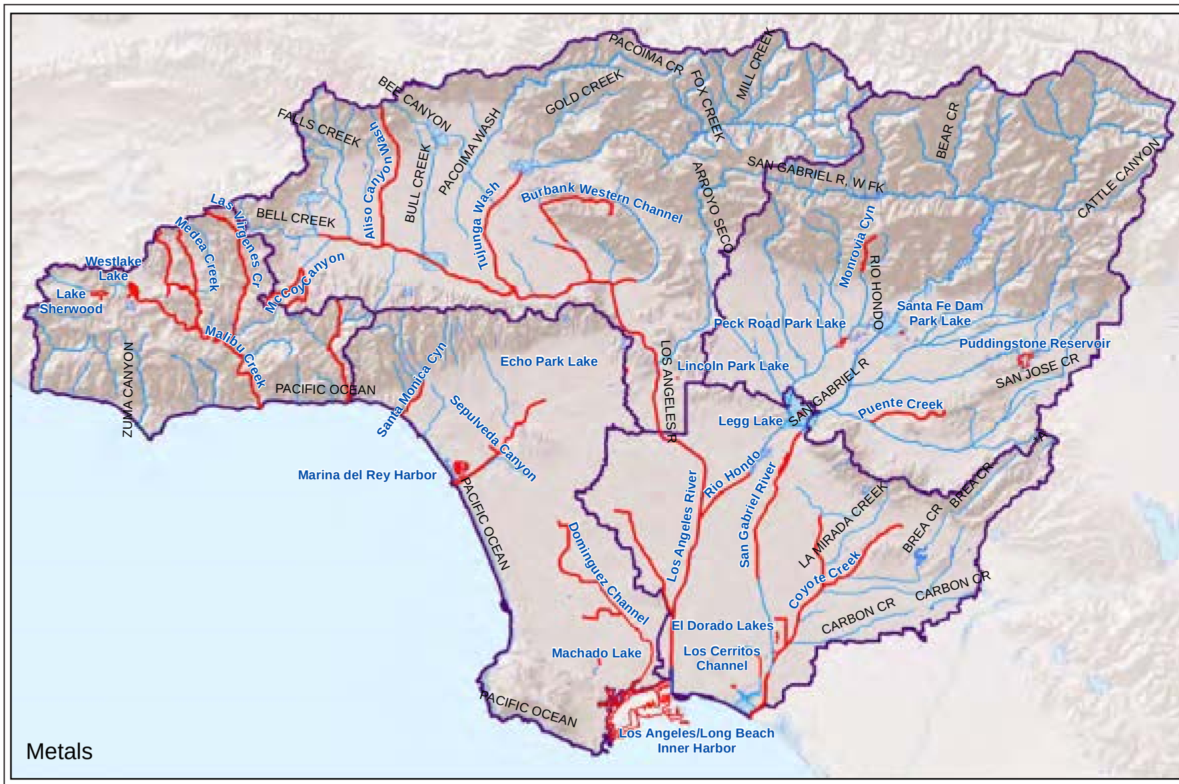
Tujunga Wash
Las Virgenes Cr
Medea Creek
McCoy Canyon
Lake Sherwood
Westlake Lake
Malibu Creek
Echo Park Lake
Peck Road Park Lake
Puddingstone Reservoir
Lincoln Park Lake
Legg Lake
San Jose Cr
Sepulveda Canyon
Los Angeles River
Dominguez Channel
Coyote Creek
El Dorado Lakes
Los Cerritos Channel
Machado Lake
Nutrients
Miles
0 2.5 5 10
Nutrient Impairment
Major Streams
Subregions
Water Bodies
303(d) Impaired Water Bodies
Integrated Regional Water Management Plan
Map 2-11 (b)




Trash Impairment
Pathogen Impairment
Major Streams
Subregions
Water Bodies

Miles 0 2.5 5 10

303(d) Impaired Water Bodies
Integrated Regional Water Management Plan
*Map 2-11 (c)*




Metals and Selenium Impairment
Major Streams
Subregions
Water Bodies

Miles 0 2.5 5 10

303(d) Impaired Water Bodies
Integrated Regional Water Management Plan
*Map 2-11 (d)*

*Santa Monica Beach. Continual improvement of the Region's surface water quality supports recreation at its many beaches.*

bons. Erosion and subsequent sedimentation is a natural process of the highly-erodible San Gabriel and Santa Monica Mountains. Other sources of sediment include stream banks, bridge pilings, vacant lots, and construction sites.

**Nutrients,** including nitrogen and phosphorous, are critical to the growth of plants. However, elevated nutrient levels can result in excessive or accelerated growth of vegetation, such as algae, which can result in water quality impairment. Common sources of nutrients include fertilizers used in landscaping and agriculture, human and animal waste, effluent from wastewater treatment facilities, and can be naturally elevated from local petroleum shales.

**Bacteria and viruses** are common contaminants in both urban runoff and stormwater. High levels of indicator bacteria (such as Escherichia coli) in stormwater sometimes results in the closure of beaches to contact recreation. Sources include sanitary sewer leaks and spills, illicit connections of sewer lines to the storm drain system, malfunctioning septic tanks, and fecal matter from humans, pets, and wildlife.

**Oil and grease** includes a wide array of hydrocarbon compounds, some of which are toxic to aquatic organisms at low concentrations. Sources of oil and grease include leakage from tanks, pipelines and old extraction sites, accidental spills, cleaning of vehicles and equipment, leaks in hydraulic systems, and the improper disposal of restaurant wastes and used oil.

**Metals** found in the Region's urban and stormwater runoff include lead, zinc, cadmium, copper, chromium, nickel, and mercury. Metals can be toxic to aquatic organisms at a trace concentration and mercury can bioaccumulate (accumulate to toxic levels in animals such as fish or birds). Many artificial surfaces of the urban environment (e.g., galvanized metal, paint, automobiles and brake pads, or preserved wood) contain metals, which enter stormwater as those surfaces corrode, flake, dissolve, decay, or leach. During storms, many of the metals present in stormwater are attached to sediments.

**Organic compounds** (e.g., adhesives, cleaners, sealants, solvents, etc.) and pesticides (e.g., herbicides, fungicides, rodenticides, and insecticides) may be found in urban and stormwater runoff in low concentrations. The widespread use of these substances and their improper disposal are the common sources of these compounds. Bioaccumulation of pesticides can have adverse effects on aquatic life and the animals that consume that life (e.g., seabirds that eat fish). Some of these substances were prohibited long ago due to negative impacts but are still detected in low concentrations (such as dichloro-diphenyl-trichloroethane [DDT]) and are now termed "legacy" pollutants.

**Trash, debris, and other floatables** are the result of the improper use, storage, and disposal of packaging and other products in urban environments, plant debris (such as leaves and lawn-clippings from landscape maintenance), animal excrement, street litter, and other organic matter. In addition to negative aesthetic impacts, these substances may harbor bacteria, viruses, and vectors.

During the last decade, over 30 TMDLs have been developed to address water quality impairments within the Region, with a number of impaired waters yet to be addressed. Various water quality improvement projects and programs are being implemented by point and non-point source dischargers including the counties, the cities in the Region and other responsible agencies such as park agencies and the California Department of Transportation. Table 2-3 contains a listing of TMDLs and Table 2-4 contains a list of 303(d) listed waters and impairments not yet addressed by a TMDL.

Watershed management plans have been developed for watersheds within the Region to help to guide future land use planning and projects, and improve the state of the watershed. Various agencies have developed management plans for the following watersheds:

- Los Angeles River
- San Gabriel River
- Santa Monica Bay
- Dominguez Channel
- Ballona Creek (part of the Santa Monica Bay Watersheds)
- Arroyo Seco (subwatershed of the L.A. River)
- Sun Valley (subwatershed of the L.A. River)

**Table 2-3: Adopted TMDLs (as of 2012)**

- Ballona Creek Estuary Toxic Pollutants TMDL
- Ballona Creek Metals TMDL
- Ballona Creek Trash TMDL
- Ballona Creek Wetlands Sediment and Invasive Exotic Vegetation TMDL
- Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL
- Colorado Lagoon Pesticides, PAHs, PCBs, Metals, etc. TMDL
- Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL
- Echo Park Lake TMDLs
- El Dorado Park Lakes Multiple TMDLs
- El Dorado Park Lakes Copper TMDL
- Lake Calabasas TMDLs
- Legg Lake Trash TMDL
- Lincoln Park Lake TMDLs
- Long Beach City Beaches and Los Angeles River Estuary TMDLs for Indicator Bacteria
- Los Angeles Harbor Bacteria TMDL
- Los Angeles Area Lakes Nitrogen, Phosphorus, Mercury, Trash, Organochlorine Pesticides and PCBs TMDLs
- Los Angeles River Bacteria TMDL
- Los Angeles River Metals TMDL
- Los Angeles River Nutrient TMDL
- Los Angeles River Trash TMDL
- Los Cerritos Channel Metals TMDL
- Machado Lake Nutrient TMDL
- Machado Lake Toxics TMDL
- Machado Lake Trash TMDL
- Malibu Creek Bacteria TMDL
- Malibu Creek Nutrient TMDL
- Malibu Creek Trash TMDL
- Marina del Rey Harbor Toxics TMDL
- Marina del Rey Harbor, Mothers' Beach and Back Basins Bacteria TMDL
- North, Center, and Legg Lake Multiple TMDLs
- Peck Road Park Lake TMDLs
- Puddingstone Reservoir TMDLs
- San Gabriel River East Fork Trash TMDL
- San Gabriel River Metals TMDL
- Santa Fe Dam Park Lake TMDL
- Santa Monica Bay Beaches Dry Weather Bacteria TMDL
- Santa Monica Bay Beaches Wet Weather Bacteria TMDL
- Santa Monica Bay DDTs and PCBs TMDL
- Santa Monica Bay Nearshore Debris TMDL

**Table 2-4: 303(d) Listed Waters without an adopted TMDL (as of 2012)**

- Alamitos Bay: Bacteria
- Arroyo Seco: Benthic-Macroinvertebrate Bioassessments
- Ballona Creek: Cyanide, Shellfish harvesting advisory
- Ballona Creek Wetlands: Shellfish harvesting advisory
- Burbank Western Channel: Cyanide
- Compton Creek: Benthic Community Effects
- Coyote Creek: Diazinon, Toxicity, Ammonia, pH, Bacteria
- Crystal Lake: Organic Enrichment/Low Dissolved Oxygen
- Dominguez Channel: Ammonia, Indicator Bacteria
- Dominguez Channel Estuary: Ammonica, Coliform Bacteria, Benthic Community Effects
- Lake Lindero: Chloride, Selenium, Specific Conductivity
- Lake Sherwood: Mercury
- Las Virgenes Creek: Benthic-Macroinvertebrate Bioassessments, Invasive Species, Sedimentation/Siltation, Selenium
- Lindero Creek: Benthic-Macroinvertebrate Bioassessments, Selenium, Invasive Species
- Los Angeles Harbor: Benthic Community Effects
- Los Angeles River Estuary: Chlordane, PCBs, DDT, Sediment Toxicity
- Los Angeles River: Cyanide, DDT, Oil, Diazinon, Dieldrin, Dibenz[a,h]anthracene
- Los Cerritos Channel: Ammonia, DEHP, Chlordane, Bacteria, Trash, pH
- Malibu Beach: DDT
- Malibu Creek: Benthic-Macroinvertebrate Bioassessments, Selenium, Invasive Species, Fish Barriers, Sedimentation/Siltation, Sulfates
- Malibu Lagoon Beach (Surfrider): Benthic Community Effects, DDT, PCBs
- Medea Creek: Benthic-Macroinvertebrate Bioassessments, Selenium, Invasive Species, Sedimentation/Siltation
- Rio Hondo: Cyanide, Oil, Diazinon
- San Gabriel River Estuary: Dioxin, Dissolved Oxygen
- San Gabriel River: Bacteria, Cyanide, pH
- San Jose Creek: TDS, pH
- San Pedro Bay: Chlordane, DDT, PCBs, Sediment Toxicity, ChemA, Bacteria, Nitrogen/Nitrate, Toxaphene, Toxicity
- Santa Monica Canyon: Bacteria, Copper, Lead, Selenium, Ammonia
- Sawpit Creek: Bis(2ethylhexyl)phthalate (DEHP), Fecal Coliform
- Topanga Creek: Lead
- Torrance Carson Channel: Coliform Bacteria
- Triunfo Creek: Lead, Mercury, Sedimentation/Siltation, Benthic-Macroinvertebrate Bioassessments
- Walnut Creek Wash: Benthic-Macroinvertebrate Bioassessments, Indicator Bacteria, pH
- Wilmington Drain: Coliform Bacteria

## Groundwater Quality

Groundwater quality varies throughout the Region, based on naturally occurring conditions, historical land use patterns, and groundwater extraction patterns.

Naturally occurring soil and geologic conditions in the Region often result in elevated levels of dissolved solids in groundwater (measured in terms of TDS). Commonly referred to as "hard" water, these dissolved solids include inorganic salts (including calcium, magnesium, potassium,sodium, bicarbonates, chlorides and sulfates) and small amounts of organic matter. Increases in groundwater TDS concentrations are a function of the recharge of storm and urban runoff, imported water, and incidental recharge. Naturally hard water precludes the use of groundwater throughout one of the GLAC IRWMP Subregions, the North Santa Monica Bay Subregion. They are also attributed in part to the legacy of salt contamination from past agricultural and land uses, including fertilizer use and waste disposal.

Groundwater quality in some portions of the Region has been degraded by elevated levels of nitrates primarily from past agricultural land use practices and plumes of volatile organic compounds (VOCs) from the past disposal of industrial solvents. These include trichloroethylene (TCE), a common degreaser and cleaning product, and perchloroethylene (PCE), commonly used in dry cleaning of clothing. In addition, perchlorate contamination, associated with the manufacturing and testing of solid rocket propellants, is another major concern. The solid salts of ammonium perchlorate, potassium perchlorate, or sodium perchlorate are soluble in water and can persist for decades. Groundwater contamination has also occurred in some locations from the use of methyl tertiary butyl ether (MTBE) a gasoline additive used to increase octane ratings and reduce emissions. Although the use of MTBE was discontinued in 2003 (following the discovery of MTBE in groundwater wells in the City of Santa Monica), many underground gasoline storage tanks leaked and created the potential for contamination. Groundwater cleanup efforts are being coordinated by various agencies and cities, including the San Gabriel Basin WQA and WRD.

The following is a summary of water quality issues in each of the Region's groundwater basins:

- **Main San Gabriel Basin:** VOCs, NDMA, nitrate, perchlorate, and TDS
- **Puente Basin:** TDS, nitrate, VOCs
- **Six Basins:** nitrate, perchlorate, VOCs, arsenic, radon
- **Raymond Basin:** TDS, nitrate, perchlorate, VOCs
- **San Fernando Basin:** TCE, PCE, hexavalent chromium, nitrate, sulfate, TDS
- **Verdugo Basin:** MTBE, nitrate
- **Sylmar Basin:** nitrate
- **Central Basin:** TDS, VOCs, perchlorate, nitrate, iron, manganese, chromium
- **West Coast Basin:** TDS
- **Santa Monica Basin:** TCE, PCE, perchlorate, MTBE
- **Hollywood Basin:** TDS

The cost of treating these contaminants so that groundwater supplies can be optimized is often significant. Additionally, effective treatment has not yet been identified for some chemicals and testing needs to be performed of different treatment methods prior to identifying the preferred treatment alternative. Some of the contamination is extensive and several sites are on USEPA's National Priorities List for remediation. The cost to treat this groundwater is typically in the millions of dollars.

One example is the Baldwin Park area where VOCs have been detected at 1000 times above the established maximum contaminant levels (MCLs). Although responsible parties, who are obligated to pay for the remediation, were identified, it has taken years for this remediation project to begin. Although the VOCs were identified in the 1980s and an agreement was reached in the late 1990s to begin treatment, other contaminants were subsequently found and new treatment methods had to be identified. In 2000, treatment of the VOCs, N-nitrosodimethylamine (NDMA), and perchlorate began. Additional programs are planned or underway.

The extraction of groundwater above natural replenishment levels and the subsequent intrusion of seawater have adversely affected groundwater quality at some coastal locations in the Region since the 1940's. Seawater intrusion can degrade water quality such that wells become unusable and reduce available aquifer storage. Los Angeles County operates and maintains three seawater intrusion barrier systems along the coast that utilize treated wastewater and imported water to reduce the seawater intrusion in coastal aquifers.

## 2.8 Environmental Resources

### Historical Wetlands

California is estimated to have lost over 90 percent of its coastal wetlands since the 1850s due to development, according to the California Coastal Commission. According to the Coastal Conservancy, within the Los Angeles River watershed, 100 percent of the original lower riverine and tidal marsh and 98 percent of all inland freshwater marsh and ephemeral ponds have been drained or filled (California Resources Agency, 2001).

*Ballona Wetlands is a large historical wetland adjacent to the Marina Del Rey small craft harbor.*

Similar loss occurred with the channelization and improvement of the Region's creeks. Currently, two expansive areas of coastal wetlands remain: the Los Cerritos wetlands complex, and the Ballona wetlands and lagoons near the mouth of Ballona Creek. Other remaining historic wetland areas include the El Dorado wetlands near the confluence of Coyote Creek and the San Gabriel River; the lower reach of Compton Creek where the channel bottom is unlined; some limited saltwater marsh along the banks at the lowest reach of the Los Angeles River (SCWRP, 2001 and Resources Agency, 2001), and the coastal lagoons in the North Santa Monica Bay Watersheds, including Malibu, Trancas, Topanga, Zuma and Las Flores lagoons.

After a long history of widespread destruction and degradation, wetlands have belatedly been recognized as performing many valuable, even critical roles in the environment. Wetlands can function as sources, sinks and transformers of chemical, genetic and biological materials. They have been likened to "the kidneys of the landscape" for the role they play in hydrologic and chemical cycles, and in improving water quality (Mitsch & Gosselink, 1986). Functional wetlands (e.g., those that retain their natural ecological functions) have been shown to cleanse polluted waters, prevent or mitigate floods, protect shorelines and channel banks, and recharge groundwater aquifers. Additionally, wetlands provide unique and critical habitats for large numbers of flora and fauna. Thus, expansion and restoration of existing wetlands which retain natural functions, and development of constructed wetlands which recreate natural functions have the potential to improve water quality, improve flood protection, restore or create habitat, and enhance groundwater recharge.

There are many different ways to categorize or define aquatic habitats, including approaches based on various ecological or regulatory perspectives. For this Plan, rather than use the term "wetland", which might have unintended associations, the term "aquatic habitat" is used to refer to land transitional between terrestrial and aquatic systems where the water table is usually at or near ground surface or the land is covered by shallow water.

Aquatic habitat can be categorized into three general categories: (1) tidal aquatic habitat, (2) freshwater aquatic habitat, and (3) riverine (or riparian) aquatic habitat based on categories defined by the National Wetland Inventory (NWI). Although incomplete, the NWI is a very important source of information for the present aquatic habitat conditions with the GLAC. Larger, regional areas that function as off-system detention and storage would be considered freshwater aquatic habitat. While it is recognized that rivers and stream beds are not always considered aquatic habitats, for they do provide some aquatic habitat value, and therefore are considered for this study. The definition for each of these categories is as follows:

- Tidal aquatic habitats
- Freshwater aquatic habitats
- Riverine aquatic habitats

## Tidal Aquatic Habitat

Tidal aquatic habitats include aquatic habitats that are inundated by tides, either seasonally or year-round. Marine harbors, a man-made habitat, are also considered tidal aquatic habitats. In the NWI mapping system, the three categories included in tidal aquatic habitats are estuarine and marine deepwater, estuarine and marine aquatic habitat, and tidal aquatic habitats.

## Freshwater Aquatic Habitat

Freshwater aquatic habitats include aquatic habitats such as depressional marshes, lakes, and ponds. The NWI category "freshwater aquatic habitats" include freshwater emergent aquatic habitat, freshwater forested/shrub aquatic habitat, freshwater ponds and lakes, and also considers man-made habitats such as flood control basins and ponds which may include areas of freshwater aquatic habitats. It is an important distinction that although spreading grounds and some stormwater Best Management Practices, such as detention basins, swales, and depressional areas, also provide ecosystem benefits, they belong under a separate category and should not be subject to the same protection criteria.

## Riverine Aquatic Habitat

Riverine aquatic habitats include the streambed and associated riparian areas, including upper and lower riverine habitats and dry washes. Man-made habitats considered riverine aquatic habitats include concrete-lined channels and soft-bottomed channels. Note that "riparian" is sometimes used to mean riverine aquatic habitats. Because of its common usage, the terms are used interchangeably here. However, strictly speaking, riparian refers to the vegetated habitat adjacent to streams, rivers, lakes, reservoirs and other inland aquatic systems. This habitat is typically a linear corridor of variable width that occurs along perennial, intermittent, and ephemeral streams and rivers. In undisturbed areas, two distinguishing features of riparian ecosystems are the hydrologic interaction that occurs between the stream channel and adjacent areas through periodic exchange of surface water and groundwater, and the distinctive geomorphic features and vegetation communities that develop in response to this hydrologic interaction.

Due to the extensive urbanization on the coastal plain and inland valleys, current riverine aquatic habitat within the Region bears little resemblance to the pre-development conditions. Faber et al. (1989) estimated that 90 to 95 percent of the riparian habitat has been lost. Most native riverine aquatic habitat in the Region is located in the Santa Monica and San Gabriel Mountains, although some riverine aquatic habitat corridors occur along the upper and middle reaches of the San Gabriel River, including portions of Walnut, San Jose, and Coyote Creeks, the Chino, Puente, and Simi Hills, and the Verdugo and Santa Susana Mountains. In-stream habitat also occurs in the upper San Gabriel River and streams in the San Gabriel foothills, the Whittier Narrows, Sepulveda Basin, Hansen Dam, and the Glendale Narrows. Although the San Gabriel Mountains contain some large areas of quality riverine aquatic habitat, much of the other riverine aquatic habitat in the Region is increasingly stressed by recreational use, exotic species, hydrologic modifications, natural disturbance such as fires and drought, and encroaching development. In regional parks, recreation areas, and other protected areas, patches of natural or nearly natural habitat of varying size remain, supporting native species of plants and animals. Substantial portions of the remaining riverine aquatic habitat are located on private lands.

Where riverine aquatic habitats remain within or adjacent to urbanized areas, conditions are often impaired by degraded water quality, altered hydrologic conditions, encroachment on, and modification of, adjacent "buffer" habitat, and modified sediment transport. Water quality impairments generally include increases in 1) water temperature; 2) nontoxic elements such as sediment and nutrients; and 3) toxic contaminants such as pesticides and heavy metals. Since functional riparian vegetation and wetlands can improve water quality by removing or sequestering many contaminants, the widespread loss of riparian and aquatic habitat and/ or reduction of their normal functions have reduced the potential for these natural systems to enhance water quality, provide flood protection, recharge groundwater, and serve as wildlife corridors.

## Significant Ecological Areas and Environmentally Sensitive Habitat Areas

Significant Ecological Areas (SEAs) are ecologically important areas that are designated by the County of Los Angeles as having valuable plant or animal communities. Similar to the SEAs are Environmentally Sensitive Habitat Areas (ESHAs), which are designated by the Coastal Commission via local coastal programs. Terrestrial or aquatic habitat can qualifies for recognition as an SEA or

ESHA if the habitat possesses one or more of the following features, or classes:

- Habitat of rare, endangered, or threatened plant or animal species;
- Represents biotic communities, vegetative associations, or habitat of plant or animal species that are either one-of-a-kind, or are restricted in distribution on a regional basis;
- Represents biotic communities, vegetative associations, or habitat of plant or animal species that are either one-of-a-kind, or are restricted in distribution in Los Angeles County;
- Habitat that at some point in the life cycle of a species or group of species serves as a concentrated breeding, feeding, resting, or migrating grounds, and is limited in availability;
- Represents biotic resources that are of scientific interest because they are either an extreme in physical/geographical limitations, or they represent an unusual variation in a population or community;
- An area important as game species habitat or as fisheries;
- An area that would provide for the preservation of relatively undisturbed examples of the natural biotic communities in Los Angeles County; and
- A special area worthy of inclusion, but one that does not fit any of the other seven criteria.

*Rindge Dam is an example of aging infrastructure as well as a major barrier to Steelhead Migration in the Malibu Creek Watershed.*

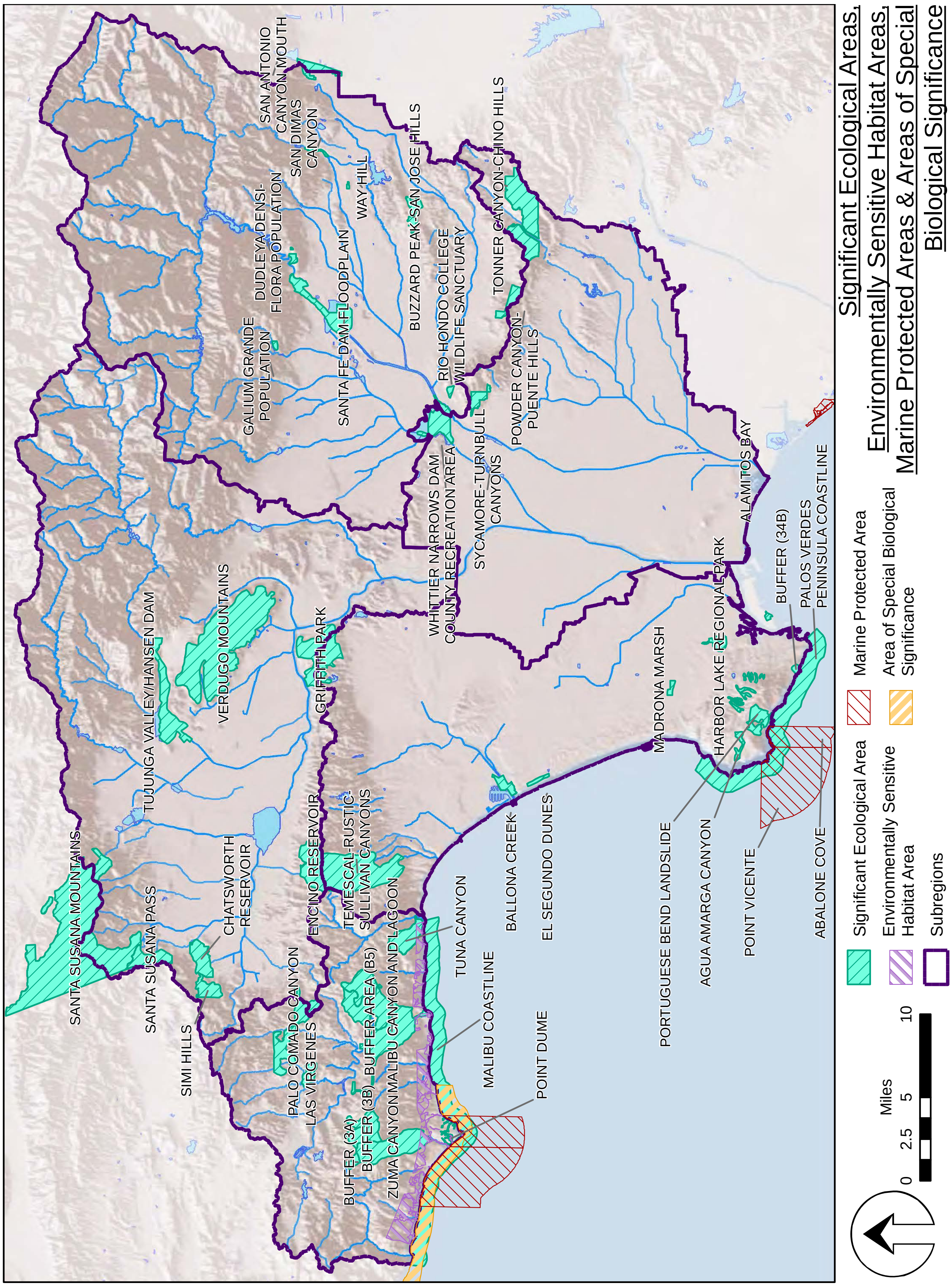
SEAs are offered certain protections within the unincorporated portions of Los Angeles County. Development proposals located within a SEA and outside incorporated City boundaries are reviewed by the Significant Ecological Area Technical Advisory Committee (SEATAC) which recommends changes to the project and mitigation measures to protect the habitat. The County of Los Angeles is in the process of updating the SEA designations and policies. Current SEAs within Los Angeles County are depicted on Map 2-12.

## Areas of Special Biological Significance

In the mid-1970s, to protect sensitive coastal habitats, the SWRCB designated 34 areas on the coast of California as ASBS, including the area between Mugu Lagoon in Ventura County and Latigo Point in Los Angeles County. Several watersheds in the North Santa Monica Bay drain to the eastern portion of this ASBS, between Sequit Point (near the Los Angeles County line) and Latigo Point, which begins at the intertidal zone and extends 1,000 feet from the shore (or to a depth of 100 feet, whichever is greater). The California Coastal Commission has designated all watershed lands adjacent to an ASBS as Critical Coastal Areas (CCA). Thus, development in this CCA and runoff from that area is subject to special conditions.

The land form along this portion of the ASBS generally consists of a coastal bluff with cliffs along the shoreline, except at Zuma Beach, where the coastal bluff is separated from the shore by a wide sandy beach. Vegetation types in the adjacent onshore areas include coastal strand, coastal sage scrub and riparian woodland (where several intermittent streams reach the coast). Subtidal habitat types along this ASBS include exposed rock reefs and kelp beds, semi-protected sandstone reefs and kelp beds, shallow sands, and deeper sands along most of the ASBS (SWRCB, 1979).

Runoff in this area includes stormwater discharge from roads (including State Highway 1) and some dry-weather urban runoff from the residential development along the coast and in upland areas. Several beaches along this area are 303(d) listed for beach closures and high coliform bacteria counts.




Significant Ecological Areas, Environmentally Sensitive Habitat Areas, Marine Protected Areas & Areas of Special Biological Significance

Integrated Regional Water Management Plan
*Map 2-12*

Sources: Cal-Atlas, LACDPW

The Public Resources Code prohibits the discharge of point source waste and thermal discharges into an ASBS, except by special conditions. In addition, the California Ocean Plan prohibits the discharge of dry-weather runoff from nonpoint sources into an ASBS. In 2012, the City of Malibu and the County of Los Angeles were granted a general exemption to the California Ocean Plan Waste Discharge Prohibition for discharges of stormwater. The exception is subjected to special conditions, such as elimination of dry weather flows, control of stormwater pollutants, and extensive monitoring.

## 2.9 Open Space and Recreation

The Region's open space resources are extensive, due to the presence of large portions of the Angeles National Forest and the Santa Monica Mountains National Recreation Area. The benefits of open space lands within the Region, whether in public or private ownership, are numerous. These natural areas provide large expanses of open space, which absorb rainfall that contributes to groundwater recharge and produce runoff that feeds local streams and the Region's two major rivers, and so provides a substantial portion of the Region's local water supply.

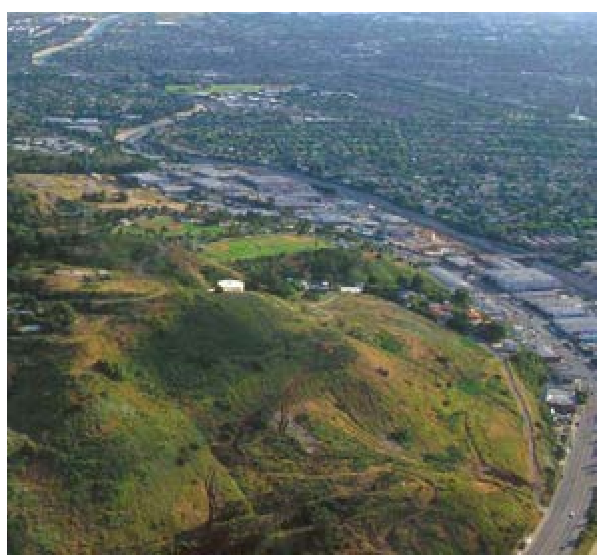
Additionally, the physical benefits of open space are complemented with economic benefits that open space provides to those who live near open space lands and to entire communities. Ecosystem services provide one approach for framing the values and benefits of open space. Ecosystem services are the benefits people obtain from ecosystems. The Millennium Ecosystems Assessment (2005) has presented a scheme for classifying ecosystem services using four general categories:

- **Provisioning services** such as food, water, timber, and fiber
- **Regulating services** that affect climate, floods, disease, wastes, and water quality
- **Cultural services** that provide recreational, aesthetic, and spiritual benefits
- **Supporting services** such as soil formation, photosynthesis, and nutrient cycling

Aquatic habitats provide services in all four categories, as is shown in Table 2-5 (Vymazal, 2011). Aquatic habitat ecosystems reduce flood damage to human communities, sequester carbon, and reduce pollutants in runoff entering streams (Brauman et al., 2007). Aquatic habitats support consumptive uses such as hunting and fishing as well as non-consumptive uses such as bird watching. Zedler and Kersher, 2008, consider four of the many functions performed by aquatic habitats to have global significance and value as ecosystem services: biodiversity support, water quality improvement, flood abatement, and carbon management.

Upland habitats also provide a wide range of ecosystem services. As with aquatic habitats, uplands provide biodiversity support and support consumptive uses such as hunting as well as non-consumptive uses such as recreation and education.

The preservation of environmental resources within open space and recreation areas is generally promoted by the Land Management Plan for the Southern California Forests and the Santa Monica Mountains Comprehensive Plan. Additional open space is located in the undeveloped portions of the foothills south of the Angeles National Forest, and throughout the Santa Monica, Santa Susanna and Verdugo Mountains, the Baldwin, Chino, and Puente Hills, and the Palos Verdes Peninsula. Protection of the open space in these areas is generally the responsibility of local Park Agencies and General Plans.



*Baldwin Hills is one of the few remaining preserves of large open space in the heart of the Region.*

| Table 2-5: Examples of Services Provided by Aquatic Habitats | |
|---|---|
| Provisioning Services | |
| Food | Production of fish, wild game, fruits, grains |
| Fresh water | Storage and retention of water for domestic, industrial and agricultural use |
| Fiber and fuel | Production of logs, fuel-wood, peat, fodder |
| Biochemical | Extraction of medicines and other materials from biota |
| Genetic materials | Genes for resistance to plant pathogens, ornamental species |
| Regulating Services | |
| Climate regulation | Source of and sink for greenhouse gases; influence local and regional temperature, precipitation, and other climate processes |
| Water regulation (hydrological flows) | Groundwater recharge/discharge; flow attenuation |
| Water purification and waste treatment | Retention, recovery, and removal of excess nutrients and other pollutants |
| Erosion regulation | Retention of soils and sediments |
| Natural hazard regulation | Food control; storm protection |
| Pollination | Habitat for pollination |
| Cultural Services | |
| Spiritual and inspirational | Source of inspiration; many religions attach spiritual and religion values to aspects of aquatic habitat ecosystems |
| Recreational | Opportunities for recreational activities |
| Aesthetic | Many people find beauty or aesthetic value in aspects of aquatic habitat ecosystems |
| Educational | Opportunities for formal and informal education and training |
| Supporting Services | |
| Soil formation | Sediment retention and accumulation of organic matter |
| Nutrient cycling | Storage, recycling, processing, and acquisition of nutrients |

Preservation of such spaces can protect existing water resources and native habitat, as these open spaces absorb rainfall, produce runoff that feeds local streams, and may contribute to groundwater. Watershed and open space plans, such as Common Ground from the Mountains to the Sea, also promote the preservation of these areas.

Excluding the large open spaces and other state lands in the upper portions of the watersheds, within the urbanized portions of the Region, there are over 1,000 parks with a combined total area of approximately 31,800 acres. Major open spaces and parks are depicted on Maps 2-13(a) through 2-13(e). With a current population of approximately 9.6 million, the Region has approximately 3.3 acres of parkland per 1,000 residents (excluding Angeles National Forest Lands), although considerable variation exists between the Subregions. In some communities, which are proximate to large open spaces, access to parkland with active recreational opportunities is limited. Most municipalities within the Region use a standard of four acres of parkland per 1,000 residents and six acres of open space per 1,000 residents. Thus, current parkland in the Region is below this identified minimum recommendation.

Open space used for recreation and public access has the potential to optimize use of local water resources by preserving or enhancing groundwater recharge, and thereby improving water supply reliability and providing opportunities to reuse stormwater or recycled water for irrigation improve surface water quality, to the extent that it filters, retains, or detains stormwater runoff (although few existing parks or open spaces include specific features to improve the quality of stormwater runoff).

## 2.10 Ecological Processes

Although large portions of the Region have been subject to urban and suburban development, ecological processes still play an important role in the management of water resources. The large expanses of open space in the upper watersheds of the Los Angeles and San Gabriel Rivers and throughout the Santa Monica Mountains provide a substantial portion of Region's water supply.

Fire is an integral and necessary part of the natural environment and plays a role in shaping the landscape, yet fire frequency has increased due to human ignition with increasing populations and human activity which has resulted in open spaces with varying fuel loads. Catastrophic wildfire events can denude hillsides which create opportunities for invasive plants and increase the potential for subsequent rains to result in debris flows that erode the landscape and can clog stream channels, damage structures, and injure inhabitants in the canyons and lower foothill areas.

Invasive species in the Region have also substantially affected specific habitats and areas. Along with the rest of California, most the Region's native grasslands were long ago displaced by introduced species. The receptive climate has resulted in the widespread importation of plants from around the globe for landscaping. Some plant introductions have resulted in adverse impacts. In many undeveloped areas, non-native plants such as arundo (*Arundo donax*), tree of heaven (*Alianthus altissima*) tree tobacco (*Nicotiana glauca*), castor bean (*Ricinus communis*), salt cedar (*Tamarix ramosissima*) and cape ivy (*Senecio mikanioides*) are out-competing native species because they are not edible to wildlife or lack natural predators such as disease and insects. Arundo, a tall bamboo-like grass that is prolific and difficult to eradicate, is probably the most invasive of the exotic plant species. In riparian areas, it takes up large amounts of water, crowds out native plants, clogs streams, and disrupts the balance for aquatic species. The removal of this particular species, which requires focused and repeated efforts, can provide substantial dividends in water savings and restored species diversity.

As noted earlier, limited aquatic habitat remains within those areas subject to development. In locations where such habitat exists, contact with water is critical to long-term viability. To the extent that channelization of streams prevents natural percolation of water into the soil, and in some locations, the return of baseflow to stream channels, the continued presence of aquatic vegetation cannot be ensured. The presence of riparian vegetation within soft-bottom portions of the rivers (e.g., the Los Angeles River in the Sepulveda Basin and Elysian Valley, the Rio Hondo in Whittier Narrows, and many locations along the San Gabriel River) creates habitat that has become dependent on runoff, which in some locations is supplemented by recycled water discharge from wastewater treatment plants. Consequently, the removal or redirection of that flow could adversely affect habitat in those locations. In addition, the proposed restoration of steelhead fisheries in the Santa Monica Mountains, such as Malibu Creek, may require that some recycled water discharge be maintained.

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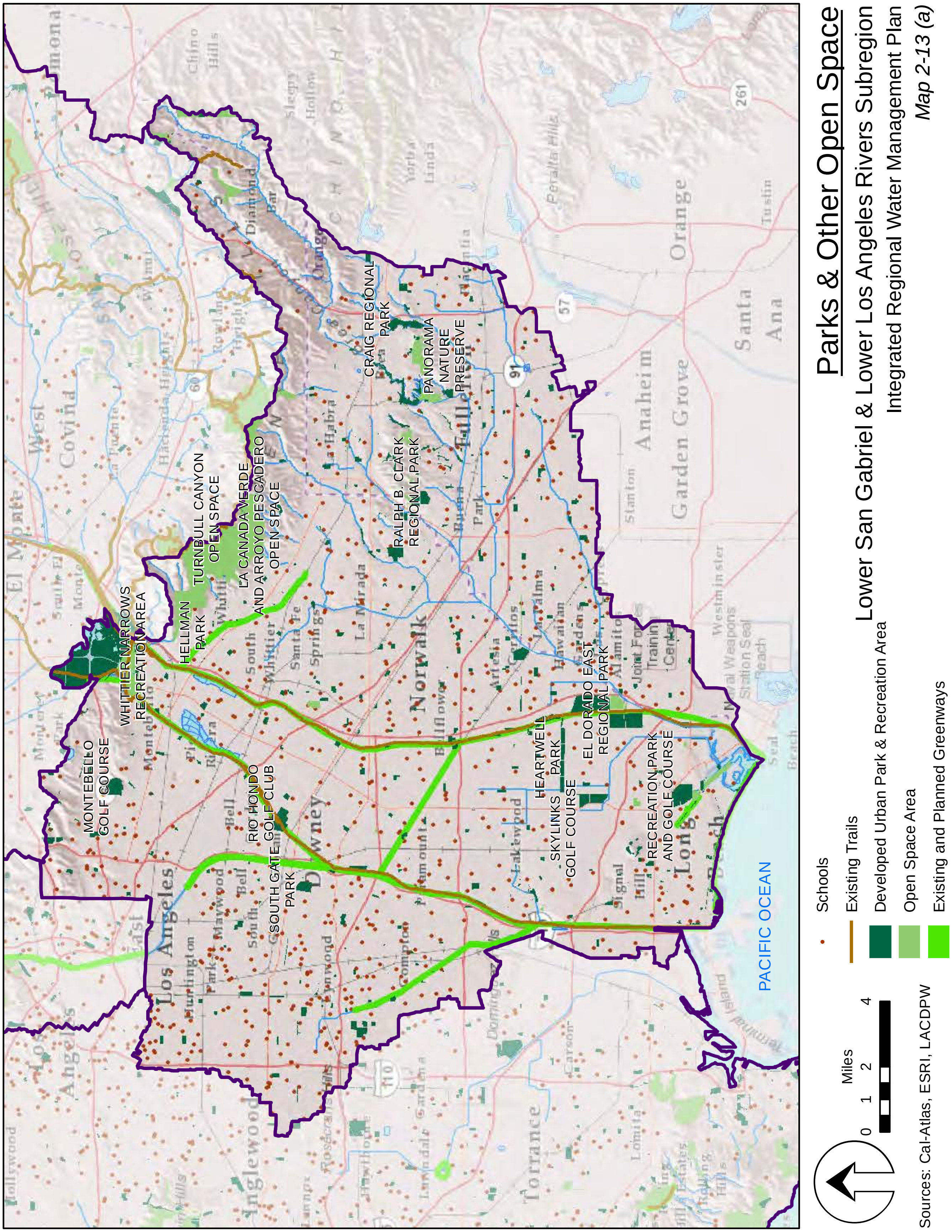


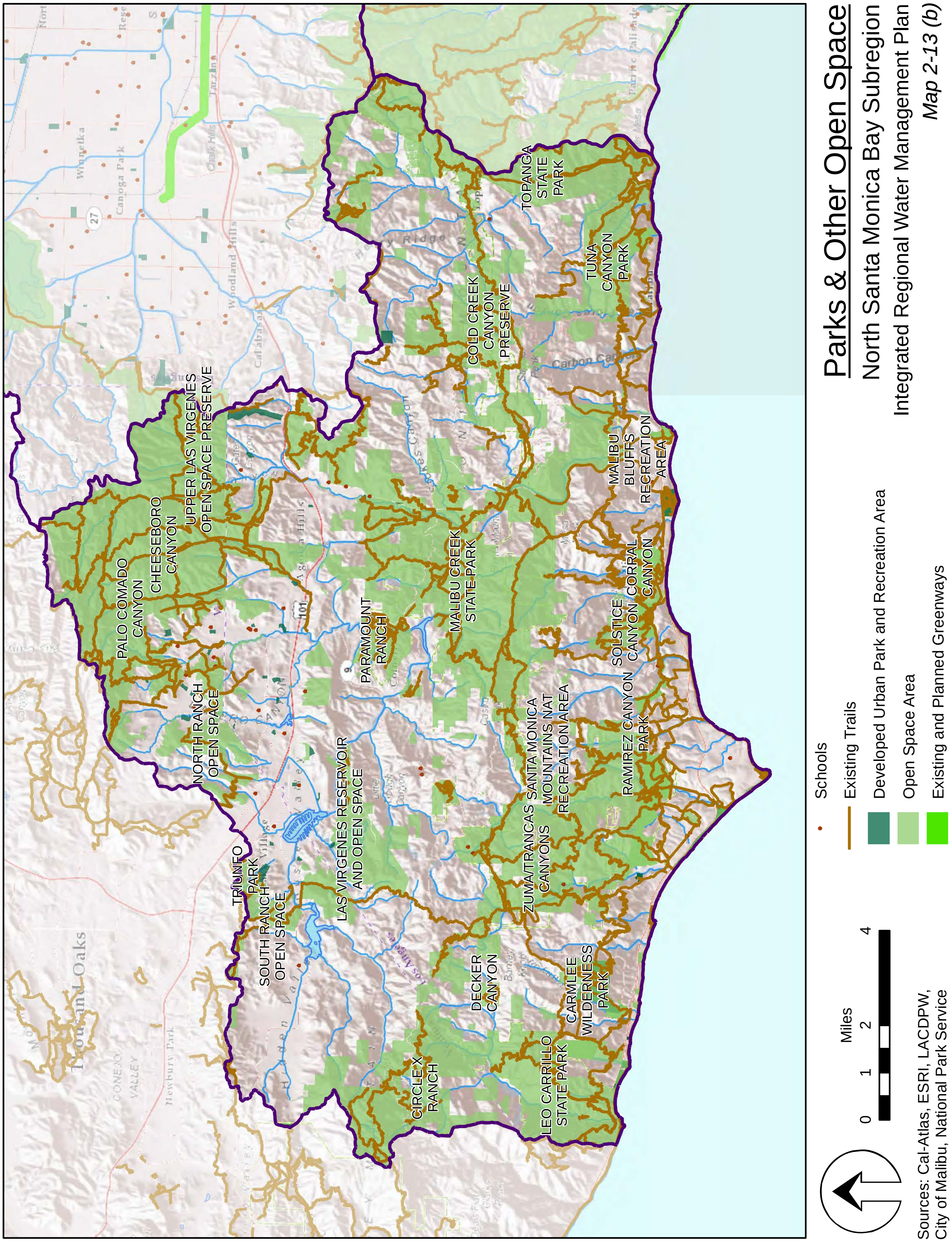

Sources: Cal-Atlas, ESRI, LACDPW

**Parks & Other Open Space**

Lower San Gabriel & Lower Los Angeles Rivers Subregion

Integrated Regional Water Management Plan

*Map 2-13 (a)*



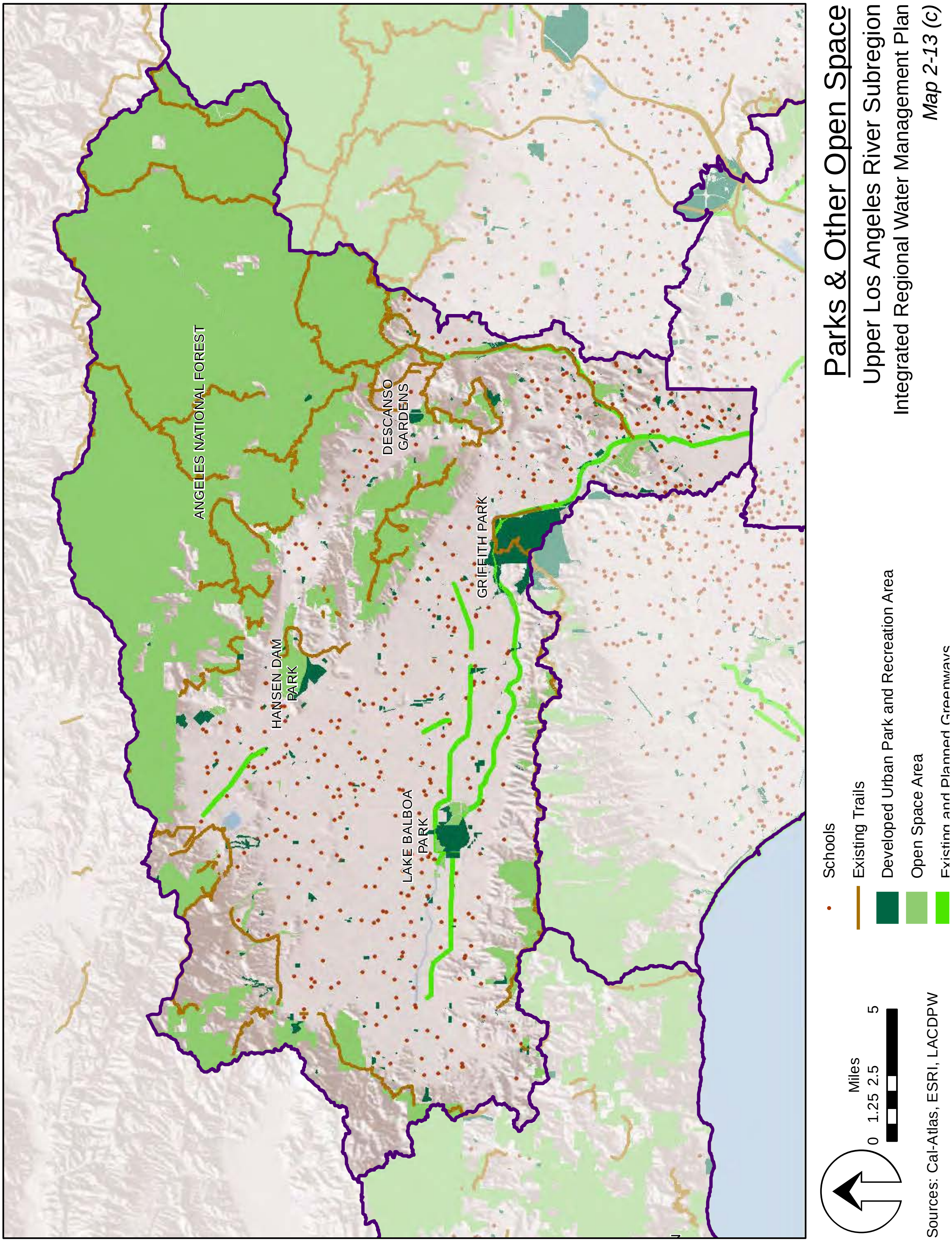

Parks & Other Open Space

North Santa Monica Bay Subregion

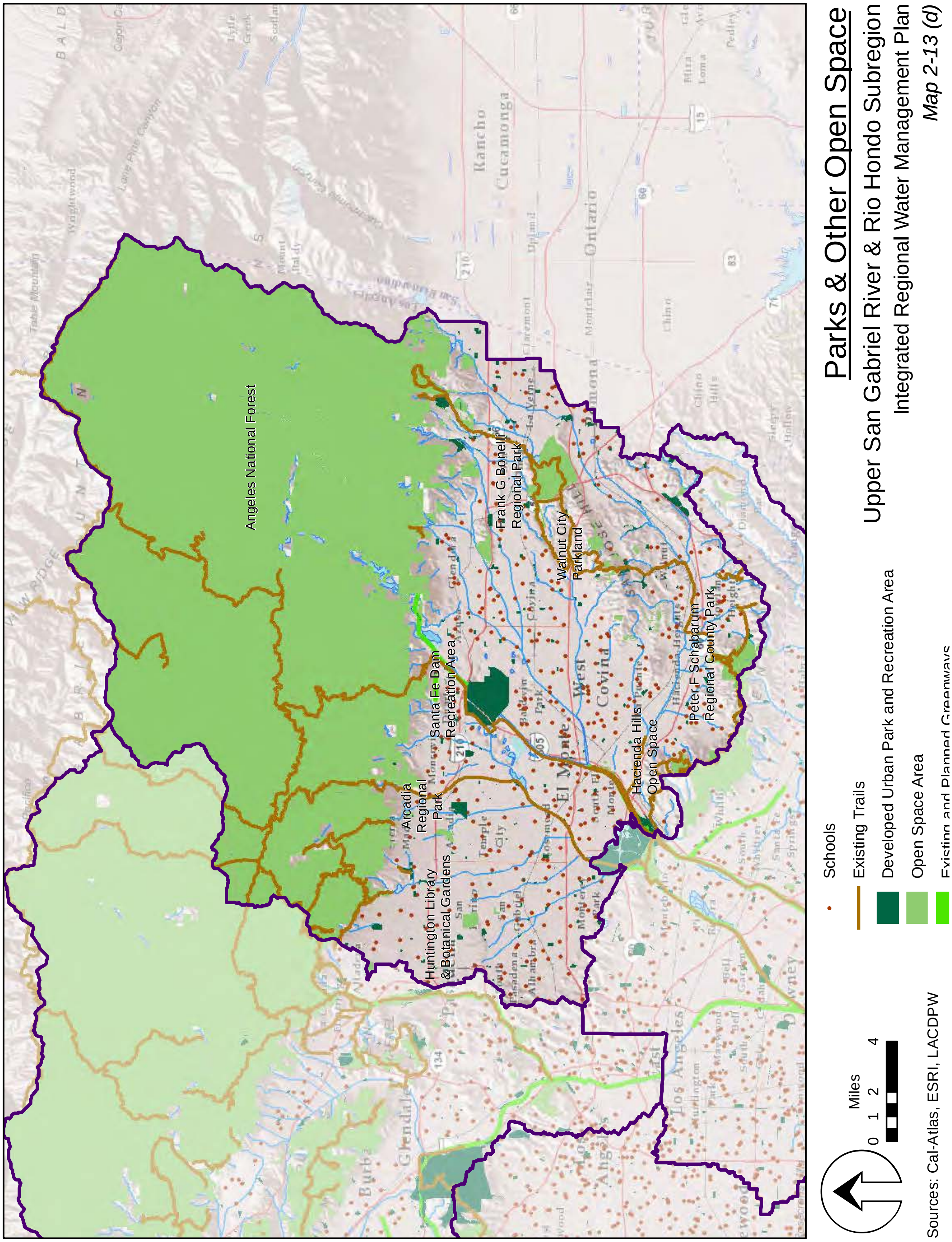
Integrated Regional Water Management Plan

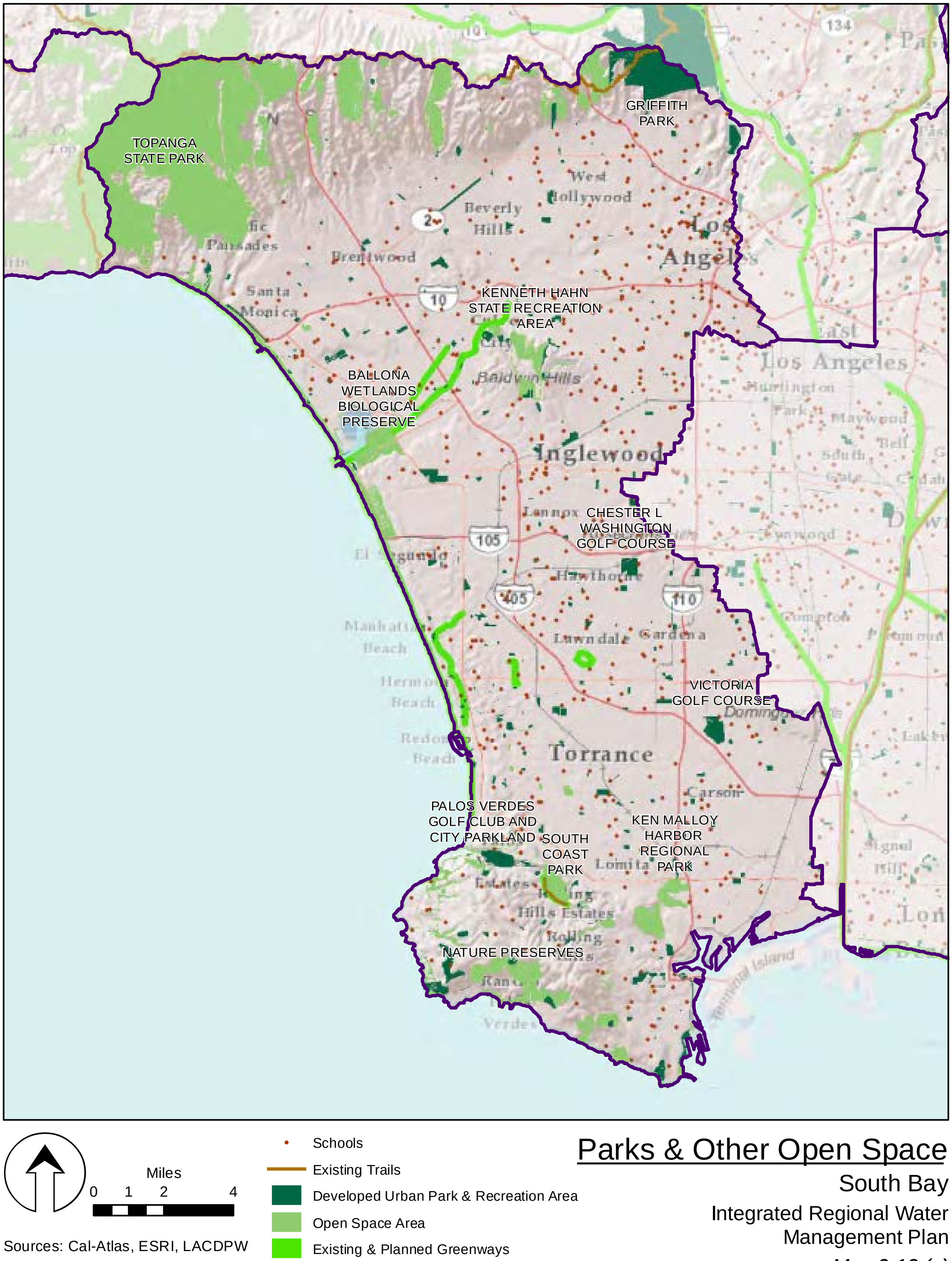
*Map 2-13 (b)*

Sources: Cal-Atlas, ESRI, LACDPW, City of Malibu, National Park Service



Parks & Other Open Space
Upper Los Angeles River Subregion
Integrated Regional Water Management Plan
Map 2-13 (c)
ANGELES NATIONAL FOREST
DESCANSO GARDENS
GRIFFITH PARK
HANSEN DAM PARK
LAKE BALBOA PARK
Schools
Existing Trails
Developed Urban Park and Recreation Area
Open Space Area
Miles
0 1.25 2.5 5
Sources: Cal-Atlas, ESRI, LACDPW


Parks & Other Open Space
Upper San Gabriel River & Rio Hondo Subregion
Integrated Regional Water Management Plan
Map 2-13 (d)
Schools
Existing Trails
Developed Urban Park and Recreation Area
Open Space Area
Existing and Planned Greenways
Miles
0 1 2 4
Sources: Cal-Atlas, ESRI, LACDPW
Angeles National Forest
Frank G Bonelli Regional Park
Walnut City Parkland
Santa Fe Dam Recreation Area
Arcadia Regional Park
Huntington Library & Botanical Gardens
Hacienda Hills Open Space
Peter F Schabarum Regional County Park
El Monte
West Covina
Rancho Cucamonga
Ontario
Glendale
Los Angeles
Pomona




Sources: Cal-Atlas, ESRI, LACDPW

# Parks & Other Open Space

South Bay

Integrated Regional Water Management Plan

*Map 2-13 (e)*

## 2.11 Land Use

Land Use within the Region reflects the historic pattern of urbanization, as most of the coastal plain and interior valleys are occupied with residential, industrial, commercial, and institutional uses, and most of the foothills and mountains are principally open space. A breakdown of land use in the Region is provided in Table 2-6, and depicted on Maps 2-14(a) through 2-14(e).

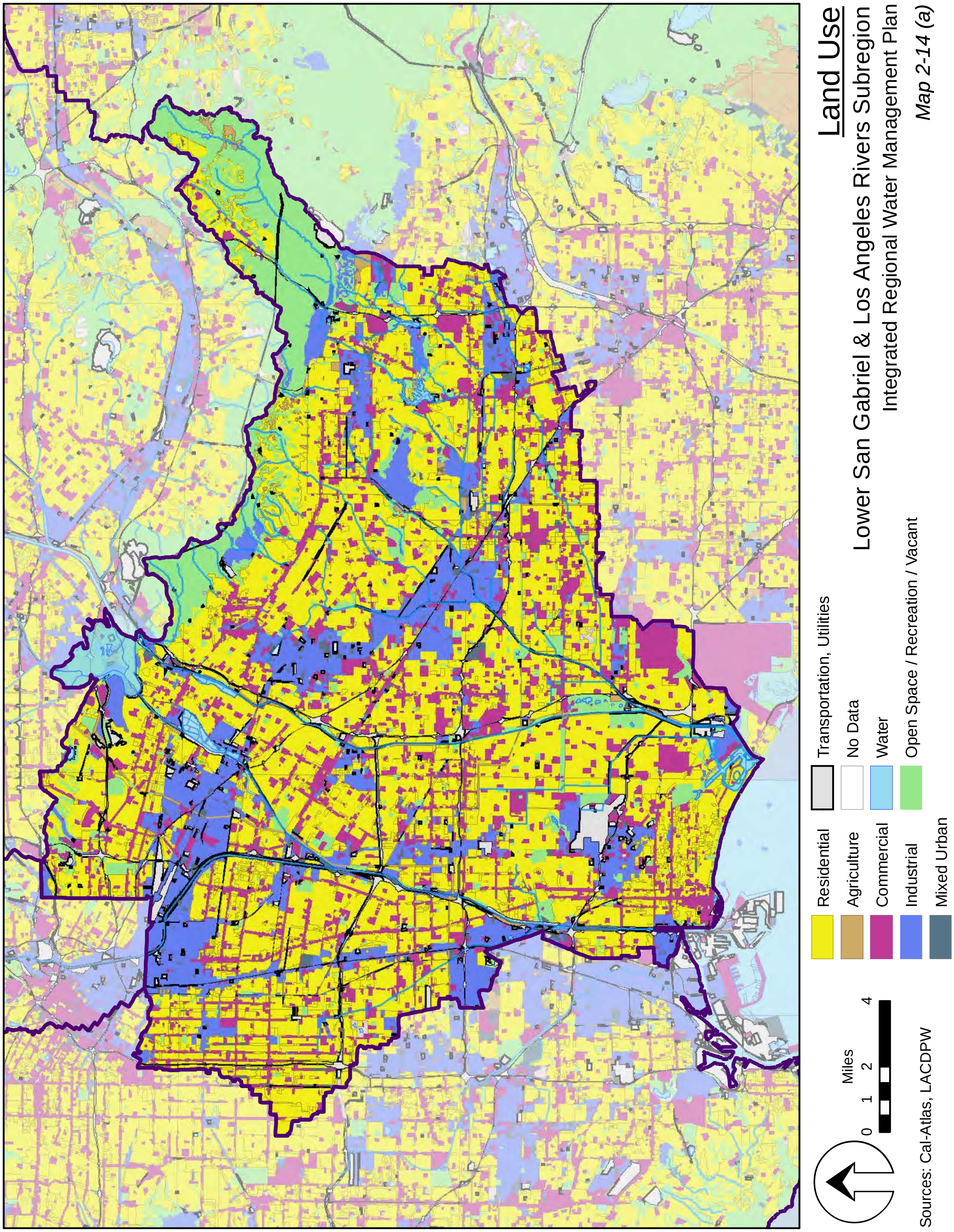
The dominant land use types are defined as follows:

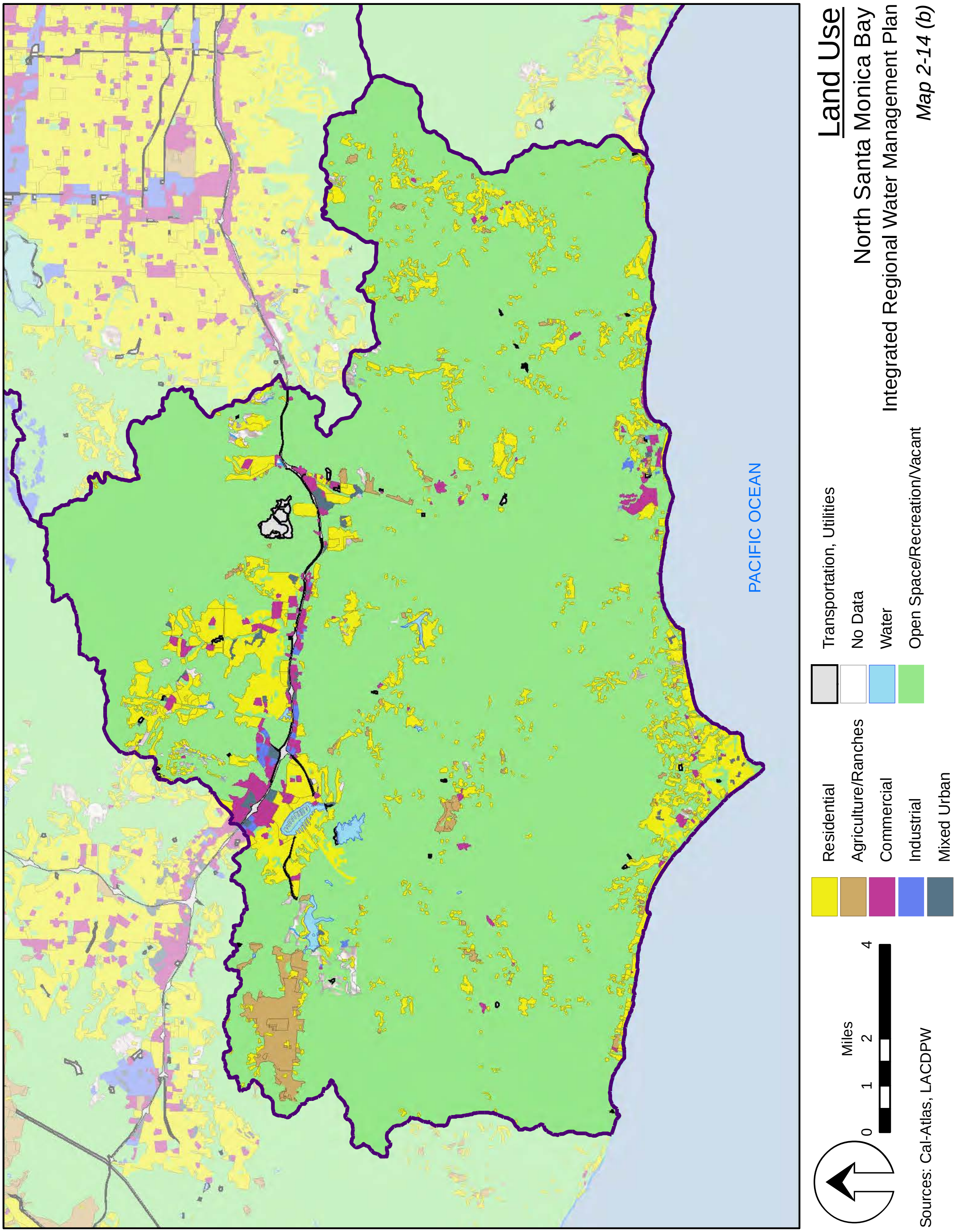
- Residential: duplexes and triplexes, single family residential, apartments and condominiums, trailer parks, mobile home courts and subdivisions
- Commercial: parking facilities, colleges and universities, commercial recreation, correctional facilities, elementary/middle/high schools, fire stations, government offices, office use, hotels and motels, health care facilities, military air fields, military bases, military vacant area, strip development, police and sheriff stations, preschools and day care centers, shopping malls, religious facilities, retail centers, skyscrapers, special care facilities, and trade schools
- Industrial: chemical processing, metal processing, manufacturing and assembly, mineral extractions, motion picture, open storage, packing houses and grain elevators, petroleum refining and processing, research and development, wholesaling and warehousing
- Transportation and Communication: airports, bus terminals and yards, communication facilities, electrical power facilities, freeways and major roads, harbor facilities, improved flood waterways and structures, maintenance yards, mixed transportation and utility, natural gas and petroleum facilities, navigation aids, park and ride lots, railroads, solid and liquid waste disposal facilities, truck terminals, water storage and transfer facilities
- Open Space / Recreation / Vacant: beach parks, cemeteries, golf courses, developed and undeveloped parks, publically-owned open space, parks and recreation, specimen gardens and arboreta, wildlife preserves and sanctuaries, national forest lands, urban vacant, abandoned orchards and vineyards, undifferentiated, and vacant land with limited improvements.

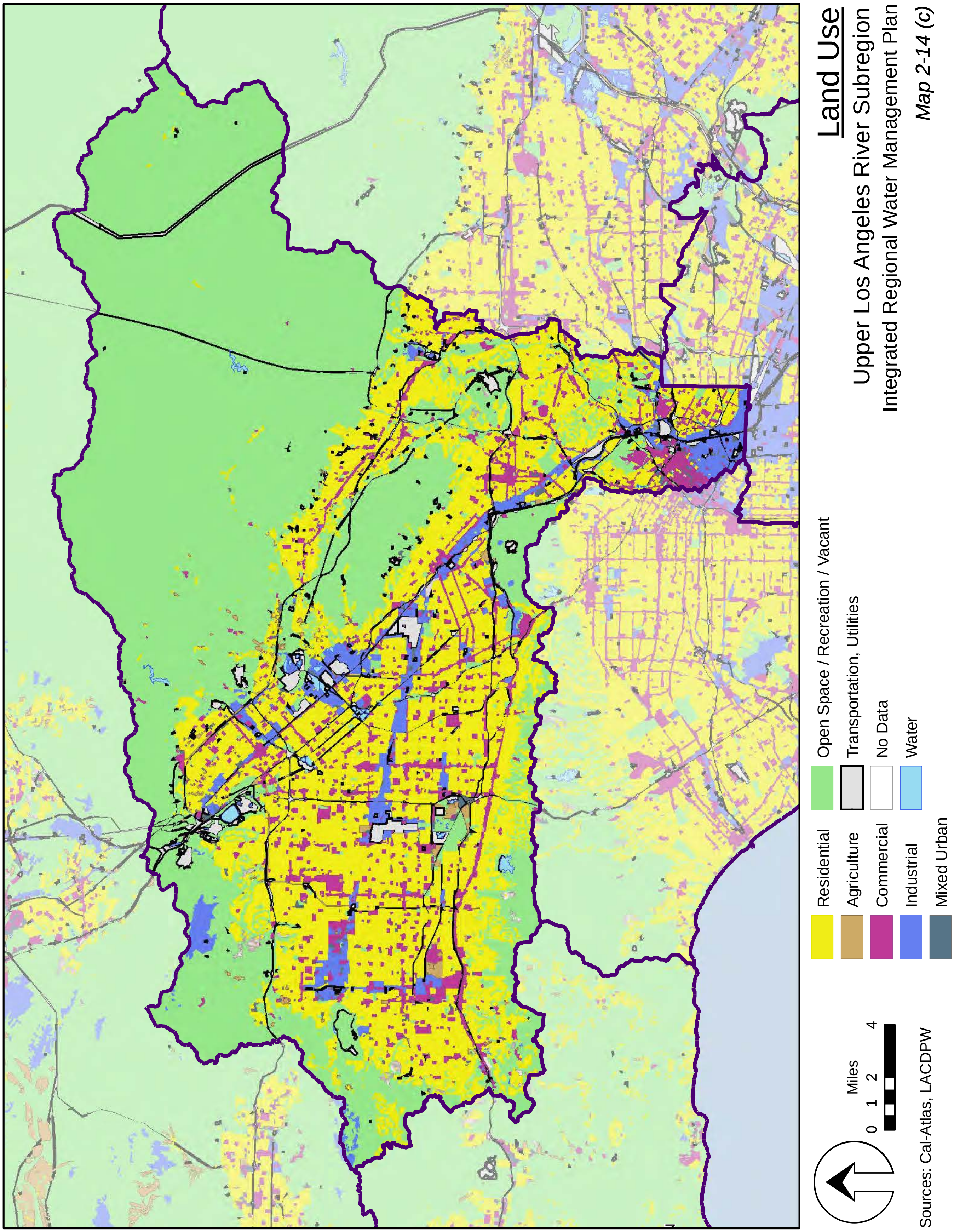
Table 2-6: Land Use (acres)

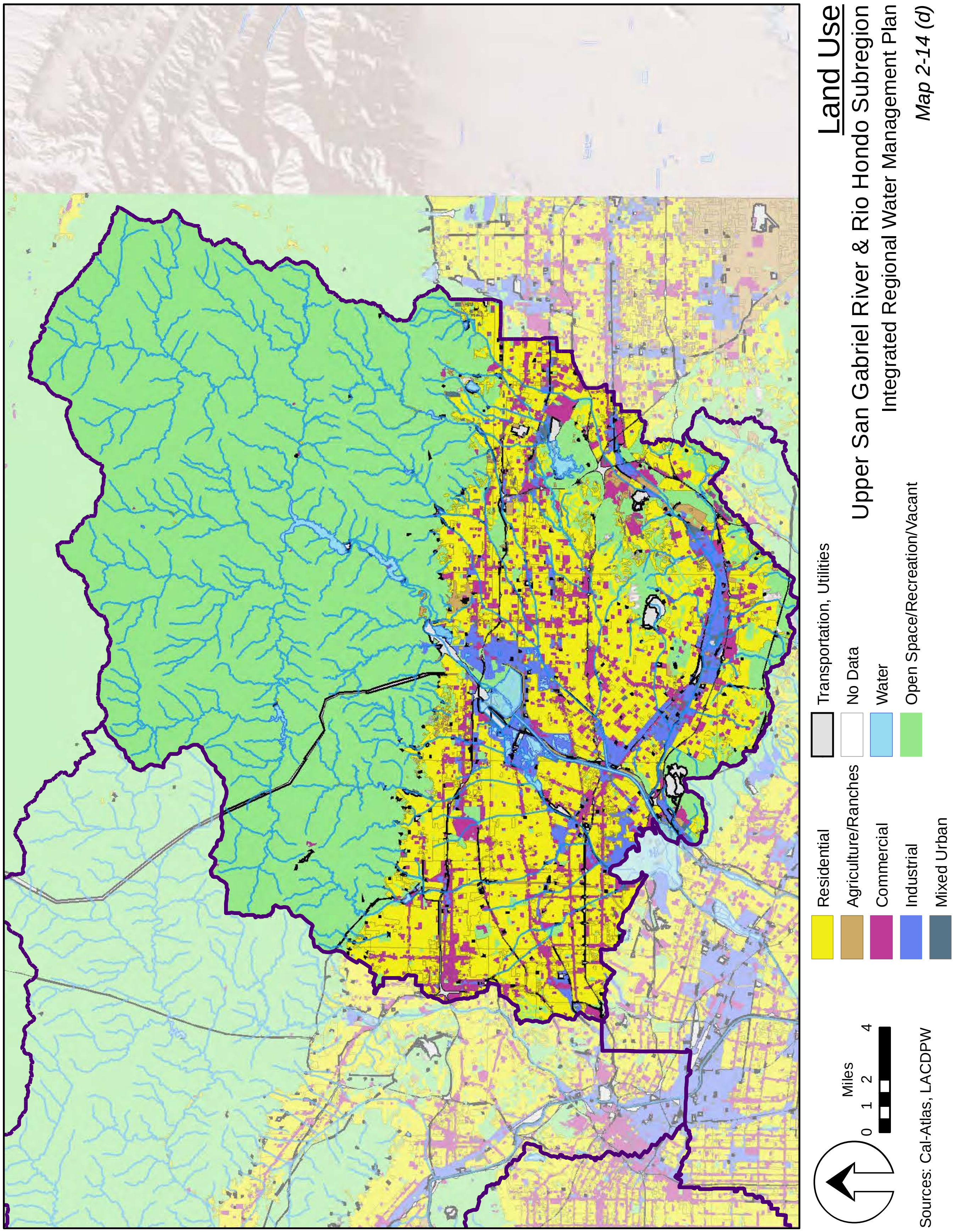
| Land Use Category | Lower SG & LA | North Santa Monica Bay | South Bay Subregion | Upper Los Angeles River Subregion | Upper San Gabriel River and Rio Hondo Subregion | Region Totals | Percent |
|---|---|---|---|---|---|---|---|
| Residential | 134,533 | 14,363 | 114,045 | 124,114 | 100,525 | 487,580 | 26.1% |
| Commercial | 36,999 | 1,941 | 28,562 | 21,726 | 21,569 | 110,797 | 5.9% |
| Industrial | 35,602 | 237 | 21,702 | 15,757 | 12,570 | 85,868 | 4.6% |
| Transportation, Utilities | 19,935 | 1,146 | 15,073 | 19,399 | 12,766 | 68,319 | 3.7% |
| Open Space / Recreation / Vacant | 42,778 | 196,142 | 56,850 | 449,515 | 323,763 | 1,069,048 | 57.2% |
| Agriculture | 3,208 | 2,017 | 1,090 | 2,195 | 3,737 | 12,247 | 0.7% |
| Mixed Urban | 221 | 438 | 3,271 | 1,944 | 3,126 | 9,000 | 0.5% |
| Water | 11,148 | 476 | 4,073 | 1,024 | 2,665 | 19,386 | 1.1% |
| No Data | 606 | 951 | 748 | 1,116 | 2 | 3,423 | 0.2% |
| Totals | 287,880 | 217,710 | 245,416 | 636,791 | 480,723 | 1,868,520 | 100 |

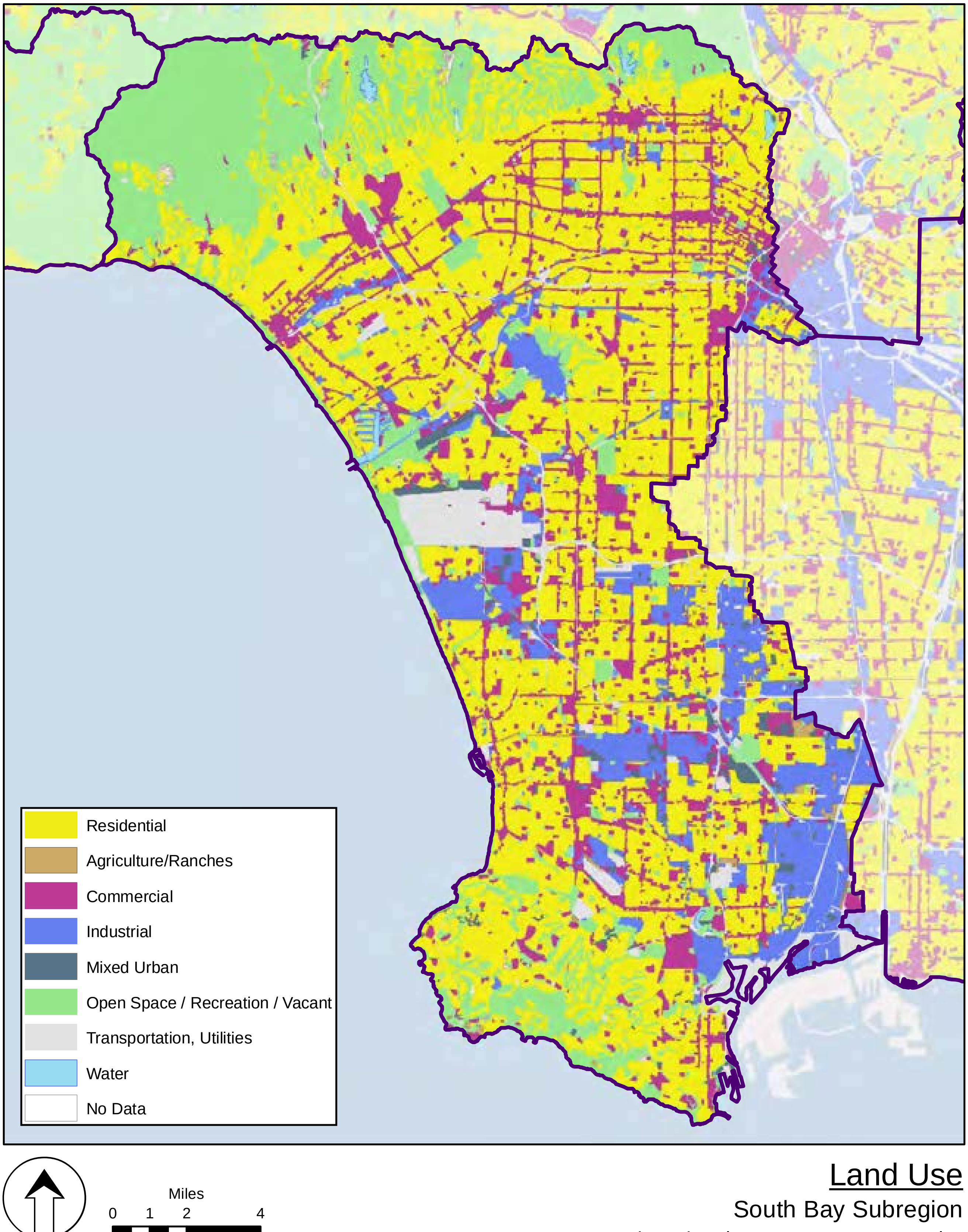
*Source: Los Angeles County and Southern California Association of Governments*


Land Use
Lower San Gabriel & Los Angeles Rivers Subregion
Integrated Regional Water Management Plan
Map 2-14 (a)
Residential
Agriculture
Commercial
Industrial
Mixed Urban
Transportation, Utilities
No Data
Water
Open Space / Recreation / Vacant
Miles
0
1
2
4
Sources: Cal-Atlas, LACDPW


PACIFIC OCEAN
Land Use
North Santa Monica Bay
Integrated Regional Water Management Plan
Map 2-14 (b)
Residential
Agriculture/Ranches
Commercial
Industrial
Mixed Urban
Transportation, Utilities
No Data
Water
Open Space/Recreation/Vacant
Miles
0
1
2
4
Sources: Cal-Atlas, LACDPW


Land Use
Upper Los Angeles River Subregion
Integrated Regional Water Management Plan
Map 2-14 (c)
Residential
Agriculture
Commercial
Industrial
Mixed Urban
Open Space / Recreation / Vacant
Transportation, Utilities
No Data
Water
Miles
0 1 2 4
Sources: Cal-Atlas, LACDPW


Land Use
Upper San Gabriel River & Rio Hondo Subregion
Integrated Regional Water Management Plan
Map 2-14 (d)
Residential
Agriculture/Ranches
Commercial
Industrial
Mixed Urban
Transportation, Utilities
No Data
Water
Open Space/Recreation/Vacant
Miles
0 1 2 4
Sources: Cal-Atlas, LACDPW



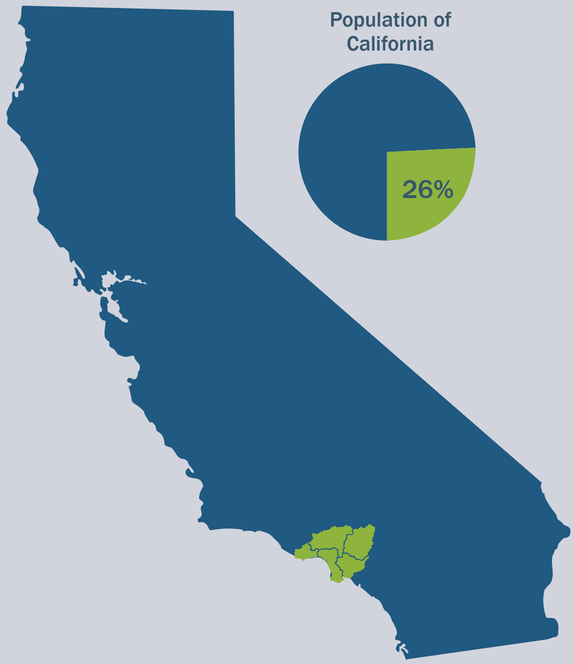

# Land Use

South Bay Subregion

Integrated Regional Water Management Plan

*Map 2-14 (e)*

Sources: Cal-Atlas, LACDPW




| Subregion | Population |
|---|---|
| Lower San Gabriel and Los Angeles Rivers | 3,031,347 |
| North Santa Monica Bay | 106,687 |
| South Bay | 2,694,337 |
| Upper Los Angeles | 2,270,314 |
| Upper San Gabriel and Rio Hondo | 1,524,271 |
| The Greater Los Angeles County Region Total | 9,626,956 |

*Figure 2-1. 2010 estimated Greater Los Angeles County Region population. The Greater Los Angeles County Region represents 26 percent of California's population.*

## 2.12 Social Characteristics

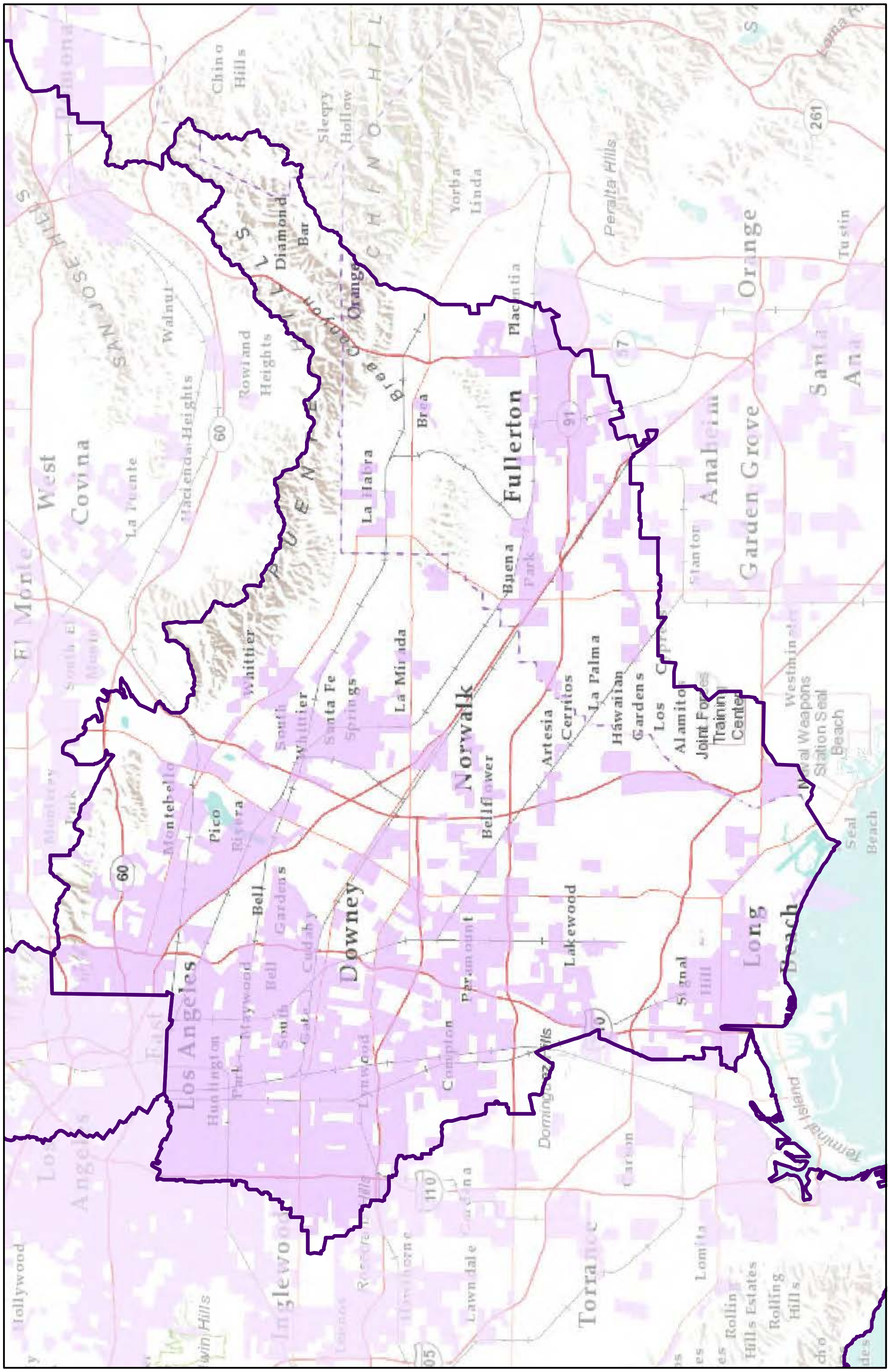
The Region's population is currently estimated at approximately 9.6 million residents as depicted in Figure 2-1, which represents approximately 26 percent of the State's estimated 2010 population of 36.6 million.

Per State Guidelines, DACs are those with an annual median household income (MHI) that is less than 80 percent of the statewide annual median household income (CWC § 79505.5 (a)). Using American Community Survey (ACS) 2006-2010 data, 80 percent of the statewide annual MHI is $48,706. Those communities meeting these criteria are depicted in Map 2-15(A) through 2-15(D). Note that there are no DACs in the North SM Bay Subregion but the area serves as a major recreation resource for over 33 million annual visitors from the GLAC area that include many programs and services for residents living in DACs.

As depicted on these maps, DACs are located throughout much of the Region. As discussed in the sections above, water management issues, such as a reliable water supply, poor surface water quality, and groundwater contamination also occur throughout the Region. The parkland to population ratio tends to be much lower in DACs, where access to park space is as low as 0.8 acres per 1,000 residents. No specific relationship has been identified between the location of DACs and the location of water resource management issues. As discussed in Chapter 1 of this Plan, the GLAC Region contacted the NAHC to determine if the Region was home to any tribes or tribal interests. The response from the NAHC indicated that the Region is not home to any federally-recognized tribes or tribal lands.

## 2.13 Social Trends and Concerns

The watershed management plans for many of the Region's major watersheds identify various goals, objectives, and guiding principles. Those various concepts are incorporated in this Plan as objectives in Chapter 3, but noted here as a reflection of the social and cultural values of the Region. They include: reduce dependence on imported water, optimize use of local water resources, enhance water supply reliability, improve the quality of urban runoff and stormwater, maintain and enhance flood protection, increase watershed friendly recreation




Subregions

Income defined DAC

Miles

0 1 2 4

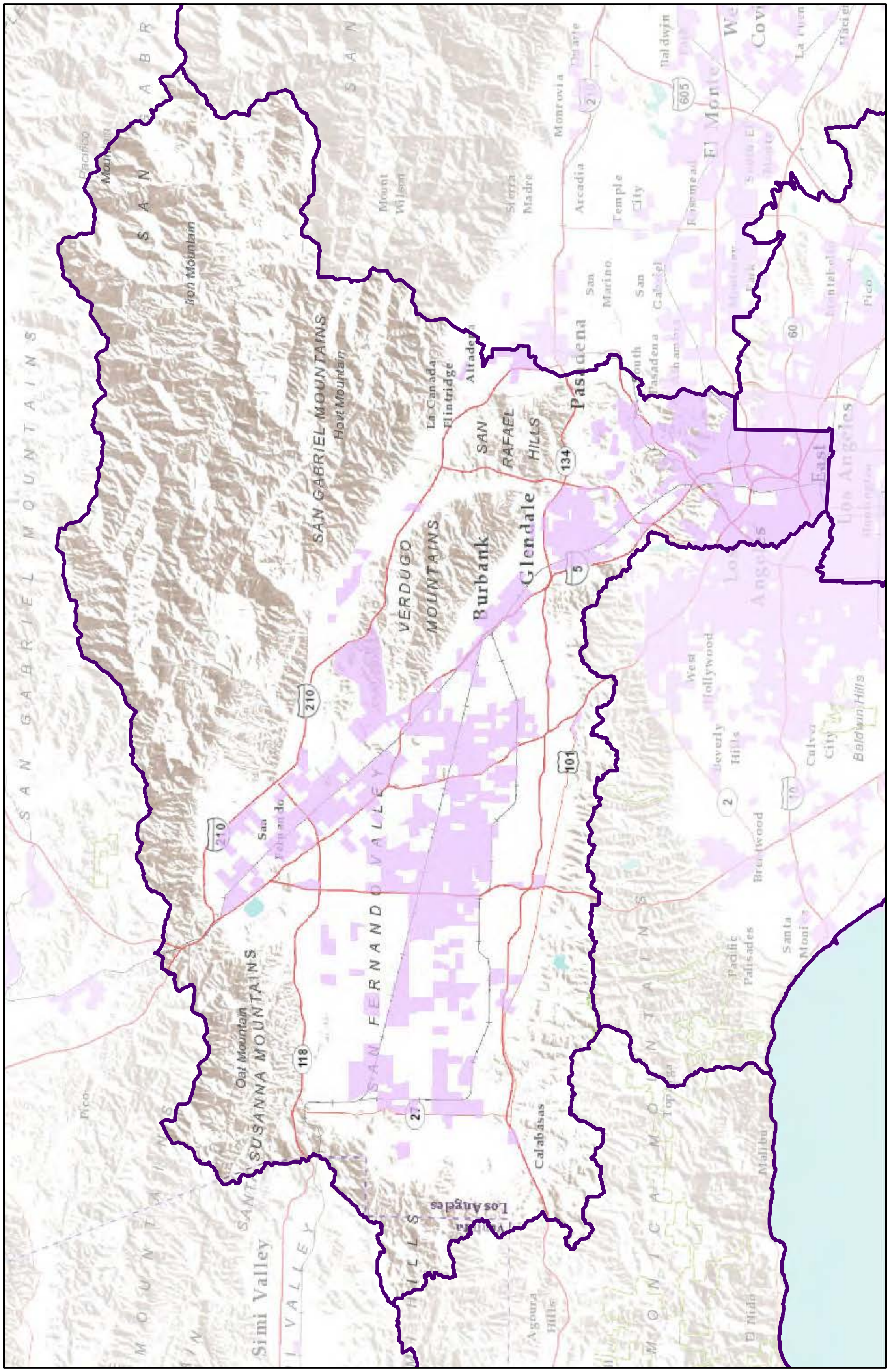
Sources: Cal-Atlas, DWR

## Disadvantaged Communities

Lower San Gabriel & Los Angeles Rivers Subregion

Integrated Regional Water Management Plan

*Map 2-15 (a)*




Subregions

Income defined DAC

Miles

0 1 2 4

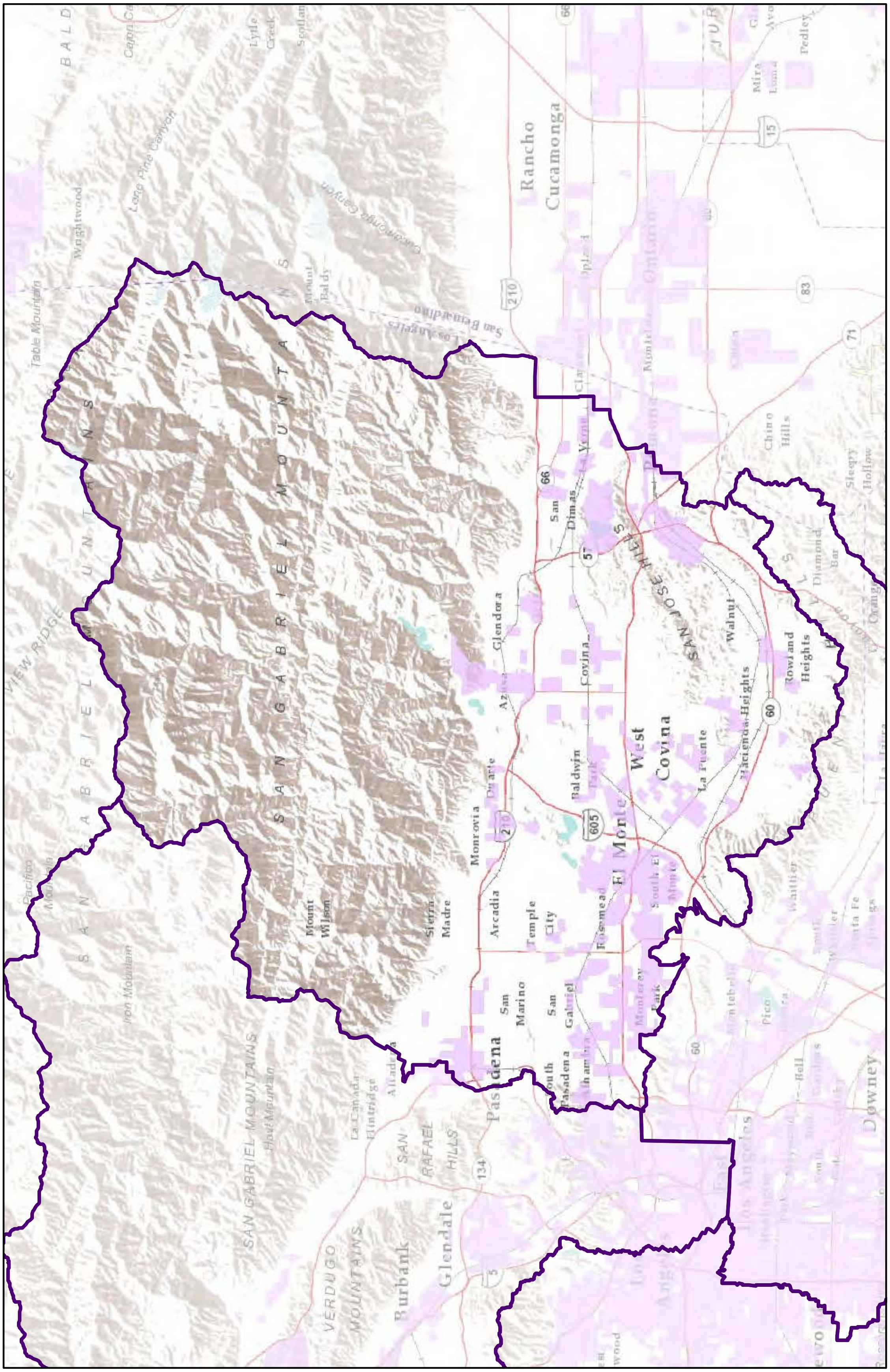
Sources: Cal-Atlas, DWR

# Disadvantaged Communities

Upper Los Angeles Subregion

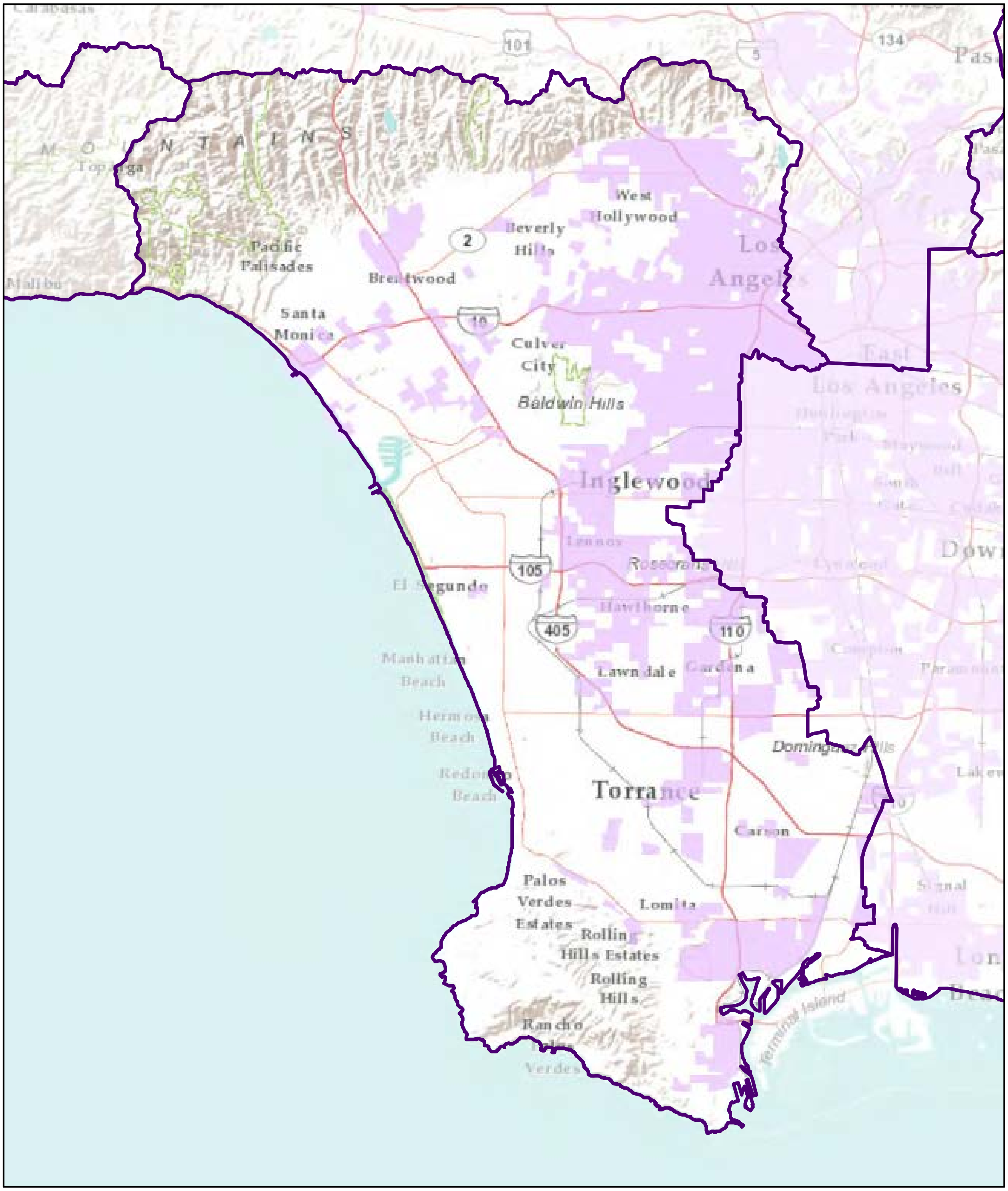
Integrated Regional Water Management Plan

*Map 2-15 (b)*




Disadvantaged Communities
Upper San Gabriel River & Rio Hondo Subregion
Integrated Regional Water Management Plan
*Map 2-15 (c)*

Sources: Cal-Atlas, DWR




Subregions

Income defined DAC

Miles

0 0.751.5 3

Sources: Cal-Atlas, DWR

# Disadvantaged Communities

South Bay Subregion

Integrated Regional Water Management Plan

*Map 2-15 (d)*

and accessible open space for all communities, conserve and restore native habitat, manage public open spaces to reduce the risk of catastrophic wildland fires, and promote the application of watershed approaches to resource management issues.

Census data shows that population growth in the Region is slowing (a three percent increase from 2000-2010, down from a seven percent increase from 1990-2000). The number of households has increased by three percent between 2000 and 2010, and average household size increasing by four percent. Social trends in the Region may be summarized on the basis of certain demographic trends. The Public Policy of California (PPIC)[2] and the Southern California Association of Governments (SCAG)[3] describes trends for portions of California, including Los Angeles, Ventura, and Orange Counties, and is representative of the Region. In the last decade, births represented the largest portion of population increase in the Region, followed by international migration. Domestic migration was a net loss to the population during that period. With the economic downturn, employment decreased over the last ten years, decreasing by approximately 7 percent[4]. Ethnic diversity continues to increase, as the percentage of non-hispanic white residents declines (from 31 percent in 2000 to 28 percent in 2010)[2].

Social concerns in the Region may be reflected by a recent survey of Los Angeles residents (PPIC, 2005), which found that residents are unhappy with some key indicators of quality of life. Large majorities say traffic congestion on freeways and major roads (74 percent) and the availability of affordable housing (64 percent) are big problems in the county today. Majorities of residents still rate police protection (57 percent) and the quality of parks, beaches, and recreation facilities (58 percent) as excellent or good, but their assessments have fallen in recent years. Residents are far less charitable in their rating of other public services: Only one-third give excellent or good ratings to streets and roads (32 percent today, 51 percent in 2004) and public schools (36 percent today, 43 percent in 2004). In contrast, large majorities of residents in neighboring Orange County give excellent or good ratings to police protection (83 percent), recreational facilities (84 percent), streets and roads (64 percent), and public schools (64 percent). Los Angeles County residents are more likely to believe that Los Angeles County will be a worse place (37 percent) rather than a better place (24 percent) to live in 20 years, with 35 percent anticipating that quality of life in the county will stay the same. Fully one-third of county residents (33 percent) expect to leave Los Angeles County in the next five years, up from 17 percent in 2003.

## 2.14 Climate Change

Climate change projections have shown that California water resources can expect to be impacted by changes to temperature, precipitation, and sea level rise, and even now California is beginning to experience these impacts.

Water resource planners already face challenges interpreting new climate change information and discerning which response methods and approaches will be most appropriate for their planning needs. However, in order for the Region to adapt to, or protect against, climate change, it must first identify the impacts climate change is expected to have on the Region. Knowing these changes will help to identify potential vulnerabilities in water resource systems, which can identify and inform planning measures. Future projects in the Region will be considered for their ability to adapt to the anticipated climate change impacts and mitigate greenhouse gas emissions (GHGs) as described in Chapter 5. These actions will help the GLAC Region be more robust in the face of a changing environment.

On a state-wide level, these impacts are expected to impact local water resources as follows (DWR, 2011):

- Temperature increases:
    - More winter precipitation falling as rain rather than snow, leading to reduced snowpack water storage, reduced long term soil humidity, reduced groundwater and downstream flows, and reduced imported water deliveries

2. PPIC, 2012. Key Stats – Population Size and Growth. Components of Population Growth. http://www.ppic.org/main/keystat.asp?i=1261
3. SCAG, 2011. Local Profiles of SCAG Jurisdictions. http://www.scag.ca.gov/resources/profiles.htm
4. Bureau of Labor Statistics, 2000-2010. May 2000 and May 2010 Occupational Employment and Wage Estimates. Metropolitan Area Cross-Industry Estimates.

- Higher irrigation demands as temperatures alter evapotranspiration rates, and growing seasons become longer
- Exacerbated water quality issues associated with dissolved oxygen levels, increased algal blooms, and increased concentrations of salinity and other constituents
- Impacted habitats for temperature-sensitive fish and other life forms, and increased susceptibility of aquatic habitats to eutrophication

- Precipitation pattern changes:
  - Increased flooding (both coastal and inland) caused by more intense storms
  - Changes to growth and life cycle patterns caused by shifting weather patterns
  - Threats to soil permeability, adding to increased flood threat and decreased water availability
  - Reduced water supply caused by the inability to capture precipitation from more intense storms, and a projected progressive reduction in average annual runoff (though some models suggest that there may be some offset from tropical moisture patterns increasingly moving northward)
  - Increased turbidity caused by more extreme storm events, leading to increased water treatment needs and impacts to habitat
  - Increased wildfires with less frequent, but more intense rainfall, and possibly differently timed rainfall through the year, potentially resulting in vegetation cover changes
  - Reduction in hydropower generation potential
- Sea level rise:
  - Inundation and erosion of coastal areas (coastal bluffs in particular), including coastal infrastructure
  - Saline intrusion of coastal aquifers
  - Increased risk of storm surges and coastal-flooding and erosion during and after storms
  - Changes in near-shore protective biogeography such as loss of sand, tide pools, wetlands, and kelp beds

Although the extent of these changes is uncertain, scientists agree that some level of change is inevitable; therefore, it will be necessary to implement flexible adaptation measures that will allow natural and human systems to respond to these climate change impacts in timely and effective ways. In addition to adapting to climate change, the Region has the opportunity to mitigate against climate change by minimizing GHGs associated with provision of water and wastewater services. The following is a discussion of likely climate change impacts on the Region, as determined from a vulnerability assessment. Opportunities for adapting to and mitigating against climate change will be discussed in later chapters of this Plan.

## Effects of Climate Change on the GLAC Region

Estimating the impacts of climate change at a regional level is challenging due to the coarse spatial scale of the global models that project climate change impacts of temperature and rainfall. These global models also project estimates for the year 2100, which is well beyond typical planning horizons of 20 to 30 years. To incorporate climate change into water resources management, downscaled temperature and precipitation projections are input into hydrologic and water resources system models to project impacts to water supplies, water demand, snow pack, sea level rise, and wildfires.

The need for and interest in more refined geographic and temporal scale climate change models has precipitated two recent climate change analysis efforts within the GLAC Region.

**Climate Change in the Los Angeles Region:** A modeling effort being led by UCLA for a partnership of the Los Angeles Regional Collaborative for Climate Action and Sustainability and the City of Los Angeles to refine climate modeling for the Greater Los Angeles area between 2041 to 2060. The results of the temperature modeling have already been released and have been incorporated into the climate change effects described here. The modeling effort will also produce precipitation, hydrology, cloud cover, wind and sea level rise impacts – however the results of these analyses were not yet available for this section.

**Los Angeles Basin Stormwater Conservation Study:** A partnership between the US Bureau of Reclamation and the LACFCD to refine climate change projections influenced by localized geographic differences between coastal and inland areas, as well as changes in topography. Resulting climate projections will be simulated in existing LACFCD facilities and hydrologic models to identify potential flooding and supply effects and vulnerabilities. Since the effort was begun in February 2013, the results were not yet available for use in this 2013 Plan Update.

## Regional Climate Change Impacts

Climate change impacts and effects are based on different climate change assumptions and analysis approaches. Table 2-7 summarizes the impacts and effects of climate change on the GLAC Region by 2100 (unless otherwise indicated), which are typically based on an average of various climate change analyses. However, only temperature projections are available at a refined scale for the GLAC Region as shown in Table 2-7.

Climate change is expected to increase average temperature by at least 3.5 degrees Fahrenheit by mid-century with the number of hot days (with temperatures greater than 95° F) tripling at the coast. This effect is further exacerbated in the inland areas. Precipitation is expected to decrease by at 2 to 5 inches throughout the South Coast of California with the most extreme reductions taking place in the higher elevations. These temperature effects are presented in Figures 2-2 and 2-3 from the UCLA climate change modeling effort.

Recent sea level rise studies have estimated an average 11 inch rise along coastal areas in Southern California. The three major imported water supplies feeding the Region are also anticipating delivery decreases as a result of climate change.

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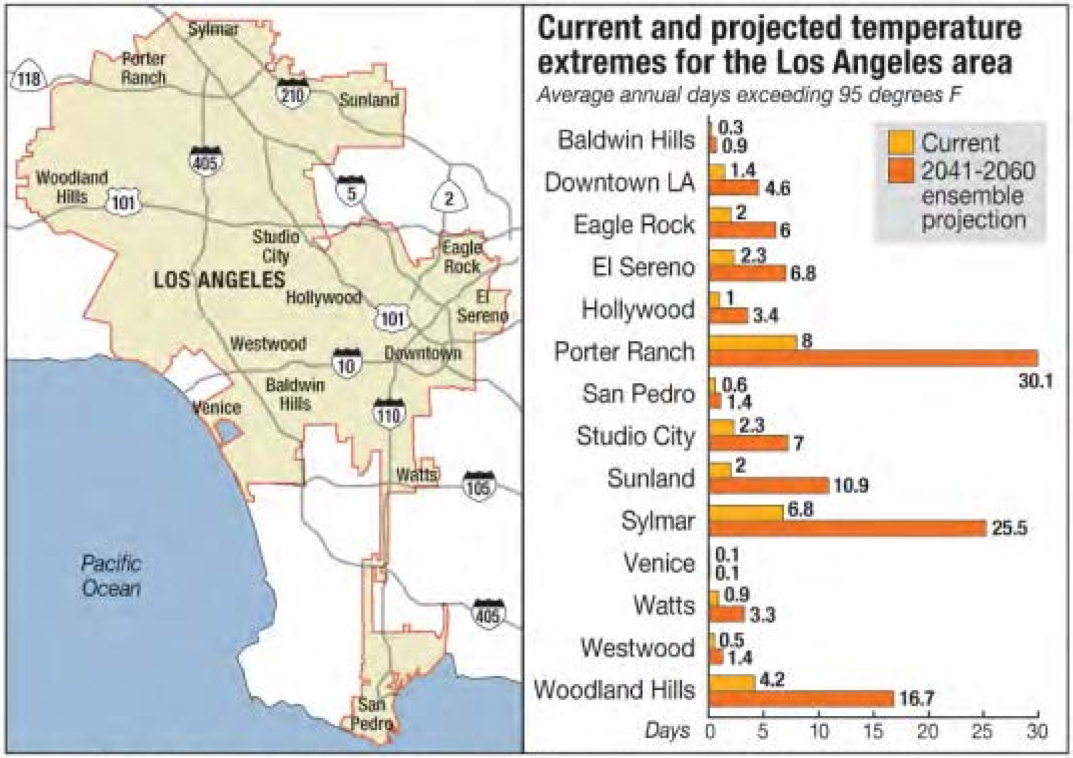
**Table 2-7: Impacts and Effects of Climate Change on Region**

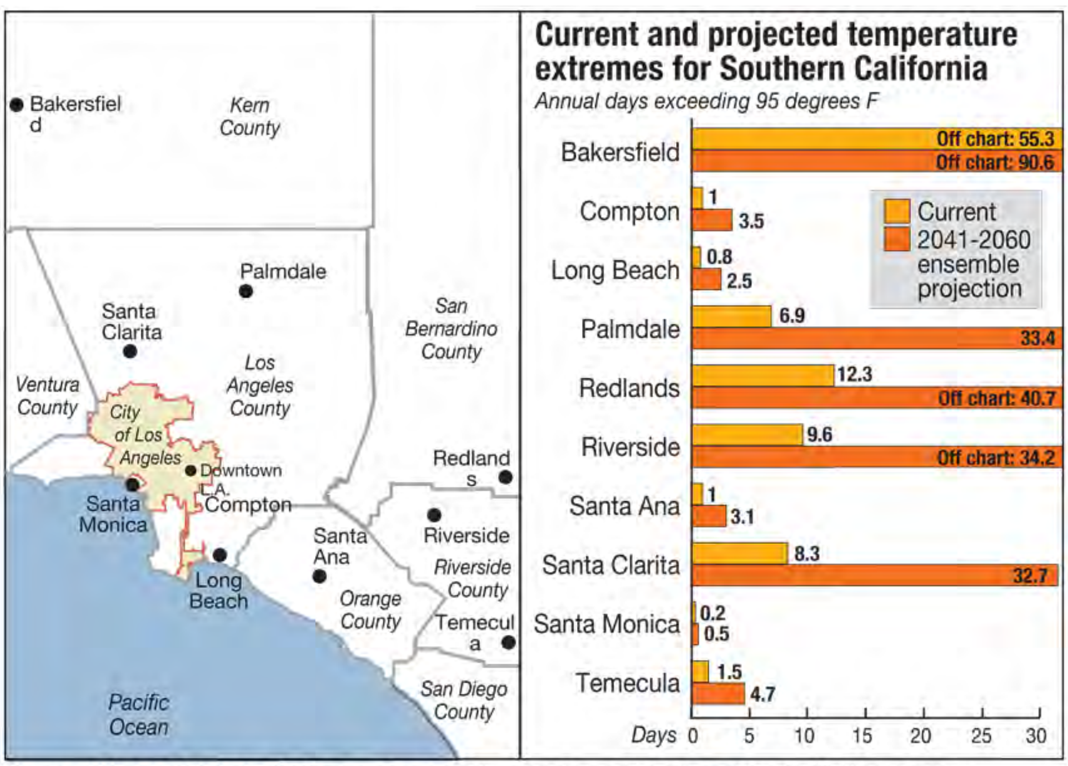
| Impact to | Effect |
|---|---|
| Temperature change[1] | • Coastal LA Basin: Increases of 3.5 to 4°F (2041-2060)<br>• Inland LA Basin: Projected increases of 4 to 4.5°F (2041-2060)<br>• Extreme hot days: Number will triple in coastal areas and central Los Angeles, quadruple in San Fernando and San Gabriel Valleys (2041-2060) |
| Precipitation[2] | • Low-lying Southern California coastal areas: 2 inch decrease in average rainfall<br>• Higher Southern California elevations: 4 to 5 inch decrease in average rainfall |
| **Wildfire Risk**[2] | • Little change is projected – already high fire risk |
| Sea Level Rise[3] | • Rise of 11 inches by 2050 (Southern California) |
| Demand | • Increases expected, but not quantified |
| Supply | • State Water Project[4]: delivery decrease of 7-10% by 2050<br>• Colorado River[5]:<br>  • Flows to decrease by 7-9% by 2050<br>  • Shortages to Lower Basin of:<br>  • 1 MAF over any 2 year window up to 51% of the time<br>  • 1.5 MAF over any 5 year window up to 59% of the time<br>• Los Angeles River Aqueduct[6]: Deliveries to decrease by 10,000 AFY<br>*Local groundwater and local river flow impacts not available* |

*1. Climate Change in the Los Angeles Region Project: Mid-Century Warming in the Los Angeles Region (UCLA, 2012)*
*2. California Climate Change Adaptation Planning Guide (CA Emergency Management & Natural Resources Agencies, 2012)*
*3. Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future (NRC, 2012)*
*4. Using Future Climate Projections to Support Water Resources Decision Making in California (Climate Change Center, 2009)*
*5. Colorado River Basin Water Supply and Demand Study Final Reports (USBR 2012)*
*6. City of Los Angeles 2010 Urban Water Management Plan (LADWP, 2011)*




Source: UCLA LARC study, 2012; chart based on the mean/average projected by the 19 climate models

*Figure 2-2: Current and Projected Temperature Extremes for City of Los Angeles Communities*




Source: UCLA LARC study, 2012; chart based on the mean/average projected by the 19 climate models

*Figure 2-3: Current and Projected Temperature Extremes for Southern California*

## Climate Change Impacts to DACs

Climate Change effects can present even greater potential impacts to the Region's DACs. DACs are, by their definition, resource limited which impacts their ability to meet current water management needs that would be further exacerbated by climate change. Of particular concern is increased flooding that could result from both sea level rise in coastal DACs like the Wilmington area and from flashier precipitation events in inland DAC areas like Sun Valley (OPC, 2011). DAC residents are also less likely to be able to afford relocation as a way to respond to sea level rise and flooding impacts.

## Identification of Vulnerabilities

Understanding the potential impacts and effects that climate change is projected to have on the Region allows an informed vulnerability assessment to be conducted for the Region's water resources. A climate change vulnerability assessment helps a Region to assess its water resource sensitivity to climate change, prioritize climate change vulnerabilities, and ultimately guides decisions as to what strategies and projects would most effectively adapt to and mitigate against climate change. DWR has recommended IRWM Regions use the Climate Change Handbook for Regional Planning (developed by USEPA, DWR, Army Corps, and the Resource Legacy fund) as a resource for methodologies to determine and prioritize regional vulnerabilities. The Climate Change Handbook provided specific questions that helped to identify key indicators of potential vulnerability, including:

- Currently observable climate change impacts (climate sensitivity)
- Presence of particularly climate sensitive features, such as specific habitats and flood control infrastructure (internal exposure)
- Resiliency of a region's resources (adaptive capacity)

The Climate Change Subcommittee conducted an exercise to answer vulnerability questions taken from Box 4-1 of the Climate Change Handbook and associated the answers with potential water management issues/vulnerabilities. See Appendix O for a summary of the analysis. Included in this analysis are qualitative vulnerability questions framed to help assess resource sensitivity to climate change and prioritization of climate change vulnerabilities within a region. Answers to vulnerability questions are given for the GLAC Region with local examples provided as justification for the answer. Vulnerability issues are prioritized in the next section.

## Prioritization of Vulnerabilities

The vulnerability issues identified in the climate change analysis discussed above were reviewed by the group, and some of the language was refined to better articulate the vulnerability issues of the Region. Those vulnerability issues were then prioritized into three tiers relative to each other and based upon the perceived risk and importance of the issue. Those vulnerabilities posing the greatest risk of occurrence and resulting in the greatest impacts upon occurrence were ranked as the highest priority.

The list of prioritized vulnerabilities developed by the Workgroup is shown in Table 2-8, and discussed further below. Note that the vulnerability issues shown in Appendix O do not necessarily exactly match those in Table 2-8 since refinements and edits were made to the vulnerabilities during the prioritization process.

The justification as to why the following vulnerability issues were classified as high priority is provided below:

- **Decreased ability to meet conservation goals:** There is concern that it will be very difficult for the Region to reach the state goal of a 20 percent reduction in per capita potable water use by 2020. In addition, demand hardening will reduce the water use efficiency options available to make further reductions in use beyond the current goal of 20 percent. Although conservation programs reduce the amount of water needed by customers, long-term conservation programs have not generated overall cost savings to those customers. Water supply agencies must still maintain and operate supply facilities so decreased revenues as a result of conservation must be balanced through rate adjustments. Increased costs to customers could discourage them from continuing water conservation.

Table 2-8: Prioritized Climate Change Vulnerability Issues

| Level | Vulnerability Issue |
|---|---|
| High | • Decreased ability to meet water conservation goals<br>• Reduced resiliency to drought<br>• Municipal water demand would increase<br>• Decrease in imported water supply (from impacts to Bay-Delta system)<br>• Decrease in coastal groundwater supply<br>• Increase in wildfire risk and erosion and sedimentation which may impact water quality, flood control, and habitat<br>• Damage to coastal infrastructure/recreation/tourism due to sea level rise and storm surge |
| Medium | • Invasives can reduce water supply available, alter flood regimes, and alter wildfire regimes<br>• Decrease in local surface water supply<br>• Decrease in seasonal water reliability<br>• Increase in nutrient loading and decreased Dissolved Oxygen<br>• Decrease in dilution flows<br>• Decrease in recreational opportunity<br>• Increase in source control or surface water treatment<br>• Decrease in land due to SLR<br>• Increased impacts to habitat and flow availability for species |
| Low | • Agricultural water demand would decrease<br>• Limited ability to meet higher peaks in water demand (both seasonally and annually)<br>• Habitat water demand would increase<br>• Damage to ecosystem/habitat due to sea level rise<br>• Increases in inland and flash flooding<br>• Decrease in habitat protection against coastal storms<br>• Decrease in hydropower potential |

- **Reduced resiliency to drought:** The Region is highly vulnerable to persistent drought and the projected climate change effects will only increase the potential for drought and therefore the need for resiliency.
- **Municipal demand would increase:** The inland areas of the Region are projected to have the most growth because of lower housing costs and more area to be developed. These inland areas will also show the greatest increases in temperature, which will increase water demand and the likelihood of drought. Supply development projects to meet these demands will take time to develop and implement.
- **Decrease in imported supply:** The Region is heavily dependent upon imported water supplies which are very susceptible to the impacts of climate change given their reliance on seasonal snowpack. The Region could not be solely dependent upon local resources to sustain the current economy, so imported water must be secured. Much of the supply is also highly vulnerable at its source, given the dependence upon the stability of the San Francisco Bay Delta levee system and ecological condition. Climate change impacts to this area from higher sea level rise and higher storm surges and increased salinity could be catastrophic to the supply.
- **Decrease in groundwater supply:** Imported and other local supplies (like surface and recycled water) are necessary to sustain the current levels of groundwater replenishment needed to meet groundwater pumping adjudication levels. If overall surface supplies are less available due to climate change impacts, then replenishment supplies would be jeopardized. Furthermore, coastal groundwater supplies are susceptible to salinity intrusion, which would be exacerbated by sea level rise.

- **Increased wildfire risk and erosion and sedimentation which may impact water quality, flood control, and habitat:** Increases in erosion from increased wildfires and flashier storm events would result in increased sediment loads entering local streams. Many of the Region's local streams have flood control facilities that serve to not only protect from flood events but are also used to capture and recharge storm flows into the groundwater basins for both supply and water quality objectives. Increased sediment loads would impact the ability of these facilities to provide either of those functions
- **Damage to coastal infrastructure/recreation/tourism due to sea level rise and storm surge:** Coastal infrastructure is vulnerable because of the combined effects of sea level rise and increased flooding from climate change. Current populations are higher along coast areas and so dependency on these facilities is greater. However, relocation of facilities will be expensive and challenging given limited open space and land availability. Recreation and tourism will be greatly impacted from potential increases in beach closures.

### Climate Change Reporting and Registry Coordination

Individual agencies within the GLAC IRWM may individually decide whether to participate in the California Adaptation Strategy Process as part of further integrating the information derived from the local climate change studies being conducted and described above.

Agencies that are part of the GLAC IRWM effort may consider joining the Climate Registry, http://www.theclimateregistry.org. The Climate Registry serves as a voluntary GHG emissions registry that developed tools and consistent reporting formats which may aid agencies in understanding their GHG emissions and ways to promote early actions to reduce GHG emissions. Both the State and the federal government require reporting of emissions for regulated entities of electricity and fuel use. These programs have reporting, certifying and verifying requirements that are separate from those under the voluntary programs.

# 3. OBJECTIVES AND PRIORITIES

Ballona Creek

**Broad consensus on quantitative Regional targets for the next 25 years provides clear direction for projects and accountability for success.**

## 3.1 Purpose

This chapter identifies the objectives for the Plan, establishes quantified planning targets for the 25 year planning horizon (2010 through 2035) that can be used to gauge success in meeting the objectives, and identifies short- and long-term priorities for the Region.

## 3.2 Objectives

This Plan is intended to improve water supply and water quality, enhance open space, recreation and habitat, and improve flood management in the GLAC Region. To meet those broad goals, the five regional objectives outlined in the 2006 Plan were refined and updated to better reflect the needs of the Region and its stakeholders. Each of these objectives is supported by specific and measurable planning targets. Instead of setting regional metrics first, the new regional 2013 Plan objectives and targets described in this chapter were generally developed as a summation of individual subregional targets developed through two processes.

1. **Technical Input:** To provide oversight and technical vetting of the methods used to develop the objectives and targets, the LC established three Water Management Subcommittees: 1) Water Supply, 2) Water Quality and Flood Management, and 3) Habitat and Open Space. These Subcommittees met to develop the format and calculation methods used to determine targets in each of the objective areas.
2. **Stakeholder Input:** The Subregional SCs also conducted meetings to engage stakeholders in the development of subregional targets by commenting on the methods and formats being finalized by the Subcommittees, providing information and data from existing planning efforts and reviewing/revising draft target calculations developed. Because all subregional steering committees were not completely satisfied with habitat and open space targets at the subregional level, it was agreed that targets for this category would only be expressed at the regional level.

The input and decisions made by the stakeholder SC and technical Subcommittee meetings resulted in draft targets listed as part of the Subregional Plans and Water Management Objective and Targets TMs. The TMs were made available for review and finalized based upon comments received. These documents are attached as appendices to this Plan Update. The documents and data provided by stakeholders in development of the objectives and targets included in the TMs were drawn from water resource management plans, habitat and open space inventories, FEMA flood management and the County Sediment Management Plan, municipal general plans, and water quality impairment listings.

The LC did not choose to prioritize the regional objectives or targets with the understanding that each objective is equally important relative to the others given that the IRWM Plan is intended to be a truly integrated plan. The Region may choose, however, to prioritize these objectives relative to grant requirements to enhance project prioritization and selection. In those cases, the type of funding program will dictate which target should be emphasized. The six regional objectives and their affiliated planning targets are listed in Table 3-1 and described in the following sections.

Table 3-1. GLAC Objectives and Targets

| Objectives | Planning Targets for 2035 |
|---|---|
| **Improve Water Supply**<br>Optimize local water resources to reduce the Region's reliance on imported water. | • Conserve 117,000 AFY of water through water use efficiency and conservation measures.<br>• Create additional ability to pump 106,000 AFY using a combination of treatment, recharge, and storage access.<br>• Increase indirect potable reuse by 80,000 AFY.<br>• Increase non-potable reuse of recycled water by 83,000 AFY.<br>• Increase capture and use of stormwater runoff by 26,000 AFY currently lost to the ocean.<br>• Increase both centralized and distributed stormwater infiltration by 75,000 AFY.<br>• Develop 26,000 AFY of ocean water desalination. |
| **Improve Surface Water Quality**<br>Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater and wastewater. | Develop[1] 54,000 AF of new stormwater capture capacity (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[2]. |
| **Enhance Habitat**<br>Protect, restore, and enhance natural processes and habitats. | • Preserve or protect 2,000 acres of aquatic habitat.<br>• Enhance 6,000 acres of aquatic habitat.<br>• Restore or create 4,000 acres of aquatic habitat. |
| **Enhance Open Space and Recreation**<br>Increase watershed friendly recreational space for all communities. | • Create 38,000 acres of open space.<br>• Create 25,000 acres of urban parks. |
| **Reduce Flood Risk**<br>Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. | • Reduce flood risk in 11,400 acres of flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches.<br>• Remove 68 million cubic yards of sediment from debris basins and reservoirs. |
| **Address Climate Change**<br>Adapt to and mitigate against climate change vulnerabilities. | • Increase local supplies by an additional 7-10% (beyond water supply target) by 2050.<br>• Implement "no regret" adaptation strategies<br>• Implement mitigation strategies that decrease emissions of GHGs |

*1 Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75", 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed)*

*2 High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.*

### Improve Water Supply

#### Optimize local water resources to reduce the Region's reliance on imported water

Most years, the San Gabriel Mountains receive substantial rainfall and existing dams and natural storage slowly release runoff, providing an important source of high-quality and low-cost water that can be treated for direct use or recharged into groundwater basins for later use. At several locations, recharge is limited by the capacity of existing recharge facilities. Rehabilitation and expansion of recharge facilities, modified operation of existing storage facilities, rehabilitation and enlargement of upstream storage capacity, and optimization of operational practices could improve the utilization of this local water source.

Direct reuse of runoff from urbanized areas is generally limited by concerns about the presence of contaminants. To increase the utilization of this local resource, runoff capture and infiltration could be expanded (where appropriate), the quality of surface runoff improved, and projects implemented to capture, treat, and utilize stormwater for either non-potable direct use or recharge.

The widespread implementation of water use efficiency projects and conservation programs has resulted in significant reductions in demand throughout the Region. Aggressive adoption of additional measures, such as public outreach and education on water use, ultra low-flush toilets, and evapotranspiration-based irrigation controllers will be needed to continue progress. Since there is very little agriculture in the Region, no specific agricultural water use efficiency objective was developed. Additional progress could be made with agency and industry partnerships working to improve water use efficiency standards.

Although local wastewater treatment plants produce substantial amounts of recycled water, due to insufficient and/or seasonal demand and infrastructure limitations, not all of this production is currently utilized to augment water supply, resulting in the discharge of excess supplies to the rivers and creeks. Expansion of distribution systems and the creation of new storage facilities could facilitate increased production and expand the utilization of this local resource for direct non-potable reuse (e.g., landscape irrigation) and groundwater recharge.

Ocean water desalination is being considered by some coastal agencies to improve supply reliability and reduce dependence on imported water. Seawater desalination has become more economical in recent years due to improvements in membrane technology, plant siting strategies, and increased costs for traditional water treatment. Additional research and supporting studies will be needed to optimize treatment technology, develop pretreatment alternatives, resolve brine disposal management issues, and identify appropriate mitigation for any adverse environmental impacts.

The Region's concern about water shortages has increased the local interest in graywater reuse as a source of non-potable water supply. The California Plumbing Code was amended in August 2009 when Chapter 16A was adopted to allow the use of graywater from clothes washers without a permit from local government subject to some environmental protection conditions. Local governments are reviewing options for expanding the graywater reuse opportunities for more fixtures while addressing potential impacts on a case-by-case basis. Total graywater within a residence may account for as much as 60 percent of the total indoor water consumption. The LADWP estimates that the residential graywater reuse capacity may range from 50 to 165 million gallons per day.

### Improve Surface Water Quality

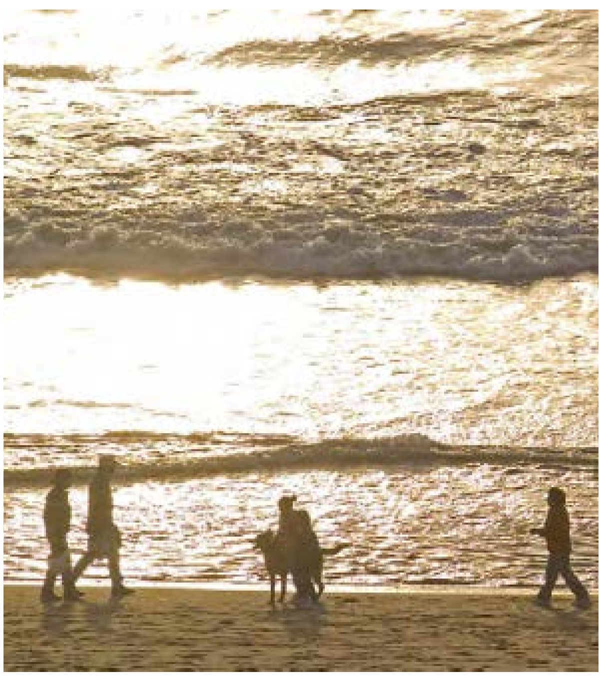
#### Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater and wastewater

Increasing the capture of stormwater either using it on site or infiltrating it, will have a beneficial impact on the quality of urban and stormwater runoff and will help reduce impairment of the designated beneficial uses of rivers, creeks, beaches, and other bodies of water in the Region. Due in part to the degree of development in the GLAC Region, stormwater quality in the Region is heavily impacted by the constituents often associated with urban runoff. Because of this, the LARWQCB identified storm water and urban runoff as one of the leading sources of pollutants to surface waters in Southern California (LARWQCB 2002).

A number of common urban runoff-associated pollutants, (for instance bacteria, metals and nutrients) have been found to directly impact human and/or ecosystem health. These impacts may lead to significant economic costs in terms of health care, loss of productivity, tourism and will impact DACs disproportionally. Tourism is particularly important for the GLAC Region which is well known and visited for the recreational opportunities afforded by its wealth of natural resources. In addition, and no less significant is the negative impact urban runoff can have on the availability of the already limited usable water supply in the Region.

Water quality benefits can also be attained through changes in water use. Residential and commercial irrigation can be modified to reduce or eliminate dry weather runoff.

In addition, wastewater agencies must ensure continued compliance of discharge permit limits. As such, as TMDLs are implemented, and wastewater agencies design and implement projects to meet the new permit limits, effluent water quality improves.



*IRWMP targets for water quality are based on the desire to protect our ocean and tributary rivers.*

## Enhance Habitat

### Protect, restore, and enhance natural processes and habitats

Urban and suburban growth in the Region has displaced extensive areas of native habitat, including wetlands, riparian, and upland habitats, which has adversely affected local watersheds and water resources. The protection of existing habitats along the coast and interior valleys and upland habitats in the foothills and mountains will preserve areas that contribute to the natural recharge of precipitation. Many of these existing habitats have been adversely affected by land use practices and the introduction of invasive and nonnative species and thus are in need of preservation and restoration to enhance their value as native habitat. Functional linkages between the remaining areas of native habitat are needed to preserve long-term species diversity.

The loss of functional native habitat and the extensive modification of natural channels in urbanized areas have also reduced the extent to which natural processes can remove or sequester contaminants in urban and stormwater runoff, cycle nutrients through watersheds, and provide functional habitat for aquatic and terrestrial species that inhabit or depend on these areas. The protection, restoration and enhancement of native functional riparian habitats should also restore natural ecosystem processes to the extent feasible given the equally important need to preserve or enhance existing flood protection levels.

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*The Open Space Continuum from Uplands to the Coast and from Regional Land to Urban Parks.*

## Enhance Open Space and Recreation

### Increase watershed friendly recreational space for all communities

The amount of undeveloped open space and habitat in the upper portions of many watersheds has been decreasing as urbanization continues. To maintain the water supply, water quality, habitat and recreational benefits that these areas provide, the undeveloped portions of the upper watersheds not currently included within protected areas (i.e., national forests or parks) need to be identified, quantified, and protected where feasible. Analysis of the benefits of restoring natural processes may be useful to demonstrate the value of this practice.

Open space and parkland has the potential to enhance groundwater resources (by preserving or expanding the area available for natural groundwater recharge), improve water quality (to the extent that these open spaces filter, retain, or detain stormwater runoff), and provide opportunities to reuse treated runoff or recycled water for irrigation (thereby reducing the demand for potable water). The amount of existing parkland in the urbanized portions of the Region does not always meet the state standards of per capita parkland access, particularly in disadvantaged communities. Additional watershed-friendly recreational space is needed and these spaces should provide native vegetation to create habitat, passive recreational opportunities, and where feasible, contribute to stormwater detention and treatment and natural groundwater recharge.

## Reduce Flood Risk

### Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches

Although, abundant sunshine is one of the Region's main attractions, occasional storm events have the potential to generate substantial amounts of runoff which can create significant flood risks. The Region's extensive flood management system must be operated, maintained, and enhanced where needed to protect lives and property. As elements of the flood protection system warrant significant repair or replacement, consideration should be given to the implementation of more integrated flood management systems. Projects that propose to: 1) reduce runoff via onsite best management practices (BMPs); 2) capture and treat urban and storm water runoff for treatment; 3) expand groundwater recharge; or 4) restore habitat, must also preserve or enhance existing flood protection levels.

## Address Climate Change

### Adapt to and mitigate against climate change vulnerabilities

The potential effects, impacts and vulnerabilities of climate change impacts on the GLAC Region were assessed as part of the 2013 Plan Update and described in Chapter 2. In general, the Region can expect to have significant temperature increases, and precipitation decreases (by 2010) that will impact local water demands, supplies, water quality and habitat. Sea level rise and more intense storm events are also expected to impact the Region causing flooding, water quality and other water management and land use issues. With the three major imported water supplies feeding the Region are also anticipating delivery decreases as a result of climate change, the Region recognizes that it must be ready to adapt to these impacts.

*Improvement of flood control channels is being considered to achieve IRWMP objectives.*

In addition to adaptation, the Region also recognizes the importance of trying to mitigate against further climate change increases, avoiding conflicts with existing environmental justice issues that will inevitably disproportionately impact DACs, and by working to reduce energy consumption thereby decreasing GHG emissions. As a result, the Region has developed a climate change objective that addresses both adaptation and mitigation needs.

## 3.3 Planning Targets

Planning targets were developed to provide a measurable means to gage the Region's progress toward meeting the first five objectives over a 25-year time horizon (2010 through 2035). The Climate Change Objective, however, uses a longer 40-year time horizon to be in-keeping with the current science of climate change time scales and impact estimates that use the year 2050. The planning targets described in this section also further define the objectives relative to stakeholder needs and requirements as documented in other planning efforts throughout the Region. The vetting of these targets and the quantities used was completed by multiple reviews from both the Water Management Area and Climate Change Subcommittees of the LC and through stakeholder participation facilitated at Subregional SC meetings. These targets, summarized in Table 3-1, will help the Region to define projects that will help it to address its water-related issues, and are described in detail below.

### Improve Water Supply

#### Conserve 117,000 AFY of water through water use efficiency and conservation measures

Water use efficiency measures aim to reduce water demand and free up supply for other uses. Retail water suppliers within the Region, as with the rest of the State, are required to report and meet water conservation targets in compliance with regulations set forth in the Water Conservation Act of 2009, also known as 20x2020. 20x2020 seeks a reduction in State-wide daily per person potable water use of 20 percent by the year 2020 and uses UWMPs as the compliance reporting vehicle. The first UWMPs completed with 20x2020 requirements were due to DWR in 2011. Each retail water supplier was required to include a calculation of the demand reduction target to meet 20x2020 as part of its 2010 UWMP.

The GLAC regional target of 117,000 AFY was developed through the compilation of subregional targets generated by the review of individual and regional UWMP targets. The target reflects what can be achieved if the Region's municipal water providers are able to meet the targets identified for 20 x 2020 as well as those conservation targets for subsequent years through 2035 (the UWMP Planning horizon).

#### Create additional ability to pump 106,000 AFY using a combination of treatment, recharge, and storage access

The Region's groundwater resources have primarily been adjudicated through court orders, and are managed to maintain safe yield levels through pumping rights and recharge. Typically, groundwater basins are pumped to the safe yield level on an annual basis, though at times pumping is limited due to groundwater quality issues or a lack of groundwater wells. Given the urbanized nature of the majority of the Region, many of the groundwater basins within the GLAC Region are recharged through projects that capture and spread local stormwater, imported water and recycled water supplies. This groundwater objective is, however, limited to accessing groundwater pumping allocations that could not be met due to issues within the groundwater basin and not relative to the amount of available recharge supply. Any plans to increase or change recharge supplies are identified as indirect potable water reuse (recycled water recharge) and stormwater targets.

It has been estimated that the Region's groundwater resources could provide an additional 106,000 AFY through groundwater treatment or through the construction or improvement of additional wells. This target was determined by looking at goals and future project needs articulated in groundwater management plans, watermaster annual reports, integrated water resources plans and UWMPs.

### Increase indirect potable reuse of recycled water by 80,000 AFY

Groundwater recharge with recycled water, or indirect potable reuse, is a practice which has increased in recent years given its ability to help meet both water supply and water quality goals. Recycled water can be used for the recharge of groundwater in place of imported water supplies as well as to supplement existing recharge requirements. Recycled water can enter the groundwater basins through spreading grounds or injection wells, though it should be noted that some amount of blending with imported or local surface water is required to meet State regulations.

The 80,000 AFY target was developed by reviewing recycled water master plans and UWMPs for major water suppliers in the Region which provide projections for increases in indirect potable reuse for each of the Region's groundwater basins.

### Increase non-potable reuse of recycled water by 83,000 AFY

Water suppliers in the Region also are interested in expanding non-potable use of recycled water supplies to offset potable supply sources. Non-potable use of recycled water exemplifies the idea of matching quality of water to use as water demands such as irrigation, toilet flushing, and certain industrial uses do not require potable water. Though the Region has already constructed several water reclamation facilities and distribution systems, there are still opportunities to increase the use of existing recycled water supplies through non-potable distribution projects and potential user outreach. There are also opportunities to further treat additional existing water effluent to non-potable standards for beneficial uses such as irrigation, groundwater recharge, industrial use or environmental uses.

The Region's target of increasing non-potable reuse by 83,000 AFY was developed based on an examination of recycled water master plans and UWMPs for major water agencies in the Region.

### Increase capture and direct use of stormwater runoff by 26,000 AFY

Stormwater runoff is a largely underutilized resource within the Region. The Region's highly urbanized areas generate a large amount of runoff during winter storms that is only partially captured for direct use or to recharge local aquifers. However, this supply is very seasonal and so it is often infeasible to construct and operate facilities to store larger amounts of surface water supplies, so much of the winter storm flows are lost to the ocean. It is possible to capture urban runoff for direct use through the implementation of both small, decentralized projects as well as storage reservoirs.

*Replacement of water-thirsty landscapes with native plants offers significant opportunities for additional conservation in the Region as well as reduction of dry weather urban runoff.*

While the capture and direct use of local stormwater is considered a desirable objective by most of the Region's stakeholders, few agencies have yet to quantify the potential supply targets. The City of Los Angeles has, however, developed a stormwater management plan that projects that the City will be able to capture and directly use 10,000 AFY of stormwater. This estimation was then extrapolated to the entire Region's area by assuming that 21 AFY of stormwater could be captured and used per acre, which yields the 26,000 AFY for capture and direct use of stormwater runoff for the entire Region.

### Increase stormwater infiltration by 75,000 AFY

In parallel with the above discussed stormwater capture and direct use target, the Region has developed a target to increase stormwater infiltration. The Region has a large groundwater recharge system in place that utilizes local surface water in addition to imported water and recycled water supplies. Imported water supplies have become less reliable, and therefore more expensive, to meet replenishment needs. Stormwater provides a much less expensive alternative supply, however is only readily available during part of the year. Therefore, increasing the ability to maximize stormwater recharge for storage in groundwater basins during the wet season for use in the dry season is a desirable solution.

As with stormwater capture and direct use, stormwater infiltration projects can vary in scale from small, onsite projects to large, centralized projects. Small, onsite projects are typically those associated with BMPs that capture stormwater and infiltrate stormwater runoff onsite. Large, centralized stormwater infiltration projects will either develop or enhance existing spreading ground facilities.

The Region's target to increase stormwater infiltration by 75,000 AFY was calculated by looking at both potential centralized stormwater recharge and decentralized stormwater recharge. Centralized stormwater recharge estimates were developed by looking at the MWD's 2010 Integrated Regional Plan (MWD IRP) which contains a listing of groundwater recharge projects that agencies would like to implement, as well as groundwater basin master plans.

The decentralized portion of the stormwater infiltration target was calculated by utilizing the water quality targets in AFY described below. The water quality targets were calculated by prioritizing catchments ranging from low to high priority. The decentralized portion of the stormwater infiltration supply uses the area of the low priority catchments (assuming that supply uses will require higher quality runoff), and assumes capture of three 0.75-inch storm events per year. The stormwater capture and direct use target is then subtracted to prevent double counting of stormwater use. Only those subregions with groundwater basins that are capable of percolation were included as part of this target. For example, groundwater basins in the South Bay Subregion generally do not have the appropriate hydrogeology for percolation to take place.

### Develop 26,000 AFY of ocean water desalination

Ocean water desalination is being explored by water suppliers near the coast. The desalination of ocean water has historically been an expensive supply, but improvements in treatment technology have begun to make it a more affordable option. West Basin MWD and the City of Long Beach are planning on developing 26,000 AFY of ocean water desalination in the future to diversify their water supplies.

## Improve Surface Water Quality

### Develop[3] 54,000 AF of new stormwater capture capacity (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[4]

Stormwater capture for direct use and infiltration also has great benefits to water quality. The current regional flood management system has been designed to efficiently carry stormwater runoff, not captured for supply use, to the Santa Monica

*3 Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75", 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed)*

*4 High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.*

*BMPs such as vegetated swales and tree well infiltration pits offer stormwater capture benefits as well as pollutant reduction and groundwater recharge benefits.*

and San Pedro Bays. Due to the presence of trash, bacteria, metals, nutrients and organic chemicals in those stormwater flows that aren't captured for treatment or use, the Region's water quality is impacted. The Region has over 60 impaired water bodies for a variety of constituents. These impairments form the basis for many of the Region's stakeholders water quality related TMDL's and permits. In urbanized areas, stormwater runoff volumes can be reduced through onsite measures (by reducing impervious surfaces, or utilizing swales, berms and other onsite BMPs to capture and infiltrate runoff). These BMP's can also have the potential to augment local supplies through natural recharge offsetting potable use when pervious soils are present. However, water quality requirements and goals attained through these methods will require regional partnerships and significant funding.

The regional water quality target developed was the result of many in-depth stakeholder discussions, data reviews and new techniques and analysis developed specifically through the IRWM process. These processes are detailed further with the Water Quality Objectives and Targets TM in Appendix F. The process began by dividing each subregion into multiple catchments. These catchments were then prioritized based upon the number of receiving waters that are impaired within the catchment as well as downstream of those catchment coupled with their potential for impacting more environmentally sensitive or significant areas. This prioritization will be helpful in determining project location priorities but was not seen as a method for determining an overall regional target since progress toward water quality targets would not be measured through progress in only high priority areas.

The regional target of 54,000 AFY assumes the detention of stormwater runoff (from rainfall events with approximately ¾ inch of precipitation) for three storms per year over the entire Region over all catchments (except for those at least 98 percent vacant or classified as having at most 1 percent impervious surface). When this method is applied to the NSMB Subregion with scattered development throughout many subwatersheds, it used results in an overestimated value. A simpler method of multiplying developed area by ¾ inch was used for the catchments in the NSMB Subregion: the total amount of rain that would fall on the 11percent developed area in a ¾ inch storm. This target also acknowledges that large storm events produce runoff volumes which are too large to feasibly capture and treat.

Although measures to reduce runoff from urbanized sites (per the above target) would reduce the volume of stormwater discharged to storm drains, creeks and rivers, most of the remaining runoff that is discharged will need to be captured and treated in order to meet applicable water quality standards. Although some situations may warrant single-purpose stormwater treatment solutions, preference should be given to multi-purpose solutions that provide functional native habitat, create recreational opportunities, and utilize treated runoff to augment water supplies, either via direct non-potable reuse or groundwater recharge

### Enhance Habitat

**Preserve or protect 2,000 acres of terrestrial aquatic habitat**

**Enhance 6,000 acres of terrestrial aquatic habitat**

**Restore or create 4,000 acres of terrestrial aquatic habitat**

Aquatic habitat is of interest to the Region since habitat has a direct relationship to the management of water resources. Therefore, the Region's IRWM targets were developed relative to aquatic habitat since they should be viewed in concert with other water management targets. Existing aquatic habitat in the Region is mostly confined to the San Gabriel and Santa Monica Mountains, and isolated areas along the coast. Although much of this habitat in the San Gabriel Mountains is protected within the Angeles National Forest, and much in the Santa Monica Mountains is protected in State and National Parks, the majority of the remaining habitat has been subject to modification since it is located in urbanized areas. Natural habitat has the ability to support other water management needs by cleansing polluted waters, preventing or mitigating floods, protecting shorelines and channel banks, and recharging groundwater aquifers. Additionally, these habitats provide unique and critical environments for large numbers of flora and fauna. The preservation, enhancement or restoration of these areas has the potential to improve water quality, improve flood protection, restore habitat, and enhance groundwater recharge.

The Region's habitat enhancement targets were developed as part of the OSHARTM effort conducted as part of the 2013 Plan Update. The OSHARTM process used a regional, instead of subregional, approach toward target development. Subregional targets could be defined in a later planning effort that would allow for stakeholder outreach and coordination to further detail habitat opportunities and targets relative to local individual planning efforts.

The regional target to preserve or protect 2,000 acres is equivalent 20 percent of all privately held existing habitat. The regional target to enhance 6,000 acres is equivalent to 25 percent of existing habitat. The regional target to restore or create 4,000 acres is equivalent to 10 percent of the land area considered to be lost habitat and 10 percent of land converted to a different kind of habitat into an aquatic habitat. Detailed information on development of these targets may be found in the OSHARTM (Appendix H).

### Enhance Open Space, Recreation

**Create 38,000 acres of open space**

**Create 25,000 acres of urban parks**

Given the urbanized nature of the GLAC Region, the development of new open space and parks can be challenging. Although the Angeles National Forest does provide the Region a great deal of open space, it lies on the northern border and is greatly inaccessible to the Region's population. To address existing deficiencies in access to parkland and open space in urbanized areas, and meet additional demand associated with projected population growth, additional recreational open space is needed. As many disadvantaged communities lack sufficient park space, development of new recreational open spaces can provide benefits that integrate well with water management targets. Watershed-friendly recreational open space includes native vegetation for habitat, provides passive recreational activities, and where feasible, contributes to stormwater detention and treatment and groundwater recharge.

The Region's open space and urban parks targets were generated from existing land-use planning goals. Local general plans cite an average goal of four acres of urban parkland per 1,000 people, while for passive recreation, the Los Angeles County General Plan cites a standard ratio of six acres of open space per 1,000 people. It is therefore estimated that approximately 25,000 acres of urban parks should be targeted as well as 38,000 acres of additional open space.

The inclusion of a planning target for recreational open space is intended to gauge to what extent the implementation of the IRWMP can contribute towards meeting the Regional need for additional recreational space through the inclusion of watershed-friendly recreational or open space features in water quality and water supply projects. It is not meant to serve in-lieu of targets and goals developed through a formal local or regional land use planning process.

### Reduce Flood Risk

#### Reduce flood risk in 11,400 acres of flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches

Despite the extensive flood control system in place in the Region, a number of areas may still be prone to flooding. To identify a community's flood risk, FEMA conducts a Flood Insurance Study using statistical data for river flow, storm tides, hydrologic/hydraulic analyses, and rainfall and topographic surveys. Using this data, FEMA creates flood hazard maps that outline different flood risk areas.

The 11,400 acre regional flood risk reduction target was developed by first calculating the acres of land that overlay the areas designated by FEMA as having flooding risk and then eliminating parcels without structures that would be impacted by flooding (some of these areas are intended to be flooded).

#### Remove 68 million cubic yards of sediment from debris basins and reservoirs

Debris basins and reservoirs in the Region serve the purpose of preventing debris flows from travelling downstream and increasing flood risks in urban areas. Over time, these debris basins and reservoirs fill up with sediment, reducing their effectiveness and increasing flooding downstream. Additionally, reservoirs that have significant sediment build-up have a reduced water conservation benefit. Recent upland fires and subsequent storm events have increased the immediacy and visibility of how important sediment management is in order to preserve flood management facilities. Sediment management also helps to increase the infiltration capacity of surface flows into groundwater aquifers.

The LACFCD is responsible for regional flood management and operates and maintains regional flood control and associated spreading facilities. The regional target of 68 million cubic yards for sediment removal was taken from the LACFCD's recently completed Sediment Management Plan based on historical sediment build-up at existing facilities.

### Address Climate Change

#### Increase local supplies by an additional 7% to 10% (beyond the local supply target) by 2050 to reduce reliance on imported water

The potential decreases to both imported and local water supplies was identified as the greatest vulnerability facing the Region as a result of climate change. The water supply targets previously stated are necessary to meet the water supply objective of offsetting imported supply through local resource development and demand management. However, climate change impacts are expected to further stress imported and local water supplies – coupled with potential increases in demand, the Region has set a target to further develop local supplies by an additional 7-10 percent to adapt to climate change impact by 2050.

#### Implement "no regret" adaptation strategies

Given that the majority of projected climate change impacts exceed the planning horizon of this document, there are no numeric targets developed. However, the Region recognizes that climate change impacts are progressive and have already begun, therefore "no regret" solutions should be implemented immediately, in addition to measures that seek to reduce GHGs. "No regret" strategies provide benefits today under current climate conditions, while also reducing vulnerability to future climate change impacts (e.g. water use efficiency measures). As local water supply projects are being developed it is encouraged that the capacities of facilities are engineered to adapt to the potential for climate change impacts instead of relying on historical hydrologies for future planning. Longer-range planning may also incorporate "low-regrets" or "climate-justified" strategies that may cost more and may not provide current benefit, but are expected to provide benefits with expected future climate change.

Progress toward meeting the climate change targets described above can be measured through the reporting of local supply development in agency UWMPs, the documentation of implementation of projects that implement "no regret" adaptation strategies, and reduced GHGs.

### Implement mitigation strategies that decrease emissions of GHGs

Decreasing the amount of energy required to produce water supply is one of the greatest ways that the Region can mitigate against further climate change impacts. By optimizing facilities and using less energy intensive water resource strategies to meet needs, the Region and its stakeholders can reduce GHG emissions and contribute to lessening the future climate impacts. Some "no regret" strategies, like water use efficiency, will directly reduce GHG emissions by not requiring water to be produced to meet the same need.  The GLAC Region is supportive of strategies that both help adapt to mitigate against climate change. The strategies that can be used to meet these targets are provided in Chapter 4.

# 4. REGIONAL WATER MANAGEMENT

*The Region integrates a diverse mix of water management strategies*

**The public receives the benefit of more efficient use of limited fiscal resources through the coordination of water management strategies.**

## 4.1 Introduction

As part of the 2013 Plan Update process, the GLAC Region reviewed the management strategies called out in the 2006 Plan relative to the new IRWM Plan 2013 objectives and the Resource Management Strategies (RMS) listed in the California Water Plan Update 2009 (DWR, 2009). The purpose of reviewing these Management Strategies in this context is to identify which ones will help achieve the Plan objectives through project or program implementation within the GLAC Region. In order to determine which strategies are suitable for the Region, Subregional SC meetings were held to solicit feedback and input from the Region's stakeholders. Section 4.3 describes each of the Resource Management Strategies that the stakeholders determined were relevant to the GLAC Region. Those RMS's not discussed in Section 4.3 were considered not applicable. This chapter presents the strategies considered by the SC stakeholders for the 2013 Plan Update, and updates the 2006 Plan language accordingly. This chapter also specifically includes an evaluation of the adaptability of water management systems in the Region to climate change.

## 4.2 California Water Plan Resource Management Strategies

Division 43, Chapter 2, Section 75206(a) of the California Water Code authorizes funding (pursuant to Proposition 84) for long-term water needs of the state, and requires that eligible projects implement IRWM Plans that address the water management strategies identified within the *California Water Plan Update 2009*:

*Eligible projects must implement regional water management plans that meet the requirements of this section. Integrated regional water management plans shall identify and address the major water related objectives and conflicts within the region, consider all of the resource management strategies identified in the California Water Plan, and shall use an integrated, multi-benefit approach to project selection and design.*

Table 4-1: DWR California Water Plan Update 2009 Resource Management Strategies

| CA Water Plan Update 2009 Volume 2 Chapter Number | Resources Management Strategy within CA Water Plan Update 2009 | Strategy Overview |
|---|---|---|
| Reduce Water Demand | | |
| 2 | Agricultural Water Use Efficiency | Increasing water use efficiency and achieving reductions in the amount of water used for agricultural irrigation. Includes incentives, public education, and other efficiency-enhancing programs. |
| 3 | Urban Water Use Efficiency | Increasing water use efficiency by achieving reductions in the amount of water used for municipal, commercial, industrial, irrigation, and aesthetic purposes. Includes incentives, public education, and other efficiency-enhancing programs. |
| **Improve Operational Efficiency and Transfers** | | |
| 4 | Conveyance - Delta | Maintaining, optimizing use of, and increasing the reliability of regional treated and untreated water conveyance facilities. Included within this strategy is maintaining the ability to obtain and convey imported water supplies into the Region. |
| 5 | Conveyance – Regional/ Local | Strategies include improvement conveyance systems, upgrading aging distribution systems, promoting development of more extensive interconnections among water resources systems, establishing performance metrics for quantitative and qualitative indicators (e.g., quantity of deliveries, miles of rehabilitated conveyance facilities, and resiliency of conveyance to earthquakes and fewer regulatory conflicts), and assuring adequate resources to maintain the condition and capacity of existing constructed and natural conveyance facilities. |
| 6 | System Reoperation | Managing surface storage facilities to optimize the availability and quality of stored water supplies and to protect/enhance beneficial uses. Includes balancing supply and delivery forecasts, coordinating and interconnecting reservoir storage, and optimizing depth and timing of withdrawals. |
| 7 | Water Transfers | Contracting to provide additional outside sources of imported water to the Region over and above contracted State Water Project and Colorado River supplies |
| Increase Water Supply | | |
| 8 | Conjunctive Management and Groundwater Storage | Using and managing groundwater supplies to ensure sustainable groundwater yields while maintaining groundwater-dependent beneficial uses, including coordinating management of groundwater and surface water supplies (conjunctive use). |
| 9 | Desalination | Developing potable water supplies through desalination of seawater. Includes disposal of waste brine. |
| 10 | Precipitation Enhancement | Increasing precipitation yields through cloud seeding or other precipitation enhancing measures. |
| 11 | Recycled Municipal Water | Developing usable water supplies from treated municipal wastewater. Includes recycled water treatment, distribution, storage, and retrofitting of existing uses. |
| 12 | Surface Storage – CALFED | Developing additional CALFED storage capacity or more efficiently using existing CALFED storage capacity. |
| 13 | Surface Storage – Regional/Local | Developing additional yield through construction or modification (enlargement) of local or regional surface reservoirs or developing surface storage capabilities in out-of-region reservoirs. |
| Improve Water Quality | | |
| 14 | Drinking Water Treatment and Distribution | Includes improving the quality of the potable supply delivered to potable water customers by increasing the degree of potable water treatment. Strategy also may include conveyance system improvements that improve the quality of supply delivered to treatment facilities. |
| 15 | Groundwater and Aquifer Remediation | Includes strategies that remove pollutants from contaminated groundwater aquifers through pumping and treatment, in situ treatment, or other means. |
| 16 | Matching Water Quality to Use | Optimizing existing resources by matching the quality of water supplies to the required quality associated with use. |

| Table 4-1: DWR California Water Plan Update 2009 Resource Management Strategies | | |
|---|---|---|
| CA Water Plan Update 2009 Volume 2 Chapter Number | Resources Management Strategy within CA Water Plan Update 2009 | Strategy Overview |
| 17 | Pollution Prevention | Strategies that prevent pollution, including public education, efforts to identify and control pollutant contributing activities, and regulation of pollution-causing activities. Includes identifying, reducing, controlling, and managing pollutant loads from non-point sources. |
| 18 | Salt and Salinity Management | Recommendations that encourage stakeholders to proactively seek to identify sources, quantify the threat, prioritize necessary mitigation action and work collaboratively with entities with the authority to take appropriate actions. |
| 19 | Urban Runoff Management | Includes strategies for managing or controlling urban runoff, including intercepting, diverting, controlling, or managing stormwater runoff or dry season runoff. |
| Practice Resources Stewardship | | |
| 20 | Agricultural Lands Stewardship | Includes strategies for promoting continued agricultural use of lands (e.g. agricultural preserves), strategies to reduce pollutants from agricultural lands, and strategies to maintain and create wetlands and wildlife habitat within agricultural lands. Stewardship strategies for agricultural lands include wetlands creation, land preserves, erosion reduction measures, invasive species removal, conservation tillage, riparian buffers, and tailwater management. |
| 21 | Economic Incentives | Includes economic incentives (e.g. loans, grants, water pricing) to promote resource preservation or enhancement. |
| 22 | Ecosystem Restoration | Strategies that restore impacted or impaired ecosystems, and may include invasive species removal, land acquisition, water quality protection, revegetation, wetlands creation and enhancement, and habitat protection and improvement, habitat management and species monitoring. |
| 23 | Forest Management | Strategies that promote forest management include long-term monitoring, multi-party coordination, improvement in communications between downstream water users and communities and upstream forest managers, residents, and workers, and revisions of water-quality management plans between the State Water Board and forest management agencies to address concerns with impaired water bodies. |
| 24 | Land Use Planning and Management | Includes land use controls to manage, minimize, or control activities that may negatively affect the quality and availability of groundwater and surface waters, natural resources, or endangered or threatened species. |
| 25 | Recharge Area Protection | Includes land use planning, land conservation, and physical strategies to protect areas that are important sources of groundwater recharge. |
| 26 | Water-Dependent Recreation | Enhancing and protecting water-dependent recreational opportunities and public access to recreational lands. |
| 27 | Watershed Management | Comprehensive management, protection, and enhancement of groundwater and surface waters, natural resources, and habitat |
| Improve Flood Management | | |
| 28 | Flood Risk Management | Strategies that decreasing the potential for flood-related damage to property or life including control or management of floodplain lands or physical projects to control runoff. |
| Other | | |
| 29 | Other Strategies | Other Resource Management Strategies include:<br>Crop Idling for Water Transfers<br>Dewvaporation/Atmospheric Pressure Desalination<br>Fog Collection<br>Irrigated Land Retirement<br>Rainfed Agriculture<br>Waterbag Transport/Storage Technology |

## 4.3 2013 GLAC Region Water Management Strategies

The GLAC Region management strategies presented below also indicate any California Water Plan RMS (RMS #) that correlate to these overall strategies.

### Water Supply

#### Desalination (RMS # 9)

Brackish groundwater desalination (i.e., the removal of salts by forcing water through porous membranes) has been in practice in the Region for many years, in part due to financial incentives provided by the MWD and allowing for greater water reliability. WRD and West Basin MWD operate brackish water desalters that produce significant water supplies from local groundwater sources.

Until recently, seawater desalination had not been a cost-effective alternative to more conventional sources of water supply. As improvements in membrane technology have lowered operating pressures, the cost of producing drinking water from seawater has become more attractive. Considering the vast supply of seawater available to coastal regions and the demand for "new" drinking water, seawater desalination presents a promising new option for the Region's water supply. Several water providers are currently examining the feasibility of desalinating seawater through pilot and demonstration scale projects.

In order to further diversify the regional water resource portfolio, the MWD has utilized a program to provide $250 per acre-foot for water produced from desalination that offsets imported water, and thereby defray the production cost which is particularly sensitive to the cost of electrical power. This program identifies viable desalination projects through a proposal process. Ongoing research to improve membrane efficiency has lowered power requirements and therefore the total cost of seawater desalination.

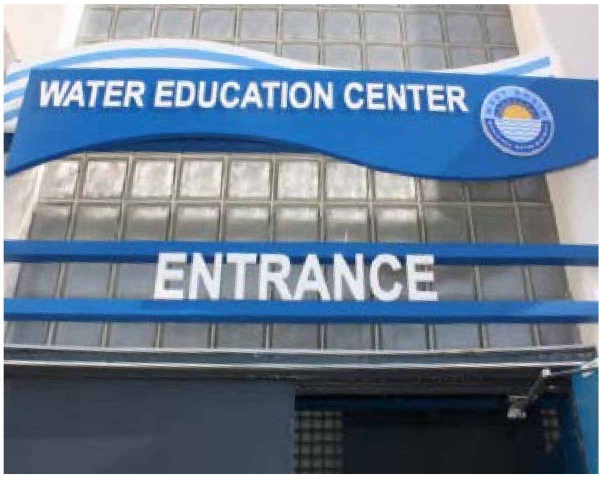
| Desalination Opportunities | |
|---|---|
| Expanded desalination of brackish groundwater | New ocean desalination facilities |

*Figure 4-1. Local water suppliers operate brackish water desalters that have the potential to produce significant drinking water supplies from otherwise unusable groundwater sources. Seawater desalination facilities have the potential to provide even larger quantities of reliable water supplies to the Region. .*

*Reverse Osmosis Membranes at West Basin Municipal Water District, Brewer Desalination Facility. Desalination of local brackish groundwater helps reduce the Region's dependence on imported water.*

Other challenges to the expanded use of desalination in the Region include the following: disposal of saline discharge water (or brine) into the ocean and its effects on marine biology; environmental concerns about impingement and entrainment of fish, fish larvae, and plankton by seawater intake structures; and a need for new infrastructure to deliver water from ocean desalination facilities to more inland locations. Public acceptance will also need to be built through public education.

Opportunities for greater use of brackish desalination in the Region include a planned expansion of desalination of brackish groundwater, such as WRD's expanded desalination of brackish groundwater at the Goldsworthy Desalter, and new ocean desalination facilities. For seawater desalination, West Basin MWD has been operating a demonstration facility since 2010 to test various technologies for operating a full-scale facility, including reverse osmosis membranes, ocean intake and brine discharge technologies, and energy recovery methods. This is currently located at the SeaLab facility in Redondo





*Images courtesy of West Basin Municipal Water District*

*Ocean-Water Desalination Demonstration Facility and Water Education Center at the SeaLab in Redondo Beach.*

Beach and also includes an education center that offers tours to the public to learn about water supply reliability and the ocean-water desalting process. The next step for West Basin MWD is to proceed with the environmental process for a full-scale ocean-water desalination facility.

### Groundwater Management and Conjunctive Use (RMS # 6, 8, 15 & 25)

Groundwater represents a significant portion of local supplies in the Region, although the extent of impervious surfaces resulting from urban and suburban development has greatly curtailed natural recharge. In some basins expanded pumping has caused significant declines in groundwater levels, seawater intrusion and other water quality concerns, and has limited the ability of producers to continue pumping from the basin without drilling deeper wells. Given long-standing groundwater demand, very few basins remain unadjudicated in the Region. This adjudication provides opportunities to better develop conjunctive use programs to meet pumping requirements as well as maximize the longer-term storage potential offered by underground basins.

Many overlying groundwater users in the Region use artificial recharge as a means of maintaining groundwater levels and production volumes. Artificial recharge can occur with either local water (e.g., surface runoff or recycled water) or imported water. Spreading grounds are typically used to recharge local and imported water whereas imported and recycled water recharge can occur through direct means using spreading grounds or injection wells. Imported water recharge can also occur through in-lieu means. In some instances, spreading is limited because of the capacity limitations of the spreading facilities rather than water supply. Therefore, there is a need for further examination of the potential to increase groundwater recharge at existing facilities through system reoperation, sediment removal and other strategies. Increasing local supplies (like stormwater and recycled water) made available for recharging groundwater basins is also a critical part to further implementation of the conjunctive use strategy.


*Figure 4-2. Groundwater basin water quality is a significant issue in the Region as many factors have contributed to the deterioration of water quality in the groundwater basins.*

## GROUNDWATER MANAGEMENT

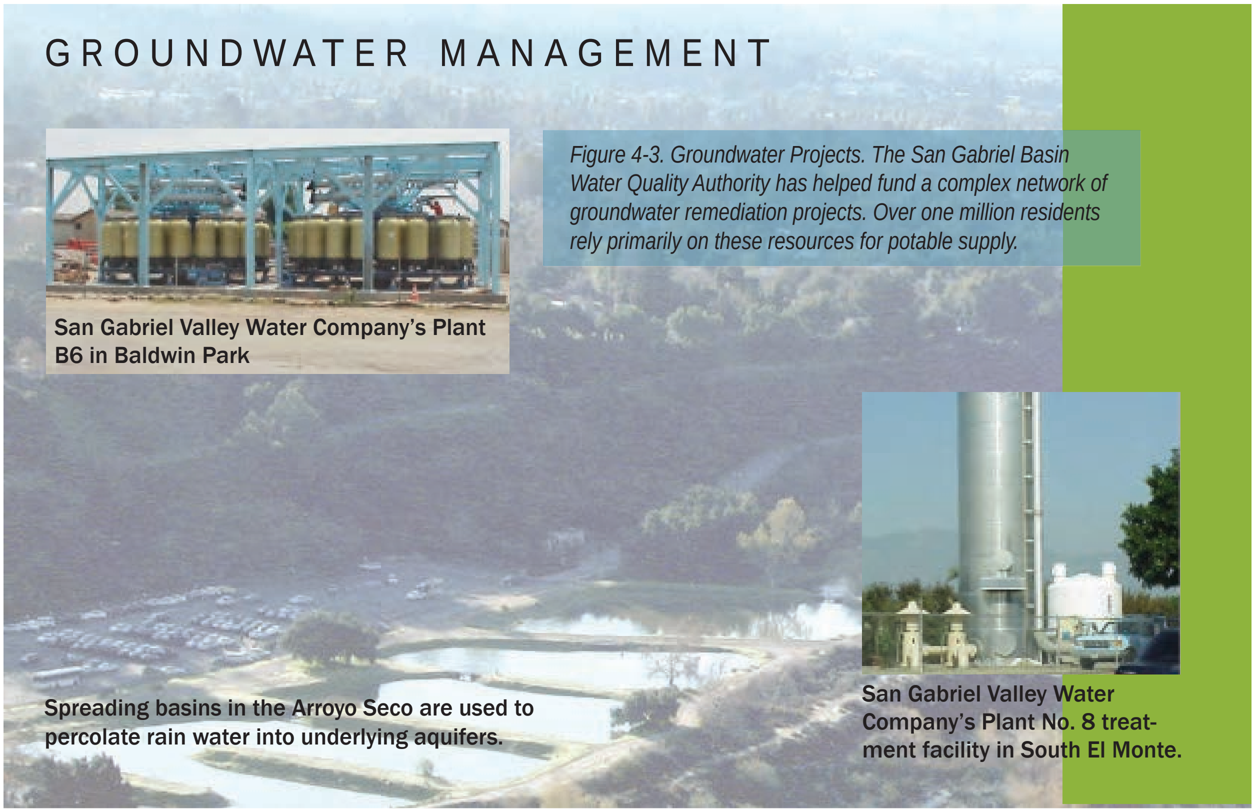


*Figure 4-3. Groundwater Projects. The San Gabriel Basin Water Quality Authority has helped fund a complex network of groundwater remediation projects. Over one million residents rely primarily on these resources for potable supply.*

**San Gabriel Valley Water Company's Plant B6 in Baldwin Park**

**Spreading basins in the Arroyo Seco are used to percolate rain water into underlying aquifers.**

**San Gabriel Valley Water Company's Plant No. 8 treatment facility in South El Monte.**

Recharge by in-lieu means does not require facilities. It simply requires that an agency suspend production from its wells and meet retail demand needs through deliveries of other supplies into its distribution system. Groundwater levels recover due to the reduction in pumping.

Groundwater basin water quality is a significant issue in the Region. Many factors have contributed to the deterioration of water quality in portions of certain groundwater basins including historic overdrafting resulting in seawater intrusion, industrial discharges, farming and agricultural chemical usage, and naturally occurring constituents. The cost of treating these contaminants is significant.

Additionally, effective treatment has not yet been identified for some chemicals and various agencies are currently testing different treatment technologies to identify the preferred treatment alternatives. Stormwater quality concerns may also need to be addressed as recharge may impact groundwater quality and are discussed below under Stormwater Quality and Flood Management.

Opportunities for the optimized use of groundwater basins in the Region include: a reduction in impervious surfaces to increase native infiltration; expansion of existing, or construction of new, conjunctive use facilities to spread or inject both local and imported water when available; expansion of existing, or development of new, projects to replenish local groundwater aquifers using recycled water; enhancement of seawater intrusion barrier facilities to increase their effectiveness; implementation of projects to recharge treated stormwater; and inter-basin transfers of recycled water.  All of these opportunities for optimized use of groundwater basins should be used to maximize storage potential identified in Table 4-2; to the extent that institutional challenges can be overcome and cost-effectiveness can be demonstrated.

### Imported Water and Conveyance – Delta, Regional/Local (RMS # 4, 5 & 12)

The Region is heavily dependent on imported surface water for drinking water supply. The primary sources of imported water supplies are the SWP, the Colorado River Aqueduct (CRA), and

| Table 4-2. Groundwater Management and Conjunctive Use | |
|---|---|
| Basin | Additional Storage Potential (Acre-Feet) |
| Los Angeles Coastal Plain | 450,000 |
| San Fernando Valley | 504,000 |
| San Gabriel Valley | 245,000 |
| Total | 1,199,000 |

*MWD has estimated in its Integrated Water Resources Plan 2010 Update that the groundwater basins underlying the Los Angeles IRWMP planning area have long-term storage potential of an additional 1,199,000 acre-feet. Water supply agencies are continually evaluating projects to make use of this efficient and reliable storage.*

the Mono Basin and Owens Valley conveyed via the Los Angeles Aqueduct (LAA). Although these sources have been instrumental in the growth of much of the Region, each of these sources face various challenges and issues, including concerns about the higher salt content of some sources.

The California SWP is a system of reservoirs, pumps and aqueducts that carries water from north of the Sacramento area to areas north, west and south of the Sacramento-San Joaquin Delta. Although originally designed to deliver slightly more than four million AFY, the system was never fully completed and typically delivers less than designed. The decline of key fish populations in the Bay-Delta system (e.g., the Delta smelt) has limited the volume of water that can be pumped to the SWP. The potential impact of further declines in ecological indicators in the Bay-Delta system on SWP water deliveries is unclear, and uncertainty about the long-term stability of the levee system surrounding the Delta system raises concerns about the ability to transfer water via the Bay-Delta to the SWP. These concerns have led to the development of the Bay Delta Conservation Plan (BDCP). The


*Figure 4-4. The Region is continually improving its ability to reduce its dependence on imported surface water for drinking water supply.*


*The primary sources of imported water supplies to the Region are the State Water Project, the Colorado River Aqueduct, and the Los Angeles Aqueduct.*

BDCP is a planning and environmental permitting process to restore habitat for Delta fisheries and improve the Delta water conveyance in a way that provides reliable water delivery operations to 25 million Californians. The heart of the BDCP is a long-term conservation strategy that sets forth actions needed for a healthy Delta. This "Delta fix" is not anticipated to produce new water for Southern California, only allow for delivery of allotments prior to Delta pumping restrictions.

The CRA delivers water from the Colorado River to southern California. MWD has traditionally received in excess of its entitlement when excess water is available. Future water allotments to California supplies from the Colorado River may be reduced as other states increase their diversions in accord with their authorized allotments. California's Colorado River Water Use Plan and the Quantification Settlement Agreement identify measures to increase the beneficial uses of the water and offset potential reductions in future deliveries to California.

The LAA delivers high-quality water from the Mono Basin and Owens Valley to the City of Los Angeles. Approximately 480,000 AFY of water can be delivered to the City of Los Angeles, however the amount the aqueduct delivers varies from year to year due to fluctuating precipitation in the Sierra Nevada mountains and mandatory in-stream flow requirements. In addition, the diversion of water from Mono Lake has been reduced by a decision of the SWRCB and export of water from the Owens Valley is limited by the Inyo-Los Angeles Long Term Water Agreement (and related MOU), and an additional MOU between the Great Basin Air Pollution Control District and the City of Los Angeles (to reduce particulate matter air pollution from the Owens Lake bed). As a result of these restrictions, future deliveries are expected to be reduced to an average of 250,000 AFY over the next 20 years.

Thus, although imported water will continue to be an important component of the Region's water supply, as the major sources are fully allocated or have constraints on deliveries, it is unlikely that substantial new sources of imported water will be available to meet the Region's future needs.

### Improve and Protect Water Quality (RMS # 14, 17, 19)

For the purposes of this Plan, the strategy to improve and protect water quality includes the quality of potable water, the quality of groundwater, and the quality of stormwater and urban runoff.

The USEPA requires all states to establish and implement a Source Water Assessment Program (SWAP) for all public water systems, as promulgated in the 1996 Amendments to the federal Safe

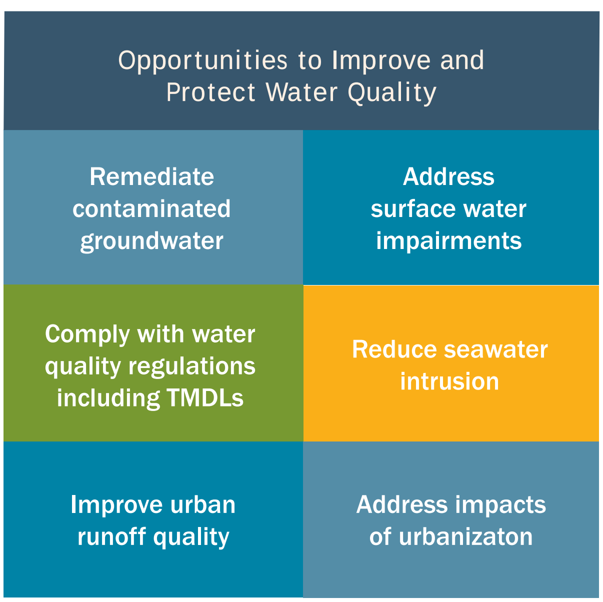



*Figure 4-5. For the purpose of this Plan, the strategy to improve and protect water quality includes the quality of potable water, groundwater, and stormwater/urban runoff.*

Drinking Water Act. In California, the federal SWAP requirement is administered by the CDPH (Health and Safety Code Chapter 4, Section 116270). CDPH developed the Drinking Water Source Assessment and Protection (DWSAP) Program, to evaluate the vulnerability of water sources to contamination and prioritize activities for protective measures. Surface water used for local water supplies may be susceptible to potential contamination from a variety of land use practices such as runoff, recreational activities, residential and industrial development, and wildland fires.

The CDPH requires that water suppliers complete a Watershed Sanitary Survey every five years, to examine possible sources of drinking water contamination and recommend how to protect water quality at the source.

Protection of groundwater quality has historically been a local concern, most notably reflected by seawater intrusion along the coast. Los Angeles County operates and maintains three seawater intrusion barrier systems composed of 290 injection wells along the coast that rely upon recycled water and imported water to reduce the intrusion of saline water in underground aquifers. In recent decades, there has been a growing recognition that historical and current agricultural and industrial activities have the potential to adversely affect groundwater quality, which is reflected in expanded enforcement of other regulatory programs to implement the clean-up of contaminants. Public water supply wells are also subject to the Wellhead Protection Program, which requires the identification of potential water quality threats (in close proximity to the wellhead) and implementation of measures to address the identified threats.

The protection of surface water quality (e.g., in the rivers, creeks, and storm drains) is regulated by the SWRCB and its RWQCBs, via the applicable Basin Plan, which identifies surface and groundwater bodies, designates applicable beneficial use classifications to each water body, establishes general and water body-specific water quality objectives; and suggests an implementation plan for maintaining or restoring the water quality objectives. The RWQCBs utilize NPDES permits and Waste Discharge Requirements to limit the discharge of contaminants and protect surface water quality.

Coupled with the introduction of imported and recycled water supplies for groundwater recharge is the issue of salt management within the basins. The development of basin salt and nutrient management plans is a strategy that is currently being implemented to better understand and address this issue.

Constraints to the implementation of water quality protection and improvement programs and projects include the extent of urbanization, pressure for development within the foothills and adjacent mountains, contamination of soils from previous land uses, and importation of water which contributes to salt management issues.

Opportunities for the expansion of water quality protection and improvement programs and projects include Safe Drinking Water Act (SDWA) projects and programs to remediate groundwater contamination and address surface water impairments through the establishment and implementation of TMDLs, and public education to reduce point and non-point source pollutants.

### Surface Storage (RMS # 6, 12 & 13)

As the water supply in the Region is heavily dependent on imported surface water, various surface reservoirs (managed by MWD and the DWR) located outside the Region are used to facilitate water delivery to various local water agencies. Several smaller reservoirs have been developed within the Region to assist in the management of local water supplies. However, most of these reservoirs are limited in their ability to capture local runoff. Most of the remaining dams in the Region have been created for flood management purposes and are not used for long term surface storage. Insufficient storage also limits recycled water delivery. In the future, reservoirs could store recycled water produced in the cooler months when irrigation demand is low for delivery in the warmer months when demand is high.

| Surface Storage Opportunities | |
|---|---|
| Increase water storage capability | Improve management of water flows |
| Increase operational flexibility of local reservoirs, canals and dams | Surface impoundments for recycled water and treated stormwater runoff |

*Figure 4-6. LACFCD oversees several surface water storage facilities, which were created to improve flood protection and store runoff for subsequent release and diversion to groundwater spreading grounds for recharge.*

*LACFD operates inflatable dams on the San Gabriel River to promote short-term in stream recharge.*

LACFCD oversees several surface water storage facilities which were created to improve flood protection and store runoff for subsequent release and diversion to groundwater spreading grounds for recharge. These include dams for short-term storage, and in-stream rubber dams to promote short-term in-stream recharge. Las Virgenes MWD purchases pretreated potable water from MWD and stores it in the Las Virgenes Reservoir in the City of Westlake Village. The reservoir also provides seasonal water storage allowing Las Virgenes MWD to purchase supplies off-season and deliver at times of peak demand to meet high summer irrigation needs. The in-city drinking water distribution systems of the City of Los Angeles once included 15 open distribution reservoirs. Due to concerns from CDPH about open water storage, nine reservoirs have been bypassed, replaced, or covered.

Constraints on the development of additional surface storage in the Region include: the lack of suitable sites for surface impoundments, since most of the mountainous areas are protected open space and habitat; constraints on open reservoirs to reduce potential contaminants; political constraints; and the cost of developing new reservoirs.

Opportunities to enhance surface storage include: modification of local reservoirs, waterways, retention ponds and dams to increase storage capability and operational flexibility; installation of additional in-channel rubber dams to improve management of flows; creation of new surface impoundments for recycled water and/or treated stormwater runoff; and the development of unused resource extraction sites (e.g., gravel pits) as surface impoundments. It should be noted that gravel pits are privately-owned industrial sites and any use other than the owner's intended use would be subject to approval by the owner.

### Water Conservation/Urban Water Use Efficiency (RMS # 2, 3 & 21)

Water conservation is a critical water resource management strategy for the Region. Given that there is very little agricultural crop production in the Region, the conservation strategy is primarily on more efficient municipal use. The strong reliance on imported water and the inherent variability in both imported and local supplies has spurred efforts throughout the Region to minimize the use of water where possible through water efficiency measures.

| Water Conservation Opportunities | |
|---|---|
| **Passive Conservation** | **Active Conservation** |
| Responses to Price Shifts | New Technologies - Indoor Devices |
| Building and Plumbing Codes | New Technologies - Outdoor Devices |
| Consumer Behavioral Changes | Economic Incentives (Subsidies and Rebates) |

*Figure 4-7. Strong reliance on imported water and the inherent variability in both imported and local supplies has spurred efforts throughout the Region to minimize the use of water where possible through water use efficiency measures.*

Conservation is an element in drought planning as well as an ongoing strategy to ensure long term availability of local supplies in the face of additional demand generated by population growth.

Since the drought of 1987-1992, conservation efforts have stepped up significantly within the Region. Most local agencies have adopted specific goals for water conservation which suggests that additional conservation is still feasible. The California Urban Water Conservation Council (CUWCC) has established a set of 14 BMPs for water conservation, recently categorized as Foundational and Programmatic, although not all agencies in the Region are signatories to a MOU to implement these BMPs. The DWR requires in the Urban Water Management Plan updates that water suppliers address these 14 BMPs every five years. Reporting of progress is through DWR, or both DWR and the CUWCC if a signatory.

Additionally, the Water Conservation Bill of 2009 (20x2020) requires individual retail water supplier to set water conservation targets for 2015 and 2020 to support an overall state goal of reducing urban potable per capita water use by 20 percent by the year 2020. The majority of municipal water suppliers operating within the Region will be incorporating additional conservation strategies to meet these targets.

Opportunities to expand water conservation generally fall into two categories – active and passive (or code-based). Active conservation comes from programs offering things such as rebates, device installation, and plumbing retrofit. Rebates can be given for both hardware installation and for landscape conversion to lower water-use types (e.g. turf removal). Although many agencies have ongoing programs, expanding active conservation can be directly influenced by water agencies. Expansion of passive or code-based conservation can occur either through local ordinances or new State laws that require certain water conservation actions or penalize the theft or waste of water. Passive conservation can also be produced by building and plumbing codes, consumer behavioral changes (particularly through education and water pricing), and responses to price shifts. In addition, local water agencies could continue to develop

*A demonstration landscape project In the City of Inglewood. This garden showcases native and drought tolerant plants that can provide attractive alternatives to traditional Southern California landscaping.*

and update water conservation master plans to coordinate and prioritize conservation efforts, and identify enforcement protocols.

Given the substantial progress already made by local agencies, further expansion of water conservation will need to incorporate economic incentives and new technology, and in some instances, change public perceptions (e.g., about the desirability of sub-tropical landscaping in a semi-arid climate or use of gray water for irrigation). Conservation techniques must offer the consumer opportunities to save money as well as save water. In some cases—such as subsidies or rebates to change out older, water-using appliances like washing machines and toilets—the subsidizing agency can reduce demand as an alternative to building infrastructure. The expanded utilization of California friendly landscaping may also benefit from economic incentives such as rebates or land use ordinances established by cities or counties. Newer technologies, such as smart irrigation controllers that use current weather information to modify irrigation patterns, have worked well in commercial applications, but have proven to be expensive for homeowners without the use of rebates. As this technology evolves, it is anticipated that such controllers will become more widespread.

Water conservation also has the potential to produce secondary benefits such as through improved irrigation techniques that reduce irrigation runoff and thereby improve surface water quality.

A constraint on the development of water conservation that may need to be addressed by local agencies is the loss of revenue to utilities with increased conservation. The unit cost of conservation also increases over time as cheaper conservation strategies are employed first. Additionally, there is often low incentive to conserve water due to the low cost of water and the difficulty of raising the cost of water.

### Water Recycling (RMS #11 & 16)

Recycled (or reclaimed) water is used for a variety of applications in the GLAC Region, including landscape irrigation, groundwater recharge, and some industrial processes, thereby helping the Region to supplement its potable water supplies with a local supply. Recycled water can be supplied in a manner that matches the water quality to its use. In addition, use of recycled water can reduce the energy-intensity of the Region's water supply, reduce the Region's reliance on imported water, reduce the Region's greenhouse gas footprint, and thereby increase the resiliency of the Region to drought and climate change. The cost of developing needed infrastructure (treatment, storage facilities, pump stations, and distribution lines) to distribute recycled water has limited the use of recycled water in some areas. Some agencies, including the MWD and the U.S. Bureau of


*Figure 4-8 As the cost of "new" water increases because of market forces, reclaimed water will become an increasingly economic and environmental choice.*

## WATER RECYCLING

*Figure 4-9. Water Recycling. Recycled/reclaimed water currently provides 120,000 acre-feet/year to the Region. Recycled water will become an increasingly important water source for the Region.*

Reclamation, have provided grant funding or subsidies for the development of recycled water facilities in the past. Temporal and spatial disparities in production and demand for recycled water inhibit the development of fully utilized recycled water systems. Recycled water is produced at a fairly constant rate year-round, yet demand for landscape irrigation uses is seasonal – high in the summer and low in the winter. Construction of storage facilities (e.g. surface impoundments, tanks and reservoirs) could allow producers to store excess recycled water to make it available during periods of higher demand. As groundwater recharge and industrial uses increase, the use of available supplies can be maximized as recycled water can be utilized by these uses year-round. Additionally, as the cost of "new" water increases due to scarcity and market forces, recycled water will become even more economically and environmentally desirable. In the future, recycled water will become an ever more important source of water in the Region for both non-potable uses and potable uses.

Key challenges for future expansion of the use of recycled water in the Region include: identification of new recycled water users close to wastewater treatment plants or distribution infrastructure; disposal of advanced treatment waste products (e.g., brine); diurnal and seasonal variations in recycled water supply and demand; cost-effectiveness of building additional infrastructure (storage facilities due to seasonal variations in demand, pump stations, distribution lines, dual plumbing); treatment requirements; regulatory trends (which suggest increasingly stringent recycled water standards); potential requirements to maintain minimum in-stream flows which may limit operational flexibility or the availability of supplies; proximity of recycled water production to area of demand; nutrient TMDLs; and public support. In general, significant increased funding will be needed to overcome many of these obstacles and achieve significant increases in the amount of water supply obtained from recycled water.

Opportunities to expand recycled water use are continually being sought by the Region's water and wastewater agencies, which often work in partnership (when they are not under the same agency's authority). Water agencies can encourage large water users in close vicinity of wastewater treatment plants and recycled water distribution systems to modify their operations to use recycled water as opposed to potable water; build or modify existing wastewater infrastructure to address water quality issues, capacity issues, and provide storage; add and/or expand regional distribution systems; merge regional systems as needed; and develop or expand groundwater recharge and seawater intrusion projects.

Additionally, development of new regional partnerships and projects could be pursued, such as those identified in USBR's 2002 Southern California Comprehensive Water Reclamation and Reuse Study (which identified proposals for several regional projects within the Calleguas/ Las Virgenes, East San Gabriel, West Basin, and Central Basin areas).

The 2009 California State Water Recycling Policy has also mandated that salt and nutrient management plans (SNMPs) be created and implemented to determine how to deal with salt loading issues. The implementation of recycled water projects can serve as both salinity management strategies and challenges. SNMPs are under development for the major basins in the Region and will be completed in the next several years

### Water Supply Reliability (RMS 6, 8, 9, 11, 13, 15, 16, 19 & 25)

The availability of imported water in southern California, beginning with the development of LADWP's system from the Owens Valley and later continuing with MWD's Colorado River Aqueduct and partnership in the California SWP, allowed many agencies throughout the Region to shift their reliance to imported water and away from local supplies. Increasing costs of imported water, concerns about the health of the Bay-Delta ecosystem, enlightened environmental attitudes in areas where imported water originates and increasing competition for potable water resources have all resulted in a rekindling of interest in local resources. In some cases, new reservoir storage, expansion of groundwater recharge basins, or the implementation of conjunctive groundwater projects have all been developed to take advantage of surplus imported water (water not required to satisfy immediate consumptive demand) in years when snowfall has been abundant. These measures can decrease reliance on imported water and improve local water supply reliability during periods of drought.

Pumping and treating brackish groundwater can expand local supplies and create opportunities to enhance water supply reliability by removing and replacing the brackish water with higher quality water. This could be accomplished through well injection operations (to replace the removed brackish water with fresh or treated water) or expanded groundwater spreading operations to recharge surplus runoff or imported water. Such operations must be carefully designed to avoid adversely affecting the quality of the injected or recharged water.

Urban growth displaces open space and increases impervious surfaces, thereby reducing natural recharge of precipitation. The channelization of streams, particularly when the channel bottom becomes impervious, reduces natural percolation of stream flow into underlying soils. Thus, the preservation of open space, particularly in those areas that directly recharge aquifers used for water supply, and the preservation of or restoration to natural stream channels, preserves groundwater recharge in many areas, thus contributing to the long-term reliability of existing groundwater supplies. The creation of new parkland, which may reduce impervious surfaces (e.g., via removal of existing development) may also reduce runoff and enhance groundwater recharge. The creation of new habitat, such as wetlands, can improve groundwater recharge by increasing retention of runoff.

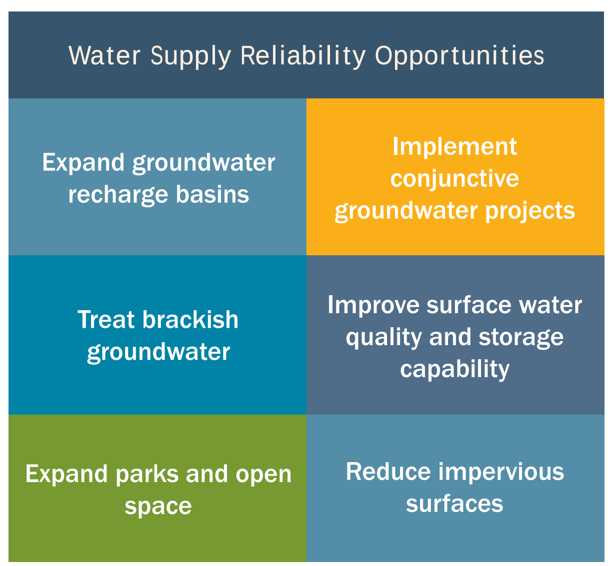



*Figure 4-10. Increasing competition for potable water resources has resulted in a rekindling of interest in local resources.*

Constraints to the improvement of water supply reliability include the limited availability of undeveloped land for the expansion of recharge facilities or creation of constructed wetlands, and the limited ability to recharge groundwater across large portions of the coastal plain due to limited permeability in soils with high clay content. Constrains may also include the cost of ensuring water reliability as it may be necessary to construct new facilities, and legal constrains such as court adjudicated limits on groundwater pumping.

Opportunities to improve water supply reliability include: the expansion of groundwater recharge basins; the implementation of conjunctive use groundwater projects; and the development of natural treatment systems, such as constructed wetlands, to improve both surface water quality and storage capability.

### Water Transfers and Local / Regional Conveyance (RMS # 7, 6 & 5)

Prior to 1991, water transfers within the Region had mostly been limited to transfers of annual groundwater basin rights (which continue to occur, although conditions imposed by groundwater basin adjudication sometimes restrict export of groundwater outside the basins' boundaries), and transfers of water to enhance operational flexibility.

Additionally, MWD's transmission facilities have not been used to transfer local water from one agency to another, mainly because of water quality issues and potential downstream impacts. Lastly, regulations limit mixing of different source waters

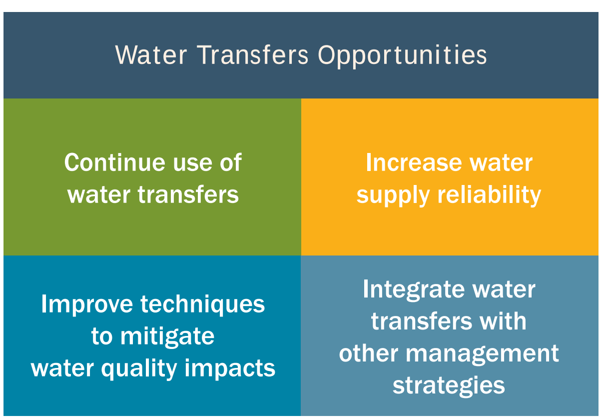



*Figure 4-11. Historically, water transfers were arrangements between two parties; one with surplus water supply, and one in need of additional water.*

in transmission lines used for potable water, which sometimes imposes restrictions on the movement of water.

With the 1991 drought, the Governor's Water Bank was developed. MWD and other SWP contractors took advantage of that resource to augment supplies and lessen the severity of the impacts of the drought. Since that time, MWD has participated in water transfers as a water management strategy to augment supplies. The City of Los Angeles plans to develop water transfers as part of its supply strategy rather than purchasing water from MWD during dry years. Should the costs of purchasing and wheeling transfer water from outside the Region be lower than purchasing MWD water, other agencies would likely be interested in such a supply strategy.

However, over the course of the past 15 years, significant changes have occurred in agriculture which led to concerns that one-year or "spot market" water transfers might be a less viable tool. For instance, the significant rise in the percentage of permanent crops in California's Central Valley led to a concern that not only would there be less agricultural water available to transfer, but the significant investment in those permanent crops would force those farms to compete for available water transfer supplies. In addition, growing urbanization in the Central Valley has created a higher urban demand in a number of areas.

The good news is, despite these shifts and challenges, MWD and other agencies have been able to secure transfer water and move that water when needed. For example, during the most recent drought, MWD was able to acquire significant amounts of SWP transfer and exchange supplies via spot market transactions. In addition, MWD's participation in cooperative buyer coalitions proved to be a more effective means for acquiring SWP water transfer supplies than participating in the state-wide 2009 Governor's Drought Water Bank (2009 Bank). Accordingly, MWD led the effort in 2010 to re-convene a State Water Contractors Buyers Group, which provided MWD with a greater amount of transfer supplies than the 2009 Bank secured for all buyers and at a lower cost.

Constraints to the use of water transfers within the Region include institutional constraints related to the wheeling (or transfer) of water, which may affect various transmission elements, and the limitation on using MWD facilities because of potential water quality impacts to downstream users.

## Water Quality

### Nonpoint Source Pollution Control (RMS #17, 19, 23 & 24)

To conform to the requirements of the federal Clean Water Act and the federal Coastal Zone Act Reauthorization Amendments of 1990, the State of California has developed the Nonpoint Source (NPS) Program Strategy and Implementation Plan (1998–2013) which has identified actions to reduce nonpoint pollution, and a companion volume, the California Management Measures for Polluted Runoff Review Document, which identifies a range of management measures for agriculture, forestry, urban areas, marinas and recreational boating, hydro-modification (including modification of stream channels, water impoundments, and stream bank erosion), and wetlands, riparian areas and vegetated treatment systems. Additional information on sources of nonpoint source pollution and measures to reduce and/or treat polluted runoff is provided in the California NPS Encyclopedia, developed by the SWRCB.

To reduce stormwater pollution the RWQCBs have issued stormwater and urban runoff NPDES permits which regulate the discharge of runoff from municipal storm sewer systems (MS4s), otherwise known as storm drains. These permits prohibit non-stormwater discharges into the storm drain system, limit discharges to receiving waters that would cause or contribute to a violation of water quality standards, and require implementation of a Stormwater Quality Management Program (SQMP) that includes the use of BMPs to reduce the discharge of pollutants identified.

In 2012, RWQCB adopted a new MS4 Stormwater Permit for the Los Angeles Basin area. As part of the new MS4 Stormwater Permit, permittees have the option to customize the programs as part of a Watershed Management Program or Enhanced Watershed Management Program. Within most of Los Angeles County, the SQMP has seven programs, including:

- The Industrial/Commercial Facilities Control Program, which covers industrial and commercial facilities, including restaurants, automobile service facilities, retail gasoline outlets, automobile dealerships and other federally-mandated facilities;

*The Santa Monica Urban Runoff Recycling Facility collects, treats, and reuses approximately 500,000 gallons per day of urban runoff.*

*Caltrans has a successful program to reduce pollutants from freeway stormwater runoff. Their research is ongoing in the Los Angeles Basin.*

- The Planning and Land Development Planning Program, which requires implementation of post-construction BMPs and site-specific mitigation measures for commercial developments on sites one acre or greater in impervious area, automotive repair shops, retail gasoline outlets, restaurants, residential development with ten or more dwelling units, parking lots with 25 or more spaces (or are greater than 5,000 square feet in area), single-family hillside residences, and locations within, or directly adjacent, or discharging to, environmentally sensitive areas;
- The Development Construction Program, which requires control of erosion and the prevention of runoff from construction sites, and the containment of construction materials, equipment fuel, maintenance and washing fluids through a combination of BMPs, and inspections. For projects over one acre in area, preparation of a Stormwater Pollution Prevention Program is required, per the Construction Activities Stormwater General Permit (Order No. 99-08-DWQ);
- The Illicit Connections and Illicit Discharges Elimination Program, which requires the County and the cities to identify and investigate illicit discharges, resolve undocumented connections to the storm drain system, and take enforcement action;
- The Public Agency Activities Program, which consists of maintenance, inspection, and response to minimize stormwater impacts from public agency activities;
- The Public Information and Participation Program, which requires measures to increase awareness, change behavior, and involve the public in mitigating the impacts of stormwater pollution; and
- The Countywide Monitoring Program, which requires measures to assess receiving water impacts, identification of sources of pollution, evaluation of BMPs, and measurement of long-term trends in mass emissions.

In response to the identification of water quality impairments (via the 303(d) list), the RWQCBs have begun to establish TMDLs for contaminants including trash, metals, organic compounds,

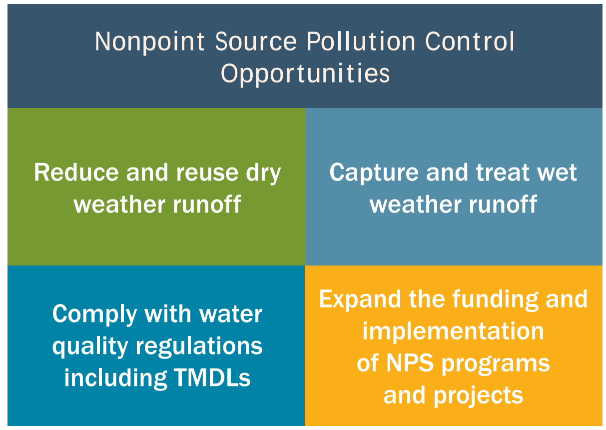



*Figure 4-12. Improvement of stormwater runoff quality will lead to an increase in the availability of local non-potable water supplies.*

nutrients, and bacteria. Given the pervasive nature of some contaminants, development of implementation plans for TMDLs may need to include measures to address NPS pollutants. In addition, the discharge of dry-weather runoff is prohibited in a portion of the North Santa Monica Bay, which may require specific measures to address NPS pollutants in upland areas draining to the ASBS (described in Chapter 2, Regional Description).

Constraints to the implementation of NPS pollution control programs and projects include: the substantial portion of the Region that has been subject to urban and suburban development; the pervasive nature of surface water contaminants; and the need for widespread individual action for some aspects of NPS pollution control.

Opportunities include the continued implementation of existing programs in accordance with NPDES permits, and establishment and implementation of TMDLs, which may expand funding and implementation of NPS programs and projects.

### Stormwater Quality and Flood Management (RMS # 15, 17, 19, 27 & 28)

Historically, the management of stormwater has been viewed either as an element of flood management, or as a means to augment water supply via the managed transfer of runoff from river or stream channels into groundwater recharge basins (discussed above in groundwater management). However, that component of stormwater that is not already used for groundwater recharge (and is therefore discharged via the flood control network to the ocean), is a potential candidate for capture and treatment to improve surface water quality in the rivers and other bodies of water, and to further augment local water supplies.

Given the extent of urbanization in the Region (with approximately 54 percent developed), runoff quality has been notably degraded in most of the rivers and tributaries. The capture (and subsequent treatment) of stormwater, as a structural solution to surface water quality impairments, could be implemented as one element of a comprehensive surface water quality improvement program.

In some locations, historical concerns about the quality of stormwater runoff have limited the willingness of water supply agencies to consider recharge of stormwater from urbanized areas.

Challenges to the expansion of stormwater capture and management include: the need to maintain flood protection for any potential modification of storm drain systems that would expand or enhance capture of stormwater in detention basins, cisterns, or recharge basins; concerns about the potential for contaminants in stormwater to migrate to groundwater; limited land availability, which limits options for development of structures to capture and manage stormwater; and short duration/high intensity storm events which make storage difficult. Other constraints may include plumbing codes and other regulatory restrictions on stormwater reuse.

Opportunities for expansion of stormwater capture and management include development of local and regional facilities to capture and treat urban runoff and stormwater as part of a TMDL compliance strategy. This could include package treatment plants to remove contaminants, filtration systems, or natural treatment systems such as constructed wetlands. Water cleansed by such facilities could either be recharged to groundwater, or stored for delivery to local uses, such as landscape irrigation. As mentioned previously, the new MS4 Stormwater Permit includes the option to develop Enhanced Watershed Management Programs that identify projects that retain stormwater runoff and achieve other benefits such as flood control and water supply. In addition, new developments can implement low impact development (LID) to reduce stormwater runoff, and existing developments could retrofit existing infrastructure to reduce runoff and potentially use stormwater onsite.

Flood management measures in the Region began in earnest in the 1920s, but the major elements of the current system were developed beginning in the 1930s. The current flood management system generally consists of concrete river and stream channels designed to expedite flow, dams and reservoirs on the rivers to regulate flow, debris basins on streams to capture sediment washed down from the mountains, and hundreds of miles of channels to direct flow into spreading basins, rivers, or directly to the ocean. Flood management measures are less developed in those portions of the Region within the Santa Monica and San Gabriel Mountains, where a larger percentage of stream miles are in their natural state, except for dams on the San Gabriel River, Malibu Creek, and several major tributary streams and channel armoring in some developed areas.

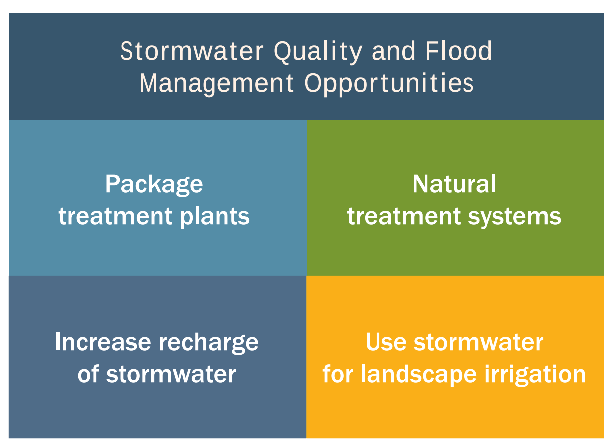



*Figure 4-13. Stormwater currently lost to the ocean is a potential candidate for capture treatment, recharge, and reuse.*

Despite the extensive network of flood management structures and channels, the counties track areas throughout the Region where flooding or drainage problems persist. Information is reported by the cities, through individual complaints, or directly to each county in unincorporated areas. Unmet drainage needs have been identified throughout the Region, but mostly in localized urban areas. If the situation requires a new drainage structure, the cities and the counties, sometimes in conjunction with the U.S. Army Corps of Engineers, will study the best solution. The recently completed Los Angeles County Drainage Area project, which enhanced flood protection on the lower Los Angeles River, is an example. The Army Corps Coastal Sediment Management Plan includes an appendix on ASBSs that should be considered in coastal flood control management planning. The Nature Conservancy's Coastal Resilience Ventura could also serve as a model.

Constraints to the expansion of flood management programs include: limited funding, and the lack of undeveloped land within the urbanized portions of the Region that could be used for flood management improvements and steep slopes within the local mountains, which combined with the potential for heavy rains, can result in substantial soil erosion or debris flows and may affect the capacity at downstream drainage facilities.

Opportunities to enhance flood management include projects such as the Sun Valley Watershed Plan, which addresses an area of chronic flooding with alternative approaches to construction of a flood conveyance channel through the use of gravel pits and underground drains below parkland to infiltrate runoff and thereby enhance groundwater recharge. If successful, the Sun Valley Plan can serve as a model for future localized flood management improvements. Flood attenuation to reduce peak flood flows, via expanded on-site infiltration and increased upstream storage, represents an opportunity to enhance the potential for river channel modifications, such as those proposed in the Los Angeles River Revitalization Master Plan.

### Water and Wastewater Treatment (RMS # 6,14, 18)

As noted above, the principle sources of water supply in the Region are imported water and groundwater, with recycled and local surface water supplementing these sources. Water utilized in the Region for potable purposes must meet state and federal drinking water standards. The federal SDWA, passed by Congress in 1974, requires the USEPA to develop drinking water standards that must be implemented nationwide. In California, the EPA has delegated implementation of drinking water regulations to the state. CDPH has responsibility to protect the quality of drinking water, in accord with California's Drinking Water Source Assessment and Protection Programs that were developed in response to the 1995 reauthorization of the Federal SDWA. Drinking water standards for the State of California are specified in the State's Safe Drinking Water Act, which is in the Health and Safety Code (Division 104, Part 12, Chapter 4, Sections 116270-117130) with implementing regulations in Title 22 of the California Code of Regulations.

Responsibility for treatment of potable water supplies rests with the approximately 120 wholesale and retail water agencies and districts in the Region. Compliance with SDWA rules may require improvements to potable water supply treatment facilities, reduction of disinfection by-product production, and implementation of source water protection practices. Considerable uncertainty exists over the timing and extent of possible future requirements related to contaminants which are not currently regulated, such as endocrine-disrupting compounds,

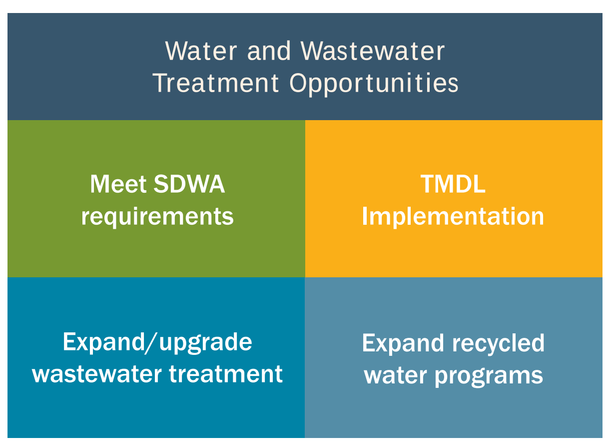



*Figure 4-14. The majority of water utilized in the Region's watersheds is potable water which must meet drinking water standards.*

pharmaceuticals, and components of common household products, such as shampoo, which have been detected in various source waters.

The treatment of wastewater in the Region is governed by provisions of the federal Clean Water Act, the California Porter-Cologne Water Quality Control Act, and various implementing regulations such as federal and state water quality regulations. Key implementing regulations include the National and California Toxics Rules (40 CFR Sec. 131.36-131.38), the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California, and the Water Quality Control Plan for the Los Angeles Region (and Santa Ana Region). These are in turn implemented via NDPES discharge permits, and individual Waste Discharge Requirements for wastewater treatment plants established by the RWQCBs. Wastewater treatment services within the Region are currently provided by:

- Sanitation Districts of Los Angeles County
- Orange County Sanitation District
- City of Los Angeles Department of Public Works, Bureau of Sanitation
- Las Virgenes MWD (under a joint partnership with Triunfo Sanitation District)
- City of Burbank
- Los Angeles County Department of Public Works

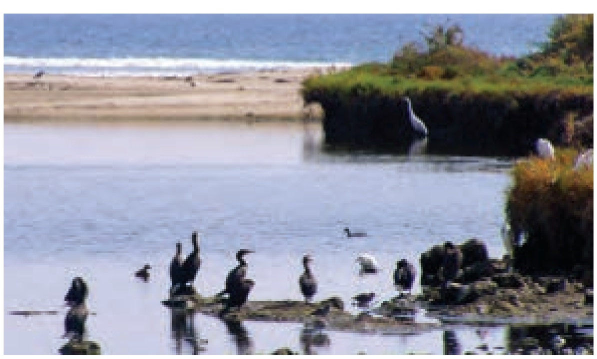
In addition, various other entities operate small treatment facilities (e.g., less than 0.2 mgd) or onsite package plants.

In addition to these regulatory constraints, constraints to the expansion of water and wastewater treatment facilities in the future may include: anti-degradation issues; land and siting constraints; uncertainty over pending regulatory developments; challenges associated with conflicting or competing regulatory requirements, and the cost of implementation.

Opportunities to expand water treatment include projects designed to meet SDWA requirements. Opportunities to expand or modify wastewater treatment facilities include projects and programs needed to meet new regulatory requirements that may include new state and federal water quality standards, new permit conditions, TMDL implementation (including acceptance of dry weather runoff diversions to assist municipal stormwater permittees in compliance with their regulatory requirements) and modifications to facilitate the expansion of recycled water programs and/or to meet new recycled water regulatory requirements. Recently adopted statewide policy for onsite wastewater treatment systems (OWTS) provides an opportunity to address OWTS issues locally.

## Habitat

As part of the 2013 Plan Update, the GLAC Region completed an Open Space, Habitat and Recreation Technical Memorandum (OSHARTM). The objective of the OSHARTM is to provide a framework for the Region's water and land managers to assist in the development of integrated projects for funding through the IRWMP.



*Malibu Lagoon has suffered the negative impacts of human activity. Completely filled in at one point to create ballparks, work has continued since 1983 to restore the natural ecosystem and associated water quality benefits.*

*Rocky tidal pool in Paradise Cove along the Malibu coastline.*

### Ecosystem Restoration (RMS # 22, 28)

Despite their exceptional importance and value, many of the Region's inland, riverine, and coastal ecosystems have suffered from over a hundred years of human impacts—development activities to support population growth have taken a heavy toll on many ecosystems. Many rivers, streams, and wetlands have been diked, ditched, and filled. Dams and flood control channels have been built to contain and direct waterways; fundamentally altering the natural processes that used to exist. Much of the historic coastal dunes, woodlands, wetlands, grasslands, scrub communities, and estuary ecosystems have succumbed to development or been degraded by declines in water quality and ecosystem functionality.

In recent decades, technologies have emerged to restore function and productivity to degraded or destroyed ecosystems. Scientists, engineers, and community groups have begun working with federal, state, and local governments to restore ecosystem function to the Region's native ecosystems. According to the CWP Update 2009 (Ecosystem Restoration, Chapter 22), ecosystem restoration improves the condition of modified natural landscapes and biological communities to provide for their sustainability and for their use and enjoyment by current and future generations. Few, if any, of California's ecosystems can be fully restored to their condition before development. Instead, efforts must focus on rehabilitation of important elements of ecosystem structure and function. Successful restoration increases the diversity of native species and biological communities, and the abundance and connectivity of habitats.

Restored ecosystems result in physical, chemical, and biological changes to both the specific system, and the areas that it influences. The benefits of ecosystem restoration are difficult to quantify, but, depending upon the type of ecosystem restored (e.g., aquatic vs. terrestrial), they can include capturing and storing stormwater, groundwater recharge, flood protection, increasing water supply reliability, wildlife habitat creation and enhancement, water quality enhancement, and recreation. Economic benefits can also be realized through increased property values and the reduced cost of water quality enhancement compared to conventional stormwater treatment systems.

To achieve long-term success, ecosystem restoration needs to address the causes and not just the symptoms of ecological disturbance. Sometimes these causes are obvious; sometimes they are subtle and far removed in space and time from the ecological damage, as is the case in many southern California coastal wetlands. Most watersheds that drain into the Region's coastal wetlands were hydrologically modified as a result of urbanization and flood protection measures. Runoff quantities and velocities were increased by the straightened, more efficient drainage systems that reduced deposition of sediments on the floodplain and increased the movement of sediments (and pollutants) downstream. These materials entered the coastal

*Ballona wetlands in Playa Del Rey. The Region has lost more than 90 percent of its historic wetlands. The last remaining 600 acres of the Ballona wetlands are in the planning stages of restoration.*

wetlands, estuaries and bays, causing water quality problems that fundamentally changed how many of these ecosystems functioned.

These large-scale cause-and-effect relationships pose major constraints to ecosystem restoration such as: the scale of the impact, the cost of both restoration and maintenance, and the magnitude and potentially permanent nature of the environmental changes that resulted in the loss of many ecosystem functions. In addition, although human activities in the watershed have substantially altered many ecological processes, some of these activities provide important public benefits (e.g., flood protection and water supply). Ecosystem restoration efforts therefore must balance the need to provide high quality environments that fulfill the needs of plant and animal communities with preservation of the functions provided by human modifications to such ecosystems. Additional constraints include the high cost of land acquisition and restrictions on some grant funding programs for acquisition.

Opportunities for ecosystem restoration in the Region have been identified in many existing plans, such as the Los Angeles and San Gabriel River Master Plans, and the Los Angeles River Revitalization Master Plan. Existing or future ecosystem restoration projects include: the Oxford Retention Basin; the Ballona Wetlands Restoration Project; the Hazard Park Wetlands Restoration; Devil's Dip Creek Restoration and Daylighting; Topanga Creek Restoration Program; Malibu Creek and Tributary Restoration; Malibu Ecosystem Restoration Feasibility Plan; Las Flores Creek Restoration and fish passage barrier removal; Solstice Creek Restoration, Arroyo Sequit Restoration, Whittier Narrows Nature Center Ecosystem Restoration; Malibu Lagoon Habitat Enhancement Program; Ballona Creek Ecosystem Restoration Project; Hydrodynamic Study for the Restoration of the Tujunga Wash; Taylor Yard Multi-Objective Feasibility Study, the Limekiln Canyon Stream Restoration and Habitat Improvement Project; Puente Chino Hills Wildlife Corridor; Los Cerritos Wetlands Restoration; Medea Creek Restoration at Chumash Park; Oak Park Medea Creek Restoration; and Las Virgenes Creek Bank Stabilization, Stream Restoration, Fish Migration Enhancement and Trail Connection project.

### Environmental and Habitat Protection and Improvement (RMS # 22, 27)

Risks to the environment and upland and riparian habitat in the Region include urbanization and the loss of green space, invasive species, hydrological alterations, channel hardening, incompatible land uses, habitat fragmentation, and other common problems associated with urbanization and pollution. The results of riparian and aquatic habitat degradation can lead to increased erosion of banks and channels; diminished water quality for wildlife and domestic use; loss of habitat for wildlife; alteration in flood protection; loss of aquatic and terrestrial productivity and health; and loss of recreational, educational, and aesthetic values. For some surface water bodies, water quality impairments include increases of non-toxic elements such as sediment, nutrients, and water temperature, as well as toxic contaminants such as pesticides, bacteria, and heavy metals. Degraded water quality may require substantial treatment to remove the pollutants that may limit recreational use of southern California beaches, bays, and lagoons, and may potentially affect fish and wildlife habitat quality. Recreational waters are undoubtedly used more in warm summer dry weather, however, in Los Angeles County year-round recreation demand, even during wet weather, is higher than many other counties or states. For example, water quality regulations at Santa Monica Bay Beaches are relevant year round in all weather conditions.

In addition, the loss of habitat throughout the coastal watersheds has aggravated water supply and reliability problems since riparian vegetation, wetlands, and surrounding uplands can act to slow and retain stormwater flows and allow the water to recharge groundwater.

The long-term restoration, improvement, and protection of the Region's riparian and aquatic habitat and environment would reduce the water quality, water supply and biological impacts of urbanization and the environmental degradation associated with the increased population in the Region. Because many of the issues involved in environmental and habitat protection and improvement cut across traditional political and organizational boundaries success will only be accomplished


*Figure 4-15. Multiple agencies in the Greater Los Angeles Region are collaborating across organizational boundaries to develop long-term solutions to historical environmental degradation.*

through cooperative planning efforts like the IRWMP that include non-governmental organizations, private landowners, industry, and local, state and federal government agencies.

The potential for habitat protection and improvement is limited by extensive development in the Region, as well as by geologic and topographic constraints. Improvement in such a heavily urbanized Region is hindered because the physical and hydrological landscape has been irreversibly altered in so many locations that it may be difficult to recreate the natural state of the landscape. Hydrologic and land use changes in the watersheds also continue to impact stream corridors and downstream aquatic habitats. Many created habitats that were designed to mitigate for losses from development seldom perform the same ecological functions as those that were removed. Additional constraints include the high cost of land acquisition and restrictions in some grant funding programs for land acquisition.

Opportunities for improvement and protection of the Region's riparian and aquatic habitat (including land acquisition and fish passage removal) include the following examples: Las Virgenes Creek Naturalization and Restoration, Restoration of Southern Steelhead Habitat in Solstice Creek, Triunfo Creek Riparian Enhancement, Hahamongna Watershed Park Habitat Restoration and BMP Implementation; the Flint Wash Restoration; the Central Arroyo Park Habitat Restoration and BMP Implementation; the Lower Arroyo Park Habitat Restoration and BMP Implementation; the San Rafael Creek Restoration; Santa Fe Dam Recreation Area and Habitat Enhancements; Rio Hondo Vision Plan (Emerald Necklace Concept); Wilmington Drain Restoration Multiuse Project; Machado Lake Improvements; Stone Canyon Creek Restoration; the Long Beach RiverLink; the Sepulveda Basin Habitat Enhancement; the Arroyo Seco Watershed Feasibility Study; the Cold Creek Diamond Acquisition; and the Topanga Connection Acquisition.

### Wetlands Enhancement and Creation (RMS 22, 27)

The Region has lost more than 90 percent of its historic wetlands. Those remaining are threatened by development, changes in hydrology, invasive species, and poor water quality. The results of degradation of remaining wetlands and the associated environment can lead to increased erosion of banks and channels; diminished water quality for wildlife and domestic use; loss of ecosystem function; loss of habitat for wildlife; alteration in flood protection; loss of aquatic and terrestrial productivity and health; and loss of recreational, educational, and aesthetic values. Water quality impairments include increases of both non-toxic elements such as sediment, nutrients, and water temperature, as well as toxic contaminants such as pesticides, bacteria, and heavy metals. The degraded water quality may require substantial treatment to remove the pollutants that may affect aquatic and terrestrial habitat quality and function, and may limit recreational use of beaches, bays, and lagoons.

In addition, the loss of wetlands throughout the coastal watersheds has aggravated water supply and reliability problems, since riparian vegetation and wetlands can act to slow and retain stormwater flows and allow the water to recharge groundwater.

The long-term restoration, improvement, and protection of the Region's wetlands would help ameliorate the water quality, water supply and biological impacts of environmental degradation. Because many of the issues involved in wetland restoration and enhancement cut across traditional political and

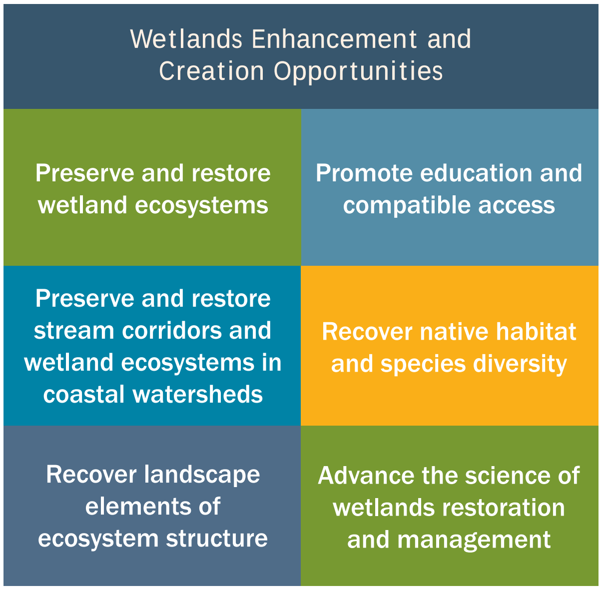



*Figure 4-16. The long-term restoration, improvement and protection of the Region's wetlands would help ameliorate the water quality, water supply and biological impacts of environmental degradation.*

organizational boundaries, success can more easily be accomplished through cooperative planning efforts like the IRWMP that include non-governmental organizations, private landowners, industry, and local, state and federal government agencies. Education and public outreach will be critical in helping the public understand their role in protection and achieving buy-in on the necessary improvements.

Wetland restoration and enhancement is constrained by existing development over much of the historical wetland areas, private ownership, permanently altered hydrology, and lack of funding for operation and maintenance. In today's funding environment, it is probably not possible that all of the required projects can be completed as single purpose projects. With planning, cooperation, and vision, projects can be integrated to achieve multiple goals. Integrated projects may be more likely to be funded, in that funding agencies may treat them more favorably, or various fund sources would be available to fund individual elements of projects. In addition, wetland restoration and enhancement projects may require ongoing maintenance and operation that requires environmental permits.

Opportunities for enhancement and creation of the Region's wetlands include: Los Cerritos Wetland Restoration (Bryant, Bixby, and Hellman); Gardena Willows Restoration; Ballona Wetlands Restoration; Colorado Lagoon Enhancement; DeForest-Dominguez Wetlands Restoration; Hansen Dam Recreational Area Wetlands Restoration Project; Los Angeles River Headworks Wetlands and Water Protection Project; the Multiuse Wetlands Project at Children's Museum of Los Angeles; and El Dorado Park Wetlands.

## Open Space, Recreation

### Recreation and Public Access (RMS # 23, 24 24 & 26)

Open space used for recreation and public access has the potential to enhance water supply (by preserving or enhancing groundwater recharge and thereby improving water supply reliability) and improve surface water quality, to the extent that these open spaces filter, retain, or detain stormwater runoff (although few existing parks or open spaces include specific features to improve the quality of stormwater runoff, and poorly managed open space has the potential to be a source of sediment which can degrade water quality). Additional open space areas will also benefit the public, including DACs.

The 2013 OSHARTM developed by the GLAC Region as part of the IRWM Plan Update assessed the need for recreation and open space relative to population and existing recreation and open space areas. The OSHARTM pointed out that although much of the remaining open space in the Region is located in the northern foothills and the mountains, the bulk of the need exists within the densely developed coastal plain and the inland valleys. If new parkland and open space can be created within these urbanized areas, particularly within or near Disadvantaged Communities, then public access to parkland could be improved. To increase open space, the acquisition of land will be necessary. Opportunities for acquisition could include vacant parcels, under-utilized public land, and brownfields (when remediation is feasible), including the lands

| Opportunities to Integrate Water Resource Objectives with Recreation and Public Access | |
|---|---|
| Create and preserve functional native habitat | Preserve and enhance groundwater recharge |
| Improve the quality of urban and stormwater runoff | Preserve and enhance flood management |

*Figure 4-17. Open space used for recreation and public access has the potential to enhance water supply and improve surface water quality.*

along rivers, creeks or tributaries that meet these criteria. Also maintenance of the forested upland areas in the mountains will be key to maintaining the water quality and recreational value of an important regional resource.

Current plans and proposals for new parks, trails and recreational projects in the Region include: Rio de Los Angeles State Park, Annandale Golf Course Habitat Restoration and Infiltration; Welch Site BMP and Habitat Restoration; Lincoln Heights Freeway Interchange Restoration and BMP; Malibu Linear and Civic Center Legacy Park; Trancas Canyon Park; Las Flores Creek Park; Morris Dam Peninsula Park; Azusa Canyon River Wilderness Park; San Gabriel River Master Plan, (National Park Service) San Gabriel River Watershed Special Resource Study, San Gabriel Canyon Spreading Grounds; Maywood Riverfront Park; San Gabriel River Discovery Center at Whittier Narrows Regional Park; Woodland (Duck) Farm Park; Pico State Historic Park; Paseo del Rio at San Gabriel and Rio Hondo Spreading Grounds; Santa Fe Springs Park Expansion; Downey Landing, City of Downey; Bellflower Riverview Park; Pacoima Wash Greenway Project Parkside Drive Park; South Los Angeles Wetlands Park; Puente Creek Nature Center; Strathern Pit Multiuse Project; North Atwater Creek Restoration and Water Quality Enhancement; Marsh Street Park; Walteria Lake Enhancement; and Lafayette Creek Daylighting.

Coupled with open space recreation is the need for maintaining the water dependent recreation opportunities within the Region. The Santa Monica Bay coastline is a vital and key recreation destination for the entire Region as well as the world. Maintaining this environmental, recreational and economic resource through pollution prevention and education programs and access route maintenance is critical. The Los Angeles River has also in recent years become a recreation resource for kayaking and other activities. Further enhancements as part of the Los Angeles River Revitalization Plan could allow for more public access and ability to use the River as a recreation resource.

As new parks or open space are created, these places may also provide opportunities to meet other regional needs, including:

- Creation or preservation of functional native habitat and habitat linkages
- Preservation or enhancement of groundwater recharge, to the extent that new parks preserve existing open space or reduce impervious surfaces
- Improve the quality of urban or stormwater runoff, so that new parks or open space are designed to include runoff water quality improvement features, such as vegetated swales, buffers, or other BMPs
- Preserve or enhance flood management; the preservation of open space can avoid potential increases in runoff associated with new development, and reduce runoff if impervious surfaces are reduced.

*Each year more than 33 million visitors enjoy the beaches and mountains within the Santa Monica Mountains National Recreation Area. Visitors hike, bike or ride on hundreds of miles of mountain trails, or drive the scenic roads.*

## Sustain Communities

### Asset Management

With more than 10 million people residing in a developed area of approximately 1,125 square miles, the infrastructure developed for water, wastewater, and flood protection is significant. To maintain the quality of potable water, the collection and treatment of wastewater, and minimize risks to life and property from flood events, this infrastructure must be maintained, repaired as needed, and replaced or expanded when appropriate.

Traditionally viewed as a form of monetary management, in the past decade, asset management has increasingly replaced traditional assessments of repair and replacement costs. The Statewide General Waste Discharge Requirements for Sanitary Sewer Systems requires the development of Sewer System Management Plans (SSMP) for all publicly owned sewage collection systems greater than one mile in length in California, with a goal to protect public health and the environment by reducing the severity and number of sanitary sewer overflow events.

Although the specific components of an asset management program may vary, in general the process consists of the development of an overall strategy, an inventory of assets, an assessment of asset condition, a financial valuation, and the establishment of capital and operating budgets followed by the ongoing maintenance, repair, and replacement of assets. Challenges to implementing such a program might include funding for replacement infrastructure, obsolescence of technologies, and the cost of implementing the asset management program.

Public agencies and districts responsible for water, wastewater, and flood protection should implement asset management programs, which will preserve and protect water quality, enhance water supply reliability, and protect the public and environment.

### Integrated Planning (RMS # 3 through 28 except 10 & 20)

This Plan is the most visible evidence of integrated planning in the Region, but it is not the only example. As noted elsewhere, in recent years the potential for a transformation of the watersheds in this Region has emerged, beginning with visions of restoring the Los Angeles and San Gabriel Rivers, development of watershed management plans on most of the major tributaries and creeks, and the preparation of IRPs by water and sanitation agencies. These various plans promote integrated efforts to manage resources and recognize that water and watershed resources are interconnected.

Three general approaches to integrated planning are: 1) Geographic Integration, which links similar kinds of projects or programs that are geographically separated, but can work together to create a whole that is greater than the sum of its parts; 2) Multi-purpose Projects, where multiple water management strategies are incorporated into individual projects or programs; and 3) Collaborative Projects, which requires agencies, jurisdictions or organizations to work together on collaborative projects or programs which cross jurisdictional boundaries and address multiple water management strategies.

Due to the extensive urbanization constraints in the Region, the opportunities for implementing water resource projects are constrained by the availability of funding and competing demands for available land to site new projects. Plans, programs, and

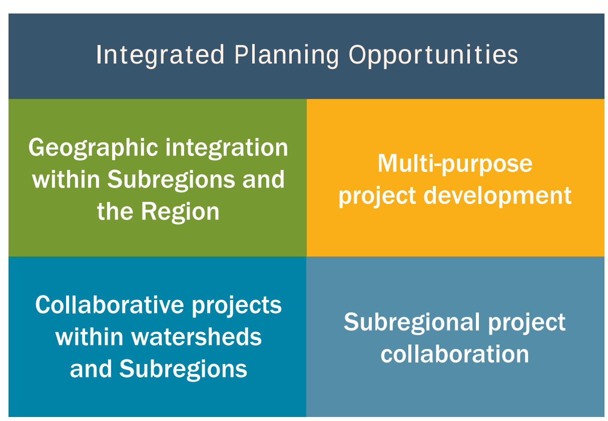



*Figure 4-18. The IRWMP has provided an opportunity to integrate planning at the scale of watersheds, Subregions, and the Greater Los Angeles County Region.*

projects need to integrate multiple water management strategies to meet regional water resource needs, efficiently use fiscal resources, and provide the public with tangible community benefits.

As the IRWMP will largely be implemented by the individual actions of local agencies, jurisdictions, and organizations, the consistent application of integrated planning will be necessary to assure that the objectives and planning targets established in this Plan are realized.

### Land Use Planning (RMS #24)

The constitution of the State of California confers responsibilities for land use planning to the cities and counties (for unincorporated areas). The Government Code establishes requirements for the development of General Plans to guide land development decisions, which must include seven required elements: land use, circulation, housing, conservation, open space, noise, and safety. Because of this structure, water resources may be discussed within the conservation element (as relates to water supply and stormwater management), the open space element (as relates to water-based recreation or the use of lands that may protect water supply or enhance groundwater recharge), and the safety element (as relates to flood protection). Thus, most jurisdictions' policies with respect to water resources and their management are typically fragmented throughout several elements. The State of California's General Plan Guidelines (GOPR, 2003) describe the concept of an optional water resources element, which would combine water supply and demand, water quality, wastewater treatment and disposal, watershed features and processes, flood management, and stormwater management.

In 2001, Senate Bill 610 and Senate Bill 221 further correlated development to water supply by requiring Water Supply Assessments be conducted to determine if supplies were available to meet any new demands.

Given the pervasive nature of some NPS pollutants, land use planning, in the form of ordinances, could be used to reduce stormwater runoff volume and/or the discharge of pollutants from development or redevelopment sites. Some portions of the Region require the development of a Standard Urban Stormwater Mitigation Plan (SUSMP), to retain the runoff from storms of approximately 0.75 inches. SUSMP requirements could be amended to require both retention and treatment of runoff with individual jurisdictions extending these requirements to development/redevelopment on smaller sites or additional development types. Existing stream corridors, open spaces, or other valued watershed resources could be protected via ordinance (i.e., a stream protection ordinance) or incentives could be provided to reduce impervious surfaces and increase natural recharge. To address water quality issues, the Orange County Drainage Area Master Plan was followed by the development of watershed action plans and the subsequent amendment of local General Plans to integrate water quality and runoff policies. A more comprehensive approach to natural resource management, which could provide corollary benefits to water resources, is provided by the City of Santa Monica's Sustainable City Plan, which promotes a well-maintained open space system that can support natural functions, wildlife habitat, passive and active recreation, and supports implementation of land use and transportation planning and policies that encourage compact development and mixed-use projects.

Implementation of projects designed to capture, treat, and reuse urban and stormwater runoff as part of the implementation of the IRWMP, could require acquisition of land to site those projects. To the extent that acquisition displaces existing uses, cities and counties may consider modification of their general plans to facilitate the accommodation of displaced uses or provide incentives to take advantage of newly created open spaces (e.g., detention basin or natural treatment areas) or recreational areas.


*Figure 4-19. The State of California Government Code establishes requirements for the development of General Plans to guide landuse decisions.*

Where feasible, general plan modifications should incorporate the concepts articulated in Common Ground from the Mountains to the Sea, and in the SCAG Compass Growth Vision Report, such as mixed-use land use designations with increased density along existing transportation corridors. Cities and counties should also consider providing incentives to private development that promote the inclusion of features that improve surface water quality, enhance groundwater recharge, and reduce water demand.

Constraints to the use of land use planning to enhance the integrated management of water resources include: the lack of fiscal resources to support development of optional general plan elements; cost effectiveness of the program; the potential for disparities amongst local jurisdictions to subtly affect development patterns (as developers may choose those jurisdictions with less stringent requirements); and the absence of model programs to demonstrate the effectiveness of such measures.

Opportunities to expand the use of land use planning in the integrated management of water resources include: the adoption of natural resource protection measures (e.g., floodplain or stream protection ordinances); the preparation of water resource elements in city and county General Plans; the adoption of Sustainability Plans by jurisdictions, agencies, and organizations; and the SCAG Compass Growth Vision Report. As part of the IRWM's 2013 OSHARTM, next steps were identified that would call for further collaboration with city land use planning departments to further refine the opportunity areas for developing recreation, open space and habitat benefits on a subregional level.

### Watershed Planning (RMS # 27)

Numerous watershed plans have been prepared in the Region, including the Arroyo Seco Watershed Restoration Feasibility Study, the Ballona Creek Watershed Management Plan, Common Ground, from the Mountains to the Sea, Compton Creek Watershed Management Plan, Dominguez Channel Watershed Management Master Plan, Malibu Creek Watershed Management Area Plan, Rio Hondo Watershed Management Plan, San Gabriel River Corridor Master Plan, Sun Valley Watershed Plan,

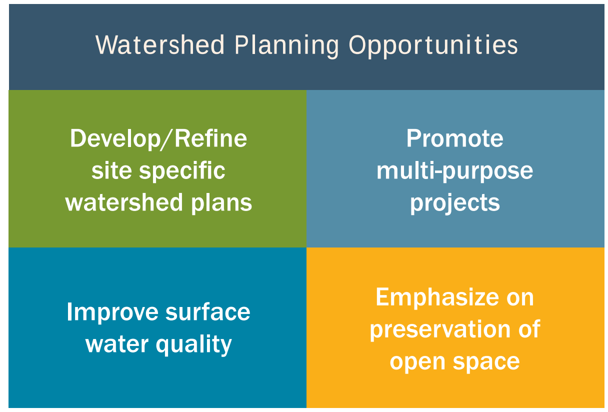



*Figure 4-20. As noted by the 2005 update of the California Water Plan: "...Los Angeles County [is] the most productive county in the state in terms of watershed planning." (DWR, 2005).*

and the draft Upper San Gabriel River Watershed Management Plan. Draft plans are under development for the Tujunga Wash, the Headwaters of the Los Angeles River, and Coyote Creek, along with the Green Visions Plan for Los Angeles County and portions of Orange and Ventura Counties.

The primary focus of these plans has been improvement of surface water quality, with additional emphasis on preservation of open space, and the promotion of multi-purpose projects. Most of these efforts have been stakeholder-driven, so that the list of recommended actions reflects local concerns and priorities.

Constraints on the development of additional watershed plans include: availability of funding; absence of established stakeholder groups for some of these areas; and a defined minimum scope to assure regional consistency.

Opportunities for the preparation of new watershed plans include: Burbank (east and west) Wash; Verdugo Wash; the main stems of both the Los Angeles and San Gabriel Rivers (although the respective river master plans cover the river corridors and some adjacent lands); Los Cerritos Channel; and numerous smaller watersheds that drain directly to Santa Monica Bay and San Pedro Bay. In addition, this IRWMP could serve to promote regional consistency between both new and existing plans, and use the opportunity to come into compliance with MS4 permits.

- The GLAC Region Water Resource Management Strategies presented in this

Chapter include nearly all of the 2009 California Water Plan RMS. The remaining RMS not included the previous sections are identified and explained here: #2 Agricultural Water Use Efficiency and #20 Agricultural Lands Stewardship: given that the GLAC Region does not have significant areas of agricultural crops, these RMS were considered to be irrelevant for GLAC implementation. Local small-scale nurseries do exists, but would be covered by other strategies like, pollution prevention etc.

- #10 Precipitation Enhancement and #29 Other Strategies: The GLAC Region has many other water supply development opportunities that should be exhausted before engaging in these newer strategies

## 4.4 Climate Change

The strategies discussed above can be used to help the Region adapt to the climate change vulnerabilities identified in Chapter 2, and mitigate further climate change impacts. The Climate Change Subcommittee reviewed the Resource Management Strategies discussed above, and also developed an initial list of both adaption and mitigation strategies through review of relevant climate change related documents. These documents include:

- Managing an Uncertain Future (DWR, 2008)
- Climate Change Scoping Plan (CARB, 2006)
- Climate Action Team Biennial Report (CalEPA, 2010)
- Resolution on Sea Level Rise (OPC, 2010)
- Coastal Regional Sediment Management Plan for Los Angeles County Coast (USACE, 2012)

Strategies from this initial list were considered based on their potential for addressing the Region's vulnerability issues and removed if they were deemed infeasible or irrelevant for the GLAC Region. Strategies were also refined and added to develop a more accurate and comprehensive list. Table 4-3 shows the management strategies considered. These strategies are listed based upon their ability to help the Region plan for future impacts of climate change on water resources, mitigate against further climate change by reducing GHGs, and providing carbon sequestration.

IRWM Plan projects that implement any of these strategies would therefore be helping the Region meet the specific targets identified that support the objective.

| Table 4-3: Management Strategies Considered for Climate Change | | |
|---|---|---|
| Adaptation or Mitigation Measure | Infeasible/ Irrelevant/ Opposition | Considerations / Explanations |
| Reduce Water Demand | | |
| Agricultural water use efficiency | | Although no large-scale crop lands exist in the Region, there are nurseries. |
| Urban water use efficiency | | |
| Crop idling for water transfers | Irrelevant | There is a spot market for imported water transfers, but irrelevant because there are no large-scale crops in the Region. |
| Water meters installation | | This is only applicable for smart meters and multi-unit residence water meters since the Region is already metered. |
| Education/public outreach | | |
| Gray water use | | There could be public perception issues and potential groundwater quality impacts, but Los Angeles County can permit. |
| Decentralized stormwater use | | |
| Rainfed agriculture | Infeasible | Agriculture is limited to specific small scale ventures like nurseries that require more water than naturally occurs through local rainfall. |
| **Improve Operational Efficiency/Transfers** | | |
| Conveyance - regional/local | | |
| System reoperation | | |
| Water transfers | | |
| Localized/decentralized treatment | | For wastewater, this could reduce available supplies of recycled water. |
| Shift water use to off-peak hours | | |
| Conduct emissions inventory and target | | |
| Treatment and distribution efficiency (urban and ag) | | |
| Increase use of renewable energy sources | | |
| Optimize sewer systems | Irrelevant | This is already accomplished separately with wastewater / stormwater systems so there is no impact on climate change. |
| Increase Water Supply | | |
| Conjunctive management & groundwater storage | | |
| Desalination of brackish groundwater | | |
| Desalination of ocean water | Opposition | This will help the Region to adapt to climate change by offsetting surface supplies, but will not mitigate GHGs due to its high energy needs. Plants would also need to be constructed on the coast so there could be issues with sea level rise. |
| Precipitation enhancement | | |
| Recycled Municipal Water | | |

| Table 4-3: Management Strategies Considered for Climate Change | | |
|---|---|---|
| Adaptation or Mitigation Measure | Infeasible/ Irrelevant/ Opposition | Considerations / Explanations |
| Surface Storage - Regional/local | | |
| IPR/Reservoir Augmentation | | This is already being done; several new/expanded projects are under consideration. |
| Dewvaporation or Atmospheric Pressure Desalination | Opposition | Dewvaporation is not favorable compared to more energy efficient supplies and would not mitigate against GHGs. |
| Fog Collection | Irrelevant | Future fog amounts are unknown given climate change, so is not considered useful to this Region. |
| Irrigated land retirement | Irrelevant | Region does not have large enough agricultural areas for this to be a meaningful measure. |
| Direct Potable Reuse | | This is an emerging technology that has some permitting and perception challenges to near-term implementation. |
| Improve Water Quality | | |
| Drinking Water Treatment and Distribution | | |
| Groundwater/Aquifer Remediation | | |
| Matching quality to use | | |
| Pollution Prevention | | |
| Salt and Salinity Management | | |
| Urban Runoff Management | | |
| Improve Flood Management | | |
| Flood risk management | | |
| Protective infrastructure | | |
| Sediment management | | |
| Practice Resource Stewardship | | |
| Agricultural lands stewardship | Irrelevant | There are no large-scale crop lands in this Region to make this measure relevant. |
| Economic incentives (loans, grants, water pricing) | | |
| Ecosystem restoration | | |
| Forest management | | |
| Land use planning and management | | Strategies that include sediment management and creation of sediment reserves to adapt to SLR along beaches should be encouraged. |
| Recharge area protection | | |
| Water-dependent recreation protection | | Strategies that include sediment management and creation of sediment reserves to adapt to SLR along beaches should be encouraged. |
| Watershed management | | |
| Water-dependent cultural resources and practices preservation | | Although no federally-recognized Tribes in the Region, important cultural resources, including wetlands, do exist. |

# 5. INTEGRATED REGIONAL PROJECTS

*San Gabriel Canyon Spreading Grounds*

**135 projects are included in the 2013 Plan Update as of January 2013and are being evaluated for opportunities to accomplish integrated solutions.**

## 5.1 Introduction

Water resource management projects developed prior to the IRWM Program generally focused on a single purpose, and avoided or minimized impacts on other water resource interests. Examples of this approach include: flood protection, water supply and water treatment projects. Today, agencies, jurisdictions, and stakeholders are increasingly recognizing the value of addressing the interrelationships and interdependencies of water resource management projects and the value of developing integrated projects. Since the 2006 IRWM Plan was published, the GLAC Region has worked to further define and improve the process by which IRWM projects are developed, included, and evaluated. The main characteristic of this process is that it is dynamic – meaning that projects being included and modified as needed, as part of the GLAC IRWM Program.

Given the dynamic nature of the project process, this chapter will focus primarily on how the GLAC Region conducts the process and secondarily, provide the most recent list of projects as of January 2013. Specifically, this chapter will:

- Present the project review process including procedures for: 1) submitting a project to be included in the IRWM Plan, 2) reviewing and selecting projects to implement the IRWM Plan, and 3) communicating the list(s) of selected projects for public review,
- Discuss integration efforts for stakeholder-identified projects and
- Describe the current list of IRWM implementation projects identified by the Region's stakeholders and vetted by the Region's SCs (including DAC projects).

## 5.2 Project Review and Selection Process

The GLAC IRWM Plan will be implemented through specific studies and actions. In order to identify potential projects that facilitate IRWMP implementation, the Region periodically conducts an open "call for projects." Stakeholders and others are encouraged to submit projects via the IRWMP website. The discussion below will summarize 1) procedures for submitting a project to be included in the IRWM Plan, 2) procedures for review of projects to implement the IRWM Plan, and 3) procedures for communicating the list of selected projects.

### Procedures for Submitting a Project to be included in the IRWM Plan

Although a proponent can submit projects for consideration at any time, the GLAC Region will review submittals quarterly, as described below, to determine whether the submittals are sufficiently developed and demonstrate appropriate need that can be funded through the IRWM Grant program (PRC §75028 (a)) or other funding opportunities.

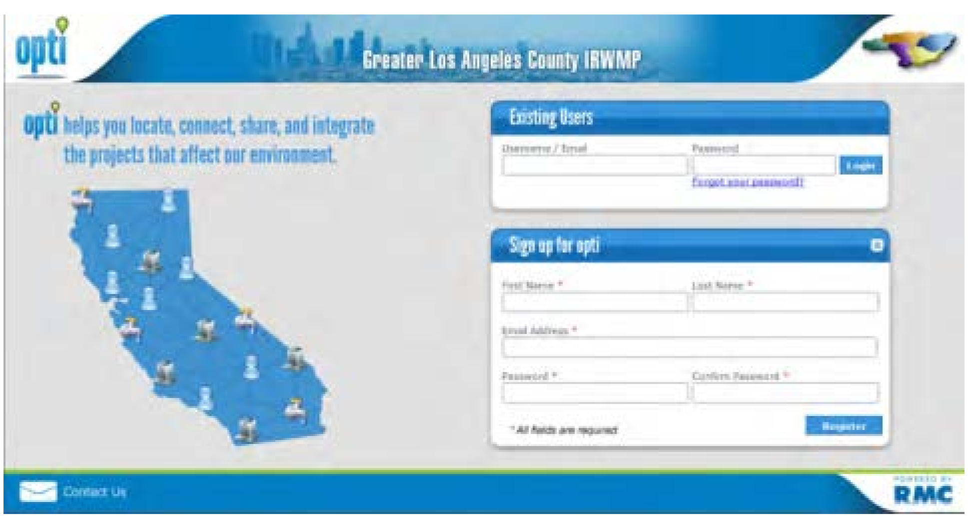
In addition, the Region conducts periodic calls for projects. These calls for projects provide dates by which projects will need to be submitted or updated in time for the next round of project reviews or selections for either the overall plan or for consideration in funding applications. These notices are posted on the IRWM website, on the announcement board of the project database communications system, and via email from each of the Subregional SCs. All regional stakeholders are encouraged to submit projects by logging on as a project user (also known as a "project proponent") to the Region's project database. The most up-to-date IRWMP Project list can be found by logging into the project database from the IRWM website at www.lawaterplan.org.

The last call for projects concluded January 31, 2013. Projects were then reviewed, categorized and prioritized according to the process described below.

#### What types of projects are encouraged?

IRWM Plan projects that aim to accomplish the following GLAC Region objectives are encouraged:

- Optimize local water resources to reduce the Region's reliance on imported water
- Improve water quality of receiving waters and comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater, and wastewater
- Protect, restore, and enhance natural processes and habitats
- Increase watershed friendly recreational and open space for all communities within the Region
- Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches
- Adapt to and mitigate against climate change vulnerabilities



### How can projects be submitted and/or updated?

Project proponents can submit new projects or make modifications to existing projects using the project database from the GLAC IRWM website at www.lawaterplan.org. There is a web interface project form with specific sections for required and desired information. For applicants without internet access, projects can be submitted in a hard copy format by contacting LACFCD at (626) 458-3525.

In order to enter projects into the database, stakeholders need to sign-up through the webpage to be a user/proponent. It is highly recommended that new users review the User Guide which is accessible after log-in through the "Help" menu.

### What information is required?

Projects at all levels of planning completeness are welcome. However, basic information must be supplied in order for a project submittal to be accepted into the project database for consideration by the appropriate SC. Those items listed in the top half of the sidebar are the minimum required. They are shown with a single asterisk on the database project submittal form.

However, the GLAC Region is primarily interested in well-developed projects for inclusion in the IRWM Plan, in order to implement the Plan's objectives. The information listed in both the top and bottom half (shown with two asterisks on the project submittal form) of the sidebar must be submitted in order that a project's entry be considered for inclusion in the IRWM Plan. If all required information is submitted, the project will be evaluated by the appropriate Subregional SC for completeness and to determine that the project meets the IRWMP objectives -- among many other factors -- as described below.

The GLAC Region encourages proponents to submit conceptual projects. Conceptual projects will be discussed by SCs and, if they meet specific basic criteria, but don't include all the detail required to be included in the IRWM Plan (just the information on the top of the sidebar), they will only be viewable to other stakeholders on the project database webpage. They will not be included in the IRWM Plan. By also including promising conceptual projects in the database, the SC is able to help foster additional project development creativity and potential project integration.

Required information For Project Submittal in the database:

- Project Title
- Implementing Organization
- Project Location
- Primary and other Subregion
- Primary Contact
- Description
- Primary Benefits
- Resource Management Strategies
- Status
- Schedule
- IRWM Plan Adoption
- Statewide Priorities
- State Program Preferences

Additional Information Required for Submittal in the database for Consideration for Inclusion in the IRWM Plan:

- Project Partners & Other Stakeholders
- Project Start Date
- Environmental and other permits
- Total Cost and Local Match
- Annual O & M Costs
- Project Cost Breakdown
- Address Critical Water Supply and Water Quality needs of Disadvantaged Communities
- Consider environmental justice
- Address Critical Water Supply and Water Quality needs of American Tribal Communities
- Address climate change / GHG reduction

### How are projects accessed and viewed?

Any interested party can register as a user with the system to log on and view project lists and information, as well as maps of project locations. Any uploaded data and information associated with projects is also accessible. Again, it is possible to sign up for the project database from the GLAC IRWM website at www.lawaterplan.org.

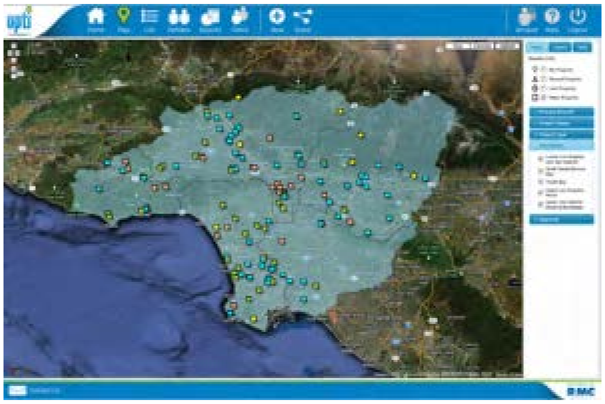


Figure 5-1: Project Database Viewing (Points indicate project locations)

## Procedures for Review of Projects to Implement the IRWM Plan

Project development and review is intended to be an on-going process. Each Subregional SC is responsible for reviewing all projects submitted by proponents within their Subregion. Projects are reviewed at least quarterly to determine if they can be included as part of the GLAC IRWM Plan or considered as conceptual for further development by proponents and potential partner stakeholders. Project proponents are encouraged to attend these meetings to present additional information and answer any questions from SC members and Subregional stakeholders.

The decision to include or not include a project for public viewing in the web database as a conceptual project or for inclusion in the Plan is documented in the SC meeting notes and communicated directly to project proponents. Each SC has the authority to make the designation for their Subregion. The review process is comprised of two stages as shown in the box below.

The list of projects in Section 5.4 of this 2013 Plan Update were submitted by January 31, 2013 and reviewed and categorized at February 2013 SC meetings. Worksheet A, used to make the determination, is included in Appendix B. Worksheet A was developed according to DWR Guidelines for project selection and will be used by the Subregional Steering Committees to evaluate whether projects meet the criteria for Stages I and II, as described in the following box. Therefore, all projects in the listing provided in Section 5.4 needed to meet Stage II criteria by January 31, 2013 to be eligible.

The Stage II criteria are the same as those provided in the *Department of Water Resources' 2012 Integrated Regional Water Management Program Guidelines* available at www.lawaterplan.org and on the DWR website. After January 31, 2013, submitted projects will continue to be reviewed on at least a quarterly basis by each SC.

## Selecting Projects

After much deliberation, the LC decided not to prioritize projects for the IRWMP, for the reasons outlined below. First, while a prioritized list may provide a snapshot of projects at any given time, the LC recognized that as soon as a prioritized

### Project Review Stages

**Stage I: Does the project meet basic minimum criteria that should allow it to be in the project database for general public viewing?**

Is the project a useful conceptual project which addresses IRWM objectives and targets? The information that must be provided is shown with a single asterisk on the project form. If yes, the project will be accepted into the database for public viewing assuming basic information on the project concept is included and certain questions are answered affirmatively. (There will be a special designation for conceptual projects.) Or alternatively,

**Stage II: Does the project meet criteria that should allow it to be included in the IRWM Plan?**

Are key elements of a project complete enough that the SC can determine that the project will meet DWR requirements and GLAC Region IRWM objectives and targets, and that it is implementable either in the short or long term? The information that must be provided is shown with a double asterisk on the project form.

list is compiled, it can quickly become inaccurate due to, for example, an important multi-benefit project being added the day after the list is prioritized, or a project proponent modifying or pulling a formerly-prioritized project off the list the day after the list is prioritized.

Next, the Region intends to pursue achieving the IRWM objectives, but prioritizing them may improperly indicate that certain objectives are more important than others. Also, project proponents may choose to enter individual projects with the understanding that agreements will be worked out in the future to combine similar benefit projects, but there is no realistic way to account for that in a project prioritization process.

Finally, and perhaps most importantly, the Region wants to maintain flexibility to prioritize projects as needed, based on issues the Region is facing at the time, such as severe drought, flooding conditions, or other unforeseen circumstances. Not prioritizing projects also gives the Region more flexibility to select projects for funding from various grant programs that may not be at/near the top of a prioritized list, but may be well supported by a deserving community. For all these reasons, the Region's decision was to maintain a list of projects, but without prioritizing them. The process occurs at the direction of the LC and the most recent project selection is posted on the project database webpage. The general process and criteria to be used to determine the priority level of projects are provided in the box below. These could be superseded by specific grant criteria

### Procedures for Communicating the List of Selected Projects

As noted earlier, the Region conducts periodic "calls for projects". These notices are posted on the IRWM website, on the announcement board of the project database communications system, and via email from each of the SCs. These same communication tools are used to communicate about the status of projects. The database system is particularly user friendly in that it offers web access to registered users for the latest conceptual and IRWM projects. This information is shown on maps by type of project or Subregion, and all users can view project details including photos and detailed reports that have been submitted. Users are also able to "friend" projects and follow them as they grow and change.

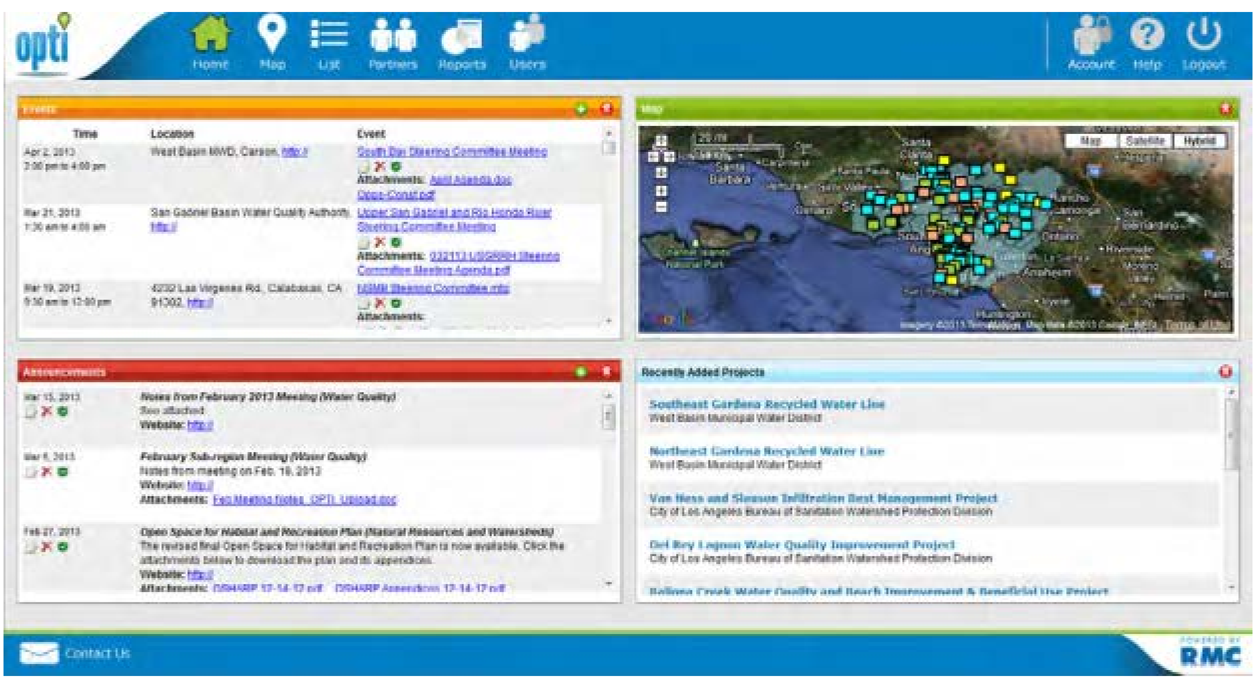



*Figure 5-2: Project database user dashboard*

## 5.3 Project Integration

As DWR notes in the Guidelines, IRWM planning decisions can lead to existing or "off the shelf " projects being combined or replaced by new and/ or different projects. Part of the advantage of regional planning is addressing similar objectives of local interests with a regional project. Resources of personnel, finance, and equipment to implement multiple smaller efforts may benefit from economies of scale when similar local interests can be met with a regional project. IRWM plans must contain provisions for reviewing project objectives and considering new, expanded, or even different solutions that meet multiple local needs. The decisions made in the IRWM Plan should consider the interconnected needs of the Region and not just the needs of specific entities in the RWMG. Opportunities for project integration are regular topics of discussion at GLAC Subregional SCs' monthly meetings and during quarterly project review workshops.

The new MS4 Permit, adopted November 2012 and effective December 2012 by the LARWQCB, encourages enhanced watershed management planning and gives special credit to projects that meet multiple benefits beyond water quality alone. This parallel effort, which is also watershed-based, may create opportunities to merge water quality watershed management approaches with the IRWM planning process resulting in additional economies of scale.

### Integration Process and Tools

As part of the objectives and targets update process, the GLAC Region compiled and developed several geo-referenced data layers to assist in spatially identifying priorities and potential opportunities to achieve water supply, water quality, habitat, recreation and flood management benefits. These data layers were initially used individually to determine the objectives and planning targets for each water management area. However, these datasets can also be overlaid to visually highlight areas with the greatest potential to provide multiple benefits. The resulting Potential Benefits Geodatabase can also align these areas relative to other layers containing agency service areas and jurisdictions – allowing for project proponents and partners to be identified.

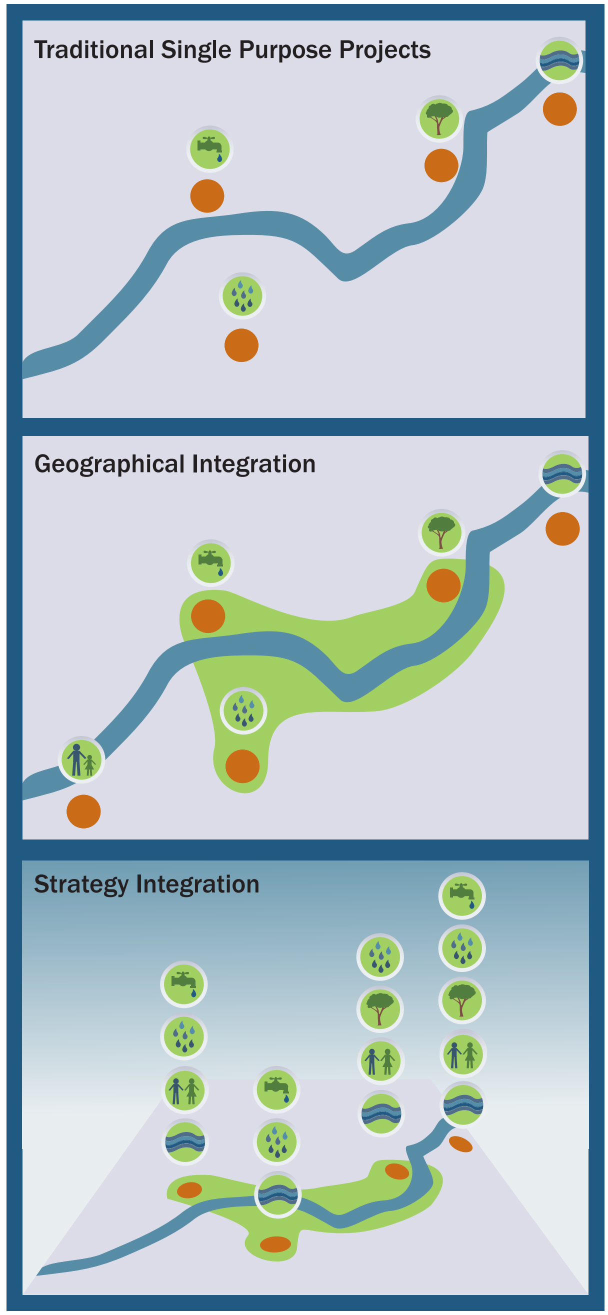



*Figure 5-3. Stakeholders can identify opportunities to integrate projects near each other (geographic integration) and redesign projects to accomplish multiple objectives (strategy integration).*

### Potential Benefits Geodatabase

The GLAC IRWMP Potential Benefits Geodatabase is a dynamic tool that should be updated as new data is made available in order to maintain its relevance in the IRWM planning context. However, in order to provide an analysis of potential integration and partnership opportunities for the 2013 GLAC

IRWM Plan, current data layers were overlaid and analyzed. The key layers used are shown in Map 5-1. It should be noted that these datasets may not be complete or in need of further refinement and therefore will be updated on an as-needed basis – which is part of the dynamic process previously described. Therefore, the Geodatabase should only be used as an initial step in identifying multi-benefit potential and by no means used to invalidate the potential for achieving benefits in other areas.

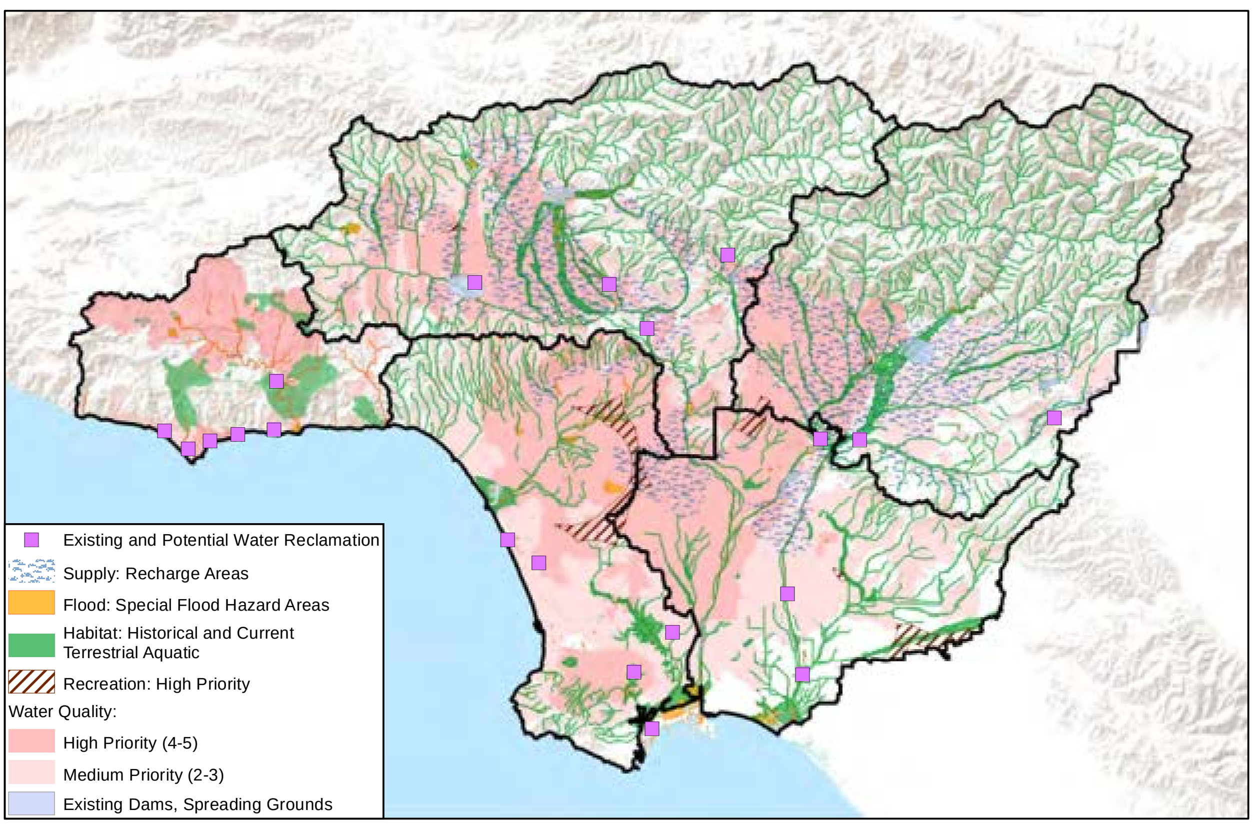
### Using the Geodatabase

The Geodatabase is a dynamic visual tool. The data layers and maps shown in Table 5-1 and Map 5-1 are only some of a multitude of ways to package and view the datasets to help with the integration process. It is important to note that not all data that could be useful in identifying integration and partnership potential for the Region is easily viewed spatially in this format. Therefore the Geodatabase should only be used as one of several potential integration tools or methods.

The Geodatabase can also be used to identify the potential for further integration between existing projects included in an IRWMP. Currently the GLAC Region's web-based project database geo-references all projects included in the IRWM. As part of the 2013 Plan Update, this dataset of projects will eventually be updated and prioritized.

This resulting project dataset could be included as a layer in the Geodatabase or conversely, the existing Geodatabase layers could be uploaded to the database for public viewing and made available to the project database users. In the future, additional layers, such as groundwater quality and general plan areas, can be added to the Geodatabase to enhance the ability of project proponents to identify integration opportunities. Either way, by over-laying the current projects on top of the potential benefit layers, additional benefits could be added to existing projects or linked to other projects and proponents through those benefits.

Planning for the GLAC Region is primarily done on a subregional level, given that each Subregion has a unique set of physical characteristics and stakeholders that create opportunities for project identification and collaboration.  Therefore, the Geodatabase layers are more useful when examined and discussed on a subregional scale.




*Note that detailed data for the NSMB Subregion is currently absent, but will be improved over time.*

*Map 5-1: GLAC Region Potential Benefits Geodatabase Layers*

| Table 5-1: Potential Benefit Geodatabase Layers | |
|---|---|
| **Data Layer** | **Description** |
| Supply: Recharge Areas[1] | Shows areas where soils suitable for recharging are above supply aquifer recharge zones. Thereby indicating that water infiltrating in these areas has the potential to increase groundwater supplies. NOTE: The Central Basin and Main San Gabriel Basins are adjudicated basins, so pumping and recharge are actively managed to maintain both water supplies and water quality. |
| Supply: Existing and Potential Water Reclamation[2] | Shows locations of existing water reclamation plants. |
| Flood: Special Flood Hazard Areas[3] | Shows some of the areas that would benefit from increased drainage to alleviate flooding potential. |
| Habitat: Historical and Current Terrestrial Aquatic[4] | Shows the combined current and historical habitat areas that would indicate the potential for aquatic habitat protection, enhancement, or restoration benefits to be derived. (Note: North Santa Monica Bay Subregion did not have similar data so it shows Significant Ecological Areas instead5.) |
| Recreation: High Priority[6] | Shows areas that have the greatest need for open space recreation given the distance from current open space recreation sites. |
| Water Quality: Medium and High Priority[7] | Shows watershed areas with medium and high priority and therefore relative potential to improve surface water quality. |

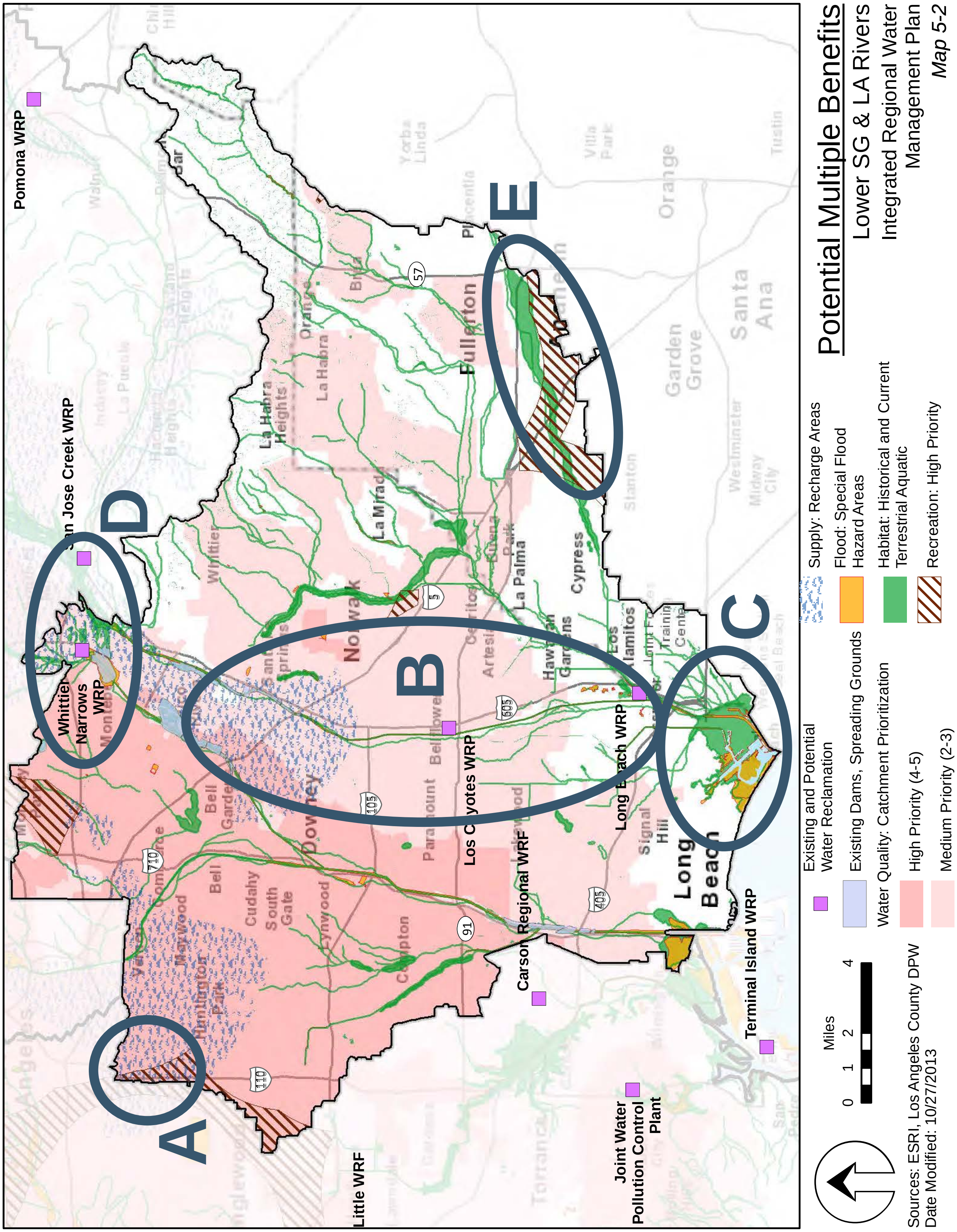
*1 Created using Los Angeles County's groundwater basins shapefile overlaid with soils and known forebays shapefiles.*
*2 Created by RMC Water and Environment for the Los Angeles Department of Water and Power's Recycled Water Master Planning program to show reclaimed water that could be made available for recycled water use.*
*3 Created by Federal Emergency Management Agency to define areas at high risk for flooding (subject to inundation by the 1% annual chance flood event) and where national floodplain management regulations must be enforced.*
*4 From Regional restoration goals for wetland resources in the Greater Los Angeles Drainage Area: A landscape-level comparison of recent historic and current conditions using GIS (C. Rairdan, 1998) and additional current terrestrial aquatic habitat is based on the extent of current habitat derived from the National Wetlands Inventory.*
*5 Significant Ecological Areas are those areas defined by Los Angeles County as having ecologically important land and water systems that support valuable habitat for plants and animals.*
*6 Created for the GLAC IRWM Open Space for Habitat and Recreation Plan (2012), and shows where there is less than one acre of park or recreation area per one thousand residents.*
*7 Created for the GLAC IRWM Surface Water Quality Targets TM (2012), which ranked catchments based on TMDLs, 303(d) listings and catchments that drain into Areas of Special Biological Significance (ASBS).*

The areas described here are meant to provide examples of potential multiple-benefits areas and are not meant to be a comprehensive inventory of opportunities. As Subregions move forward to identify potential projects, it will be necessary to examine localized site characteristics (such as land uses) to confirm that it will be possible to meet the potential benefits discussed below.

## Integration Opportunities in Lower Los Angeles and San Gabriel Subregion

Map 5-2 focuses on the Lower San Gabriel and Los Angeles River Subregion and highlights just a few unique areas within the Subregion that have potential for generating multiple benefit projects. The areas described here are meant to provide examples of potential multiple-benefits areas and are not meant to be a comprehensive inventory of opportunities. As Subregions move forward to identify potential projects, it will be necessary to examine localized site characteristics (such as land uses) to confirm that it will be possible to meet the potential benefits discussed below.

- There is a relatively high need for recreational open space in three different areas.
- There are critical recharge areas for the Central Basin in the upper Subregion (where the hydrogeology is the most favorable for recharge) while the majority of pumping is done in the southern portion of the basin. NOTE: The Central Basin and Main San Gabriel Basins are adjudicated basins, so pumping and recharge are actively managed to maintain both water supplies and water quality.
- The western portion of the Subregion has high priority drainage areas for water quality improvements that also overlap some of the recharge areas.
- There are coastal areas that could provide both flood control and habitat benefits.
- There are several sources of recycled water supply that could be further utilized as local supply, though it should be noted that this could be limited by contractual agreements for existing and future recycled water supplies.



Potential Multiple Benefits
Lower SG & LA Rivers
Integrated Regional Water Management Plan
Map 5-2
Existing and Potential Water Reclamation
Existing Dams, Spreading Grounds
Water Quality: Catchment Prioritization
High Priority (4-5)
Medium Priority (2-3)
Supply: Recharge Areas
Flood: Special Flood Hazard Areas
Habitat: Historical and Current Terrestrial Aquatic
Recreation: High Priority
Miles
0 1 2 4
Sources: ESRI, Los Angeles County DPW
Date Modified: 10/27/2013
A
B
C
D
E
Pomona WRP
San Jose Creek WRP
Whittier Narrows WRP
Los Coyotes WRP
Long Beach WRP
Carson Regional WRF
Terminal Island WRP
Joint Water Pollution Control Plant
Little WRF
Long Beach
Fullerton
Downey
Norwalk
La Habra Heights
La Habra
La Mirada
La Palma
Cypress
Whittier
Compton
Paramount
Bellflower
Cerritos
Artesia
Hawaiian Gardens
Los Alamitos
Signal Hill
Bell
Bell Gardens
Cudahy
South Gate
Huntington Park
Maywood
Lynwood
Orange
Garden Grove
Santa Ana
Stanton
Westminster
Tustin
Villa Park
Yorba Linda

The following sections highlight a few areas in the Subregion where integration and partnership opportunities could be found based upon the Geodatabase layers and multiple benefit analysis performed.

### A. South Central Los Angeles Area Recreation, Recharge, Stormwater Quality Benefits

There are areas with the potential for groundwater recharge in the northwestern area of the subwatershed (South Central Los Angeles) overlying the Central Basin. Additionally, there are park-poor areas which also overlay high priority stormwater management catch basins. These recharge areas predominately lie within high priority areas for water quality improvements. Given that this area is heavily urbanized, it would be well suited for decentralized stormwater capture and use projects as well as infiltration BMPs that could achieve water quality and groundwater water supply benefits. Because it is park-poor, finding locations that can be converted from industrial use to parkland with infiltration for stormwater (where industrial areas border residential areas) shows promise. Care would need to be taken in the heavily industrialized areas that soils are not contaminated before infiltration is encouraged here.

Partnerships between the WRD, Central Basin MWD and the City of Los Angeles, and cities such as Vernon and Huntington Park as well as unincorporated Los Angeles County could result in integrated projects.

### B. Central Basin Recharge and Pumping

The majority of pumping demand is located in the southern, more heavily urbanized, portion of the Subregion; however replenishment is conducted at the northern forebay recharge facilities. Although there are both underutilized recycled water and stormwater supplies available, the ability to infiltrate more supply is limited by the rapidity at which supplies can be pumped to ensure that mounding does not become an issue. Pumping in closer proximity to the recharge could prevent mounding. Partnership projects that would seek to create a recharge and pumping balance could be explored between the southern Central Basin pumpers and WRD.

### C. Lower San Gabriel River Watershed and Seal Beach Habitat Improvements and Flood

The mouth of the San Gabriel River provides opportunities for integrated project development that could result in achieving habitat and flood control benefits. Integrated flood management projects would become even more beneficial as a way to adapt to sea level rise as a result of climate change. Partnership opportunities exist between LACFCD, the City of Long Beach and the City of Seal Beach.

### D. Intra-Regional Montebello Forebay Recharge and Open Space

The San Gabriel River Valley narrows in the Montebello area which also provides the dividing line between the Upper San Gabriel and Rio Hondo Subregion and the Lower Los Angeles and San Gabriel Rivers Subregion. This area is also the main recharge forebay for the Central Basin where several spreading ground facilities are located. Although somewhat urbanized relative to other densities in the Region, this area also provides a great deal of open space given those facilities. Preserving and further enhancing the spreading capacity is critical to meeting supply goals, as well as water quality goals. Increased stormwater infiltration will lessen the amount of contaminants able to be transported further downstream. If there are projects that could also incorporate both habitat and recreation elements without compromising these primary functions, there is the potential for achieving further integrated and beneficial results.

Recycled water supplies in this area could be further maximized for increased recharge and supply benefits. Partnerships with WRD, LACSD, LACFCD, Central Basin MWD, Central Basin pumpers and overlying cities could also benefit from above ground open space.

### E. Anaheim and Fullerton Recreational and Habitat and Open Space

There is a significant band of priority area for recreational open space in this swath of Orange County overlapping a wetlands and habitat area. Water supply or quality projects in this area could be developed to include both recreation ad habitat components to achieve those benefits. Partnership opportunities exist for the Mountains and Rivers Conservancy or similar conservancies in Orange County along with the Cities of Anaheim and Fullerton.

## Integration Opportunities in North Santa Monica Bay

Based upon Map 5-3, the North Santa Monica Bay Subregion is notable relative to other subregions in a few ways:

- There is less need for additional passive recreation and open space; however there is deficit of active recreation in this Subregion.
- There are urbanized upstream areas with stormwater quality and potential flood impacts on downstream developed areas and sensitive nearshore habitat areas.
- There is less concrete channelization of streambeds than in other subregions and greater potential to more easily return channelized streambeds to natural streambeds and habitat areas.

What is not seen in the map, but is true of the North Santa Monica Bay Subregion, is that relative to other subregions, the North Santa Monica Bay is heavily dependent upon imported water supplies given limited groundwater recharge potential. Therefore local supply development anywhere within the Subregion would be considered to provide great benefits.

The following sections highlight a few areas in the North Santa Monica Bay Region where integration and partnership opportunities could be found based upon the Geodatabase layers and multiple benefit analysis performed.

### A. West Lake Village and Agoura Hills Integrated Flood Management and Water Quality

This area is a priority area for water quality issues as well as flood issues. Additionally, capturing stormwater for onsite use has the potential to reduce reliance on imported water supplies. There could also be opportunities to return channelized streams to more natural systems with habitat restoration as an added benefit. Projects could provide multiple benefits when coupled with water quality improvement components and flood management. Removal of non-native species in the upper watershed is also an opportunity for this area. There is the potential for partnerships between LACFCD, Santa Monica Mountains Conservancy, State Parks, and the cities of Westlake Village and Agoura Hills.

### B. City of Calabasas Supply, Water Quality and Flood Management

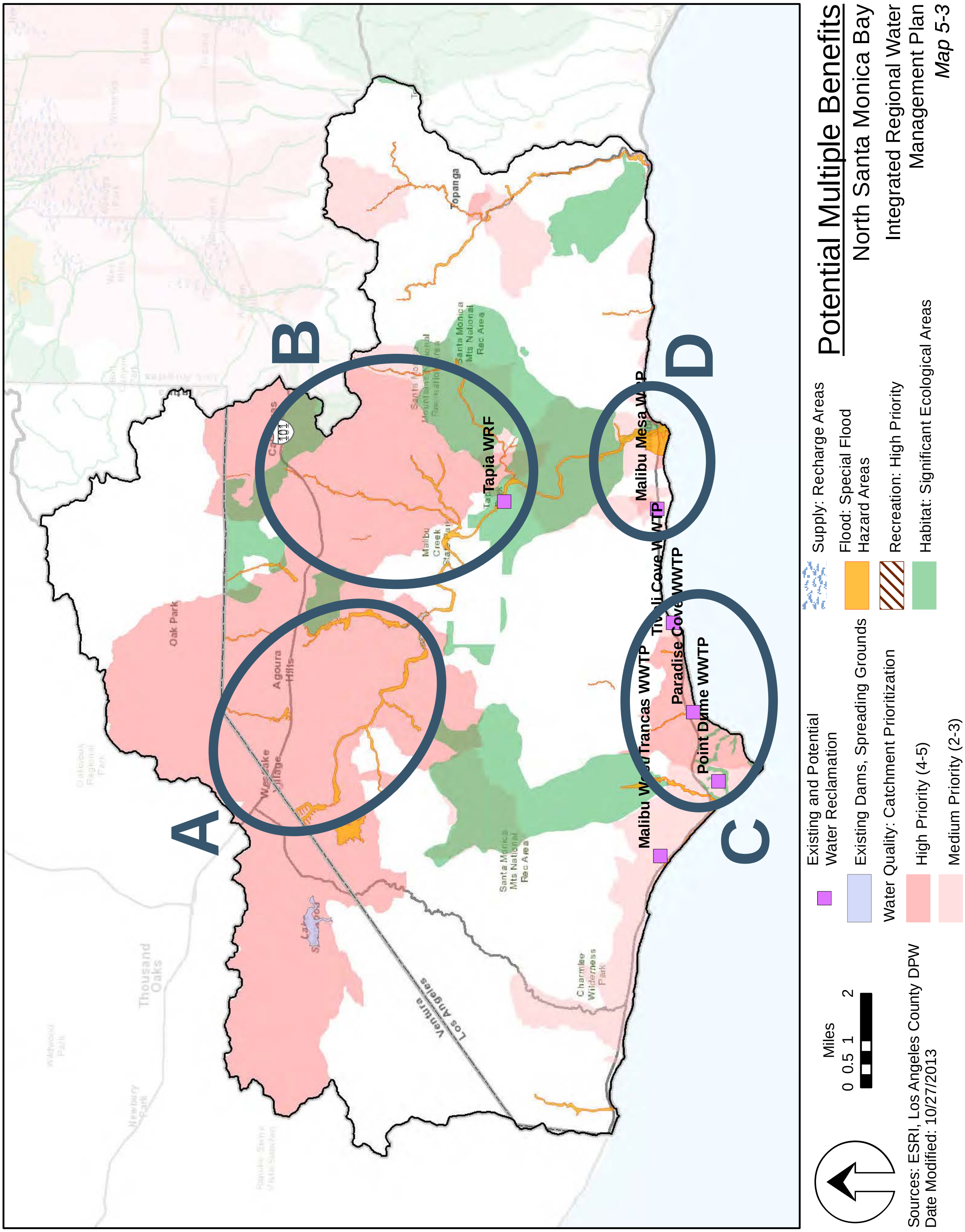
The City of Calabasas is on the border between the Upper Los Angeles River Watershed and the North Santa Monica Bay Subregion, and therefore provides an opportunity for collaboration between these two Subregions. This area is also a priority area for water quality improvements and integrated flood management that could further enhance habitat benefits for the Region by returning channelized streams to more natural systems. The proximity to a reclaimed water source could also incorporate a water supply benefit into projects developed in this area. Partnerships between the City of Calabasas, LACFCD, Las Virgenes MWD and local watershed groups could generate the multiple benefit projects.

### C. Point Dume and South East Coastal Watershed Protection of ASBS

This coastal area is adjacent to an offshore significant habitat area and designated ASBS and MPAs, and has special need for water quality best management practices (BMPs) to protect the ASBS. This area also provides good opportunities for habitat restoration and partnerships between the City of Malibu, LACFCD, LACPW, LACB&H, Caltrans and State Parks. The area up coast of Point Dume Headlands is also a Marine Protected Area and the same partnership opportunities apply.

### D. Malibu Creek Habitat and Water Quality and Supply

This coastal area near and including Malibu Lagoon has great potential for habitat restoration, water quality protection and flood protection. Encouraging above ground collection of rain water in nearby residential and retail communities can also help reduce dependence on imported water while removing some potential for flooding and stormwater quality impacts. Partnerships between the City of Malibu, the Santa Monica Bay Restoration Commission, State Parks, Caltrans, LACB&H and LACFCD could result in integrated projects for the Subregion. The proposed centralized wastewater treatment facility in the Malibu Civic Center area will provide recycling opportunities to reduce dependence on imported water supplies.


Potential Multiple Benefits
North Santa Monica Bay
Integrated Regional Water Management Plan
Map 5-3
Existing and Potential Water Reclamation
Existing Dams, Spreading Grounds
Water Quality: Catchment Prioritization
High Priority (4-5)
Medium Priority (2-3)
Supply: Recharge Areas
Flood: Special Flood Hazard Areas
Recreation: High Priority
Habitat: Significant Ecological Areas
Miles
0 0.5 1 2
Sources: ESRI, Los Angeles County DPW
Date Modified: 10/27/2013
A
B
C
D
Tapia WRF
Malibu Mesa WRP
Tivoli Cove WWTP
Paradise Cove WWTP
Point Dume WWTP
Trancas WWTP
Malibu West
Agoura Hills
Westlake Village
Oak Park
Thousand Oaks
Topanga
Santa Monica Mts National Rec Area
Malibu Creek State Park
Charmlee Wilderness Park
Ventura
Los Angeles
101

## Integration Opportunities in the South Bay

The South Bay Subregion's integration potential is notable relative to other subregions in a few ways:

- There are minimal areas suitable for groundwater recharge for water supply.
- It has the largest area in need for open space and recreation.
- It has great potential for coastal habitat preservation, enhancement and restoration.
- There are significant areas with a high priority water quality improvement potential.

What is not obvious from Map 5-4 is that relative to other subregions, the South Bay is heavily dependent upon imported water supplies given limited groundwater recharge potential. Therefore local supply development anywhere within the Subregion would be considered to provide great benefits.

The following paragraphs describe the circled areas in Map 5-4 where integration and partnership opportunities could be found based upon the Geodatabase layers and multiple benefit analysis performed. There are multiple areas beyond those few highlighted here for further exploration by the South Bay Subregion stakeholders and project proponents.

### A. Hollywood Basin Water Supply and Water Quality

Although limited, there are areas with the potential for groundwater recharge in the northern area of the Subregion (Beverly Hills and Hollywood areas) that could recharge the Hollywood Groundwater Basin. These recharge areas also predominately lie within high priority areas for water quality improvements. Given that this area is heavily urbanized, it would be well suited for decentralized stormwater capture and use projects as well as infiltration BMPs that could achieve water quality and groundwater supply benefits. Potential partnerships between LACDPW, and the cities of Beverly Hills, West Hollywood and Los Angeles as well as several nongovernmental organizations could result in multi-benefit projects.

### B. Mid City Los Angeles Water Quality, Flood Management Habitat and Recreation

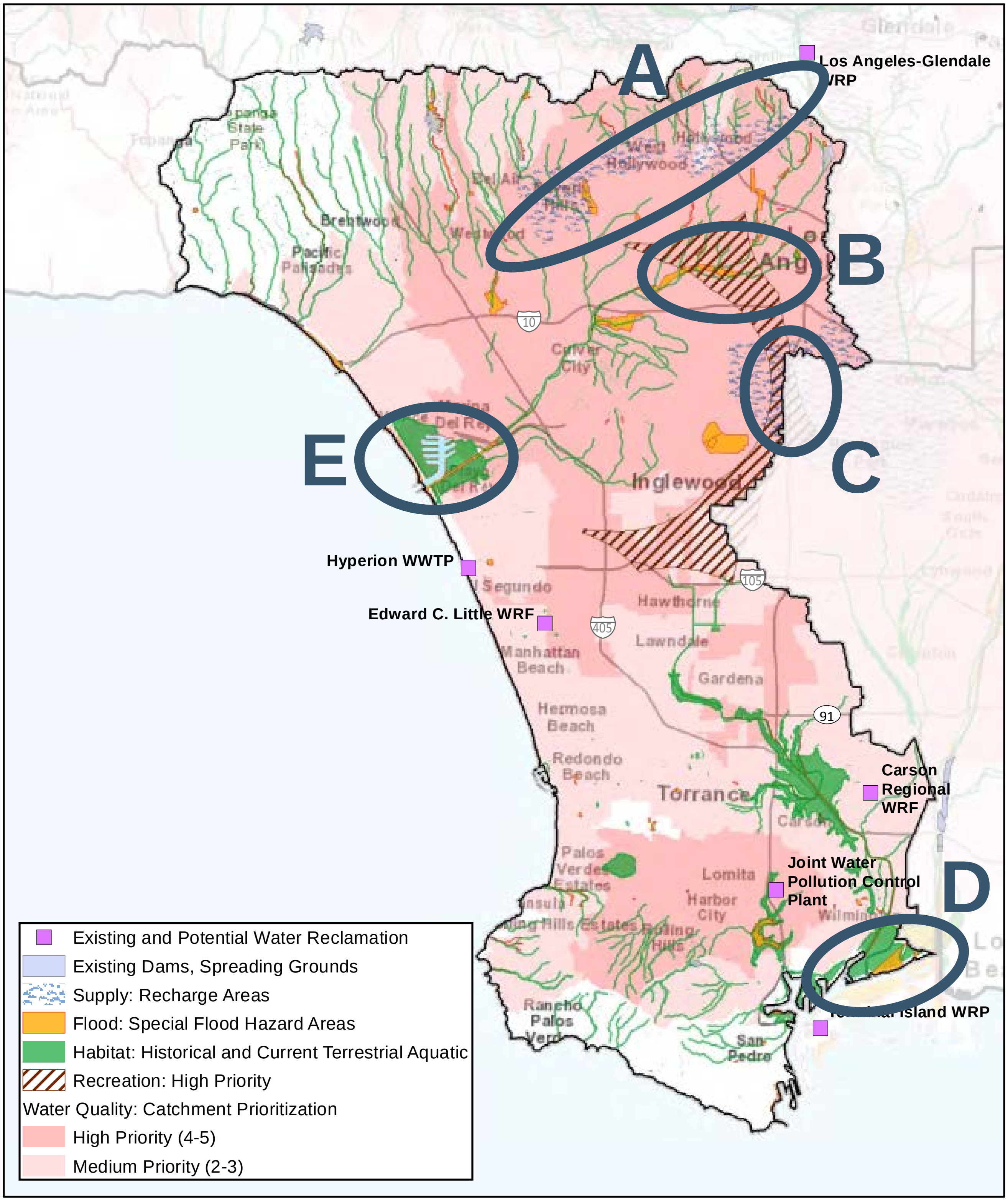
Historically, this area was the upstream area of Ballona Creek but has since then become heavily urbanized. These unique characteristics provide an area with opportunities for both flood management and water quality improvements. The area's current urban density may limit the ability to provide habitat benefits, however recreation opportunities could still be feasible in the area on a neighborhood scale. Projects could provide multiple benefits when coupled with water quality improvement components and flood management.

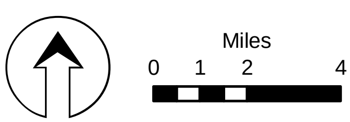
### C. South Central Intra-Subregional Groundwater Recharge, Recreation and Water Quality

The northern-most boundary between the South Bay and Lower Los Angeles and San Gabriel River Subregions is South Central Los Angeles. This area has a high recharge potential and water quality improvement priority as well as a great need for open space recreation for the heavily urbanized neighborhoods. Therefore, this area has great potential for generating integrated projects that could provide benefits to both Subregions. Projects could include stormwater landscaping BMPs on a site (yard) and neighborhood (park) scale to capture and infiltrate stormwater flows in open areas. Close proximity to regional water reclamation plants can also provide additional supplies to further enhance current use of recycled water for groundwater recharge. Project partners could be West Basin MWD, WRD and the City of Los Angeles.

### D. Dominguez Channel Flood Management, Water Supply and Coast Habitat

Another area for potential intra-subregional project with Lower Los Angeles and San Gabriel Subregion is at the mouth of the Dominguez Channel. The area also houses the City of Los Angeles Terminal Island Water Reclamation Plant that could supply recycled water supplies for potable offset for agencies in both Subregions though their joint involvement in the Central Basin. Although heavily industrial, there is potential for habitat benefits if such a project were conceived that could also improve the flood management needed in the area. Partnerships between the cities of Los Angeles, Carson, Long Beach, WRD and West Basin MWD could result in integrated projects.




Sources: ESRI, Los Angeles County DPW
Date Modified: 10/27/2013

Potential Multiple-Benefits
South Bay
Integrated Regional Water Management Plan
*Map 5-4*

**E. Marina del Rey Water Quality and Coastal Habitat**

The Ballona Creek empties into the Santa Monica Bay at Marina del Rey. This coastal area is home to the Ballona Wetlands that are in the process of being restored through past and future new projects that will further increase its habitat and water quality value and benefits. The presence of Ballona Channel (a stream and flood control channel) also provides opportunities for the management of flood waters and coastal inundation as a result of climate change. There are also opportunities for added freshwater wetland treatment upstream of the salt marsh areas that could incorporate passive activity trails.

Potential project partners are the State Fish and Game, the Coastal Conservancy, and the Santa Monica Bay Restoration Commission, along with the LACFCD, non-profit groups (such as the Friends of Ballona Wetlands and Ballona Creek Renaissance) and cities of Los Angeles and Culver City.

The Oxford Flood Control Basin manages stormwater flows into Marina del Rey. While it is principally a flood control basin, it has potential for stormwater quality management and habitat restoration as well with potential partners including LACFCD and County Beaches and Harbors.

Venice Canals and Ballona Lagoon areas also provide opportunities for low impact development to minimize flooding and enhance water quality and open space habitat for the City of Los Angeles and local neighbors and environmental groups.

## Integration Opportunities in Upper Los Angeles River

Map 5-5 focuses on the Upper Los Angeles River Subregion and highlights just a few unique areas within the Subregion that have potential for generating multiple-benefit projects. The Subregion's integration potential is notable relative to other subregions in a few ways:

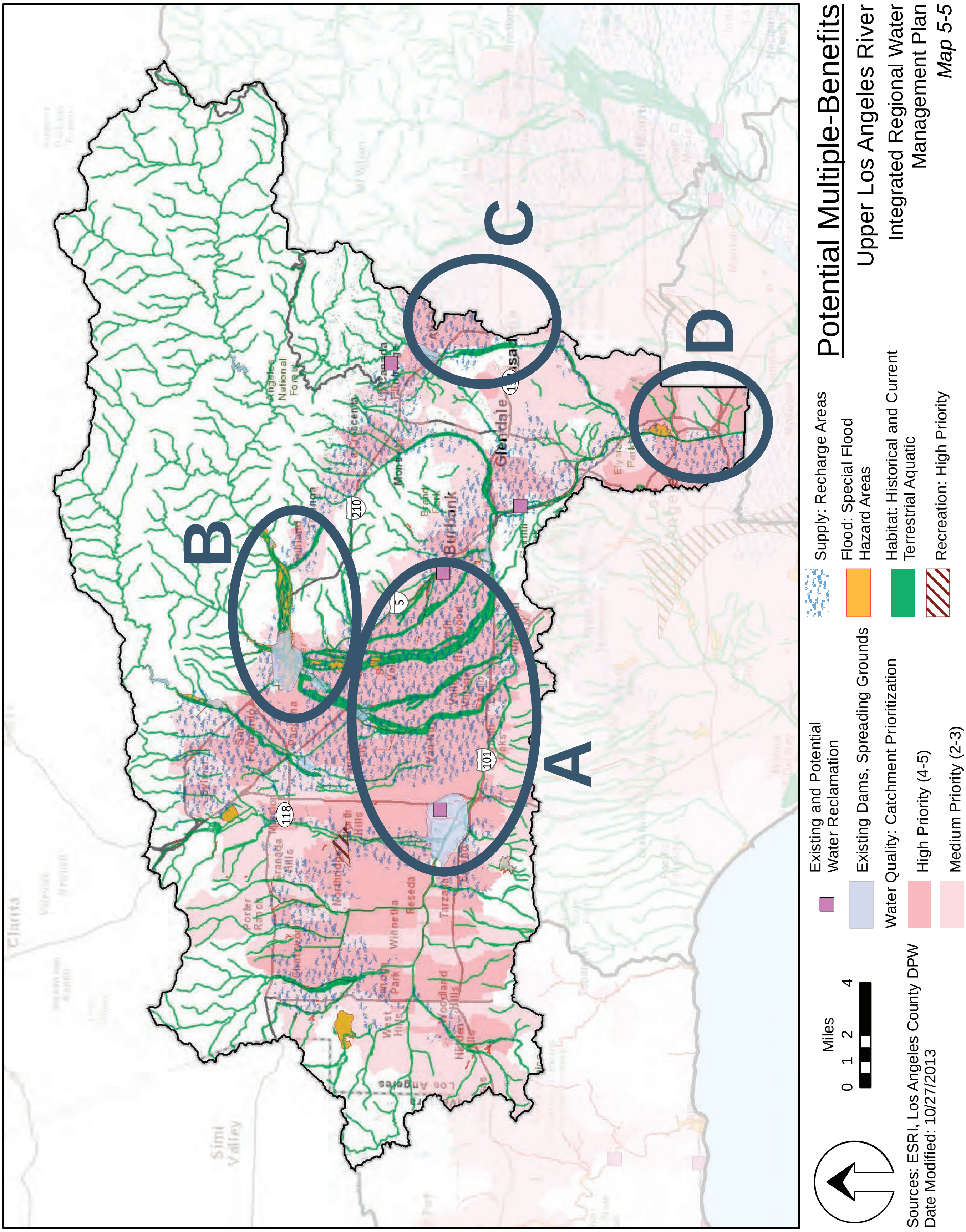
- There are large areas suitable for groundwater recharge and significant sources of local stormwater and recycled water supplies.
- There is a large northern upland open space watershed that drains into areas with a high potential to derive aquatic habitat benefits.
- There is a heavily urbanized valley area but with strong examples of successful integrated flood management facilities and great opportunities for furthering multiple-benefit projects.
- The Los Angeles River Watershed provides unique opportunities for integrated flood management projects that would improve habitat and water quality while maintaining flood control.

The following sections highlight a few areas in the Upper Los Angeles Subregion where integration and partnership opportunities could be found based upon the Geodatabase layers and multiple benefit analysis performed. There are multiple areas beyond those few highlighted here that can be explored by the Upper Los Angeles River stakeholders and project proponents.

**A. San Fernando Valley Local Supply and Water Quality**

The Upper Los Angeles River Subregion is dominated by the San Fernando Valley and underlying groundwater basin. This combination of available stormwater and recharge potential provide the area with great potential for stormwater conservation through recharge. Stormwater flows through the heavily urbanized valley areas provide both the sources and transport for contaminants that impact water quality as shown by the high priority drainage areas in Map 5-5. Therefore, capture and recharge of stormwater supplies in this area can also provide significant water quality benefits. The majority of all wastewater flows generated in this Subregion pass through the city of Los Angeles' Tillman Water Reclamation Plant. These recycled flows can be made available with stormwater flows to also recharge the basin.

Map 5-5 shows the intersection or recharge areas with high priority water quality drainage areas predominately within the City of Los Angeles, Burbank, Glendale and Pasadena. Partnerships with these cities, LACFCD and other nongovernmental organizations could further expand upon projects completed to maximize the efficacy of existing spreading grounds as well as low impact development and neighborhood stormwater capture and infiltration projects.


Potential Multiple-Benefits
Upper Los Angeles River
Integrated Regional Water Management Plan
Map 5-5
A
B
C
D
Existing and Potential Water Reclamation
Existing Dams, Spreading Grounds
Water Quality: Catchment Prioritization
High Priority (4-5)
Medium Priority (2-3)
Supply: Recharge Areas
Flood: Special Flood Hazard Areas
Habitat: Historical and Current Terrestrial Aquatic
Recreation: High Priority
Miles
0 1 2 4
Sources: ESRI, Los Angeles County DPW
Date Modified: 10/27/2013
Glendale
Burbank
Simi Valley

**B. Tujunga Area Supply, Quality, Flood and Habitat Benefit**

Although nearly the entire San Fernando Valley has recharge and water quality improvement potential, there are some areas that also provide the potential for habitat benefits given historical and current habitat map layers developed in the OSHARTM as well as increased flood management. As Map 5-5 shows, the Tujunga Creek/Hansen Dam area has multiple existing spreading grounds that serve to recharge the San Fernando Basin. As existing open spaces, these areas already provide multiple benefits but still could continue to increase their value through multiple benefit projects that enhance, protect or restore habitat that are also water quality BMPs. Partners in this region are the City and LACFCD as well as neighborhood organizations and other NGOs.

**C. Intra-Regional Raymond Basin Water Supply and Quality**

The Raymond Basin and the City of Pasadena are divided between the Upper Los Angeles River and Upper San Gabriel and Rio Hondo Subregions. This provides intra-regional opportunities between the Upper LA and Upper SG & RH Subregions for replenishment of the Raymond Basin to benefit both regions through both stormwater capture and accessing recycled water supplies from the Los Angeles-Glendale Water Reclamation Plant. This area also has been identified as a high priority drainage for achieving water quality benefits and therefore multiple-benefits project opportunities. Partnerships between the City of Pasadena, other Raymond Basin pumpers, LACSD and LACFCD could result in very beneficial integrated projects.

**D. Intra-Regional Central Basin Recharge and Los Angeles River**

The Los Angeles River Watershed is divided between the Upper and Lower Subregions however there is an obvious connection between the regions from a water supply and quality perspective. The southernmost area of the Subregion is downtown Los Angeles. As Map 5-5 shows, the area is suitable for groundwater recharge but it also has a high level of impervious surface meaning low infiltration potential. Given that this area is upstream of the Lower Los Angeles River Subregion, water quality improvements made here would benefit both Subregions. The ability to do large scale BMPs may be limited, however smaller scale decentralized LID projects in this area may be able to provide both water quality and supply benefits. Opportunities for integrated flood management projects along the Los Angeles River would seek to preserve current flood but also improve water quality and open space either for recreation and/or habitat. Partnerships could involve both the cities of Los Angeles and those in the Upper LA & SG Subregion along with the WRD and NGOs.

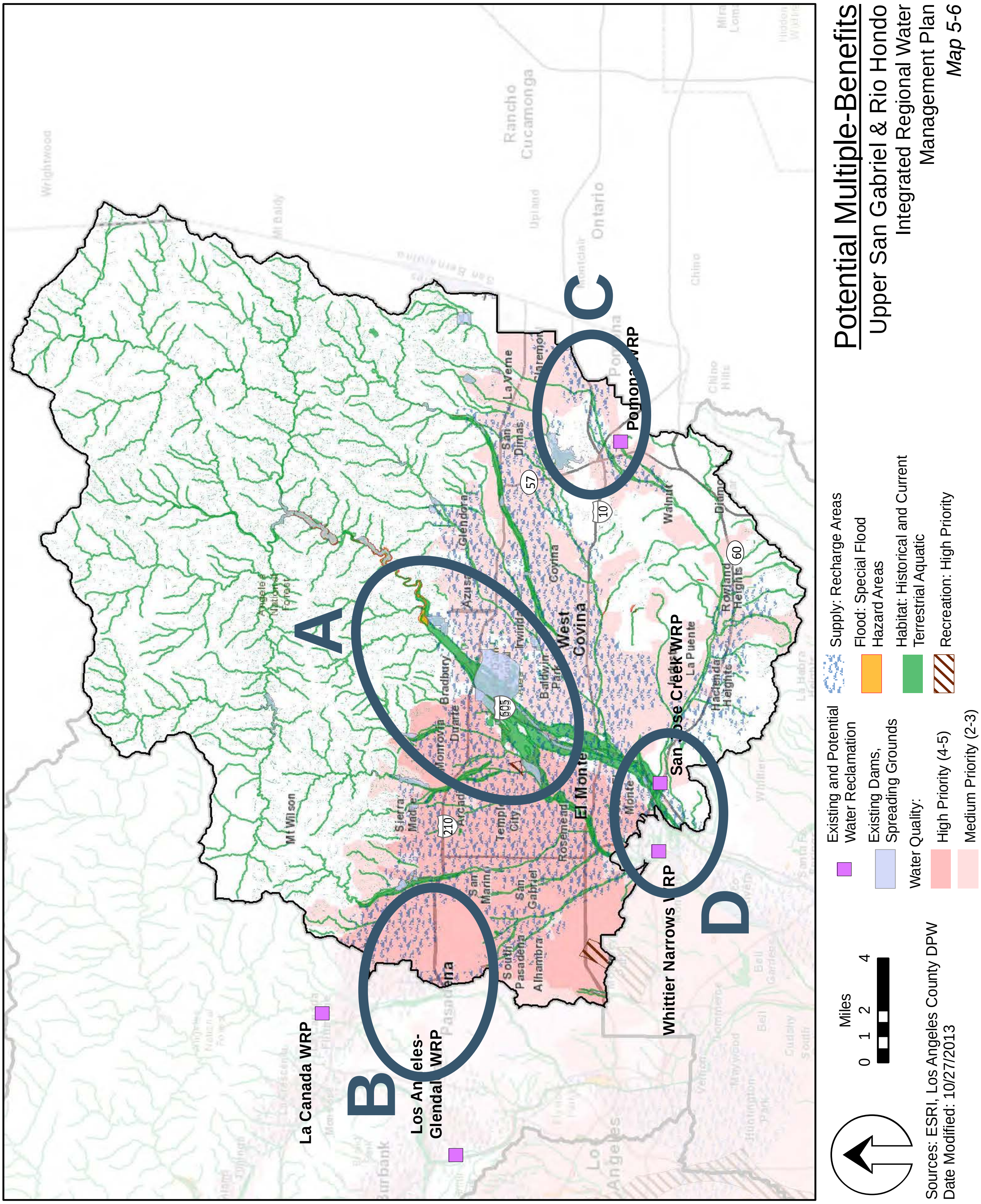
## Upper San Gabriel and Rio Hondo Integration and Partnership Opportunities

Map 5-6 focuses on the Upper San Gabriel and Rio Hondo Subregion and highlights just a few unique areas within the Subregion that have potential for generating multiple-benefit projects. The Subregion's integration potential is notable relative to other subregions in a few ways.

- There are significant areas that are suitable for groundwater recharge.
- About half of the watershed is upland open space and half is urbanized.
- Improving groundwater quality and basin replenishment are important supply sources.
- There is access to unused stormwater supply and recycled water supply (though this may be dependent on the time of year or agreements for future supplies).

**A. Main San Gabriel Basin Water Quality and Basin Recharge**

The headwaters of the San Gabriel River flow from the upland rural watershed into the lower more urbanized watershed that also serves as the main source of the Main San Gabriel Groundwater Basin. As Map 5-6 shows, projects in the area have a great potential to provide water quality, supply, habitat and integrated flood management benefits through integrated project development. Proximity to existing recharge and recycled water facilities also provide a foundation for further use of local supplies. Given the urbanized nature of this area, decentralized stormwater capture programs and BMPs could also be implemented. In addition, projects in this area could also include a habitat component to provide valuable habitat benefits.


Potential Multiple-Benefits
Upper San Gabriel & Rio Hondo
Integrated Regional Water
Management Plan
Map 5-6
A
B
C
D
La Canada WRP
Los Angeles-Glendale WRP
Whittier Narrows WRP
San Jose Creek WRP
Pomona WRP
Mt Wilson
Angeles National Forest
Sierra Madre
Monrovia
Bradbury
Duarte
Azusa
Glendora
La Verne
San Dimas
Claremont
Covina
West Covina
Baldwin Park
Irwindale
Temple City
San Marino
San Gabriel
South Pasadena
Alhambra
Rosemead
El Monte
Walnut
Diamond Bar
Rowland Heights
Hacienda Heights
La Puente
Pasadena
Rancho Cucamonga
Ontario
Upland
Chino
Chino Hills
Wrightwood
Existing and Potential Water Reclamation
Existing Dams, Spreading Grounds
Water Quality:
High Priority (4-5)
Medium Priority (2-3)
Supply: Recharge Areas
Flood: Special Flood Hazard Areas
Habitat: Historical and Current Terrestrial Aquatic
Recreation: High Priority
Miles
0 1 2 4
Sources: ESRI, Los Angeles County DPW
Date Modified: 10/27/2013

**B. Inter-Regional Raymond Basin Water Supply and Quality**

The Raymond Basin and the City of Pasadena are divided between the Upper LA and Upper SG & RH Subregions. This provides intra-regional opportunities between the Upper LA and Upper SG & RH Subregions for replenishment of the Raymond Basin to benefit both regions through both stormwater capture and accessing recycled water supplies from the Los Angeles-Glendale Water Reclamation Plant. This area, which includes the Rio Hondo watershed, also has been identified as a high priority drainage area for achieving water quality benefits and therefore multiple-benefits project opportunities. Partnerships between the City of Pasadena, other Raymond Basin pumpers, the City of Los Angeles, the City of Glendale and the LACFCD could result in very beneficial integrated projects.

**C. Six Basins/Puente Basin Area Supply and Quality Improvement**

The Six Basins and Puente Basin groundwater basin area can provide opportunities to offer regional water supply partnerships that could serve to maximize groundwater use through treatment and supply interties between neighboring agencies. Districts such as Walnut Valley Water District and Rowland Water District could work with neighboring agencies (such as the cities of La Verne, Pomona and Golden State Water Company) to increase water quality to levels that could be useful in offsetting their dependence on imported supplies.

**D. Intra-Regional Montebello Forebay Recharge and Open Space**

The San Gabriel River Valley narrows in the Montebello area which also provides the dividing line between the Upper SG & RH Subregion and the Lower SG & LA Subregion. This area is also the main recharge Forebay for the Central Basin where several spreading ground facilities are located. Although somewhat urbanized relative to other densities in the Region, this area also provides a great deal of open space given those facilities. Preserving and further enhancing the spreading capacity is critical to meeting supply goals, as well as water quality goals. Increased stormwater infiltration will lessen the amount of contaminants transported further downstream. If there are projects that could also incorporate both habitat and recreation elements without compromising these primary functions, there is the potential for achieving further integrated and beneficial results.

Recycled water supplies in this area could be further maximized for increased recharge and supply benefits. Partnerships with WRD, LACSD, LACFCD, Central Basin MWD, Central Basin pumpers and overlying cities could also benefit from above ground open space.

## 5.4 Region's Projects
### (as of April 2013)

To improve water supplies, enhance water supply reliability, improve surface water quality, expand recreational access, conserve habitat, and improve integrated flood management in the Region, agencies, jurisdictions, and organizations have proposed a range of water resource management projects for the 2013 Plan Update. The projects listed here are the most recent approved list as of April 2013 when the last cycle of project review and selection occurred prior to the publication of this document. Included in this list are DAC projects that were either entered into the project database by stakeholders, or were developed through the efforts of the DAC Subcommittee as described in Chapter 1. As previously stated, the most current listing of IRWM projects and the most recent selection of projects can be found by logging on to the project database through the Region's IRWM Plan website at www.lawaterplan.org.

### Summary of Projects

Table 5-2 provides a summary of the number of projects according to subregion and primary water management benefit. These projects have been vetted by the SC and LC as described previously. Collectively, these projects have the potential to generate substantial amounts of new water, significantly improve surface water quality, restore important habitat areas, and enhance flood protection. The complete list of projects is provided in Table 5-3.

**Table 5-2. Stakeholder Projects by Subregion and Primary Benefit Category**

| Subregion | Total Projects Submitted [1] | Number of Projects by Benefit Category [1], [2] | | | |
|---|---|---|---|---|---|
| | | Water Supply | Water Quality | Habitat & Open Space | Flood |
| Lower San Gabriel and Los Angeles River | 8 | 6 | 1 | 1 | 0 |
| North Santa Monica Bay | 18 | 6 | 6 | 5 | 1 |
| South Bay Watershed | 42 | 21 | 15 | 4 | 2 |
| Upper Los Angeles River | 49 | 23 | 8 | 14 | 4 |
| Upper San Gabriel River and Rio Hondo | 18 | 13 | 0 | 0 | 5 |

1. *Based on projects submitted by April 2013.*
2. *Primary benefits were identified by project proponent.*

| Table 5-3: GLAC IRWMP Approved Projects (as of April 2013) | | | |
|---|---|---|---|
| **Subregion** | **Project Title** | **Primary Benefit** | **Implementing Organization** |
| Lower SG & LA | Broadway Neighborhood Stormwater Greenway Project | Water Supply | City of Los Angeles Bureau of Sanitation |
| Lower SG & LA | Dominguez Gap Spreading Grounds West Basin Percolation Enhancement | Water Supply | Los Angeles County Flood Control District |
| Lower SG & LA | Graywater Standard Implementation | Water Supply | City of Long Beach |
| Lower SG & LA | Groundwater Reliability Improvement Project (GRIP) | Water Supply | Water Replenishment District of Southern California |
| Lower SG & LA | Jordan Downs Daylighting Study | Habitat/Open Space | Multi-jurisdictional Agencies-LA City Housing and Public Works |
| Lower SG & LA | San Jose Creek Water Reclamation Plant East Process Optimization Project | Water Quality | County Sanitation Districts of Los Angeles County |
| Lower SG & LA | South Los Angeles County Groundwater Pipeline Project | Water Supply | Water Replenishment District of Southern California |
| Lower SG & LA | WRD Eco Gardener Program | Water Supply | Water Replenishment District of Southern California |
| North SM Bay | Agoura Road Gap Recycled Water System Expansion | Water Supply | Las Virgenes Municipal Water District |
| North SM Bay | Citywide Storm Drain Catch Basin Curb Screens | Water Quality | City of Calabasas |
| North SM Bay | Cold Creek Diamond Acquisition | Habitat/Open Space | Mountains Restoration Trust |
| North SM Bay | Decker Canyon Recycled Water System Expansion | Water Supply | Las Virgenes Municipal Water District |
| North SM Bay | Las Virgenes Creek Bank Stabilization, Stream Restoration, Fish Migration Enhancement and Trail Connection | Flood | City of Calabasas |
| North SM Bay | LVMWD Woodland Hills Golf Course Recycled Water Pipeline Extension | Water Supply | Las Virgenes Municipal Water District |
| North SM Bay | Malibu Civic Center Area Recycled Water Delivery Project | Water Supply | City of Malibu |
| North SM Bay | Malibu Civic Center Linear Park Phase 3 | Habitat/Open Space | City of Malibu |
| North SM Bay | Malibu Equestrian Center Runoff BMPs | Water Quality | City of Malibu |
| North SM Bay | NSMB Water Conservation/Efficiency | Water Quality | City of Malibu |
| North SM Bay | Malibu Road/Malibu Colony Stormwater Management | Water Quality | City of Malibu |
| North SM Bay | Westward Beach Road Bioinfiltration | Water Quality | City of Malibu |
| North SM Bay | Medea Creek Restoration at Chumash Park | Habitat/Open Space | City of Agoura Hills |
| North SM Bay | Oak Park Medea Creek Restoration | Habitat/Open Space | Mountains Restoration Trust |
| North SM Bay | Raw Wastewater Diversion to the City of Los Angeles | Water Quality | Las Virgenes Municipal Water District |
| North SM Bay | Recycled Water Storage and Distribution System Expansion | Water Supply | Las Virgenes Municipal Water District |
| North SM Bay | Thousand Oaks Boulevard Recycled Water System Extension | Water Supply | Las Virgenes Municipal Water District |
| North SM Bay | Topanga Connection Acquisition | Habitat/Open Space | Mountains Restoration Trust |
| North SM Bay | Westward Beach Road Bioinfiltration Project | Water Quality | City of Malibu |
| South Bay | 25mgd Seawater Desalination Plant in West Basin | Water Supply | West Basin Municipal Water District |
| South Bay | Agua Amarga Lunada Canyon Habitat Restoration | Habitat/Open Space | Palos Verdes Peninsula Land Conservancy & City of Rancho Palos Verdes |

| Table 5-3: GLAC IRWMP Approved Projects (as of April 2013) | | | |
|---|---|---|---|
| **Subregion** | **Project Title** | **Primary Benefit** | **Implementing Organization** |
| South Bay | Alondra Regional Park | Water Quality | Successor Agency, City of Compton |
| South Bay | Andrews Park Subsurface Storage, Use and Infiltration Project | Water Quality | City of Redondo Beach |
| South Bay | Ballona Creek Water Quality and Beach Improvement & Beneficial Use Project | Water Quality | City of Los Angeles Bureau of Sanitation Watershed Protection Division |
| South Bay | C Marvin Brewer Desalter Brackish Groundwater Facility Expansion | Water Supply | West Basin Municipal Water District |
| South Bay | Carson Regional Water Recycling Project | Water Supply | West Basin Municipal Water District |
| South Bay | City of Carson Rain Barrel Give Away Phase II | Water Quality | City of Carson, Development Services Department, Engineering Services Division |
| South Bay | Conservation Budget Based Tiered Rate Structure | Water Supply | West Basin Municipal Water District |
| South Bay | Conversion of 237th Street Sump Tributary to Machado Lakes for Nutrient and Toxics TMDL BMPs | Water Quality | City of Torrance |
| South Bay | Conversion of Walnut Ave Sumps Tributary to Machado Lake for BMPs | Water Quality | City of Torrance |
| South Bay | Del Rey Lagoon Water Quality Improvement Project | Habitat/Open Space | City of Los Angeles Bureau of Sanitation Watershed Protection Division |
| South Bay | Demonstration Gardens at Los Angeles County Fire Department Stations | Water Supply | West Basin Municipal Water District |
| South Bay | Dominguez Channel Trash Reduction Via ARS Installation in the City of Carson, CA | Water Quality | City of Carson, Development Services Department, Engineering Services Division |
| South Bay | Freeway Runoff Infiltration Demonstration Project | Water Supply | City of Santa Monica |
| South Bay | Goldsworthy Desalter Expansion | Water Supply | City of Torrance |
| South Bay | Herondo Parking Lot and Beach Infiltration | Water Quality | City of Redondo Beach |
| South Bay | Improvements to Entradero Storm Drain Channel for Storm Water Infiltration and Habitat Restoration | Water Quality | City of Torrance, SMBBB TMDL Jurisdictional Groups 5 & 6 |
| South Bay | Landscape Irrigation Efficiency Program (LIEP) | Water Supply | West Basin Municipal Water District |
| South Bay | Manhattan Strand 28th Street Subsurface Infiltration Trench | Water Quality | City of Manhattan Beach |
| South Bay | Milton Street Park and Green Street project - Ballona Creek | Habitat/Open Space | Mountains Recreation and Conservation Authority |
| South Bay | Northeast Gardena Recycled Water Line | Water Supply | West Basin Municipal Water District |
| South Bay | Ocean Friendly Garden (OFG) Program | Water Supply | West Basin Municipal Water District |
| South Bay | Oxford Retention Basin Multi-Use Enhancement Project | Flood | Los Angeles County Flood Control District |
| South Bay | Ozone Park Runoff Treatment and ReUse Project | Water Supply | City of Santa Monica |
| South Bay | Palos Verdes Peninsula Satellite Facilities Study | Water Supply | West Basin Municipal Water District |
| South Bay | Palos Verdes Recycled Water Lateral | Water Supply | West Basin Municipal Water District |
| South Bay | Residential Indoor Plumbing Retrofit Kits | Water Supply | West Basin Municipal Water District |
| South Bay | Residential SMART Timer Retrofit | Water Supply | West Basin Municipal Water District |

| Table 5-3: GLAC IRWMP Approved Projects (as of April 2013) | | | |
|---|---|---|---|
| **Subregion** | **Project Title** | **Primary Benefit** | **Implementing Organization** |
| South Bay | San Ramon Canyon Stormwater Flood Reduction Project | Flood | City of Rancho Palos Verdes |
| South Bay | South Coast Botanic Gardens | Water Quality | Los Angeles County Department of Public Works |
| South Bay | South Park Subsurface Infiltration Gallery | Water Quality | City of Hermosa Beach |
| South Bay | Southeast Gardena Recycled Water Line | Water Supply | West Basin Municipal Water District |
| South Bay | Transfer Station Rehabilitation | Water Quality | City of Inglewood |
| South Bay | Turf's Up Water Use Efficiency Program | Water Supply | West Basin Municipal Water District |
| South Bay | Van Ness and Slauson Infiltration Best Management Project | Water Quality | City of Los Angeles Bureau of Sanitation Watershed Protection Division |
| South Bay | Vermont Avenue Storm Water Capture and Green Street Beautification Project | Water Quality | City of Los Angeles, Bureau of Sanitation/ Watershed Protection Division |
| South Bay | Vermont Median Stormwater Park | Habitat/Open Space | Council for Watershed Health |
| South Bay | Victoria Street CSUDH Water Reuse Concept Proposal | Water Supply | City of Carson |
| South Bay | Water Star Schools Pilot Program | Water Supply | West Basin Municipal Water District |
| South Bay | Well 7 | Water Supply | City of Inglewood |
| South Bay | Westwood Neighborhood Greenway Project | Water Quality | City of Los Angeles Bureau of Sanitation Watershed Protection Division |
| Upper LA | Arroyo Seco Confluence Gateway | Habitat/Open Space | Arroyo Seco Foundation |
| Upper LA | Arroyo Seco North Branch Creek Daylighting | Habitat/Open Space | Arroyo Seco Foundation |
| Upper LA | Big Tujunga Dam Spillway Dam | Water Supply | Los Angeles County Flood Control District |
| Upper LA | Big Tujunga Reservoir Sediment Removal | Flood | Los Angeles County Flood Control District |
| Upper LA | Boulevard Pit Stormwater Capture Project | Water Supply | LADWP |
| Upper LA | Branford Spreading Basin Cleanout and Pump | Water Supply | Los Angeles County Flood Control District |
| Upper LA | Bull Creek Water Conservation | Water Supply | Los Angeles County Flood Control District |
| Upper LA | Bull Creek Los Angeles Reservoir Water Quality Improvement Project | Water Quality | LADWP |
| Upper LA | Caballero Creek & Los Angeles River Confluence Park | Water Quality | Mountains Recreation and Conservation Authority |
| Upper LA | Chase Street Stormwater Greenway | Water Quality | City of Los Angeles Bureau of Sanitation, Watershed Protection Division |
| Upper LA | Devil's Gate Dam and Reservoir Water Conservation | Water Supply | Los Angeles County Flood Control District |
| Upper LA | Devil's Gate Reservoir Sediment Removal and Management Project | Flood | Los Angeles County Flood Control District |
| Upper LA | Elysian Park Water Recycling Project | Water Supply | LADWP |
| Upper LA | Elysian Reservoir Water Quality Improvement Project | Habitat/Open Space | LADWP |
| Upper LA | Foothill Municipal Water District Recycled Water Project | Water Supply | Foothill Municipal Water District |
| Upper LA | Groundwater System Improvement Study | Water Supply | Los Angeles Department of Water & Power |
| Upper LA | Groundwater Treatment Facilities | Water Supply | LADWP |

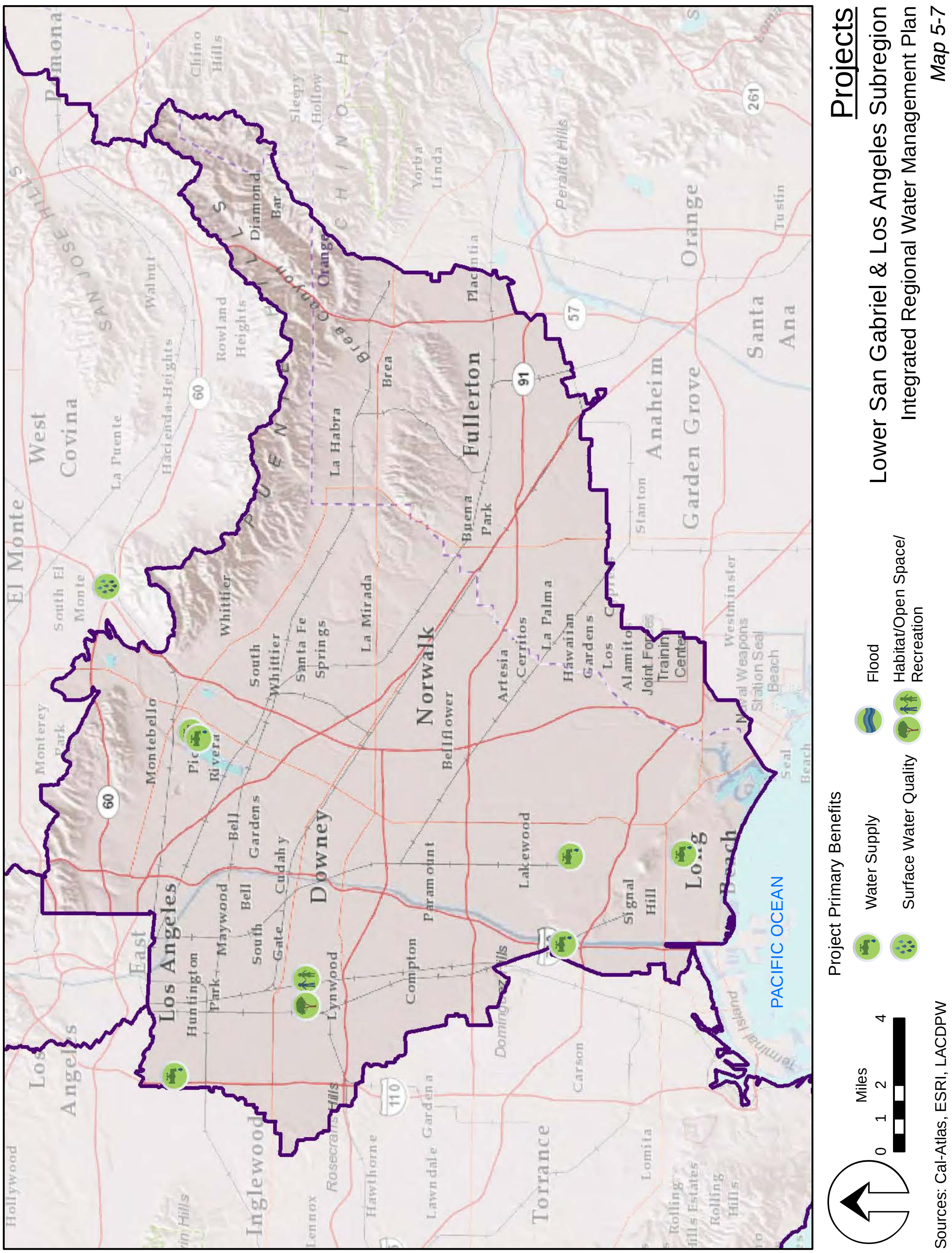
| Table 5-3: GLAC IRWMP Approved Projects (as of April 2013) | | | |
|---|---|---|---|
| **Subregion** | **Project Title** | **Primary Benefit** | **Implementing Organization** |
| Upper LA | Hansen Dam Golf Course Water Recycling Project | Water Supply | LADWP |
| Upper LA | Hansen Dam Water Conservation and Supply | Water Supply | The River Project |
| Upper LA | Hansen Dam Water Conservation Project | Water Supply | Los Angeles County Flood Control District |
| Upper LA | Headworks East Reservoir | Habitat/Open Space | LADWP |
| Upper LA | Headworks Ecosystem Restoration | Habitat/Open Space | LADWP |
| Upper LA | Humboldt Stormwater Greenway | Water Quality | City of Los Angeles, Bureau of Sanitation/ Watershed Protection Division |
| Upper LA | Johnny Carson Park Stream Restoration and Park Revitalization | Habitat/Open Space | City of Burbank |
| Upper LA | LA River Sixth Street Bridge Greenway | Water Quality | City of Los Angeles, Bureau of Engineering |
| Upper LA | Lopez Spreading Grounds Improvement | Water Supply | Los Angeles County Flood Control District |
| Upper LA | Los Angeles River Center and Gardens Green Conference Center | Water Quality | Mountains Recreation and Conservation Authority |
| Upper LA | Los Angeles River Natural Park | Water Quality | City of Los Angeles Bureau of Sanitation/ Watershed Protection Division |
| Upper LA | Los Angeles River Revitalization Master Plan 32 Mile Channel and Easement Greening | Habitat/Open Space | City of Los Angeles, Bureau of Engineering |
| Upper LA | Los Angeles State Historic Park Water Recycling Project | Water Supply | LADWP |
| Upper LA | Marsh Park, Phase II | Habitat/Open Space | Mountains Recreation and Conservation Authority |
| Upper LA | Mission Hills Green Belt | Water Supply | The River Project |
| Upper LA | Mission Wells Improvement | Water Supply | Los Angeles Department of Water and Power |
| Upper LA | Pacoima Neighborhood Retrofit | Water Supply | The River Project |
| Upper LA | Pacoima Reservoir Sediment Removal | Flood | Los Angeles County Flood Control District |
| Upper LA | Pacoima Spreading Grounds Improvements | Water Supply | Los Angeles County Flood Control District |
| Upper LA | Pasadena Recycled Water Project | Water Supply | Pasadena Water and Power |
| Upper LA | San Rafael Creek Restoration | Habitat/Open Space | Arroyo Seco Foundation |
| Upper LA | Santa Fe Spillway Basins | Water Supply | Los Angeles County Flood Control District |
| Upper LA | Septic-To-Sewer Drinking Waterwell Protection Project | Water Quality | City of Los Angeles Bureau of Sanitation/ Wastewater Engineering Services Division |
| Upper LA | Sepulveda Basin Sports Complex Multi-Purpose Open Space Project | Habitat/Open Space | City of Los Angeles, Bureau of Engineering |
| Upper LA | Sepulveda Basin Sports Complex Riparian Buffer | Habitat/Open Space | City of Los Angeles, Bureau of Engineering |
| Upper LA | Sheldon Pit | Water Supply | LADWP |
| Upper LA | Silver Lake Reservoir Bypass & Regulator Station | Habitat/Open Space | Los Angeles Department of Water & Power |
| Upper LA | Sun Valley Watershed Strathern Wetlands Park Project | Habitat/Open Space | Los Angeles County Flood Control District |
| Upper LA | Taylor Yard River Park Parcel G2 | Habitat/Open Space | City of Los Angeles, Bureau of Engineering |
| Upper LA | Valley Generating Station Stormwater Recharge Project | Water Supply | LADWP |

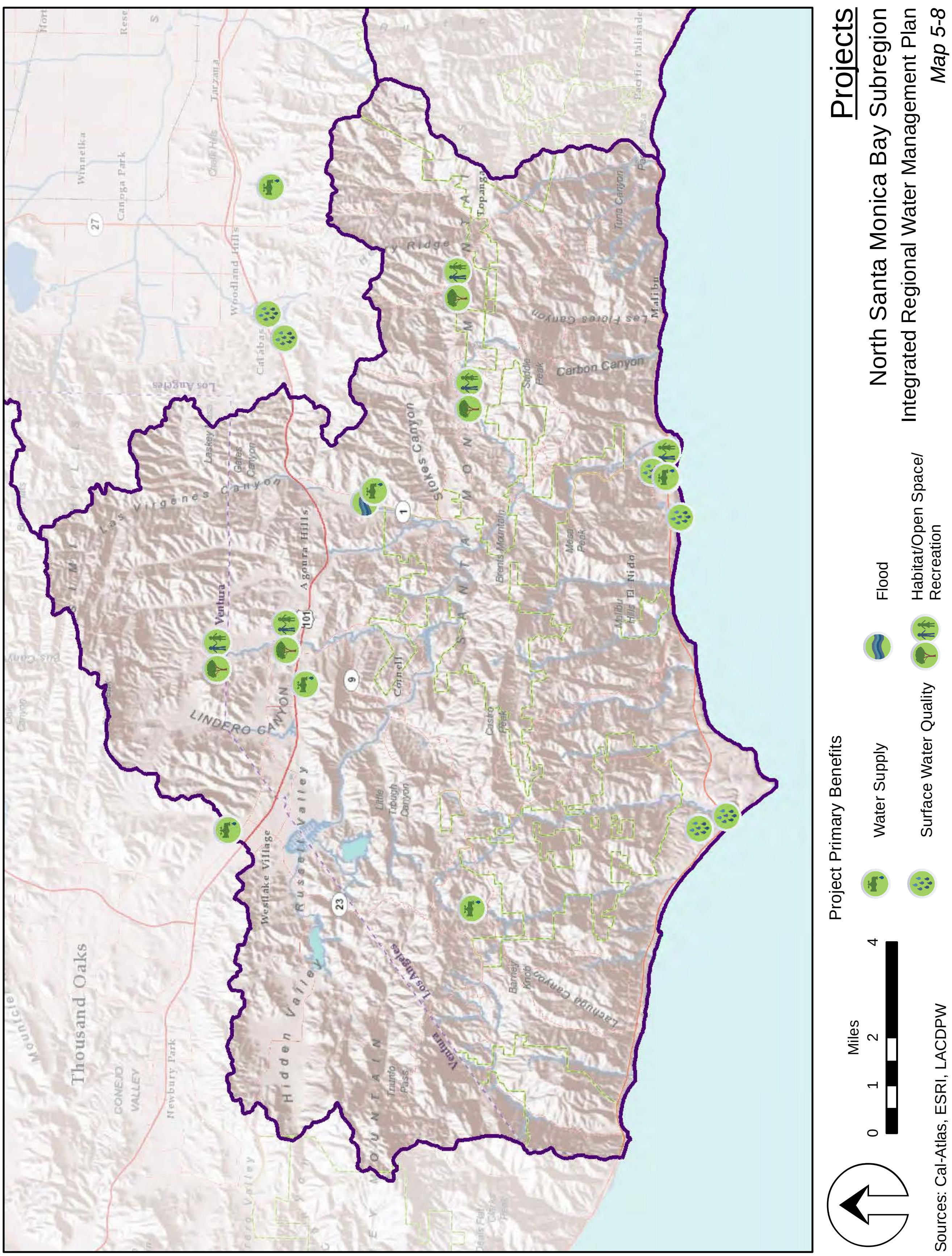
| Table 5-3: GLAC IRWMP Approved Projects (as of April 2013) | | | |
|---|---|---|---|
| **Subregion** | **Project Title** | **Primary Benefit** | **Implementing Organization** |
| Upper LA | Verdugo Hills Stormwater Project | Habitat/Open Space | City of Los Angeles, Bureau of Sanitation/ Watershed Protection Division |
| Upper LA | Whitnall HWY Powerline Easement Stormwater Capture Project | Water Supply | LADWP |
| Upper SG & RH | Big Dalton Spreading Grounds Improvements | Water Supply | Los Angeles County Flood Control District |
| Upper SG & RH | Cogswell Dam Inlet/Outlet Works Rehabilitation Project | Flood | Los Angeles County Flood Control District |
| Upper SG & RH | Eaton Spreading Grounds Intake Improvements | Water Supply | Los Angeles County Flood Control District |
| Upper SG & RH | Eaton Wash Dam Inlet/Outlet Works Rehabilitation Project | Flood | Los Angeles County Flood Control District |
| Upper SG & RH | Improvements to San Gabriel River Diversion and San Gabriel River Water Committee Canal and Appurtenances | Water Supply | Azusa Light and Water |
| Upper SG & RH | Indirect Reuse Replenishment Project | Water Supply | Upper San Gabriel Valley Municipal Water District |
| Upper SG & RH | Live Oak Spreading Grounds Improvement Project | Water Supply | Los Angeles County Flood Control District |
| Upper SG & RH | Miller Pit Spreading Basins | Water Supply | Los Angeles County Flood Control District |
| Upper SG & RH | Olive Pit Water Conservation Park | Water Supply | Los Angeles County Flood Control District |
| Upper SG & RH | Peck Water Conservation Improvement Project | Water Supply | Los Angeles County Flood Control District |
| Upper SG & RH | Puddingstone Diversion Dam Inlet/Outlet Works Rehabilitation | Flood | Los Angeles County Flood Control District |
| Upper SG & RH | Regional Water Supply Reliability Program Phase 1b | Water Supply | Puente Basin Water Agency |
| Upper SG & RH | San Gabriel Valley Water Recycling Project (Phase I - Rose Hills Expansion) | Water Supply | Upper San Gabriel Valley Municipal Water District |
| Upper SG & RH | Santa Anita Dam Seismic Rehabilitation | Flood | Los Angeles County Flood Control District |
| Upper SG & RH | Sawpit Debris Dam Seismic Strengthening Project | Flood | Los Angeles County Flood Control District |
| Upper SG & RH | South El Monte Recycled Water Expansion Project | Water Supply | Upper San Gabriel Valley Municipal Water District & San Gabriel Valley Water Company |
| Upper SG & RH | Walnut Creek Spreading Basin Improvements | Water Supply | Los Angeles County Flood Control District |
| Upper SG & RH | Well 15 | Water Supply | San Gabriel County Water District |

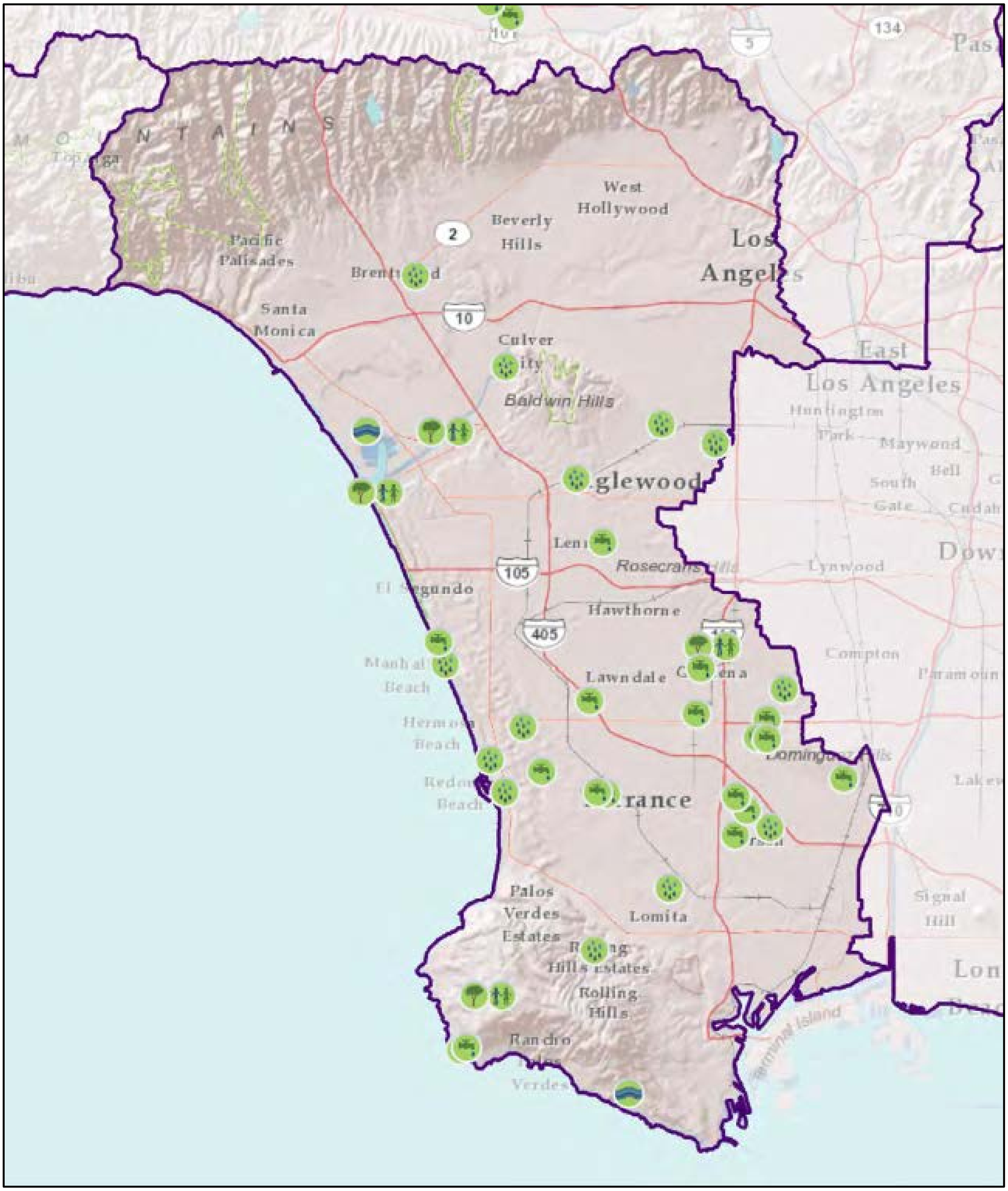
## Location of Projects

Maps 5-7 through 5-11 show the general location of stakeholder-identified and approved projects within each subregion. In some instances, multiple projects occur at the same locations, which may suggest additional opportunities for project integration. Regional projects and projects located in multiple Subregions, are not depicted on the maps.

The areas with the greatest number of projects in DACs are the Upper LA Subregion and the Lower LA & SG Subregion. The North SM Bay Subregion has no DACs.


Projects
Lower San Gabriel & Los Angeles Subregion
Integrated Regional Water Management Plan
Map 5-7
Project Primary Benefits
Water Supply
Surface Water Quality
Flood
Habitat/Open Space/ Recreation
Miles
0 1 2 4
Sources: Cal-Atlas, ESRI, LACDPW
PACIFIC OCEAN
Los Angeles
Downey
Norwalk
Fullerton
Whittier
La Habra
La Mirada
Lakewood
Long Beach
Compton
Paramount
Bellflower
Cerritos
Artesia
Montebello
Pico Rivera
Lynwood
Huntington Park
South Gate
Santa Fe Springs
Buena Park
Brea
Anaheim
Garden Grove
Orange
Santa Ana
Torrance
Inglewood
West Covina
El Monte


Projects
North Santa Monica Bay Subregion
Integrated Regional Water Management Plan
Map 5-8
Project Primary Benefits
Water Supply
Flood
Surface Water Quality
Habitat/Open Space/ Recreation
Miles
0
1
2
4
Sources: Cal-Atlas, ESRI, LACDPW
Thousand Oaks
Westlake Village
Hidden Valley
Russell Valley
Lindero Canyon
Agoura Hills
Las Virgenes Canyon
Calabasas
Woodland Hills
Canoga Park
Winnetka
Tarzana
Topanga
Malibu
Carbon Canyon
Los Flores Canyon
Tuna Canyon
Stokes Canyon
Cornell
Little Trough Canyon
Triunfo Pass
Los Angeles
Ventura
Santa Monica Mountains
Castro Peak
Brents Mountain
Saddle Peak
Mesa Peak
Malibu Hills
El Nido
Barney Knob
Newbury Park
Conejo Valley




Miles
0 1 2 4

Sources: Cal-Atlas, ESRI, LACDPW

Project Primary Benefits

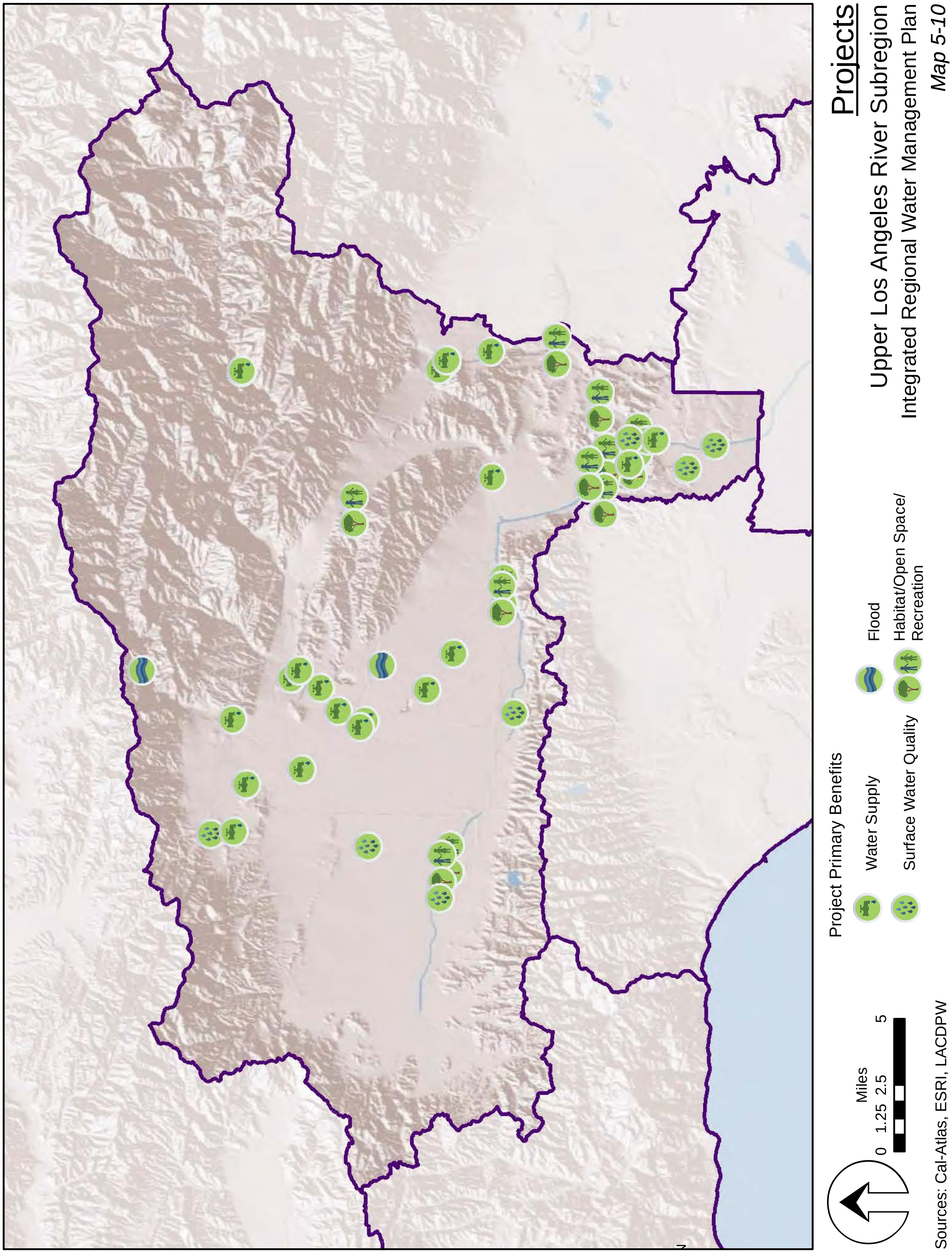
- Water Supply
- Surface Water Quality
- Flood
- Habitat/Open Space/ Recreation

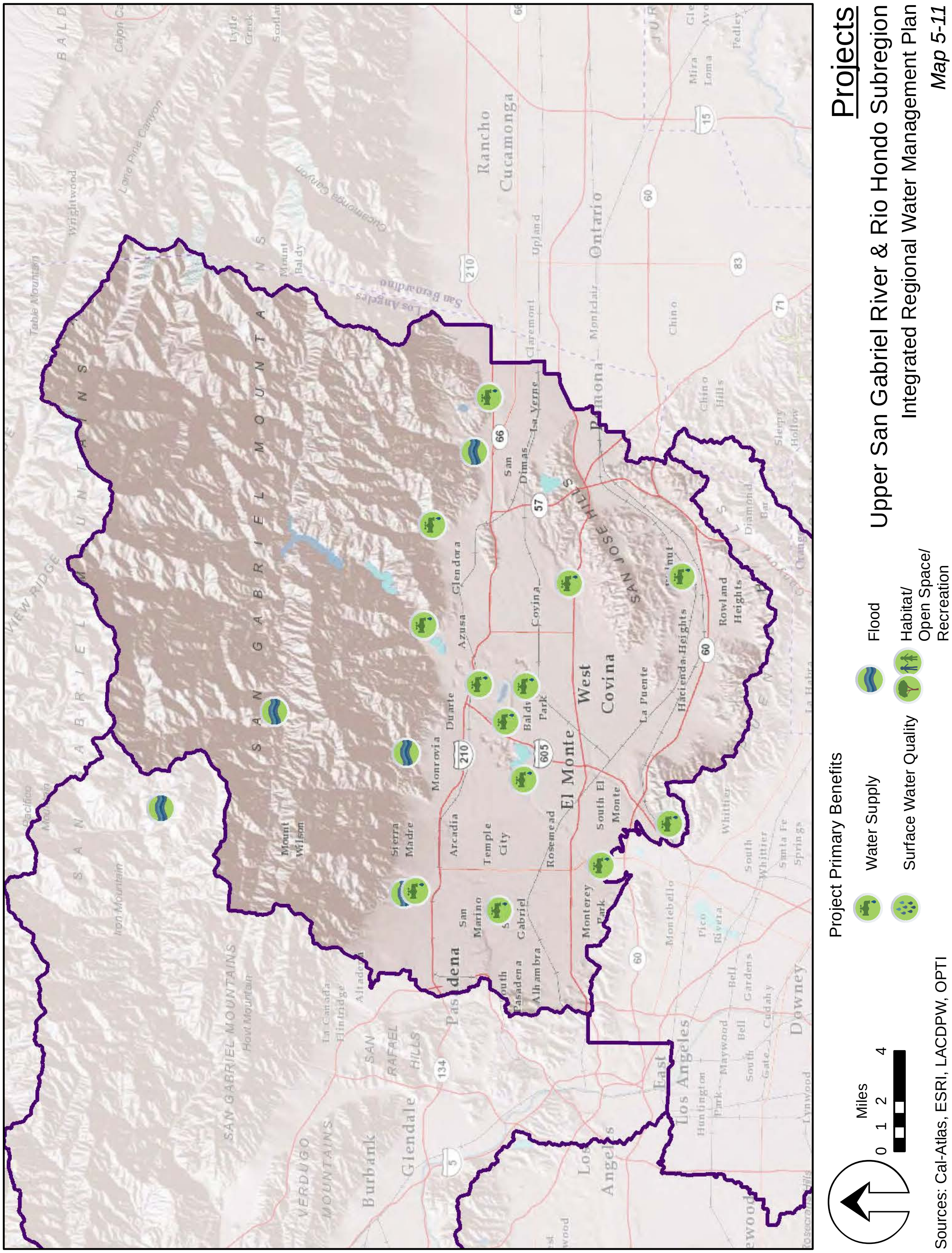
## Projects

South Bay

Integrated Regional Water Management Plan

*Map 5-9*


Projects
Upper Los Angeles River Subregion
Integrated Regional Water Management Plan
Map 5-10
Project Primary Benefits
Water Supply
Flood
Surface Water Quality
Habitat/Open Space/
Recreation
Miles
0 1.25 2.5 5
Sources: Cal-Atlas, ESRI, LACDPW


Projects
Upper San Gabriel River & Rio Hondo Subregion
Integrated Regional Water Management Plan
Map 5-11
Project Primary Benefits
Water Supply
Surface Water Quality
Flood
Habitat/
Open Space/
Recreation
Miles
0 1 2 4
Sources: Cal-Atlas, ESRI, LACDPW, OPTI

# 6. BENEFITS AND IMPACTS

*Manhattan Beach*

**The Southern California economy is dependent on clean water and clean beaches.**

## 6.1 Introduction

This chapter summarizes the potential impacts and benefits of the IRWM Plan. The IRWM Plan Impact and Benefit Standard states that the IRWM Plan must contain a discussion of potential impacts and benefits of Plan implementation, and that this discussion must include both impacts and benefits within the IRWM Region, between regions, and those directly affecting DAC, environmental justice (EJ) related concerns, and Native American communities. The Appendix goes on to state that the benefit/impact analysis does not need to be extensive or exhaustive. This chapter is organized such that benefits and impacts are discussed relative to the implementation of GLAC Region's Objectives listed in Chapter 3. Given the integrated nature of the GLAC Region, it is difficult to determine what objectives and targets would provide a disproportionate impact or benefit to DACs or create EJ concerns. However, as part of specific project screening, potential impacts and benefits relative to DACs and EJ will be considered. Any DAC and EJ related concerns that could be determined at this higher Regional level are noted in each section. Because there are no federally-recognized Native American tribes in the GLAC Region, no assessment of benefits or impacts could be conducted.

This Plan update has quantified specific targets for meeting the Plan's objectives. Target information is the first tool for understanding Plan impacts and benefits. The information presented in the tables below is primarily based on a programmatic assessment of benefits and impacts. Another resource of information on benefits and impacts for this Region can be found in the Region's project database. The database website presents information for each project in the Plan and allows that information to be used to develop an overall picture of projected benefits and costs for the projects in the Plan.

## 6.2 Benefits and Impacts Review

The impacts and benefits described in this chapter will be reviewed by the LC and SCs as projects are implemented and additional information is tracked and recorded on project and Plan performance. As part of the normal plan management activities, the Benefits and Impacts Chapter will be reviewed with each IRWM Plan update.

## 6.3 Impacts and Benefits of IRWMP Implementation

To consider potential environmental effects that could result from IRWM Plan implementation, an analysis of potential impacts and benefits of the Plan's objectives and targets was conducted. The tables below list each of the GLAC IRWM objectives and the specific targets to accomplish these objectives in the next twenty years.

- Table 6-1 describes the potential impacts and benefits of the Region's efforts to optimize local water resources to reduce the Region's reliance on imported water.
- Table 6-2 describes the potential impacts and benefits of the Region's efforts to improve water quality of receiving waters through enhanced stormwater capture.
- Table 6-3 describes the potential impacts and benefits of the Region's efforts to protect, restore, and enhance natural processes and habitats.
- Table 6-4 below describes the potential impacts and benefits of the Region's efforts to increase watershed-friendly recreational space for all communities.
- Table 6-5 below describes the potential impacts and benefits of the Region's efforts to reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches.

Image courtesy of West Basin Municipal Water District

*Water resources projects can provide many benefits, including improved water quality.*

Table 6-1: Optimize local water resources to reduce the Region's reliance on imported water

| Planning Target | Within IRWM Region | | Inter-Regional | |
|---|---|---|---|---|
| | Potential Impacts | **Potential Benefits** | Potential Impacts | **Potential Benefits** |
| Conserve 117,000 AFY of water through **water use efficiency** and conservation measures | • Decrease in finances for existing supply operations and infrastructure<br>• Loss of flow to downstream users | • Reduced need to develop new higher cost supplies<br>• Reduced dependence on imported water<br>• Increased available water supply to meet greater demand<br>• Improved air quality through decreased GHG and other emissions<br>• Decreased energy consumption for water treatment and conveyance associated with imported water | None identified | • Increased flexibility to manage available Bay-Delta and Colorado River supplies and/or environmental flows to meet demand or storage needs<br>• Improved air quality through decreased GHG emissions if water is delivered to storage<br>• Decreased energy consumption for water treatment and conveyance when delivered to storage |
| Create additional **ability to pump** 106,000 AFY of groundwater using a combination of treatment, recharge, and storage access | • Increased energy, and GHG emissions associated with pumping and higher treatment levels | • Reduced dependence on imported water<br>• Reduced need for highest cost supply<br>• Increased available water supply to meet greater demand<br>• Improved groundwater quality<br>• Improved access to local supply and increased reliability<br>• Improved use of groundwater basins<br>• Improved air quality through decreased GHG and other emissions<br>• Decreased energy consumption for water treatment and conveyance associated with imported water | None identified | • Increased flexibility to manage available Bay-Delta and Colorado River supplies and/or environmental flows to meet demand or storage needs<br>• Improved air quality through decreased GHG emissions if water is delivered to storage<br>• Decreased energy consumption for water treatment and conveyance when delivered to storage |
| Increase indirect **potable reuse by** 80,000 AFY | • Reduced recycled water supply for non-potable use<br>• Increased treatment level and energy use and GHG emissions over non-potable supply<br>• Reduced effluent discharge available for river flows<br>• Increased need for recharge facility capacity<br>• Increased need for brine disposal | • Reduced dependence on imported water<br>• Reduced need for highest cost supply<br>• Increased available water supply to meet greater demand<br>• Improved groundwater quality<br>• Improved access to local supply and increased reliability<br>• Improved use of groundwater basins<br>• Increased water quality and beneficial use of WWTP/ recycled water flows<br>• Decreased need for non-potable distribution system construction<br>• Improved air quality through decreased GHG and other emissions relative to imported supply<br>• Decreased energy consumption for water treatment and conveyance associated with imported water | None identified | • Increased flexibility to manage available Bay-Delta and Colorado River supplies and/or environmental flows to meet demand or storage needs<br>• Improved air quality through decreased GHG emissions if water is delivered to storage<br>• Decreased energy consumption for water treatment and conveyance when delivered to storage |

Table 6-1: Optimize local water resources to reduce the Region's reliance on imported water

| Planning Target | Within IRWM Region | | Inter-Regional | |
|---|---|---|---|---|
| | Potential Impacts | **Potential Benefits** | Potential Impacts | **Potential Benefits** |
| Increase non-potable **reuse of recycled water by 83,000 AFY** | • Reduced recycled water supply for indirect potable use<br>• Reduced effluent discharge available for in-stream flows<br>• Increased infrastructure construction | • Reduced dependence on imported water<br>• Reduced need for highest cost supply<br>• Increased available water supply to meet greater demand<br>• Improved access to local supply and increased reliability<br>• Increased water quality and beneficial use of WWTP/ recycled water flows<br>• Decreased need for treatment to potable or indirect potable standards Improved air quality through decreased GHG and other emissions relative to imported supply<br>• Decreased energy consumption for water treatment and conveyance associated with imported water<br>• Advancement of indirect potable engineering and application for use by other entities | None identified | • Increased flexibility to manage available Bay-Delta and Colorado River supplies and/or environmental flows to meet demand or storage needs<br>• Improved air quality through decreased GHG emissions if water is delivered to storage<br>• Decreased energy consumption for water treatment and conveyance when delivered to storage<br>• Advancement of indirect potable engineering and application for use by other entities |
| Increase capture and use of stormwater **runoff by 26,000 AFY that is currently lost** to the ocean | • Reduced in-stream flows<br>• Loss of drainage flow to downstream users<br>• Infiltration could cause geologic instability and/or impact onsite wastewater treatment system (OWTS) performance. | • Reduced dependence on imported water<br>• Reduced need for highest cost supply<br>• Increased available water supply to meet greater demand<br>• Improved access to local supply and increased reliability<br>• Reduction of pollutants to receiving waters<br>• Improved air quality through decreased GHG and other emissions relative to imported supply<br>• Decreased energy consumption for water treatment and conveyance associated with imported water | None identified | • Increased flexibility to manage available Bay-Delta and Colorado River supplies and/or environmental flows to meet demand or storage needs<br>• Improved air quality through decreased GHG emissions if water is delivered to storage<br>• Decreased energy consumption for water treatment and conveyance when delivered to storage |
| Increase both centralized and distributed stormwater **infiltration by** 75,000 AFY | • Increased construction for individual projects (decentralized)<br>• Reduced in-stream flows<br>• Loss of drainage flow to downstream users | • Reduced dependence on imported water<br>• Reduced need for highest cost supply<br>• Increased available water supply to meet greater demand<br>• Improved access to local supply and increased reliability<br>• Reduction of pollutants to receiving waters<br>• Improved groundwater quality<br>• Increased recharge of groundwater basins for supply and storage<br>• Improved air quality through decreased GHG and other emissions relative to imported supply<br>• Decreased energy consumption for water treatment and conveyance associated with imported water | None identified | • Increased flexibility to manage available Bay-Delta and Colorado River supplies and/or environmental flows to meet demand or storage needs<br>• Improved air quality through decreased GHG emissions if water is delivered to storage<br>• Decreased energy consumption for water treatment and conveyance when delivered to storage |

**Table 6-1: Optimize local water resources to reduce the Region's reliance on imported water**

| Planning Target | Within IRWM Region | | Inter-Regional | |
|---|---|---|---|---|
| | Potential Impacts | **Potential Benefits** | Potential Impacts | **Potential Benefits** |
| **Develop 26,000 AFY** of ocean water desalination | • Increased construction-related impacts<br>• Increased treatment level and energy use and GHG emissions<br>• Entrainment of aquatic species<br>• Decreased habitat for marin species<br>• Increased brine management and disposal issues | • Reduced dependence on imported water<br>• Increased available water supply to meet greater demand<br>• Improved access to previously untapped local supply and increased reliability<br>• Improved air quality through decreased GHG and other emissions relative to imported supply<br>• Decreased energy consumption for water treatment and conveyance associated with imported water<br>• Advancement of desalination engineering and application for use by other entities<br>• Increased greenspace, native plants habitats, and recreational facilities (multi-benefit projects) | • Increased treatment level and energy use and GHG emissions<br>• Entrainment of aquatic species<br>• Decreased habitat for marine species | • Increased available Bay-Delta and Colorado River supply and/or environmental flows<br>• Improved air quality through decreased GHG and other emissions relative to imported supply<br>• Decreased energy consumption for water treatment and conveyance associated with imported water<br>• Advancement of desalination engineering and application for use by other entities |

**Table 6-2: Improve Water Quality of Receiving Waters**

| Planning Target | Within IRWM Region | | Inter-Regional | |
|---|---|---|---|---|
| | Potential Impacts | **Potential Benefits** | Potential Impacts | **Potential Benefits** |
| Develop 54,000 AF of new stormwater **capture capacity** | • Increased construction for individual projects (decentralized)<br>• Reduced in-stream flows<br>• Loss of drainage flow to downstream users | • Reduction of pollutants to receiving waters<br>• Reduction of contaminant loading on land cover and use of contaminants<br>• Increased marine and fresh water quality for aquatic and riparian habitats<br>• Decreased potential for beach closures and increased ability to use marine waters for recreation<br>• Improved air quality through decreased GHG and other emissions relative to imported supply<br>• Decreased energy consumption for water treatment and conveyance associated with imported water<br>• Advancement of water quality Best Management Practices engineering and application for use by other entities | None identified | • Increased available Bay-Delta and Colorado River supply and/or environmental flows<br>• Increased marine water quality for aquatic and riparian habitats<br>• Decreased potential for beach closures and increased ability to use marine waters for recreation<br>• Improved air quality through decreased GHG and other emissions relative to imported supply<br>• Decreased energy consumption for water treatment and conveyance associated with imported water<br>• Advancement of water quality Best Management Practices engineering and application for use by other entities |

**Table 6-3: Protect, Restore and Enhance Natural Processes and Habitats**

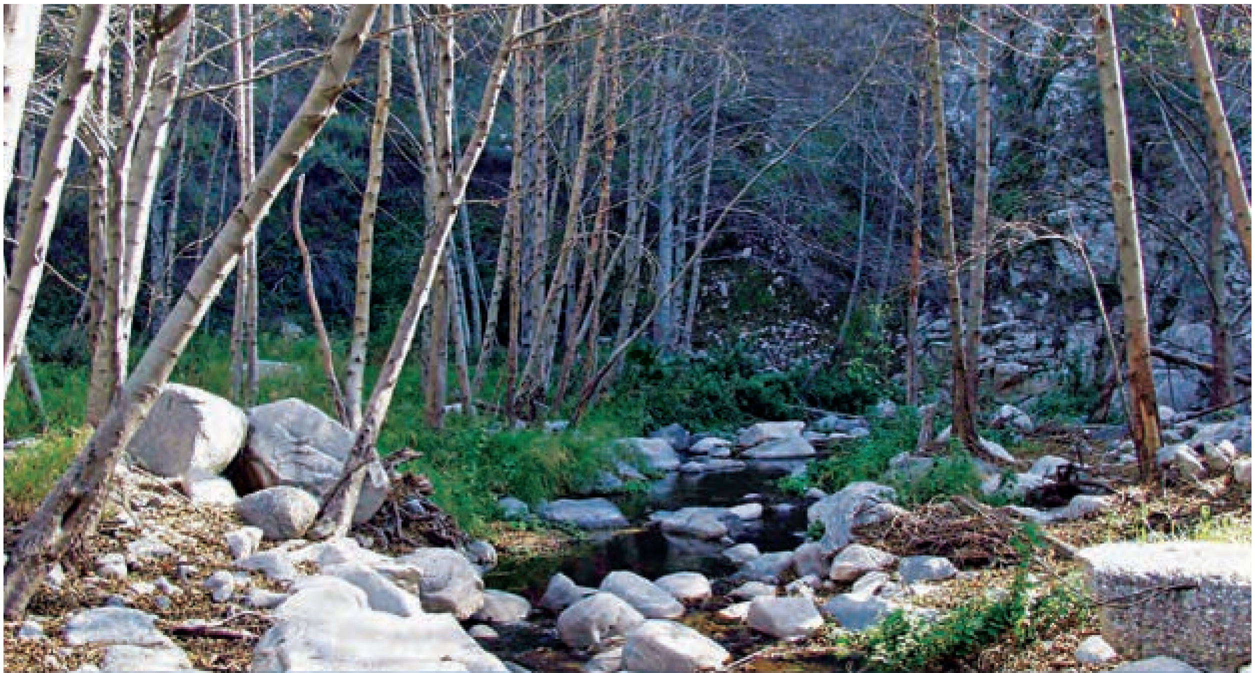
| Planning Target | Within IRWM Region | | Inter-Regional | |
|---|---|---|---|---|
| | Potential Impacts | **Potential Benefits** | Potential Impacts | **Potential Benefits** |
| Preserve or protect **by 2,000 acres of** aquatic habitat | • Increased short-term construction and site-specific impacts<br>• Loss of potential for future urban land uses and associated local revenue | • Reduced invasive species<br>• Increased potential for future habitat for endangered species<br>• Increased potential for future passive recreational opportunities<br>• Maintained receiving water quality<br>• Improved ability to increase or maintain habitat corridors | None identified | • Increased flyway protection for birds and related species<br>• Improved ability to increase or maintain habitat corridors |
| **Enhance 6,000 acres** of aquatic habitat | • Increased short-term construction and site-specific impacts<br>• Loss of potential for future urban land uses and associated local revenue | • Reduced invasive species<br>• Enhanced habitat for endangered species<br>• Enhanced passive recreational opportunities<br>• Improved receiving water quality<br>• Improved ability to increase or maintain habitat corridors<br>• Increased potential for augmentation of stream flows<br>• Increased potential for integrated flood management and reduced flood risk<br>• Increased potential for local sustainable fisheries and recreation-based businesses<br>• Increased potential educational areas | None identified | • Increased flyway protection for birds and related species<br>• Improved ability to increase or maintain habitat corridors |
| Restore or create 4,000 acres of aquatic habitat | • Increased short-term construction and site-specific impacts<br>• Loss of urban land uses and associated local revenue | • Reduced invasive species<br>• Increased habitat for endangered species<br>• Increased passive recreational opportunities<br>• Improved receiving water quality<br>• Improved ability to increase habitat corridors<br>• Increased potential for augmentation of stream flows<br>• Increased potential for integrated flood management and reduced flood risk<br>• Increased potential for local sustainable fisheries and recreation-based businesses<br>• Increased potential educational areas | None identified | • Increased flyway protection for birds and related species<br>• Improved ability to increase habitat corridors |

**Table 6-4: Increase watershed friendly recreation space for all communities**

| Planning Target | Within IRWM Region | | Inter-Regional | |
|---|---|---|---|---|
| | Potential Impacts | **Potential Benefits** | Potential Impacts | **Potential Benefits** |
| **Create 38,000 acres** of open space | • Increased short-term construction and site-specific impacts<br>• Loss of non-recreation related urban land uses and associated local revenue<br>• Increased costs to local jurisdictions for sheriff, paramedic and fire protection<br>• Increased costs to agency for operation and maintenance to maintain high use areas without source of revenue | • Increased and enhanced passive and active recreational opportunities and experiences<br>• Increased health of residents<br>• More livable communities<br>• Improved receiving water quality<br>• Increased potential for augmentation of stream flows<br>• Increased potential for integrated flood management that include recreation benefits<br>• Potential economic benefits to recreation-supporting businesses | None identified | • Increased and enhanced passive and active recreational opportunities and experiences<br>• Increased health of visitors |
| **Create 25,000 acres** of urban parks | • Increased short-term construction and site-specific impacts<br>• Loss of non-recreation related urban land uses and associated local revenue<br>• Increase costs to local jurisdictions for sheriff, paramedic and fire protection<br>• Increase costs for operation and maintenance to maintain high use areas without source of revenue | • Increased and enhanced active recreational opportunities and experiences<br>• Increased health of residents<br>• More livable communities<br>• Improved receiving water quality<br>• Increased potential for integrated flood management that include recreation benefits<br>• Improved access for DACs to recreational and educational opportunities<br>• Potential economic benefits to recreation-supporting businesses | None identified | • Increased and enhanced passive and active recreational opportunities and experiences<br>• Increased health of visitors |

**Table 6-5: Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches**

| Planning Targets | Within IRWM Region | | Inter-Regional | |
|---|---|---|---|---|
| | Potential Impacts | **Potential Benefits** | Potential Impacts | **Potential Benefits** |
| **Reduce flood risk in 11,400 acres of flood prone areas by either** increasing protection or decreasing needs using integrated **flood management** approaches | • Increased short-term construction and site-specific impacts | • Reduced risk to property and life<br>• Reduced flood insurance costs<br>• Increased multiple benefits of individual projects<br>• Increased potential for water supply enhancement<br>• Increased potential for water quality enhancement<br>• Increased potential for habitat enhancement<br>• Increased potential for recreation enhancement<br>• Advancement of integrated flood management engineering and application for use by other entities | None identified | • Advancement of integrated flood management engineering and application for use by other entities |
| Remove 68 million **cubic yards of** sediment from debris basins and reservoirs | • Increased short-term removed sediment transportation and site-specific impacts<br>• Increased sediment disposal issues if end user cannot be located | • Optimization of existing flood control and recharge facilities<br>• Reduced risk to property and life<br>• Reduced flood insurance costs<br>• Increased recharge of groundwater basins for supply and storage<br>• Increased supply of sediment for other uses in Region | None identified | • Increased supply of sediment for other uses outside of Region |



# 7. PLAN IMPLEMENTATION

*Arroyo Seco Watershed*

**Consensus and local leadership is attracting funding partners for implementation of this 20-year Plan.**

## 7.1 Introduction

The 2013 GLAC IRWM Plan Update was prepared to document the Region's planning priorities, needs and process. The GLAC Region intends to implement this Plan over its 20-year planning horizon. This chapter discusses how the Region will implement this Plan relative to the areas described below.

- Identify plan performance and monitoring approaches to track plan implementation
- Describe data management approaches to be used
- Identify ongoing and future steps and how they will be conducted
- Describe financing options and strategies for Plan implementation

## 7.2 Framework for Implementation

The 2013 GLAC IRWM Plan Update Implementation Chapter has been formatted to directly respond to DWR's guidance in meeting the Plan Performance and Monitoring Standard, the Data Management Standard, and the Finance Standard.

Monitoring performance should be closely related to the implementation of projects. The IRWM Plan needs to contain the criteria that will be used to evaluate the progress to meet plan objectives and the process that will link project completion to IRWM Plan implementation. Specifically, this Plan meets the following pieces of information.

- Contain an explanation of whom or what group within the LC will be responsible for IRWM implementation evaluation
- List the frequency of evaluating the LC's performance at implementing projects in the IRWM Plan
- Explain how IRWM implementation will be tracked with a Data Management System (DMS) and who will be responsible for maintaining the DMS
- Discuss how findings or "lessons learned" from project-specific monitoring efforts will be used to improve the LC's ability to implement future projects in the IRWM Plan
- Identify who has the primary responsibility for development of the project-specific monitoring plans and who is responsible for project-specific monitoring activities
- Specify the stage of project development at which a project-specific monitoring plan will be prepared
- Provide an explanation of typically required contents of a project-specific monitoring plan

## Data Management Standard

The intent of the Data Management Standard is to ensure efficient use of available data, stakeholder access to data, and to ensure the data generated by IRWM implementation activities can be integrated into existing State databases.

As specified in the Integration Standard, IRWM Plans should contain common protocols that gather data in a consistent manner and processes for data and information sharing that assists all IRWM stakeholders in their local and regional efforts. Data integration is best achieved through the use of common and compatible methods for data gathering, analysis, monitoring, and reporting systems used by members of the LC. The data management description in the IRWM Plan should be of sufficient detail so that it is clear to stakeholders how data are collected, validated, and shared in the region. At a minimum, the data management description in the IRWM Plan includes the following components.

- A brief overview of the data needs within the IRWM region
- A description of typical data collection techniques
- A description of how stakeholders contribute data to a DMS
- The entity responsible for maintaining data in the DMS
- A description of the validation or quality assurance/quality control measures that will be implemented by the LC for data generated and submitted for inclusion into the DMS
- An explanation of how data collected for IRWM project implementation will be transferred or shared between members of the LC and other interested parties throughout the IRWM region, including local, State, and federal agencies
- An explanation of how the DMS supports the LC's efforts to share collected data
- An outline of how the data saved in the DMS will be distributed and remain compatible with State databases including California Environmental Data Exchange Network (CEDEN), Water Data Library (WDL), California Statewide Groundwater Elevation Monitoring (CASGEM), California Environmental Information Catalog (CEIC), and the California Environmental Resources Evaluation System (CERES)

## Finance Standard

The intent of the Finance Standard is to ensure that financing of the IRWM Plan has been considered at a programmatic level by the LC; and that a snapshot of financing is documented for stakeholders. Most of the cost of developing, maintaining, and implementing an IRWM Plan is borne by local entities with State grant funding providing a necessary, but relatively small, supplement in funds. With potentially multiple sources of funding being accessed to formulate, maintain, and implement an IRWM Plan, documentation of how the funding pieces fit together is necessary for the LC and its stakeholders to understand how the plan will be implemented. The IRWM Plan contains the following items.

- A program-level description of the sources of funding, which will be utilized for the development and ongoing funding of the IRWM Plan
- The potential funding sources for projects and programs that implement the IRWM Plan

In addition to demonstrating potential funding for project construction, the IRWM Plan also contains a discussion of the potential sources of funding for project Operations and Maintenance (O&M).

## 7.3 Plan Performance and Monitoring

The GLAC Region will review and determine Plan performance in two ways.

- **Ongoing Program:** The Region will continue monthly LC and SC meetings and other governance and stakeholder outreach processes as described in Chapter 1 as well as the regular project review process described in Chapter 5 of this Plan.
- **Plan Update Process:** As part of each subsequent Plan Update (or more frequently if desired or necessary), the Region will review all projects funded through the IRWM implementation program to date and relate the results and outcomes of these projects to the benefits achieved relative to the stated objectives and planning targets described in Chapter 3 of this Plan.

### Ongoing Program Operations and Maintenance

A key part of the GLAC Region's Plan is the governance, stakeholder/DAC outreach and project development and review processes described in the previous chapters of this Update.

The implementation of the Plan relies upon the ongoing LC and SC meetings, project implementation and the continuation of the DAC outreach efforts. The performance will be evaluated through regular meeting notes posted on the GLAC Region website and the project updates regularly being included in the project database.

### Periodic Plan Update Process

GLAC IRWM projects that are implemented through the DWR funding program, require that project performance monitoring be developed and results reported as part of project implementation. The project's proponents are responsible for data that is collected and provided to the Region and DWR as part of the regular reporting process. The project monitoring plans developed by the project proponents during the grant process must include the following information.

- Parameter or constituent being monitored
- Measures to remedy or react to problems encountered during monitoring
- Location of monitoring
- Monitoring frequency
- Monitoring protocols and methodologies and responsible parties
- Data management process for tracking what is monitored
- Procedures to ensure monitoring schedule and processes can be maintained

This data can also be used by the Region's LC and SCs to determine the benefits achieved from a project. The required project reports will be posted on the GLAC IRWMP website that updates the Region on project progress and performance. The LC and SCs will be able to correlate a project's benefit data to the Plan objectives and planning targets and be able to show progress made on these targets through project implementation.

As part of the regular SC meetings, project proponents will be invited to provide updates as well as lessons learnedfrom project implementation that can then be used to enhance the development of future IRWM projects for that Subregion and the Region as a whole. These lessons learned can be memorialized in meeting notes and posted on the Region's website and project database for use in subsequent project selections, review of Regional Management Strategies and subsequent Plan Updates.

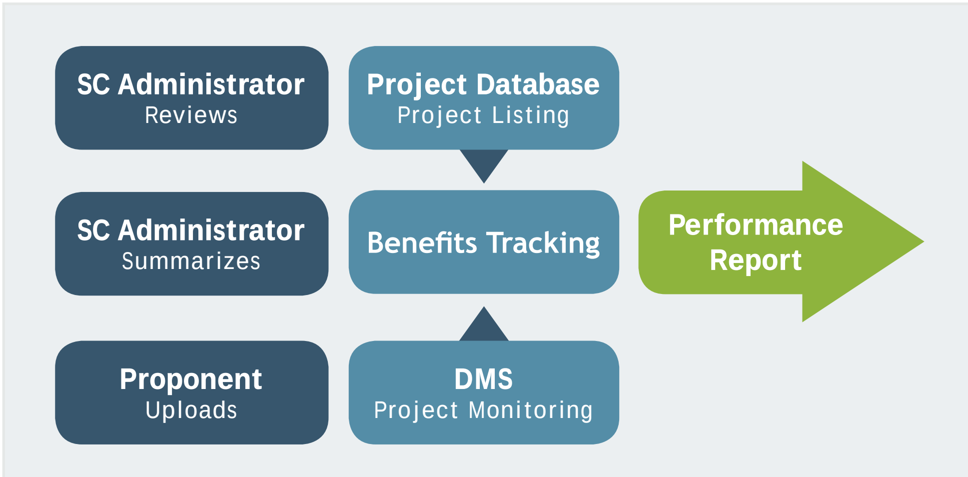



*Figure 7-1: Plan Performance Process*

The Region acknowledges that the majority of projects included as part of the IRWM Plan will need to be implemented fully through other funding sources because DWR IRWMP Implementation funding is limited. These projects certainly help the Region meet its objectives and planning targets. However, it will take additional resources to collect and integrate the data supporting the benefits achieved into the Plan Performance process and tie those benefits to the Plan objectives and targets.

## 7.4 Data Management

### GLAC Data Management Approach

Since the GLAC Region has more municipalities and public agencies per square mile than anywhere in California, and each municipality and agency is responsible for monitoring a wide range of parameters for many varied programs, implementing a Region-wide comprehensive data collection process into a single DMS, let alone one that is compatible with DWR requirements, would be prohibitively expensive at the current time without a commensurate benefit to stakeholders. Projects funded through the IRWM implementation funding programs are required to provide data from approved project performance monitoring programs in formats already consistent with the list of state agency databases called out in DWR guidance. The GLAC Region has, therefore, determined that the project proponents will provide the data required consistent with their agreement with DWR and as a condition of receiving funding for their project to track progress of the goals and objectives within this Plan. Therefore, the data provided by project proponents can be effectively shared and used by the State and the Region's stakeholders.

It is, however, recognized that a great deal of valuable data is collected from studies and projects not funded through the IRWM Program but which could benefit the Region and the State if made accessible. Therefore, if regional stakeholders and agencies wish to provide a link to their datasets on the GLAC Region's website, these datasets could be accessed by stakeholders, but the Region would not be responsible for determining if these datasets meet DWR requirements nor for including the data into the Plan Performance assessment process.

### Current Monitoring Efforts

It is important to note that there are ongoing monitoring programs that are collecting data in the Region not being directly reported to DWR through IRWM Project performance monitoring. Current pertinent monitoring activities in the Region are described briefly below.

#### Drinking Water Quality

- **SDWA compliance monitoring and reporting:** All public water systems are required to produce water that complies with the SDWA. To this end, specific monitoring is required and conducted routinely. Results of the monitoring are reported to the CDPH. In addition, monitoring information is required to be published in the annual Consumer Confidence Report (also required by the SDWA).

- **Unregulated Contaminant Monitoring Rule Results:** The 1996 SDWA Amendments mandate that USEPA publish a list of unregulated contaminants that may pose a potential public health risk in drinking water. This list is called the Contaminant Candidate List (CCL). The initial 1998 accounting listed 60 contaminants. USEPA uses this list to prioritize research and data collection efforts for future rulemaking purposes. The 1996 SDWA amendments incorporated a tiered monitoring approach. The rule required all large public water systems and a nationally representative sample of small public water systems serving fewer than 10,000 people to monitor the contaminants.
- **Groundwater Contamination:** MWD produces periodic summaries of groundwater contamination in Southern California.
- **Water Supply:** Sources of data for water supply quantities include individual agency UWMPs that are updated every 5 years, MWD's IRP updates, and MWD's IRP Report Card. These include the amount of single dry-year and multiple dry-year supplies developed to date, projected single dry-year and multiple dry-year demands over a 20-year planning horizon and the gap between the existing supplies and demands.

### Surface Water Quality

Numerous agencies and organizations have been conducting monitoring of surface water quality in the Region for years. Table 7-1 identifies a few of these programs that supply data to support the implementation of statewide programs such as TMDL development and implementation of the Clean Water Act 303(d) Listing of impaired water bodies.

Table 7-1: Existing Water Quality Monitoring Programs

| Lead Agency Program | General Overview |
|---|---|
| City of Los Angeles lead Ballona Creek Metals and Bacteria TMDLS | The City of Los Angeles coordinates monitoring efforts required by TMDLs in Ballona Creek Watershed, including the Ballona Creek Metals, the Ballona Creek Estuary Toxic Pollutants, and the Ballona Creek Bacteria TMDLs. The County and other stakeholders in the watershed contribute to the effort. |
| Caltrans | Caltrans conducts monitoring aimed at estimating loadings from highway runoff. |
| City of Los Angeles Cleaner Rivers through Effective Stakeholder-led TMDLs (CREST) | CREST is a stakeholder effort initiated by the City of Los Angeles to develop TMDLs to restore and protect water quality in the Los Angeles River and Ballona Creek. TMDL strategies must include monitoring as the final step. |
| City of Long Beach Colorado Lagoon OC Pesticides, PCBs, Sediment Toxicity, PAHs, and Metals TMDL | The City of Long Beach leads monitoring efforts for Toxics TMDL in Colorado Lagoon. The County and Caltrans contribute to the effort. |
| Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL | The City of Los Angeles coordinates monitoring efforts for TMDLs in the Dominguez Channel and the Greater Los Angeles and Long Beach Harbor. The County and other stakeholders in the watershed contribute to the effort. |
| Friends of the Los Angeles River (FoLAR) RiverWatch (319(h) grant program) | A 319(h) grant program monitoring the quality of water at 60 sites along the full length of the Los Angeles River on a monthly basis, surveying the river's biota in natural bottomed areas and tracking seasonal changes in the river and related habitat. FoLAR publishes a State of the River Report and intends to develop a successful and long-term volunteer river monitoring program. |
| Heal the Bay Beach Monitoring | Heal the Bay reports the monitoring results of total coliform, fecal coliform, enteroccus, and total fecal ratio done by various environmental health laboratories. |
| Los Angeles Basin Water Augmentation Study | The Council for Watershed Health is monitoring six sites to deter- mine whether infiltration of stormwater results in the subsequent migration of pollutants to groundwater. The Phase II Final Report is available at www.lasgrwc.org |

| Table 7-1: Existing Water Quality Monitoring Programs | |
|---|---|
| Lead Agency Program | General Overview |
| Los Angeles Basin Contaminated Sediment Task Force | The task force is conducting a study to identify sources of heavy metals loadings within the Ballona Creek Watershed. Study results could support the development of a TMDL for selected heavy metals. |
| City of Los Angeles Los Angeles River Metals TMDL Monitoring Plan | The City of Los Angeles leads monitoring efforts required under Metals and Bacteria TMDLs in the Los Angeles River watershed. The County and other stakeholders in the watershed contribute to the effort. |
| Los Angeles County Department of Public Works | LACDPW monitors runoff from major watersheds, including some tributaries, during multiple storm events as well as during dry weather in order to comply with its NPDES permit. Samples are taken for physical, chemical and biological analysis; toxicity testing, bioassessment and trash monitoring are also performed. Details of the NPDES monitoring program and prior year's data are found in the annual monitoring reports at http://ladpw.org/wmd/NPDES/report_directory.cfm. |
| Los Angeles County Department of Public Health, and City of Los Angeles Santa Monica Bay Beaches Bacteria TMDL Monitoring | The TMDL, which has been divided into dry weather and wet weather, each having its own compliance dates and limits, encompasses 27 subwatersheds that cover 44 303(d)-listed beaches from Malibu to Palos Verdes. The Coordinated Shoreline Monitoring Plan (CSMP) provided 67 sampling sites to be monitored on a weekly basis starting in November 2004. |
| Los Angeles County Department of Public Works, Machado Lake Nutrients & Toxics Monitoring Plan (Nutrients) | The County is conducting nutrients monitoring of its island areas in the watershed. Both dry and storm water monitoring is being conducted at up to 7 sites. Some sites include collection of observational data only. |
| LACFCD Machado Lake Nutrients & Toxics Monitoring Plan (Toxics) | LACFCD recently obtained approval of its Monitoring Plan from the Los Angeles Water Quality Control Board, Los Angeles Region. |
| LACFCD Marina del Rey Harbor Toxics TMDL Monitoring Plan | LACFCD will be starting the fourth year of monitoring that includes dry and wet weather sampling. Dry weather sampling is being conducted at 9 sites in the harbor. 5 sites in the watershed are being sampled during wet weather. All monitoring is being done in accordance with Regional Water Quality Control Board approved Coordinated Monitoring Plan. The plan also includes a Pilot Study to determine the best method for storm borne sediment collection. |
| City of Los Angeles Marina del Rey Bacteria Monitoring Plan | The County and City of Los Angeles coordinates monitoring efforts for bacteria TMDL in Marina del Rey Harbor. |
| Port of Los Angeles Consolidated Slip Restoration Project Draft Plan | A Consolidated Slip Restoration Project draft plan by the Port of Los Angeles described the extent of sediment contamination in Consolidated Slip and the site's history, identified data gaps, called for additional sediment sampling to characterize the area extent and vertical depth of Consolidated Slip contamination. |
| RWQCB SWAMP | The RWQCB has conducted SWAMP-funded monitoring of the North Santa Monica Bay and South Bay watersheds in fiscal years 2008-9 to 2012-13 in collaboration with the Southern California Stormwater Monitoring Coalition, and plans to continue funding monitoring in these watersheds for the next 5 years |
| Los Angeles River and San Gabriel River Regional Monitoring Program Work Group (including many county, regional, and local agencies, municipalities, and advisory organizations) | The Work Groups have developed regional monitoring programs for the Los Angeles and San Gabriel River water sheds and are now working on implementation. The monitoring programs integrate with existing monitoring efforts. The monitoring approach includes use of random sites in order to assess overall watershed health as well as directed sites at high habitat value areas and at the base of subwatersheds. Probabilistic and targeted sampling are done for water quality, toxicity, and bioassessment and habitat condition. Extensive monitoring data are available as part of NPDES monitoring and reporting programs. and through the Council for Watershed Health at http://www.watershedhealth.org/programsandprojects/larwmp.aspx# |
| Santa Monica Bay Restoration Commission (SMBRC) | The SMBRC is developing new sources and loading monitoring design for point and NPS ocean discharges from the Santa Monica Bay Watershed. |

Table 7-1: Existing Water Quality Monitoring Programs

| Lead Agency Program | General Overview |
|---|---|
| Santa Monica Bay Restoration Project (SMBRP) | SMBRP completed a marine resource inventory and habitat mapping (available on CD) for Santa Monica Bay. The objectives of these projects are to produce a detailed inventory of the bay's habitats and provide a baseline for the valuation of the bay's habitats. |
| LA Waterkeeper | The LA Waterkeeper provides volunteer monitoring of storm drains and events. |
| Southern California Coastal Water Research Project (SCCWRP) | SCCWRP has ongoing efforts to investigate the loading and impacts of stormwater runoff throughout the Region, including creeks in the Santa Monica Mountains and coordinates the regional monitoring program for the Malibu ASBS. |
| Southern California Marine Institute (SCMI) | This strategic alliance of 12 major universities in southern California operates several monitoring programs: CI-CORE Ocean Observatory Program, Citizen Water Quality Monitoring, Demonstration Cruise Monitoring, National Oceanic & Atmospheric Association's (NOAA) Volunteer Observing Ship (VOS) Program, and Rocky Intertidal Monitoring, Seasonal Bacteria Study. |
| U.S. Army Corps of Engineers | The Army Corps has worked with UCLA to collect stormwater samples in Ballona Creek to calcu- late relative contributions of pollutant loadings from each tributary and major land use types. |
| Las Virgenes MWD Tapia WRF NPDES permit monitoring | LVMWD monitors receiving water quality in Malibu and Las Virgenes Creeks and the Los Angeles River upstream and downstream of discharge points in order to comply with the Tapia WRF NPDES permit. Samples are taken for physical, chemical and biological analysis. Bioassessment of benthic macroinvertebrates and algae are also performed. |
| Resource Conservation District of the Santa Monica Mountains | Malibu Lagoon: water quality and biological monitoring and surveys.<br>Lower Malibu Creek: Multiparameter data sonde at one site and temperature of selected pools between April and October. Monthly snorkel surveys since 2005.<br>Topanga Creek: water temperature, episodic multiparameter sonde, monthly nutrient and bacteria, and 2013-2014 diatom and soft-bodied algae data.<br>Arroyo Sequit, Big Sycamore, Los Flores, Solstice, Trancas and Zuma Creeks:<br>Lagoon-ocean interface conditions and water temperature in refugia pools between April and October. |
| City of Agoura Hills - Malibu Creek Bacteria TMDL Monitoring Plan | For compliance with the Malibu Creek and Lagoon Bacterial TMDL, a number of government agencies in the Los Angeles portion on the Malibu Creek Watershed conduct weekly grab sample monitoring at 11 sites located through the Malibu Creek Watershed. Samples are analyzed for total and fecal coliform, E.coli, and enterococcus. |

## Data Gaps

In order to avoid duplicating data collection efforts such as those described above, the Region will focus on data collection from projects funded in part by IRWM Program grants. The Region does have the potential to serve as a centralized data-base for these and other datasets by enhancing its current DMS to a fully integrated and web accessible DMS that integrates with the current project database platform, but this would require a significant initial, and then annual investment, and is currently an unfunded gap. A companion Regional program for data collection that uses uniform data management protocols to allow for broader sharing and comparability could also be implemented, but only with significant annual additional funding. This centralized DMS could provide a means for addressing regional questions about the condition of water resources in the region.

## Data Management System Protocol

The GLAC Region will maintain a centralized DMS on the Region's website, which will house all original IRWM data provided by IRWM project grantees and web links to non-IRWM project data. The procedure for submitting data for inclusion in the DMS is described below.

1. The IRWM project grantee completes monitoring and data collection in accordance with DWR's approved project-specific monitoring plan, including quality assurance/quality control (QA/QC) procedures.
2. The IRWM project grantee validates data consistent with data validation protocols outlined in the project-specific monitoring plan.
3. The IRWM project grantee "spot-checks" data for accuracy at the time of entry to the project database to identify any apparent errors.
4. The IRWM project grantee submits the data to the GLAC Region.
5. The GLAC Region maintains the data in the centralized database.
6. The GLAC Region disseminates the data to stakeholders and members of the public through the IRWM Plan webpage.

Table 7-2. GLAC Objectives and Targets

| Objectives | Planning Targets for 2035 |
|---|---|
| **Improve Water Supply** | |
| Optimize local water resources to reduce the Region's reliance on imported water. | • Conserve 117,000 AFY of water through water use efficiency and conservation measures.<br>• Create additional ability to pump 106,000 AFY using a combination of treatment, recharge, and storage access.<br>• Increase indirect potable reuse by 80,000 AFY.<br>• Increase non-potable reuse of recycled water by 83,000 AFY.<br>• Increase capture and use of stormwater runoff by 26,000 AFY currently lost to the ocean.<br>• Increase both centralized and distributed stormwater infiltration by 75,000 AFY.<br>• Develop 26,000 AFY of ocean water desalination. |
| **Improve Surface Water Quality** | |
| Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater and wastewater. | Develop[1] 54,000 AF of new stormwater capture capacity (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[2]. |
| **Enhance Habitat** | |
| Protect, restore, and enhance natural processes and habitats. | • Preserve or protect 2,000 acres of aquatic habitat.<br>• Enhance 6,000 acres of aquatic habitat.<br>• Restore or create 4,000 acres of aquatic habitat. |
| **Enhance Open Space and Recreation** | |
| Increase watershed friendly recreational space for all communities. | • Create 38,000 acres of open space.<br>• Create 25,000 acres of urban parks. |
| **Reduce Flood Risk** | |
| Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. | • Reduce flood risk in 11,400 acres of flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches.<br>• Remove 68 million cubic yards of sediment from debris basins and reservoirs. |
| **Address Climate Change** | |
| Adapt to and mitigate against climate change vulnerabilities. | • Increase local supplies by an additional 7-10% (beyond water supply target) by 2050.<br>• Implement "no regret" adaptation strategies<br>• Implement mitigation strategies that decrease emissions of GHGs |

*1 Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75", 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed)*

*2 High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.*

Data collected will be compatible with statewide databases because the project-specific monitoring plans will be developed based on guidance provided for applicable statewide database. While project sponsors will be responsible for submitting data to the appropriate statewide databases, LACFCD will be able to confirm that this has been done based on the confirmation of submittal required.

The DMS will serve the important function of assisting the LC in its goal to share collected data by requiring consistent methodologies for data collection and housing all data in a centralized location that is easily accessed by stakeholders and members of the public. In this way, the DMS assists the LC in accomplishing the objectives of improved data comparability and accessibility.

## Compatibility with Statewide Databases

The IRWM project grantee submits the data that is compatible with statewide databases, as applicable.

Data collected will be compatible with statewide databases because the project-specific monitoring plans will be developed based on guidance provided for applicable statewide database. While project sponsors will be responsible for submitting data to the appropriate statewide databases, LACFCD will be able to confirm that this has been done based on the confirmation of submittal required.

The DMS will serve the important function of assisting the LC in its goal to share collected data by requiring consistent methodologies for data collection and housing all data in a centralized location that is easily accessed by stakeholders and members of the public. In this way, the DMS assists the LC in accomplishing the objectives of improved data comparability and accessibility

## Data Collection Techniques

Data collected in conjunction with Plan implementation projects will vary based on the type and scope of each individual project. Table 7-3 below outlines the types of data expected to be collected by project type. These data will include, at a minimum, data relevant to surface water, groundwater, water quality, stormwater, and ecosystem restoration.

Table 7-3. Potential Data to be Collected through IRWM Project Implementation

| Data Type | Project Type | | | | | |
|---|---|---|---|---|---|---|
| | Water Supply | Recycled Water | Water Quality | Stormwater and Flood Mgmt. | Ecosystem Restoration | Groundwater Management |
| Stream & River Flows | ✓ | | ✓ | | ✓ | |
| Stream & River Water Quality | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Locations of Sensitive Habitats & Species | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Surface Water Deliveries | ✓ | | ✓ | | | ✓ |
| Groundwater Pumping | ✓ | | ✓ | | | ✓ |
| Hydrogeologic | | | | ✓ | | ✓ |
| Precipitation | ✓ | | ✓ | ✓ | | ✓ |
| Water Demand | ✓ | ✓ | | | | ✓ |
| Water Related Facilities | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Political and Agency Boundaries | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Land Use | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Contaminant Plume Locations and Extents | ✓ | | ✓ | | | ✓ |

As described in the Plan Performance and Monitoring Section 7.3, GLAC Region project proponents implementing projects through the IRWM Program as a condition of receiving DWR funds are required to prepare project-specific monitoring plans that adhere to the data collection techniques and procedures established by the specified statewide programs. This requirement will ensure compatibility of data among projects implemented through the IRWM Program, as well as compatibility with relevant statewide databases.

## Management and Dissemination of Data

The Region's website and on-line project database have been created to store data and information about the IRWMP process so that the public can find information about meeting dates, agendas and project data. The website provides information on the IRWM process and posts reports and relevant documents that can be downloaded. Data collected during the IRWM process will be available on the website as well and will be linked to the project database through the correlation of the project monitoring data and benefits tracking. The website will also include links to other existing monitoring programs provided by Regional stakeholders to promote data exchange between these pr ograms and the IRWM.

Data collection, review, and dissemination are activities that occur during both the Plan update process, and subsequently during the implementation of the updated Plan. During the update process, data has been disseminated primarily via project-specific documentation and associated meetings, inter-agency collaboration on issues and projects of mutual interest, discussion at ongoing stakeholder/steering committee and Leadership Committee meetings, and through project database webpage and IRWM Program website postings. Project proponents, SC and LC members, and IRWM planning participants are all jointly responsible for data dissemination.

As described previously, all data will be housed in a centralized DMS on the Region's website (www.lawaterplan.org), currently maintained by LACFCD as Program Administrator and accessible to all interested parties and stakeholders. Hard copies and CDs may be available to interested parties upon request.

Dissemination of data to statewide programs administered by both the SWRCB and DWR will support statewide data needs. As described previously, individual IRWM project grantees and any additional project sponsor that choose to submit data will be responsible for submitting data to the appropriate statewide database(s) consistent with the approved project-specific monitoring plan. The GLAC Region will confirm that this submittal has occurred based on the project proponent's reporting.

To this end, the 2013 GLAC Plan Update has established standard data management documentation practices for IRWM Plan projects and programs that are required to be followed for projects and programs funded through DWR's IRWM Program. Projects and programs funded outside of the IRWM Program are encouraged to follow similar protocols to maximize usefulness and compatibility of data collected throughout the Region, and to improve potential integration into statewide databases. The data proposed to be collected and anticipated reporting procedures are presented in the sections below. For the purposes of this Plan, the term data refers to and includes technical documentation (such as designs, feasibility studies, and reports), as well as technical information collected as part of project or program planning, design, implementation, and operation.

## Integration into State Programs

Data submitted by project grantees to support IRWM Plan performance monitoring will be organized in a format that is compatible with the following major State surface water and groundwater programs by project's receiving Prop 84 grant funding.

### Surface Water Ambient Monitoring Program (SWAMP)

Typical data collection techniques for surface waters include both field measurements and laboratory analysis. Field measurements are either collected using meters or field kits for a common list of constituents including but not limited to: water temperature, pH, conductivity, dissolved oxygen and turbidity. For an example of a field data sheet and complete list of SWAMP-required fields go to: http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2009/04/swamp _sop_field_measures_water_sediment_collection_v1_0.pdf.

There is a large list of possible constituents that are measured in surface waters that require laboratory analysis. Typical laboratory analysis includes fecal indicator bacteria, metals, nutrients, persistent organic pollutants, and turbidity. SWAMP provides guidance on methods and quality assurance. This guidance can be found at: http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/qaprp082209.pdf.

Biological monitoring is helpful for determining the health of a system and whether it is able to sustain a diverse community of benthic macro invertebrates. Standard operating procedures for determining a stream's physical/habitat condition and benthic invertebrate assemblages can be found at http://swamp.mpsl.mlml.calstate.edu/wpcontent/uploads/2009/04/swamp_sop_bioassessment_collection_020107.pdf.

Projects collecting surface water data will be required to adhere to the SWAMP data collection protocols.

### Groundwater Ambient Monitoring and Assessment (GAMA)

The GAMA Priority Basin Project is grouped into 35 groundwater basin groups called "study units." Each study unit is sampled for common contaminants regulated by the CDPH, and also for unregulated chemicals. Testing for these chemicals—usually at detection levels well below those achieved by most laboratories—will help public and private groundwater users to manage this resource. Results from the Northern San Joaquin study unit, which includes the western-most portion of the MAC Region (Mokelumne/Amador/Calaveras), can be found at http://pubs.usgs.gov/fs/2011/3089/. Some of the chemical constituents that are sampled by the GAMA Priority Basin Project include:

- Low-level VOCs
- Low-level pesticides
- Stable isotopes of oxygen, hydrogen, and carbon
- Emerging contaminants (pharmaceuticals, perchlorate, chromium VI, and other chemicals)
- Trace metals (arsenic, selenium, lead, and other metals)
- Radon, radium, and gross alpha/beta radioactivity
- General ions (calcium, magnesium, fluoride)
- Nutrients, including nitrate, and phosphates
- Bacteria: total and fecal coliform bacteria

Projects collecting groundwater data will be required to adhere to GAMA data collection protocols.

### Wetland and Riparian Area Monitoring Program (WRAMP)

The WRAMP is intended to track trends in wetland extent and condition to determine the performance of wetland, stream, and riparian protection programs in California. The program defines standardized assessment methods and data management with the goal of minimizing new costs and maximizing public access to assessment information. Additional information on the WRAMP program can be found at the following location http://www.waterboards.ca.gov/mywaterquality/monitoring_council/wetland_workgroup/docs/2010/tenetsprogram.pdf

All projects that involve wetland restoration must meet the criteria for and be compatible with the State Wetland and Riparian Area Monitoring Plan.

Individual project proponents will be responsible for collecting data in accordance with the approved project-specific monitoring plan, which will clearly identify monitoring and analytical techniques and QA/QC procedures to be implemented, and will describe how those techniques are compatible with the requirements of appropriate statewide database(s). The individual project proponents will be responsible for reviewing the data collection and QA/QC protocols to validate that data was collected in accordance with QA/QC procedures required as part of the project monitoring program. In addition, project proponents will be responsible for "spot-checking" all data for accuracy at the time of entry to the database to identify any apparent errors. Once data collection and QA/QC has been complete in accordance with provisions of the approved project-specific monitoring plan, the project proponent will submit the compatible data to the website. The project proponent will also provide LACFCD with confirmation that the data has been submitted to the appropriate statewide database.

## 7.5 Adaptive Management and Planning Needs

An adaptive management process will be used to analyze project and plan performance and identify the need for modification of projects and the need for additional Region planning through the GLAC IRWM Program.

### Project Level

Proponents responsible for implementing projects have a vested interest in adjusting project operations for maximum benefit and also have familiarity with the technical aspects of the project. Documents that have been identified as the basis for scientific and technical merit for a project will be used to guide the response. Also proponents of similar projects will be consulted. In addition, SC meetings will be used to share information and experience regarding specific types of project issues.

If an IRWM funded project cannot be implemented as proposed, then a revised project may be proposed at the discretion of the project grantee but is subject to DWR's and the LC's approval. Alternatively, if some projects exceed expectations or capacity, then investigations can be made to see if the project can be expanded. For instance, with stormwater capture projects it may be discovered that pollutant loading is higher than expected or the amount of water exceeds the design capture volume of a BMP. In this case, an additional or expanded BMP could be employed to provide the additional needed treatment/capture.

Another response to performance data may be the realization that certain assumptions used to design and/or site the project were incorrect. As an example, TMDL implementation plans often use land use assumptions for initial BMP prioritization and placement. Once BMPs are in place, the data gained on the ground can be used to refine site selection.

For instance, if a certain area is demonstrated to possess higher than assumed pollutant loads, then this information will also be fed back into the BMP prioritization database to allow updated models to be completed and new projects identified.

### Plan Level

If the IRWM planning targets are not being met, then a review of the original targets, verification of submitted project data, a request for additional data and consideration of a broader mix of project types and/or water management strategies may be warranted.

If both project and plan level responses do not lead to satisfactory results, then a change in institutional structure may be considered. This could involve identifying and inviting additional stakeholders whose participation would improve success. Changes to the stakeholder process could be explored to bring new ideas. Finally, a change in governance structure or decision making process could be considered.

#### Regional Planning Needs

Through the adaptive management process, further Regional planning needs can be readily identified. Through the 2013 Plan Update process, several planning needs have already been identified and are summarized here.

#### Subregional Plans

As part of the 2013 Plan Update process, five Subregional Plans were developed for each of the Region's Subregions that were desired to be a stand-alone document that could speak to the unique aspects of each Subregion and its needs. These Plans could be regularly updated to reflect the continuously changing interests and stakeholders participating as well as the opportunities to create and develop inter-Regional integrated projects.

#### Use and Further Development of Planning Tools

The 2013 Update process also included the development of a few planning tools that if maintained and enhanced could continue to provide benefits to the Region, and to individual stakeholders as well.

Given the resources available to meet the necessary Plan Update requirements, the Region's project database is currently limited to its function as a means for uploading, viewing and evaluating projects. The mapping function that shows the location and main benefit of projects could be expanded to include the geospatial data layers that were used to create the benefits geodatabase described in

Chapter 2 and in the Subregional plans. These specific data layers were created to help identify places in the Region that could potentially yield multiple benefit projects, however, it is recognized that data is constantly evolving and new data layers could be added to further enhance the ability to see geographic relationships between stakeholders, their needs, and project opportunities.

### Integrated Project Development

Along with the subregional planning and tool development activities indicated above, the Region could enlist other activities to support further project integration and in particular new Regional projects that were born from the IRWM process. The ability to equitably foster such project develop in a Region the size of GLAC will require significant resources to develop and facilitate workshops, proponent MOUs and project scoping. Use of the tools described above can facilitate this process, however good project development requires human interaction and analysis to determine the best opportunities and foster those opportunities through implementation.

### Land Use Planning

The development of the IRWM Plan highlighted the need for further coordination with land use planning departments, water managers and land managers and groups that could further identify areas and opportunities for the Region to address IRWM objectives and targets. Workshops with City Planning department staff, water managers and other land management entities that examine the potential benefits maps presented relative to general plans, master plans and goals could result in the development of more specific project target areas (including water resources) as well as remove areas that should not be considered for these benefits, given potential constraints.

### Enhanced Data Management and Plan Performance

After months of deliberation, the GLAC Region decided to limit its data collection to those projects that receive funding through the IRWM Program. Any other entity willing to collect and submit data to DWR or any other State agency is encouraged, but not required, to do so. The Region has limited funding/resources to implement a robust data tracking system, and recognizes the limited resources relative to the sheer volume of projects and programs, diversity of grantees, and the extensive data regularly collected by the hundreds of entities within the GLAC Region. This limitation prevents the Region from reporting all non-IRWMP funded projects that are implemented into a single tracking system to meet the Plan's objectives and targets identified in Chapter 3. There is no uniform method for collecting project and program data that meet the DWR standards in the IRWM Program and no reliable funding source on an ongoing basis, therefore, it would be prohibitively expensive for the Region to develop an assessment tool that would compile and report all data from all projects in the Region and compare that data against the IRWMP objectives.  In light of these concerns, the decision was made for the IRWM Plan to limit data tracking to data compiled from IRWM grant-funded projects.

## 7.6 Financing

Given the size and number of stakeholder in the GLAC Region, funding comprehensive Plan implementation is challenging. The LC has acknowledged that significant financial resources will be needed to just operate and maintain the program in-line with DWR IRWMP Plan and Program Standards. The GLAC Region has been successful at obtaining funding through DWR's planning grant and implementation grant programs, however this funding is dedicated to either individual project implementation or as required Plan Updates (such as this one completed in 2013) to meet DWR Program guidance.

### Funding Needs

Funding needed for IRWM Plan and Program Implementation falls into the three categories of Program O&M, Projects, and Planning as shown in Figure 7-2.

Program O&M activities meet the most basic requirements necessary for the Region to exist and to implement the Plan according to DWR Standards and requirements of an IRWM Region. The Region's commitment to conducting IRWM related outreach/communication and governance activities are mainly

| Program O&M | Projects | Planning |
|---|---|---|
| ■ Outreach Communication<br>■ Governance<br>■ Plan Performance<br>■ Data Management | ■ Project Review<br>■ Project Prioritization<br>■ Grant Applications<br>■ Grant Management | ■ Plan Updates<br>■ Planning Needs |

*Figure 7-2: GLAC IRWM Program Financing Needs*

described in Chapter 1. Plan performance and data management activities have been described in the previous sections of this Chapter 7. In kind contributions and/or resources are necessary to conduct regular LC and SC meetings, outreach to stakeholders and DACs, communicate with DWR and other IRWM Regions, assess Plan performance and maintain data management standards.

The Region's project development and implementation related activities include the project review and selection processes described in Chapter 5. The Region also has (through both Proposition 50 and Rounds 1 and 2 of Proposition 84 IRWM implementation grant programs) and will continue (through Round 3 of Proposition 84 and subsequent IRWM Program appropriations) to apply for funding for projects that are a part of the Region's IRWM. Resources are necessary for the Region to solicit for new projects; work with proponents to include, review and develop projects and concepts; apply for and manage grant funding and provide matching funds for project implementation.

| Sources | |
|---|---|
| ■ Ratepayers<br>■ Operating Funds<br>■ Water Enterprise Funds | ■ Assessments/Fees/Taxes<br>■ Loans/Grants |

| Methods | |
|---|---|
| ■ In-Kind Time<br>■ Annual Dues | ■ As-Needed Assessments<br>■ Grants/Loans |

*Figure 7-3: Potential IRWMP Funding Sources and Methds*

Beyond the O&M and Project activities, there are opportunities for the GLAC Region to go beyond and further enhance the ability to provide regional planning and coordination activities to further benefit the Region's stakeholders and DWR. Since these additional planning activities are not required, the resources dedicated to them would be discretionary and only provided after the O&M and Project related activities are funded. The Region was awarded funding to pursue this 2013 Plan Update, since no additional funding for future plan updates is known, the depth and breadth of subsequent Plan updates can't be know at this time. The 2013 Plan Update process has, however identified a few future planning activities (as described in the previous section) that could be conducted as resources are made available.

## Funding Sources and Methods

To meet the resource needs identified above, the Region will need to secure funding as both in-kind services as well as monetary resources. Potential funding sources and methods are summarized in Figure 7-3. The Region has determined that local, state and federal funding strategies should be used to implement the resource management strategies.

As discussed in Chapter 5, cost estimates have been developed for the Projects which implement the Plan. In addition to these projects, it is clear that existing local revenue sources will not be sufficient to fund this level of activity during the 20-year plan horizon. These will likely be a combination of local, state, and federal sources. The following is a program-level description of the potential local, state, and federal sources of funding which will be utilized for the development and ongoing funding of the IRWM Plan, and for projects and programs that implement the IRWM Plan.

### Local Financing Strategy

Local in-kind services provided by the staff of the Region's participating agencies and groups is the most important resource used by the GLAC Region. All of the Region's governance, outreach/communication, data management, plan performance and project development and review is contributed as in-kind service by the LC and SC Chairs, Vice-Chairs WMAs, members of the LC's Subcommittees and project proponents. The ability for these agencies to continue to dedicate staff resources for the IRWM Program is critical to its success.

The LC has indicated that local funding measures should also be included as a part of their overall strategy to develop the appropriate revenue to achieve the Regional planning targets in the next 20 years. While existing funding mechanisms are in place for the development of water supply and wastewater facilities and operation and maintenance of these facilities, these revenue sources are subject to voter approval or the Proposition 218 process and are therefore not guaranteed sources of revenue. Therefore, outside funding is a critical revenue source to supplement these important projects.

LACFCD has developed a stormwater quality funding program called the Clean Water Clean Beaches Measure. This measure includes funding for operation and maintenance of projects as well as construction. The measure was originally targeted for a vote of property owners in 2013. However in March 2013, the Board of Supervisors voted not to proceed with the measure due to opposition and determined to hold the measure off for the near term to provide time to work with key stakeholders on elements of implementation. There is now a goal of bringing it to voters in November of 2014. Passage of such a measure is viewed as a critical component of a local funding strategy for GLAC IRWM Plan implementation.

The Region will need to continue to perform partnering activities including the following activities:

- Continue to work with stakeholders to develop broad support for a Regional Funding Program.
- Continue to foster the development of regional projects that can facilitate partnerships that will better leverage existing funding
- Continue to educate the public on the IRWMP targets, the need for infrastructure to achieve the targets, the need for additional local revenue, etc.

Table 7-4. Comparison of the Three Local Funding Alternatives

| Funding Source | Equity | Implementation Feasibility | Stability of Revenue | Acceptable | Flexibility |
|---|---|---|---|---|---|
| Bonds and Property Tax for Capital, Parcel Tax for O&M | All property owners pay for runoff from public places and would be appropriate for funding the general benefits of multipurpose projects. Poor nexus between payment and runoff from private properties. | Parcel taxes cannot be varied to fit well with the existing funding sources of the cities to guarantee that all residents pay their fair share. Parcel taxes could not vary between watersheds. | Property tax revenues could be reduced somewhat if falling property values force the County to lower assessed valuations. Parcel tax revenues are stable. | Requires 2/3 vote. | Can cover all types of costs, including O&M. |
| Benefit Assessment | Good nexus between payment and contribution to runoff from private property. Must assume that responsibility for runoff from streets is proportion to runoff from private property. | Can vary to fit well with the existing funding sources of the cities to guarantee that all resi- dents pay their fair share. Assessments could vary between watersheds. | Revenues are very stable. | Requires half of weighted vote of property owners. Large properties could defeat the vote. | May not cover the costs of general benefits, which could be much of the total. |
| Utility Fee | Good nexus between payment and contribution to runoff from private property. Must assume that responsibility for runoff from streets is proportion to runoff from private property. | Can be varied to fit well with the existing funding sources of the cities to guarantee that all resi- dents pay their fair share. The fees could vary between watersheds. | Revenues are very stable. | Requires either half vote of property owners or 2/3 vote of the general electorate. | May not be used for general government services, but will likely cover more than assessments. |

### State Funding Strategy

Voters of the State of California have passed a number of statewide water and watershed funding measures in the past several years including Propositions 12, 13, 40, 50, and most recently Proposition 84, which has provided significant IRWMP funding. The IRWMP LC was formed because of the funding available through the state and has acknowledged that future statewide funding could play a significant role in meeting the planning targets. The following activities are recommended as a part of a state funding strategy.

- Evaluate and apply for existing State Funding opportunities such as:
  - Pursue Proposition 84, Round 3, grant applications for IRWMP project implementation;
  - Evaluate other statewide funding opportunities including Bay-Delta watershed program grants.
- Participate in crafting and/or providing leadership of Future Statewide Funding measures including:
  - Participate in statewide discussions regarding the future of the IRWM Program;
  - Identify appropriate representatives for the IRWMP LC in discussions on development and interpretation of the language in any draft or final funding measures.
- Perform partnering activities such as:
  - Identify key statewide stakeholders;
  - Meet with stakeholders to promote state funding plan and partnerships;
  - Compile feedback from stakeholders, revise funding plan based on stakeholders' input.

### Federal Funding Strategy

Local agencies and jurisdictions seeking federal funding opportunities and federal agencies may provide opportunities to fund IRWMP projects. While no definitive funding plan has been developed to date; a description of potential funding sources for implementation of IRWMP projects is identified in Table 7-5.

## Funding Plan

The GLAC Region has demonstrated a history of effectively managing the Region to promote the IRWM program goals. The GLAC Region is committed to continuing to providing the necessary resources to further both the O&M and Projects Programs of the IRWM. These resources will be provided by the LC and SC member agencies including those elected to serve as Chairs, Vice-Chairs and Administrating agencies/organization. These IRWMP agencies/organizations can only be elected into membership roles if they are willing to provide the necessary in-kind staff time as required to fulfill the activates described in the Plan.

If the Region wishes to pursue additional IRWM planning activities, a funding plan specific to those activities would be determined at that time.

The funding required to implement the projects included as part of the GLAC IRWM Plan is not described here since each project has its own unique funding plan. Projects cannot be included as part of the IRWM without a funding plan for their implementation. Current individual project funding information is available in the project database webpage (www.lawaterplan.org) as part of each project's information report.

| Table 7-5. Potential Sources of Monetary Funding to Implement IRWMP Projects | | | |
|---|---|---|---|
| | Sources | Expected Contribution | **Targeted Beneficiaries** |
| Local | • Existing Capital Improvement Budgets<br>• Local sales tax<br>• Bond and associated property tax<br>• Utility fee or benefit assessment based on use of the property<br>• Utility fee or benefit assessment based on total area and impervious area<br>• Gasoline tax<br>• Water sales<br>• Parcel tax | High<br>(50%-100%) | Region's residents, environment, and economy |
| State | • Competitive grants<br>• Appropriations<br>• State-wide Assessments | Moderate<br>(10-50%) | Statewide environment and economy |
| Federal | • Appropriations<br>• Competitive grants | Moderate<br>(10-50%) | Areas of national environmental or economic significance |
| Others | • Individual and corporate donors<br>• Foundations and other non-profit organizations | Low<br>(<10%) | Particular communities or targeted interests in the Region |

# APPENDIX A

A. Greater Los Angeles County IRWM Memorandum of Understanding and Operating Guidelines

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Memorandum of Understanding for
Integrated Regional Water Management Planning and
Implementation

This Memorandum of Understanding (MOU) is entered into by and among the following entities which are members of the Greater Los Angeles County Region Integrated Regional Water Management Plan Leadership Committee for the purpose of developing, administering, updating and implementing an Integrated Regional Water Management Plan for the Greater Los Angeles County Region: Cities of Las Virgenes Municipal Water District, Los Angeles, Malibu, Torrance, City of Los Angeles Department of Water and Power, Council for Watershed Health, Los Angeles County Flood Control District, Main San Gabriel Basin Watermaster, Metropolitan Water District of Southern California, Raymond Basin Management Board, Rivers and Mountains Conservancy, San Gabriel Basin Water Quality Authority, Sanitation Districts of Los Angeles County, Santa Monica Bay Restoration Commission, Water Replenishment District, West Basin Municipal Water District. Signatories to this MOU shall hereinafter be referred to individually as "Party" or collectively as "Parties."

RECITALS

WHEREAS, it is in the interests of the Parties, and the region served by the Parties, that the water resources the Parties share in common are responsibly managed, protected, and conserved to the extent feasible; and,

WHEREAS, most of the Parties entered into an MOU in 2008 to coordinate and share information concerning water resources management planning programs and projects and other information for grant funding and Integrated Regional Water Management Plan (IRWMP) implementation, and to improve and maintain overall communication among the Parties which is set to expire on December 31, 2012.

WHEREAS, the Parties desire to enter into a new MOU to continue as a Regional Water Management Group (RWMG) to develop, administer, update and implement an IRWMP for the Greater Los Angeles County Region (defined in Exhibit A and hereinafter referred to as GLAC IRWM Region), in accordance with the Integrated Regional Water Management Planning Act of 2002, Division 6, Part 2.2 of the California Water Code as such Act may be amended hereafter.

NOW, THEREFORE, it is mutually understood and agreed as follows:

The recitals set forth above are incorporated herein and constitute a part of the MOU among the Parties.

Upon the effective date of this MOU, the RWMG is hereby continued and includes each of the Parties.

## SECTION 1: PURPOSES AND GOALS

1.1 Purposes and Goals:

The Parties desire to continue to coordinate and share information concerning water resources management planning programs and projects and other information for grant funding and IRWMP implementation, and to improve and maintain overall communication among the Parties. It is anticipated that coordination and information sharing among the Parties will assist the agencies in achieving their respective missions and contribute to the overall well-being of the GLAC IRWM Region. It is expected that all Parties will cooperate and coordinate with one another in order to achieve these goals.

## SECTION 2: JOINT AGENCY PLANNING FOR PROJECTS AND PROGRAMS

2.1 Projects and Programs:

It is the intent of the Parties that they coordinate and collaborate as a RWMG to develop and implement projects and programs. Such coordination can achieve greater benefits than single purpose projects. Applicable projects and programs include, but are not limited to, the following:

2.1.1 An IRWMP for the GLAC IRWM Region.

2.1.2 Solicitation of external funding for implementation of the IRWMP for the GLAC IRWM Region.

2.2 Formation of the RWMG and Adoption of the IRWMP:

2.2.1 Leadership Committee signatories that execute this MOU shall constitute the RWMG pursuant to Cal. Water Code section 10539. The RWMG shall facilitate the development and implementation of the IRWMP for the GLAC IRWM Region. Adoption of the IRWMP for the GLAC IRWM Region in accordance with the Integrated Regional Water Management Planning Act of 2002 requires a simple majority vote of the RWMG.

2.2.2 The RWMG established by execution of this MOU will serve as the RWMG for the GLAC IRWM Region IRWM Program.

2.3 Operations of the RWMG.

2.3.1 The Parties acknowledge that previously adopted Operating

Guidelines, which serve as the basis for the RWMG's decision-making process, will be reviewed and revisions will be proposed by the RWMG as necessary.

2.4 Endorsement by Other entities.

2.4.1 Other entities are encouraged to endorse this MOU by passing a resolution to demonstrate support for the GLAC-IRWM Region's IRWMP. Such endorsements do not obligate said entities beyond the demonstration of support for regional water management cooperation. Said entities will not be members of the RWMG or Parties unless they are added by amendment to the MOU upon agreement of Parties.

SECTION 3: GENERAL PROVISIONS

3.1 Term: This MOU shall become effective upon signature or counter-signature of a majority of the Parties and shall expire on December 31, 2017, or upon its replacement by the adoption of a subsequent MOU, Agreement, or Joint Powers Authority Agreement, or unless earlier terminated by mutual written agreement of a majority of the Parties. Any Party may terminate its participation in this MOU upon 60 days' written notice to the remaining Parties.

3.2 Construction of Terms: This MOU is for the sole benefit of the Parties and shall not be construed as granting rights to any person other than the Parties or imposing obligations on a Party to any person other than another Party.

3.3 Good Faith: Each Party shall use its best efforts and work wholeheartedly and in good faith for the expeditious completion of the purposes and goals of this MOU and the satisfactory performance of its terms.

3.4 Governing Law: This MOU is made under and shall be governed by the laws of the State of California.

3.5 Execution: This MOU may be executed in counterparts and the signed counterparts shall constitute a single instrument. The signatories to this MOU represent that they have the authority to bind their respective Party to this MOU.

3.6 Succession: Successor appointees shall sign this MOU prior to being seated on the Leadership Committee.

3.7 Administration: The Chair of the Leadership Committee will be responsible for the ongoing administration of the MOU.

3.8 Financial Commitment: Neither the signing of this MOU nor the adoption by the governing boards of the Parties commits any Party to any financial obligation.

3.9 Severability: The provisions of this MOU shall be deemed severable, and the invalidity, illegality or unenforceability of any provision of this MOU shall not affect the validity or enforceability of any other provisions. In the event any provision of this MOU is found to be invalid, illegal, or unenforceable, the Parties shall endeavor to modify that clause in a manner which gives effect to the intent of the Parties in entering into this MOU.

3.10 This MOU may be amended or modified only by written mutual consent of all Parties that are members of the RWMG at the time of such amendment or modification. No waiver of any term or condition of this MOU or any Party shall be a continuing waiver thereof.

3.11 There may be additional Parties entering into this MOU by amendment. Any MOU amendment adding a new Party or Parties must be approved by all Parties.

3.12 If any provision of the MOU is held, determined or adjudicated to be illegal, void or unenforceable by a court of competent jurisdiction, the Parties agree that the remainder of this MOU shall be given effect to the fullest extent possible.

3.13 Notice: Any correspondence, communication or contact concerning this MOU shall be directed to the following:

Ms. Barbara Cameron
City of Malibu
23825 Stuart Ranch Road
Malibu, CA 90265

Mr. Rob Beste
City of Torrance
20500 Madrona Avenue
Torrance, CA 90503

Mr. Shahram Kharaghani
City of Los Angeles, Bureau of Sanitation
2714 Media Center Drive
Los Angeles, CA 90065

Mr. Dave Pettijohn
City of Los Angeles Department of Water and Power
111 North Hope Street, Room 1460
Los Angeles, CA 90012

Ms. Nancy Steele
Council for Watershed Health
700 North Alameda Street
Los Angeles, CA 90012

Mr. Randall Orton
Las Virgenes Municipal Water District
1232 Las Virgenes Road
Calabasas, CA 91302

Ms. Gail Farber
Los Angeles County Flood Control District
900 South Fremont
Alhambra, CA 91803

Ms. Wendy La
Main San Gabriel Basin Watermaster
725 North Azusa Avenue
Azusa, CA 91702

Mr. Jeffrey Kightlinger
Metropolitan Water District of Southern California
700 North Alameda Street
Los Angeles, CA 90012

Mr. Tony Zampiello
Raymond Basin Management Board
725 North Azusa Avenue
Azusa, CA 91702

Mr. Mark Stanley
Rivers and Mountains Conservancy
100 North Old San Gabriel Canyon Road
Azusa, CA 91702

Mr. Randy Schoellerman
San Gabriel Basin Water Quality Authority
1720 West Cameron Avenue, Suite 100
West Covina, CA 91790

Ms. Grace R. Chan
Sanitation Districts of Los Angeles County
1955 Workman Mill Road
Whittier, CA 90607

Ms. Shelley Luce
Santa Monica Bay Restoration Commission
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Mr. Robb Whitaker
Water Replenishment District of Southern California
4040 Paramount Boulevard
Lakewood, CA 90712

Mr. Richard Nagel
West Basin Municipal Water District
17140 South Avalon Boulevard, Suite 210
Carson CA 90746

3.14 Notice shall be deemed as given upon personal delivery, receipt of fax confirmation, or five days after deposit in U.S. Mail, first-class postage, prepaid, and addressed as set forth above.

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT,
a body corporate and politic

By Christopher Stone
Chief Engineer
for Gail Farber

APPROVED AS TO FORM:

By ________________
for Lauren Dods

RP:sw
P:\wmpub\Secretarial\2012 Documents\Agreements\MOU RWMG 2012_RP Sept 26.docx

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

| APPROVED AS TO FORM: | THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA |
| --- | --- |
| By: M Scully<br>Marcia L. Scully<br>General Counsel | By: [signature]<br>Jeffrey Kightlinger<br>General Manager |
| Date: Dec 11, 2012 | Date: Dec. 18, 2012 |

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

WEST BASIN MUNICIPAL WATER DISTRICT

By ______________________
Richard Nagel, General Manager

APPROVED AS TO FORM:

By ______________________
Steven O'Neill, Counsel for
West Basin Municipal Water District

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

RAYMOND BASIN MANAGEMENT BOARD

By ___ 1-16-12

Anthony C. Zampiello
Executive Officer

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

MAIN SAN GABRIEL BASIN
WATERMASTER

By ______________ 1-12-12
Anthony C. Zampiello
Executive Officer

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

CITY OF TORRANCE
a body corporate and politic

By ______________________
Robert J. Beste
Director of Public Works

APPROVED AS TO FORM:

JOHN L. FELLOWS III
City Attorney

By: ______________________

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

SAN GABRIEL BASIN WATER
QUALITY AUTHORITY,

Date 12/19/12

By ______________________
Kenneth R. Manning
Executive Director

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

Date: 29 November, 2012

Nancy L.C. Steele, D.Env.
Executive Director
Council for Watershed Health

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

RIVERS AND MOUNTAINS
CONSERVANCY
a body corporate and politic

By ______________________
Mark Stanley
Executive Officer

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT,
a body corporate and politic

By ______________________________
Chief Engineer

Date: ____________

APPROVED AS TO FORM:

By ______________________________

WATER REPLENISHMENT DISTRICT OF SOUTHERN CALIFORNIA

By ______________________________
Robb Whitaker, General Manager

Date: ____________

APPROVED AS TO FORM:
LEAL, TREJO APC

By ______________________________
H. Francisco Leal
Attorney for the Water Replenishment District of Southern California

IN WITNESS WHEREOF, the Parties have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

CITY OF MALIBU:

JIM THORSEN, City Manager

Date: 2/11/13

ATTEST:

LISA POPE, City Clerk

(seal)

APPROVED AS TO FORM:

CHRISTI HOGIN, City Attorney

DEPARTMENT OF WATER AND POWER
OF THE CITY OF LOS ANGELES BY
BOARD OF WATER AND POWER COMMISSIONERS
OF THE CITY OF LOS ANGELES

By: 11/30/12 By: ____________________
Legal Counsel Ronald O. Nichols
General Manager

And: ____________________
Barbara E. Moschos
Secretary

AUTHORIZED BY RES. 013 097
NOV 0 6 2012

APPROVED AS TO FORM AND LEGALITY
CARMEN A. TRUTANICH, CITY ATTORNEY

NOV 10 2012

BY ____________________
EDUARDO A. ANGELES
SENIOR ASSISTANT CITY ATTORNEY

IN WITNESS WHEREOF, the PARTIES have executed this Memorandum of Understanding as of the dates opposite their respective signatures.

SANTA MONICA BAY
RESTORATION COMMISSION

By

3/5/13.

Shelley Luce, D.Env.
Executive Director

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**Guidelines for the Operation of the Regional Water Management Group and its Steering Committees for the Greater Los Angeles County Region Integrated Regional Water Management Plan**

**April 2008**

## TABLE OF CONTENTS

## I. Introduction

The intent of the Integrated Regional Water Management program is to encourage integrated regional strategies for the management of water resources, and to provide funding, through competitive grants, for projects that protect communities from drought, improve water reliability, protect and improve water quality, and improve local water security by reducing dependence on imported water.
The decision-making structure for the Greater Los Angeles Region IRWMP includes five sub-regional Steering Committees and a regional Leadership Committee. Each Steering Committee consists of representatives from local agencies and organizations involved in water management and related areas. The Leadership Committee consists of: the Chair and Vice-Chair of each Steering Committee; the Chief Engineer or another representative from the LA County Flood Control District; and five Water Management Area representatives, one for each water management area. The five Water Management Areas are surface water, groundwater, sanitation, stormwater and open space.

## II. Sub-Regional Steering Committees

Each of the five sub-regions of the Region's IRWM planning area, as identified on Exhibit A, will be guided by a Steering Committee consisting of representatives of agencies or organizations (entity(ies)) involved in local water management and related areas. To the extent feasible, the formation and composition of each Steering Committee will be consistent with the following:

### a. Formation

1. The entities will represent at least one of the following Water Management Areas: groundwater, surface water, storm water management/water quality, sanitation, and habitat/open space/recreational access.

2. Steering Committees should strive to include at least one representative organization for each of the Water Management Areas and appropriate city representation.

3. Each entity will designate a member(s) and alternate to represent it on the Steering Committee.

4. It is desirable, but not required, that the member and alternate designated by each entity should be an executive level representative. Each member will serve at the pleasure of the appointing entity.

5. Each entity must adopt or endorse, as appropriate, the Memorandum of Understanding in order to participate as a voting member of the Steering Committee. Endorsement shall be accomplished by providing

a resolution of support of the Memorandum of Understanding from the authorized representative of the entity.

6. Each Steering Committee member shall have one vote. The presence of a simple majority of the Steering Committee members at any meeting of the Steering Committee shall constitute a quorum for the purposes of conducting business. The affirmative vote of a quorum of the Steering Committee members is required for all decisions and recommendations of the Steering Committee.

7. The members of the Steering Committee will elect from among themselves a Chair of the Steering Committee. The Chair will serve at the pleasure of the Steering Committee and will serve on the Leadership Committee.

8. The members of the Steering Committee will elect from among themselves a Vice-Chair to preside over meetings of the Steering Committee in the absence of the Chair. The Vice-Chair will serve at the pleasure of the Steering Committee and will serve on the Leadership Committee.

9. Each Steering Committee will select an alternate for the Chair to serve on the Leadership Committee with voting rights in his/her absence and an alternate for the Vice-Chair to serve on the Leadership Committee with voting rights in his/her absence. The selection process for the alternates will be established by each Steering Committee.

10. The Steering Committee will nominate one representative for each Water Management Area, without geographic consideration, for consideration to serve on the Leadership Committee.

11. Each Steering Committee may, as appropriate, include Ex-Officio members.

12. Entities wishing to join a Steering Committee shall submit a written request to the Steering Committee Chair. The written request will be presented to the Steering Committee for deliberation and a vote. A majority vote of the Steering Committee is required to add members.

13. The Steering Committee may establish a membership size limitation.

14. A Steering Committee may request a participating entity replace their representative for failure to participate.

15. In addition to the above, individual Steering Committees may adopt rules for their formation and participation.

**b. Roles and Responsibilities**

The Steering Committees will have the following roles and responsibilities:

1. Represent the interests of the sub-region.

2. Meet monthly or as required to accomplish their purpose in developing the IRWM Plan, evaluating proposed projects and conducting necessary business. The Steering Committee Chair may call meetings as needed.

3. Establish, as necessary, sub-committees charged with studying, investigating and soliciting information that will advance the development, implementation and administration of the Plan and/or other areas of business. Sub-committees will be subject to the oversight of the Steering Committee and no recommendation or finding of a sub-committee will be binding upon the Steering Committee. Sub-committee size and composition will be determined by the Steering Committee, and sub-committee members may be selected from any representative of any Steering Committee agency or organization, or any appropriate stakeholder.

4. Identify reliable and long-term funding for the implementation of the Plan and the projects described in the Plan from sources, including local, state and federal funding, and pursue funds from these sources. Steering committee members will also lend individual support to efforts to apply for and procure such funds, to the extent that each entity is able. Steering Committee members may also choose to contribute funds to support any and all phases of the work to be performed for development and implementation of the Plan.

5. Prepare periodic reports to its member agencies, organizations and stakeholders describing the progress of the development, implementation and administration of the Plan.

6. Share to the extent not otherwise prohibited by law, privilege, or previous lawful agreement, all information required to develop, prepare, implement and administer and submit documents for the Plan , including monitoring data, Computer Assisted Drawing and Design (CADD) and Geographic Information Systems (GIS) or other electronic data. Such sharing shall be subject to any applicable license agreements or other restrictions. All data shared among the entities shall be provided "as is" and without warranties as to accuracy or as to any other characteristics, whether expressed or implied. The intent of this data-sharing provision is to facilitate the development, implementation and administration of the Plan, and not to authorize use of this data for tasks unrelated to the Plan, unless deemed appropriate by the Steering Committee.

7. Adopt fiscal procedures as necessary to administer funds that may be received for purposes of development, administration and/or implementation of the Plan.

8. To the extent feasible, make all meetings of the Steering Committee open to the public and post meeting notices on a designated website.

9. Provide outreach to local entities and communities to ensure adequate input from all stakeholders.

10. Maintain a sub-regional prioritized project list and ensure that the Leadership Committee's master list of prioritized projects is current.

11. Maintain a list of sub-regional goals and priorities as appropriate.

12. Track progress on sub-regional goals and planning targets (where applicable).

13. Identify and sponsor sub-regional planning studies as needed.

14. Work with the Leadership Committee to update and implement the plan as required.

15. Participate in the Leadership Committee.

## III. Leadership Committee

### a. Formation

1. The Leadership Committee will serve as the Regional Water Management Group for the Region. Once comprised, the Leadership Committee will consist of the Chief Engineer of the Los Angeles County Flood Control District or his/her designee, and the Chairs and Vice-Chairs of each of the five Sub-regional Steering Committees, and five additional members representing each of five Water Management Areas. An Interim Leadership Committee, comprised of the Chair of the Leadership Committee and the Chairs and Vice-Chairs of the five sugregional steering committees, will elect the Water Management Area Representatives from the nominees submitted by the Steering Committees, with one representative selected from each Steering Committee's list of nominees. Water Management Area representatives must meet the minimum qualifications set forth in Attachment A. Once the Water Management Area representatives are added to the Interim Leadership Committee, the body shall constitute the Leadership Committee.

2. The five Water Management Areas are surface water, groundwater, sanitation, stormwater and open space. Each Water Management Area representative will recommend an alternate to serve on the Leadership Committee in his/her absence. The alternate must be approved by the Leadership Committee and must meet the minimum qualifications for Water Management Area Representatives set forth in Attachment A.

3. The Chief Engineer of the Los Angeles County Flood Control District or his/her designee will serve as Chair of the Leadership Committee, at the pleasure of the Leadership Committee.

4. The Leadership Committee will elect an alternate (voting member) as Vice Chair. The Vice Chair will serve at the pleasure of the Leadership Committee in the absence of the Chair.

5. All Leadership Committee member terms will be reviewed every 3 years on a staggered basis, by each sub-region for the Chair and Vice-Chair positions, as illustrated in the table below. The Chair of the Leadership Committee and Chairs and Vice Chairs of the Steering Committees will review the Water Management Area positions every 3 years as illustrated in the table below. Leadership Committee members may serve consecutive terms. The Water Management Area position will rotate its representation to a different sub-region every 3 years. Each Steering Committee will nominate a representative to fill the Water Management Area position which will be reviewed by the 11 members of the Interim Leadership Committee (Chairs, Vice-Chairs, and Leadership Committee Chair) for consideration and appointment.

| **Position** | **Year** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Chair | | | X | | | X | | | X | etc |
| Vice Chair | | X | | | X | | | X | | etc |
| **WMA** | | | | | | | | | | etc |
| Surface Water | X | | | X | | | X | | | etc |
| Sanitation | X | | | X | | | X | | | etc |
| Groundwater | X | | | X | | | X | | | etc |
| Stormwater | X | | | X | | | X | | | etc |
| Open Space | X | | | X | | | X | | | etc |

6. Each entity serving on the Leadership Committee members must sign the Memorandum of Understanding. Any Leadership Committee member that withdraws from the Leadership Committee/Regional Water Management Group in writing or consistently fails to participate (as deemed by majority decree of the Leadership Committee) effectively withdraws their agency from the MOU.

7. The presence of a simple majority of the Leadership Committee members at any meeting of the Leadership Committee will constitute a quorum for the purposes of conducting business. The affirmative vote of a quorum of the Leadership Committee is required for all decisions and recommendations of the Leadership Committee.

8. The Leadership Committee may include Ex-Officio members.

**b. Roles and Responsibilities**

The Leadership Committee will have the following roles and responsibilities:

1. Form Subcommittees and work groups as necessary to achieve the objectives of the IRWMP.

2. Meet monthly or as required to accomplish its purpose in developing the IRWM Plan and conduct necessary business. The Leadership Committee Chair may call meetings as needed.

3. Establish, as necessary, subcommittees charged with studying, investigating and soliciting information that will advance the development, administration, and implementation of the Plan. The subcommittees will be subject to the oversight of the Leadership Committee and no recommendation or finding of a subcommittee will be binding upon the Leadership Committee. Sub-committee size and composition will be determined by the Leadership Committee, and Subcommittee members may be selected from any representative of the various Steering Committee entities or any appropriate stakeholder.

4. Identify and pursue funding for the development and administration of the Plan. The Leadership Committee will be responsible for determining the amount of contributions necessary for administration of the plan. Leadership Committee representatives will communicate to their respective Steering Committees the amount of funding needed and will pursue commitments for contributions from Steering Committee members and other stakeholders.

5. Identify reliable and long-term funding for the implementation of the Plan and the projects described in the Plan from sources including local, state and federal, and pursue funds from these sources.

6. Prepare periodic reports for the Steering Committees and stakeholders describing the progress of the development, administration and implementation of the Plan.

7. To share to the extent not otherwise prohibited by law, privilege, or previous lawful agreement, all information required to develop, prepare, implement and administer and submit documents for the Plan, including monitoring data, Computer Assisted Drawing and Design (CADD) and Geographic Information Systems (GIS) or other electronic data. Such sharing shall be subject to any applicable license agreements or other restrictions. All data shared among the parties shall be provided "as is" and without warranties as to accuracy or as to any other characteristics, whether expressed or implied. The intent of this data-sharing provision is to facilitate the development, implementation and administration of the Plan, and not to authorize use of this data for tasks unrelated to the Plan, unless deemed appropriate by the Leadership Committee.

8. Adopt as necessary fiscal procedures to administer funds that may be received for purposes of development, administration and/or implementation of the Plan.

9. Establish a project evaluation framework that is consistent across the Region for the purpose of quantifying project benefits to allow for the categorization and prioritization of projects based on the Water Management Areas and consistent with the Plan.

10. Facilitate the adoption of the Plan by those entities within the Region with responsibility for one or more Water Management Areas.

11. To the extent feasible, make all meetings of the Leadership Committee open to the public and post meeting notices on a designated website.

12. Provide regional oversight to the Greater Los Angeles County Region IRWMP.

13. Track regional progress towards the Greater Los Angeles County Region IRWMP targets.

14. Act as liaison between the State and the Steering Committees.

15. Represent the Region's needs to the State.

16. Provide a balance for sub-regional interests.

17. Provide regional outreach related to the Greater Los Angeles County Region IRWMP.

18. Periodically update the Greater Los Angeles County Region IRWMP.

19. Serve as the Regional Water Management Group in accordance with the Integrated Regional Water Management Planning Act of 2002, Division 6, Chapter 2.2 of the California Water Code, as amended.

## IV. Guidelines for Transparency

The following guidelines have been established to enable participation in the planning effort by all stakeholders and to ensure transparency in decision-making at the Leadership Committee:

1. The Leadership Committee will prepare and circulate agendas in advance of their meetings. The Steering Committees will have an opportunity to discuss those agendas prior to the Leadership Committee meetings where possible.

2. Minutes from Leadership Committee meetings will be posted on the website and distributed to stakeholders.

3. Key action items of the Leadership Committee will be submitted in a simple board letter format such that subsequent interested parties can review and understand the recommendations and actions.

## VI. Guidelines for Funding Contributions

1. The Leadership Committee will determine the budget for ongoing IRWMP operations (funding target). Such operations include but are not limited to consultant support, administrative expenses, special studies, direct costs, etc.
2. The budget shall be determined for multiple years so as to provide participating entities planning information for their own budgetary purposes.
3. All Steering Committees are expected to contribute equally to the funding target. The Chair and Vice Chair of each Steering Committee will be responsible for outreach to Steering Committee members and stakeholders in order to obtain the necessary contributions.
4. All Leadership Committee and Steering Committee members will be expected to contribute towards the funding target established by the Leadership Committee based on their ability to pay. Leadership Committee and Steering Committee members are also expected to assist in outreaching to local entities for funding contributions.

5. If extenuating circumstances prevent a Steering Committee from raising its portion of the funding target, the Chair and Vice Chair of the Steering Committee may appeal to the Leadership Committee for an exception to the funding target.
6. The Leadership Committee and Steering Committees will seek planning grants and other sources of funding as available to offset the amount of Steering Committee member contributions or contributions from other entities.

## Attachment A
## Water Management Area Minimum Qualifications

| Greater Los Angeles County Integrated Regional Water Management Region | | |
|---|---|---|
| **Water Management Area (WMA) Representation Minimum Requirements** | | |
| **WMA** | **Minimum Years Of Experience** | **Description** |
| Groundwater | Five + | · Experience in one of the following groundwater areas: remediation, supply, management and/or storage.<br><br>· Educational background or equivalent work experience in engineering, natural sciences, land use management, conservation, or other water resource-related field.<br><br>· Must not have competing or conflicting groundwater interests within or outside of the Greater L.A. Region. |
| Open Space | Five + | · Experience with habitat, open space and/or recreational issues at a regional level (i.e. across municipal jurisdictions and watershed boundaries).<br><br>· Educational background or equivalent work experience in natural sciences, land use management, conservation, or other water resource-related field.<br><br>· Familiar with the agencies and organizations involved in habitat/open space issues in the LA Region who are likely to be project proponents, land owners or permitters of projects. |
| Sanitation | Five + | · Experience in local or regional agency that provides wastewater collection, treatment, recycling and/or disposal services.<br><br>· Education background and work experience in science, engineering, waste management or related fields. |
| Stormwater | Five + | · Experience in overseeing/managing stormwater pollution abatement projects and knowledge in stormwater programs in multi-watersheds as defined in the Greater Los Angeles Region IRWMP.<br><br>· Educational background or work experience in engineering, environmental science, biology, chemistry, toxicology, microbiology, urban planning or closely related field.<br>· Sound knowledge of NPDES Stormwater Permit and TMDL issues as related to the region.<br>· Experience in taking a major role in regional NPDES stormwater permit and TMDL compliance efforts involving multiple jurisdictions.<br>· Ability to provide a regional perspective on stormwater and water quality issues. |
| Surface Water | Five + | · Expertise in the planning, design and construction, financing, and operations of water works facilities which includes storage |

| | | |
|---|---|---|
| | | reservoirs, transmission and distribution systems, pumping plants, water treatment, water conservation, system optimization particularly as it effects power usage.<br><br>· Education background or work experience in engineering, urban planning, environmental studies or related fields.<br><br>· Sound knowledge of existing and emerging regulations as well as environmental matters and familiarity with California water law and regulations.<br><br>· Knowledgeable of the roles of federal, state and local governmental agencies involved in either the regulation of or the operation of waters supply facilities as well as familiarity with key nongovernmental agencies that influence the operations of water systems.<br><br>· Experience in the acquisition of water rights. |

| **General Minimum Qualifications for all WMA Representatives** |
|---|
| · Familiar with the Region's IRWMP, its decision making structure, the committee members, goals and targets, and specific issues, challenges and potential solutions related to the specific WMA on a regional scale.<br><br>· Must be able to represent regional Interests in the Greater Los Angeles County Region.<br><br>· Must be able to attend and participate in Leadership Committee meetings. |

# APPENDIX B

## B. Project Selection Worksheet (Worksheet A)

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# Worksheet A

## Criteria for Inclusion of Projects in OPTI IRWM Plan

Reviewer Name:

Project Title and #:

**Stage I: Does the project meet basic information criteria that should allow it to be in the OPTI data base for general public viewing?**

Is the project a useful conceptual project which addresses IRWM objectives and targets?  The information that must be provided is shown with a single asterisk on the project form.  If yes, the project will be accepted into the database for public viewing assuming basic information on the project concept is included and certain questions are answered affirmatively.  (There will be a special designation for conceptual projects.)  Or, alternatively, see Stage II.

**Stage II:  Does  the Project meet criteria that should allow it to be included in the IRWM Plan?**

Are key elements of a project complete enough that the SC can determine that the project will meet DWR requirements and GLAC Region IRWM objectives and targets, and that it is implementable either in the short or long term?  The information that must be provided is shown with a double asterisk on the project form.

| # | DWR General Plan Requirement/ Key Steering Committee Criteria | OPTI source of information | Score | Added explanations and comments |
|---|---|---|---|---|
| **1.** | The project contributes to the IRWM Plan Objectives<br>(page 46 Draft Guidelines Appendix C) | At least one item is selected under the “Benefits” section of the “Benefits” tab | ☐ Not Addressed<br>☐ Fully Addressed | |
| **2.** | Explain how the project is related to resource management strategies. Does the Project contribute to the diversification of the water management portfolio? If so, how?<br>(page 46 Draft Guidelines Appendix C)<br>Project includes one or more of the following elements<br>• Water supply reliability<br>• Stormwater capture, storage, cleanup, treatment, management<br>• Removal of invasive, non-natives, creation and enhancement of wetlands, acquisition, protection and restoration of open space and watershed lands<br>• Non-point source pollution reduction , management, monitoring<br>• Groundwater recharge and management<br>• Contaminant and salt removal through reclamation, desalting, and other treatment tech, and conveyance of reclaimed water for distribution<br>• Water banking, exchange, reclamation and improvement of water quality<br>• Planning and implementation of multipurpose flood management programs,<br>• Watershed protection and management<br>• Drinking water treatment and distribution,<br>• Ecosystem and fisheries restoration and protection | Identified under any of the items in the “Benefits” tab under “Resource Management Strategies”. | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |

| # | DWR General Plan Requirement/ Key Steering Committee Criteria | OPTI source of information | Score | Added explanations and comments |
|---|---|---|---|---|
| **3.** | Technical feasibility is addressed –<br>Is there enough known about the geologic conditions, hydrology, geology of the project location? Is critical information missing? Will the methods, materials, equipment proposed result in a successful outcome (will the benefits claimed be actualized?)<br>(page 47 Draft Guidelines Appendix C) | All required items under “Feasibility” tab completed. | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |
| **4.** | Addresses whether there are specific benefits to DAC community water issues<br>(page 47 Draft Guidelines Appendix C) | DAC identified under “Other Considerations” tab | ☐ Yes<br>☐ No | |
| **5.** | Addresses whether there are specific benefits to critical water issues for Native American tribal communities<br>(page 47 Draft Guidelines Appendix C) | Native American tribal communities benefits identified under “Other Considerations” tab | ☐ Yes<br>☐ No | |
| **6.** | Addresses whether environmental justice considerations are applicable<br>(page 47 Draft Guidelines Appendix C) | Identified under “Other Considerations” tab | ☐ Yes<br>☐ No | |
| **7.** | Costs and financing are included<br>The basis for the project costs needs to be documented in the IRWM Plan. Are the funding sources discussed?<br>(page 47 Draft Guidelines Appendix C) | All required items under “Cost” tab are completed. Also review funding sources question. | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |

| # | DWR General Plan Requirement/ Key Steering Committee Criteria | OPTI source of information | Score | Added explanations and comments |
|---|---|---|---|---|
| **8.** | Project's economic feasibility is addressed<br><br>**A preliminary economic analysis must be included as part of the criteria in project selection based on studies within the last five years and updated to most current data available. The method used must include the types of benefits and types of costs including capital costs, O&M costs, and potential adverse effects to others from the project (see Guidebook pages 14 and 22.)**<br>(page 47-48 Draft Guidelines Appendix C) | Reasonable amount of project costs already funded under "Cost" tab. | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |
| **9.** | Project timing and status is addressed<br><br>Projects do not necessarily have to be ready to proceed to be included in the Plan, however some funding sources may require a specific timeframe<br>(page 48 Draft Guidelines Appendix C) | Project status and start date addressed under "Feasibility" tab. | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |
| **10.** | Climate change adaptation addressed<br>(page 48 Draft Guidelines Appendix C) | "Climate Change/Greenhouse Gas Emission Reduction" Section under "Other Considerations" tab | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |

| # | DWR General Plan Requirement/ Key Steering Committee Criteria | OPTI source of information | Score | Added explanations and comments |
|---|---|---|---|---|
| **11.** | GHG emissions are considered (page 48 Draft Guidelines Appendix C) | "Climate Change/Greenhouse Gas Emission Reduction" Section under "Other Considerations" tab | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |
| **12.** | Project proponent has adopted or will adopt the IRWM Plan | Identified under "Other Considerations" tab | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |
| **13.** | Project will reduce dependence on Delta for water supply | "Water supply/ groundwater" selected as a benefit under the "Benefits" tab. | ☐ Not Addressed<br>☐ Partially Addressed<br>☐ Fully Addressed | |

Once scored, projects should be reviewed for **strategic considerations:**

1. Are there geographically adjacent projects that should be recommended for integration?
2. Are there projects that should be considered for integration based on similar technical objectives

The objective here is to use the regional perspective to leverage any efficiency that might be gained by combining or modifying local projects into regional projects. The Leadership committee must consider the project's merit in light of strategic aspects of plan implementation such as:

- Purposely restructuring or integrating projects
- Purposely implementing a project as is
- Purposefully meeting project goals with an alternative project/modified project
- Plan objective priorities

- Purposefully implementing regional projects
- Purposefully implementing projects with multi-benefits

The attached agency/organization eligibility questionnaire should be sent to each project proponent to determine whether their agency/organization will be eligible for grant funding, and should be included in the committee's consideration of project prioritization.

Based on SC evaluation to the the responses above, The Steering Committee will direct their Regional Administrator to:

1. Accept the project in OPTI, recommend to the Leadership Committee for inclusion in the Plan as an IRWM project, and/or
2. Ask the project proponent for additional information and provide a due date for that response, and review the project again once the information is received for consideration in the upcoming grant cycle.

# APPENDIX C

## C. Notice of Intent to Update the IRWM Plan

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## GREATER LOS ANGELES COUNTY
## INTEGRATED REGIONAL WATER MANAGEMENT GROUP

## NOTICE OF PUBLIC HEARING

## NOTICE OF INTENT TO UPDATE THE GREATER LOS ANGELES COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

Notice is hereby given that the Greater Los Angeles County Integrated Regional Water Management (GLAC IRWM) group intends to update the GLAC IRWM Plan and will conduct a public hearing concerning the GLAC IRWM Plan update on May 22, 2013, at 9:30 a.m. in the Board Room, 17140 S. Avalon Blvd., Suite 210, Carson, CA 90746. Interested persons will be given an opportunity to review the IRWM Plan Update.

The GLAC IRWM group has received funding to provide a comprehensive update of the GLAC IRWM Plan. IRWM Plans are regional plans designed to improve collaboration in water resources management. The first IRWM Plan for GLAC IRWM was published in 2006 following a multi-year effort among water retailers, wastewater agencies, stormwater and flood managers, watershed groups, the business community, tribes, agriculture, and non-profit stakeholders to improve water resources planning in the Los Angeles Basin.

The GLAC IRWM group is currently updating the 2006 GLAC IRWM Plan to comply with new State integrated planning requirements, improve the content, and make the group eligible for future grant funding. The 2006 GLAC IRWM Plan provided a mechanism for: 1) coordinating, refining and integrating existing planning efforts within a comprehensive, regional context; 2) identifying specific regional and watershed-based priorities for implementation projects; and 3) providing funding support for the plans, programs, projects and priorities of existing agencies and stakeholders. The 2013 GLAC IRWM Plan update allows stakeholders to revisit the Plan’s goals, objectives and priorities in light of changes that have occurred since 2006.

All interested stakeholders are invited to review the GLAC IRWM Plan update. A copy of the GLAC IRWM Plan update is available for public review between 7:30a.m. and 5:00 p.m., Monday through Thursday **(closed on Fridays)** in the office of the Los Angeles County Department of Public Works, 900 S. Fremont Avenue, Alhambra, California 91803 and the following locations:

**City of Los Angeles Department of Water and Power**
111 North Hope Street
Los Angeles, CA 90012
(213) 367-2354

**Las Virgenes Municipal Water District**
4232 Las Virgenes Road
Calabasas, CA 91302
(818) 251-2167

Monday through Friday
8:00 a.m.-5:00 p.m.

Monday through Friday
8:00 a.m.-5:00 p.m.

**Main San Gabriel Basin Watermaster**
725 North Azusa Avenue
Azusa, CA 91702
(626) 815-1300
Monday through Thursday
7:30 a.m.-5:30 p.m.

**Water Replenishment District of Southern California**
4040 Paramount Boulevard
Lakewood, CA 90712
(562) 921-5521
Monday through Friday
9:00 a.m.-5:00 p.m.

**West Basin Municipal Water District**
17140 South Avalon Boulevard
Carson CA 90746
(310) 660-6225
Monday through Friday
8:00 a.m.-5:00 p.m.

The meeting schedule and comment submittal form about the GLAC IRWM Plan update are available on the GLAC IRWM website: www.lawaterplan.org. For more information or Spanish translation, please call Rochelle Paras at (626) 458-3525 between 7:00 a.m. and 5:00 p.m., Monday through Thursday.

El horario de la junta y la forma para sumisión comentario sobre el plan de actualizar el GLAC IRWM es disponible en el sitio web GLAC IRWM: www.lawaterplan.org. Para más información o traducción en Español llame a Rochelle Paras al (626) 458-3525 entre las 7:00 a.m. – 5:00 p.m., de Lunes – Jueves.

**Upon 72 hours' notice, the GLAC IRWM group can provide program information and publications in alternate formats or make other accommodations for people with disabilities. To request accommodations ONLY, or for more ADA information, please contact our ADA Coordinator at (626) 458-4081 or TDD (626) 282-7829, Monday through Thursday, from 7 a.m. to 5:30 p.m.**

# APPENDIX D

## Notice of Intent to Adopt the IRWM Plan

A Notice of Intent to Adopt the GLAC IRWM Plan pursuant to California Water Code section 10543 will be published in February 2014 and proof of publication will be provided at the time of submittal to DWR.

The tentative date for plan adoption by the RWMG is February 26, 2014.

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# E. GLAC IRWMP Water Supply Objective and Targets

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# GLAC-IRWMP

# Water Supply Objective & Targets

## Introduction

The 2006 Greater Los Angeles County (GLAC) Regional Water Management (IRWM) Plan put forth a number of goals related to expanding the use of local supplies in the GLAC Region. The 2012 update to the IRWM Plan maintains the same objective to "Optimize local water resources to reduce the Region's reliance on imported water," but refines the targets which were created in 2006 in order to better track the GLAC Region's progress towards meeting these goals. To do this, targets were created for each subregion, and focus on the following local supply areas: water use efficiency, groundwater, non-potable use of recycled water, indirect potable reuse of recycled water, ocean water desalination, stormwater recharge, and stormwater capture and use.

## Objective

### Optimize local water resources to reduce the Region's reliance on imported water.

## Current Supplies and Demands

The Region's various water supply agencies typically prepare Urban Water Management Plans (UWMPs) every five years in order to project and assess their water supplies and demands. To determine baseline supply and demand levels for the GLAC Region, the supplies and demands for each subregion were compiled from a set of representative agencies' UWMPs. The current supply and demand levels use actual measurements from 2010 for both direct use and replenishment. For the purposes of this process, direct use is defined as above ground water use, and replenishment is defined as water used for groundwater recharge.

Current direct use supplies for each subregion are shown in Table 1, while replenishment supplies are shown in Table 2. Demand projections are in each Subregional Plan and Appendix N. The categories of supply listed in the tables are defined below. The totals have been rounded to the nearest thousand acre-feet per year (AFY).

**TABLE 1: Direct Use Supplies**

- **Water Use Efficiency:** The amount of potable water considered to be "conserved" instead used to meet the same level of demand as would be expected without conservation programs. This water represents a more efficient use of water and decreases the amount of potable water used, but is captured as a form of "Supply" in order to compare against other supplies. This water is a potable water offset and does not include recycled or other non-potable supplies.

- **Groundwater:** The supply made available from the natural and engineered recharge of supply into groundwater aquifers and the subsequent pumping and treatment (if necessary) for potable and non-potable use. This supply includes any groundwater supplies made available from desalination/demineralization and other contaminant treatment. The current recharge of supplies identified in Table 2 that are necessary to meet these current groundwater pumping volumes, are an overlap since the same unit of water is being counted as both recharge supply and groundwater supply. The groundwater targets presented in Table 9 - Table 13, however, do not have the same overlap issue as calculated separately.

- **Stormwater Capture and Direct Use:** The supply made available through the capture of local stormwater and run-off flows for local non-potable use prior to reaching rivers or other water bodies.

- **Surface Water Diversions:** The supply made available from the diversion of supply flows from local streams/rivers/channels into local treatment for potable use.

- **Recycled Water - Non-Potable Reuse (NPR):** The supply made available from the treatment of wastewater effluent for non-potable use. This does not include recycled water supplies for indirect potable reuse supply (which is presented in Table 2) as a form of groundwater recharge.

- **Ocean Water Desalination:** The supply made available from the desalination of ocean water for potable use. This does not include brackish groundwater desalination.

- **Imported Water:** The supply made available by importing water from outside the GLAC Region and treating locally for direct potable use. Does not include imported supplies used for groundwater recharge (which are included in Table 2) nor supplies that are transferred between agencies within the Region.

**TABLE 2: Groundwater Recharge Supplies**

- **Stormwater Recharge:** The supply made available through the diversion of local supply from surface water bodies and the recharge of those supplies into groundwater aquifers for future potable use. Does not include groundwater supplies that would be made available through naturally occurring recharge and subsequent pumping and treatment.

- **Recycled Water - Indirect Potable Reuse (IPR):** The supply made available from the treatment of wastewater effluent and the recharge of that supply into groundwater aquifers for future potable use. Does not include non-potable direct recycled water use nor groundwater supplies that would be made available through naturally occurring recharge and subsequent pumping and treatment.

- **Imported Water Recharge:** The supply made available by importing water from outside the GLAC Region and recharging into groundwater aquifers for future potable use. Does not include imported supplies used directly (in Table 1) nor supplies that are transferred between agencies within the Region.

**Table 1: Current (2010) Direct Use Supplies (AFY)**

| | South Bay | North Santa Monica Bay | Upper San Gabriel and Rio Hondo | Upper Los Angeles River | Lower LA and San Gabriel River | TOTAL |
|---|---|---|---|---|---|---|
| **Water Use Efficiency** | 17,000 | <1,000 | 19,000 | 5,000 | <1,000 | **41,000** |
| **Groundwater** | 53,000 | <1,000 | 199,000 | 90,000 | 270,000 | **612,000** |
| **Stormwater Capture and Direct Use** | 0 | <1,000 | 1,000 | 0 | 0 | **1,000** |
| **Surface Water Diversions** | 0 | 0 | 13,000 | 1,000 | 0 | **14,000** |
| **Recycled Water – Non-Potable Reuse** | 27,000 | 5,000 | 9,000 | 13,000 | 30,000 | **84,000** |
| **Ocean Desalination** | 0 | 0 | 0 | 0 | 0 | **0** |
| **Imported Water** | 405,000 | 35,000 | 101,000 | 286,000 | 117,000 | **944,000** |
| **Total Supply** | **502,000** | **40,000** | **342,000** | **395,000** | **417,000** | **1,696,000** |

**Table 2: Current (2010) Groundwater Replenishment Supplies (AFY)**

| | South Bay[1] | North Santa Monica Bay | Upper San Gabriel and Rio Hondo[2] | Upper Los Angeles River[3] | Lower LA and San Gabriel River[2] | TOTAL |
|---|---|---|---|---|---|---|
| **Stormwater Recharge** | 0 | 0 | 111,000 | 33,000 | 52,000 | 196,000 |
| **Recycled Water – Indirect Potable Reuse** | 8,000 | 0 | 0 | 0 | 41,000 | 49,000 |
| **Imported Water** | 15,000 | 0 | 33,000 | 2,000 | 23,000 | 73,000 |
| **Total Supply** | **23,000** | **0** | **144,000** | **35,000** | **116,000** | **318,000** |

1. 2010 values obtained from the West Basin MWD 2010 Regional UWMP.
2. 2010 values for Upper San Gabriel and Rio Hondo, and Lower LA and San Gabriel River Subregions based on ten-year average recharge as reported in Los Angeles County Flood Control District Hydrologic Reports. Assumed 60% of seawater barrier recharge goes towards supply.
3. 2010 values obtained from the City of Los Angeles 2010 UWMP.

## Targets

The Region's water supply objectives and targets from the 2006 IRWM Plan were revised using a combination of water supply planning and reporting documents, and stakeholder involvement. The 2013 Plan Update preliminary water supply targets were developed using existing documents which focus on current and projected water supply use to determine the potential for expansion of local water supplies and water use efficiency to offset imported water use and meet projected demand. Due to the large number of water suppliers in the GLAC Region, it was necessary to use a variety of documents including: 2010 UWMPs, groundwater adjudication and planning documents, annual watermaster reports, and recycled water master plans.

The initial water supply targets for each subregion were presented for comment to each Subregional Steering Committee during their regular September 2011 meetings. The targets were refined over the next several months, and presented monthly for each Subregional Steering Committee as changes were made. Following this process, a water supply working group was created to provide further comment on the water supply targets at a regional level, and began meeting in November 2011. This working group is made up of water suppliers from each subregion in order to:

- Advise on development of regional water supply objectives and targets for the GLAC IRWM Plan
- Report on current water supply related developments within the Region; advise on if/how to incorporate into the GLAC IRWM Plan Update
- Advise on opportunities for integration of water supply with other water management areas (e.g. water quality/flood, habitat and open space)

This group reviewed the process used to create each subregion's water supply targets, and provided comments to further refine the water supply targets which included revised water supply projections and additional documents to be reviewed. Finally, supply targets were presented to the working group for recommended inclusion in the GLAC IRWM Plan.

## Water Supply Target Methodology

The numeric targets for each subregion were developed through a build-up method that looked at planning and reporting documents from a number of water suppliers, and calculating the projected increased use of supplies compared to supplies used in 2010. Water from suppliers that deliver to more than one subregion is apportioned according to the percentage of service area within each subregion. The supply targets resulting from this process are shown in Table 3, and are intended to be added to current supplies shown in Table 1 and Table 2. The remainder of this TM includes descriptions of how each supply target was developed.

**Table 3: Summary Table of Water Supply Targets by Subregion (AFY)[1]**

| Target | South Bay | North Santa Monica Bay | Upper San Gabriel and Rio Hondo | Upper Los Angeles River | Lower LA and San Gabriel River | TOTAL |
|---|---|---|---|---|---|---|
| **Direct Use Supplies** | | | | | | |
| **Water Use Efficiency** | 38,000 (Table 4) | 6,000 (Table 5) | 17,000 (Table 6) | 37,000 (Table 7) | 19,000 (Table 8) | **117,000** |
| **Groundwater** | 35,000 (Table 9) | 0 (Table 10) | 14,000 (Table 11) | 40,000 (Table 12) | 17,000 (Table 13) | **106,000** |
| **Stormwater Capture and Direct Use** | 6,000 (Table 14) | <1,000 (Table 15) | 6,000 (Table 16) | 7,000 (Table 17) | 7,000 (Table 18) | **26,000** |
| **Recycled Water – Non-Potable Reuse** | 36,000 (Table 19) | 4,000 (Table 20) | 12,000 (Table 21) | 13,000 (Table 22) | 18,000 (Table 23) | **83,000** |
| **Ocean Water Desalination** | 21,000 (Table 24) | 0 (Table 25) | 0 (Table 26) | 0 (Table 27) | 5,000 (Table 28) | **26,000** |
| **Groundwater Replenishment Supplies** | | | | | | |
| **Stormwater Infiltration** | 0 (Table 29) | 0 (Table 30) | 17,000 (Table 31) | 37,000 (Table 32) | 21,000 (Table 33) | **75,000** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Recycled Water – Indirect Potable Reuse** | 13,000 (Table 34) | 0 (Table 35) | 13,000 (Table 36) | 30,000 (Table 37) | 24,000 (Table 38) | **80,000** |

[1] The totals have been rounded to the nearest thousand AFY.

### *Water Use Efficiency*

The water use efficiency target was developed based on the conservation or demand reduction projections reported in the 2010 UWMPs developed by major water suppliers in each subregion. Suppliers reported their projections in one of two ways:

1. As a supply through conservation
2. As a demand reduction through a calculation of gallons per capita per day to meet 20x2020 goals

For those suppliers that reported conservation as a supply, the projection could be used directly in the build-up of a subregional goal. For those suppliers that only calculated a demand reduction in terms of gallons per capita per day, it was necessary to calculate the volume of water to be conserved using the 2035 population as reported in the 2010 UWMPs, and if possible, subtracting the projected increase in recycled water use. The subtraction of recycled water use was necessary as it's possible for water suppliers to use both water use efficiency measures and recycled water to meet 20x2020 goals.

The following tables provide a breakdown of the documents and calculations used to estimate the water use efficiency target for each subregion. The totals have been rounded to the nearest thousand AFY.

**Table 4: South Bay Subregion, Water Use Efficiency Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Santa Monica 2010 UWMP | 148 GPCD (2010) – 141 GPCD (20x2020 goal) = 7 GPCD * 92,124 (2035 population) = 700 AFY |
| West Basin 2010 RUWMP | Conservation projection: 23,632 (2035) – 14,000 (2010) = 9,600 AFY |
| Torrance 2010 UWMP | 172 GPCD (2010) – 141 GPCD (20x2020 goal) = 31 GPCD * 116,804 (2035 population) = 4,100 AFY |
| City of Los Angeles 2010 UWMP (broken down based on area of City of Los Angeles within the subregion) | Conservation projection: 64,368 AFY (2035)-8,178 AFY (2010) * 38% area = 21,400 |
| Beverly Hills 2010 UWMP | 277 GPCD (2010) – 228 GPCD (20x2020 goal) = 49 GPCD * 47,587 (2035 population) = 2,600 AFY |
| **Total South Bay Water Use Efficiency Target** | **38,000 AFY** |

**Table 5: North Santa Monica Bay Subregion, Water Use Efficiency Target Development**

| Water Supplier and Document | Calculation |
|---|---|

| | |
|---|---|
| County of Los Angeles Department of Public Works Waterworks District No. 29 2010 UWMP | 267 GPCD (2010)-257 GPCD (20x2020 goal) = 10 GPCD*25,611 population = 300 AFY (Marina Del Rey population excluded) |
| Las Virgenes MWD 2010 UWMP | 307 GPCD (2010) – 246 GPCD (20x2020 goal)= 61 GPCD *87,811 population = 6,000 AFY * 87% service area in NSMB Subregion = 5,220 AFY |
| **Total North Santa Monica Bay Water Use Efficiency Target** | **6,000 AFY** |

**Table 6: Upper San Gabriel and Rio Hondo Subregion, Water Use Efficiency Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Pasadena 2010 UWMP (60% area in Subregion) | 4,122 AFY (2035) – 0 AFY (2010) = 4,122 AFY |
| Foothill MWD 2010 UWMP (Las Flores WC, Rubio Canon Land-Water Assoc, Kinneloa ID) | Does not include conservation in the UWMP. |
| South Pasadena 2010 UWMP | Conservation included in demand projections<br>182 GPCD (2010) – 146 GPDC (20x2020 goal)= 36 GPCD* 26,410 (2035 population) = 1,065 AFY- 0 (Recycled water volume counted as part of conservation = 1,065 AFY. |
| Alhambra 2010 UWMP | Conservation target already met. (20x2020 goal is 122 gpcd, and 2010 use is 109 gpcd) |
| California American Water Co. 2010 UWMP (not including Baldwin Hills) | Conservation target already met. (20x2020 goal is 187 gpcd, and 2010 use is 176 gpcd) |
| San Gabriel County WD 2010 UWMP | Conservation target already met. (20x2020 goal is 142 gpcd, and 2010 use is 133 gpcd) |
| San Gabriel Valley Water Co. 2010 UWMP | Conservation target already met. (20x2020 goal is 142 gpcd, and 2010 use is 116 gpcd) |
| Arcadia 2010 UWMP | 259 GPCD (2010) – 236 GPDC (20x2020 goal) = 23 GPCD* 59,514 (2035 population) = 1,533 AFY- 644 AFY (Recycled water volume counted as part of conservation = 889 AFY. |
| Azusa Light and Water 2010 UWMP | 179 GPCD (2010) – 168 GPDC (20x2020 goal) = 11 GPCD* 135,000 (2035 population) = 1,663 AFY- 0 AFY (Recycled water volume counted as part of conservation = 1,663 AFY. |
| Three Valleys MWD 2010 UWMP | 27,326 AFY (2035) – 19,199 AFY (2010) = 8,127 AFY |
| Suburban Water Systems 2010 UWMP (San Jose Hills) | 810 AFY (2035) – 0 AFY (2010) = 810 AFY |
| Sierra Madre 2010 UWMP | 255 GPCD (2010) – 210 GPDC (20x2020 goal) = 45 GPCD* 11,099 (2030 population) = 560 AFY- 0 (Recycled water volume counted as part of conservation) = 560 AFY. |
| Monrovia 2010 UWMP | Conservation included in demand projections<br>165 GPCD (2010) – 162 GPDC (20x2020 goal) = 3 GPCD* 40,000 (2035 population) = 134 AFY- 0 AFY (Recycled water volume counted as part of conservation = 134 AFY. |
| Valley County WD 2010 UWMP | Conservation target already met. (20x2020 goal is 118 gpcd, and 2010 use is 110 gpcd) |

| | |
|---|---|
| **Total Upper San Gabriel and Rio Hondo Water Use Efficiency Target** | **17,000 AFY** |

**Table 7: Upper Los Angeles River Subregion, Water Use Efficiency Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| City of Los Angeles 2010 UWMP (broken down based on area within the subregion) | Conservation projection: 64,368 AFY (2035)-8,178 AFY (2010) * 58% area = 32,600 AFY |
| Burbank 2010 UWMP | Currently water use is below their 20x2020 goal (156 GPCD) at 147 GPCD and therefore plan to sustain this level of water use through 2035 = 0 AFY |
| Glendale 2010 UWMP | Currently water use is below their 20x2020 goal (137 GPCD) at 116 GPCD and therefore plan to sustain this level of water use through 2035 = 0 AFY |
| Pasadena 2010 UWMP | 210 GPCD (2010) – 168 GPDC (20x2020 goal)= 42 GPCD*199,562 (2035 population) = 9,400 AFY-1,600 AFY (Recycled water volume counted as part of conservation = 7,800 AFY. 40% of area in ULAR region = 3,100 AFY |
| Las Virgenes MWD 2010 UWMP | 307 GPCD (2010) – 246 GPCD (20x2020 goal)= 61 GPCD *87,811 population = 6,000 AFY * 13% service area in ULAR Subregion = 800 AFY |
| **Total Upper Los Angeles Water Use Efficiency Target** | **37,000 AFY** |

**Table 8: Lower San Gabriel and Los Angeles Rivers Subregion, Water Use Efficiency Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| City of Los Angeles 2010 UWMP (broken down based on area within the subregion) | Conservation projection: 64,368 AFY (2035)-8,178 AFY (2035) * 4% area= 2,200 AFY |
| Long Beach 2010 UWMP | 110 GPCD (2010) - 100 GPCD (20x2020 goal)= 10 GPCD * 508,233 population (2035 population) = 5,700 AFY |
| Fullerton 2010 UWMP | 180 GPCD (2010) - 177.7 GPCD (20x2020 goal)= 2 GPCD * 153,613 (2035) population= 400 AFY |
| Central Basin 2010 RUWMP | Conservation projection: 39,562 AFY (2035) – 17,063 AFY (2010) = 22,500 AFY -11,300 AFY (Recycled Water-NPR) = 11,200 AFY |
| **Total Lower San Gabriel and Los Angeles Water Use Efficiency Target** | **19,000 AFY** |

### *Groundwater Target*

The groundwater target is meant to capture the additional amount that can be supplied from groundwater basins by pumping up to the adjudicated limit by increasing the treatment and/or pumping of groundwater supplies previously considered to be inaccessible or unusable with existing facilities. This target does not include additional pumping that can be made available by additional groundwater recharge above 2010 levels. These groundwater recharge supply targets are described separately by the source of supply in Table 29 - Table 38 so as to avoid double counting of supply as pumped groundwater.

The groundwater targets were developed based on projections provided in Groundwater Basin Master Plans, adjudicated pumping limits in the groundwater basins located in the GLAC Region, 2010 UWMPs, the Metropolitan Water District's Integrated Resources Plan and capacity of planned groundwater quality projects. The groundwater targets for each subregion were calculated in one of three ways:

1. Difference between average pumping and adjudicated limit or allowable pumping limit (APA)
2. Projected increase in pumping between 2010 and 2035 for each water supplier according to 2010 UWMPs
3. Projected additional pumping that could be made possible through construction of groundwater quality treatment facilities

The following tables provide a breakdown of the documents and calculations used to estimate the groundwater target for each subregion. The totals have been rounded to the nearest thousand AFY.

**Table 9: South Bay Subregion, Groundwater Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Santa Monica Basin: City of Santa Monica 2010 UWMP | 7,500 AFY (estimated safe yield) – 2,062 AFY (2010 pumping) = 5,400 AFY |
| West Basin: West Basin MWD 2010 RUWMP (includes all West Basin pumpers) | 64,500 AFY (adjudicated rights) – 35,320 AFY (2010 pumping) = 29,200 AFY |
| **Total South Bay Groundwater Target** | **35,000 AFY** |

**Table 10: North Santa Monica Bay Subregion, Groundwater Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| County of Los Angeles Department of Public Works Waterworks District No. 29 2010 UWMP | Does not pump groundwater |
| Las Virgenes MWD 2010 UWMP | No additional pumping projected |
| **Total North Santa Monica Bay Groundwater Target** | **0 AFY** |

**Table 11: Upper San Gabriel and Rio Hondo Subregion, Groundwater Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Raymond Basin: Raymond Basin Management Board Annual Report, 2009-2010, Table 7 | Raymond Basin is fully adjudicated, and extractions typically meet or exceed the safe yield. |
| Main San Gabriel Basin: Main San Gabriel Basin Watermaster Five-Year Water Quality and Supply Plan | 232,797 AF (2016-2017) – 218,796 AF (2011-12) = 14,000 AF of additional pumping |
| Six Basins: Six Basins Watermaster Annual Report, 2010, Page 3-25 | Six Basins if fully adjudicated, though over the last four years, pumping was on average 700 AFY below adjudicated amount due to low demand and poor water quality. |
| **Total Upper San Gabriel and Rio Hondo Groundwater Target** | **14,000 AFY** |

**Table 12: Upper Los Angeles River Subregion, Groundwater Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Upper Los Angeles River Area Watermaster Annual Report, 2010 (includes San Fernando Basin, Verdugo Basin, Sylmar Basin, Eagle Rock Basin) | 41,484 AFY of groundwater treatment projects are projected out to 2016 |
| Raymond Basin: Pasadena 2010 UWMP | Projected decrease in groundwater production by 1,000 AFY from Raymond Basin |
| **Total Upper Los Angeles River Groundwater Target** | **40,000 AFY** |

**Table 13: Lower San Gabriel and Los Angeles Rivers Subregion, Groundwater Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Central Basin: Groundwater Basins Master Plan, 2012. | Historic pumping in the Central Basin is at approximately 200,000 AFY. Groundwater pumping plans to increase up to APA (217,000 AFY) = 17,000 AFY |
| **Total Lower San Gabriel and Los Angeles Groundwater Target** | **17,000 AFY** |

### *Stormwater Capture and Direct Use Target*

The stormwater capture and direct use target was developed to identify the potential for capturing wet-weather runoff for direct non-potable uses to offset potable water supply use. These targets were developed based on the City of Los Angeles' stormwater capture and direct use estimates provided in the City's 2010 UWMP because they were the only agency to have developed a methodology to estimate potential stormwater capture for direct use. The target was used to create an AFY per square mile estimate that was then applied to the area of each subregion. The City of Los Angeles estimates that by 2035, projects will be in place to capture and directly use 10,000 AFY, which is equivalent to 21 AFY per square mile (where the area of the City of Los Angeles is 469 square miles). The 21 AFY per square mile was then applied to the area of each subregion (less open space areas).

The following tables provide a breakdown of the documents and calculations used to estimate the stormwater capture and direct use target for each subregion. The totals have been rounded to the nearest thousand AFY.

**Table 14: South Bay Subregion, Stormwater Capture and Direct Use Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Subregion-wide | 328 sq mi (total South Bay area) – 32 sq mi (South Bay open space area) = 296 sq mi<br>296 sq mi * 21 AFY/sq mi = 6,216 AFY |
| **South Bay Stormwater Capture and Direct Use Target** | **6,000 AFY** |

**Table 15: North Santa Monica Bay Subregion, Stormwater Capture and Direct Use Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Subregion-wide | 203 sq mi (total North Santa Monica Bay area) – 181 sq mi (North Santa Monica Bay open space area) = 22 sq mi<br>22 sq mi * 21 AFY/sq mi = 462 AFY |
| **Total North Santa Monica Bay Stormwater Capture and Direct Use Target** | **<1,000 AFY** |

**Table 16: Upper San Gabriel and Rio Hondo Subregion, Stormwater Capture and Direct Use Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Subregion-wide | 570 sq mi (total Upper San Gabriel and Rio Hondo area) – 301 sq mi (Upper San Gabriel and Rio Hondo open space area) = 269 sq mi<br>269 sq mi * 21 AFY/sq mi = 5,649 AFY |
| **Total Upper San Gabriel and Rio Hondo Stormwater Capture and Direct Use Target** | **6,000 AFY** |

**Table 17: Upper Los Angeles River Subregion, Stormwater Capture and Direct Use Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Subregion-wide | 582 sq mi (total Upper Los Angeles River area) – 232 sq mi (Upper Los Angeles River open space area) = 350 sq mi<br>350 sq mi * 21 AFY/sq mi = 7,350 AFY |
| **Total Upper Los Angeles River Stormwater Recharge Target** | **7,000 AFY** |

**Table 18: Lower San Gabriel and Los Angeles Rivers Subregion, Stormwater Capture and Direct Use Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Subregion-wide | 360 sq mi (total Lower San Gabriel and Los Angeles Rivers area) – 8 sq mi (Lower San Gabriel and Los Angeles Rivers open space area) = 352 sq mi<br>352 sq mi * 21 AFY/sq mi = 7,392 AFY |
| **Total Lower San Gabriel and Los Angeles Capture and Direct Use Target** | **7,000 AFY** |

### *Recycled Water: Non-Potable Reuse*

The non-potable reuse with recycled water target was developed based on current and projected recycled water use as presented in 2010 UWMPs and Recycled Water Master Plans (RWMP). The non-potable reuse targets for each subregion were calculated in one of three ways:

1. Projected additional recycled water indirect potable reuse between 2010 and 2035 for each water supplier according to 2010 UWMPs
2. Projection additional recycled water indirect potable reuse between 2010 and 2035 according to RWMPs
3. Projected non-potable reuse use from other recycled water planning documents

The following tables provide a breakdown of the documents and calculations used to estimate the indirect potable reuse target for each subregion. The totals have been rounded to the nearest thousand AFY.

**Table 19: South Bay Subregion, Non-Potable Reuse Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| West Basin 2010 RUWMP | 37,382 AFY (2035) - 14,182 AFY (2010) = 23,200 AFY (West Basin RUWMP, Table 3-3). Note: Does not include sales to Los Angeles or Torrance |
| LADWP staff | 13,000 AFY |
| **South Bay Non-Potable Reuse Target** | **36,000 AFY** |

**Table 20: North Santa Monica Bay Subregion, Non-Potable Reuse Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| County of Los Angeles Department of Public Works Waterworks District No. 29 2010 UWMP | Does not produce/use recycled water.<br>The City of Malibu is designing a new wastewater treatment facility in the Civic Center that will provide from 200,000 – 500,000 gpd (220 – 560 AFY), phased from 2016 to 2019. |
| Las Virgenes MWD 2010 UWMP | Projecting increasing in recycled water (NPR) demands from 4,522 AFY (2010) to 9,062 AFY (2035) = 4,540 AFY * 87% area in NSMB = 3,950 AFY |
| **Total North Santa Monica Bay Non-Potable Reuse Target** | **4,000 AFY** |

**Table 21: Upper San Gabriel and Rio Hondo Subregion, Non-Potable Reuse Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Pasadena 2010 UWMP | An increase of 1,130 AFY of non-potable recycled water |
| Upper San Gabriel Valley 2010 RUWMP | Goal to provide the same average volume of non-potable recycled water = no increase. |
| San Gabriel Valley Water Company 2010 UWMP | An increase of 4,985 AFY of non-potable recycled water |
| Three Valleys 2010 RUWMP | An increase of 4,975 AFY of non-potable recycled water |
| Arcadia 2010 UWMP | An increase of 644 AFY of non-potable recycled water |
| **Total Upper San Gabriel and Rio Hondo Non-Potable Reuse Target** | **12,000 AFY** |

**Table 22: Upper Los Angeles River Subregion, Non-Potable Reuse Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Glendale 2010 UWMP | Plans to sustain current recycled water use volume (1,662 AFY) through 2035 = no increase in non potable recycle water production |
| Burbank 2010 UWMP | 5,160 AFY (2035) - 2,000 AFY (2010)= 3,160 AFY |
| LADWP staff | 9,297 AFY |
| Las Virgenes MWD 2010 UWMP | Projecting increasing in recycled water (NPR) demands from 4,522 AFY (2010) to 9,062 AFY (2035) = 4,540 AFY * 13% area in NSMB = 590 AFY |
| **Total Upper Los Angeles River Non-Potable Reuse Target** | **13,000 AFY** |

**Table 23: Lower San Gabriel and Los Angeles Rivers Subregion, Non-Potable Reuse Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Central Basin 2010 RWMP | NPR projections in Central Basin MWD (In CB's Service Area): 17,900 AFY (2035)-6,600 AFY (2010)= 11,300 AFY of NPR water |
| Long Beach 2010 UWMP | NPR projections for Long Beach: 11,000 AFY (2035) – 4,658 AFY (2010) = 6,342 AFY |
| City of Los Angeles staff | 0 AFY |
| **Total Lower San Gabriel and Los Angeles Non-Potable Reuse Target** | **18,000 AFY** |

### *Ocean Water Desalination Target*

Desalinated ocean water is not currently utilized within the GLAC Region; however, two agencies have plans for use of desalinated ocean water as a source of supply according to their 2010 UWMPs. The following tables provide a breakdown of these projections. The totals have been rounded to the nearest thousand AFY.

**Table 24: South Bay Subregion, Ocean Water Desalination Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| West Basin MWD 2010 RUWMP | 21, 000 AFY (20 MGD) |
| **Total South Bay Ocean Water Desalination Target** | **21,000 AFY** |

**Table 25: North Santa Monica Bay Subregion, Ocean Desalination Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| ***No target identified*** | |

**Table 26: Upper San Gabriel and Rio Hondo Subregion, Ocean Water Desalination Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| ***No target identified*** | |

**Table 27: Upper Los Angeles River Subregion, Ocean Water Desalination Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| ***No target identified*** | |

**Table 28: Lower San Gabriel and Los Angeles Rivers Subregion, Ocean Water Desalination Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Long Beach 2010 UWMP: | The desalination plant "will produce from 5,000 to 10,000 AF of potable water per year." |
| **Total Lower San Gabriel and Los Angeles Ocean Water Desalination Target** | **5,000 AFY** |

### *Stormwater Infiltration Target*

The stormwater infiltration target was developed to identify the potential for capturing wet-weather runoff for use as groundwater recharge. These targets were developed using water supply planning documents, stormwater management documents, and through meetings and contact with water suppliers. The stormwater infiltration targets for each subregion were calculated in one of four ways:

1. Estimated as a percentage of runoff that can be captured and recharged according to the average precipitation falling over the subregion
2. Projection of stormwater that can be captured and recharged from centralized stormwater capture projects according to other planning documents
3. Total of potential recharge basin projects provided in the Metropolitan Water District IRP
4. Numbers directly provided by water agency staff

Three dam improvement projects, all located in the Upper San Gabriel and Rio Hondo Subregion, from a planning process by the Army Corps of Engineers were suggested for inclusion in the stormwater target as they would increase the ability to store water for later use as recharge:

- Hansen Dam (3,400 AF)
- Santa Fe Dam (2,400 AF)
- Whittier Narrows Dam (1,100 AF)

However, it is assumed that these dam improvements will provide supply to the spreading ground improvement projects used to calculate the stormwater infiltration targets. To add the dam improvements to the targets would result in double counting.

The following tables provide a breakdown of the documents and calculations used to estimate the stormwater infiltration target for each subregion. The totals have been rounded to the nearest thousand.

**Table 29: South Bay Subregion, Stormwater Infiltration Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| ***No target identified as there is limited recharge potential in the West Coast Basin.*** | |

**Table 30: North Santa Monica Bay Subregion, Stormwater Infiltration Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| ***No target identified as groundwater quantity and quality is limited in the subregion.*** | |

**Table 31: Upper San Gabriel and Rio Hondo Subregion, Stormwater Infiltration Target Development**

| Description | Water Supplier and Document | Calculation |
|---|---|---|
| Centralized Stormwater Recharge | Metropolitan Water District IRP | Total of stormwater project volumes reported within the subregion = 2,900 AFY |
| Decentralized Stormwater Recharge | Water Quality Targets (low priority) | Low priority capture capacity volumes (levels 1, 2, as defined in Appendix F): 4,100 AF + 2,500 AF = 6,600 AF per 0.75-in, 24-hour storm event<br>Assuming 3 storm events per year: 6,600 AF/storm * 3 storms/year = 19,800 AFY<br>Subtract stormwater capture and direct use (Table 16): 19,800 AFY – 5,649 AFY = 14,151 AFY |
| | **Total Upper San Gabriel and Rio Hondo Stormwater Infiltration Target** | **17,000 AFY** |

**Table 32: Upper Los Angeles River Subregion, Stormwater Infiltration Target Development**

| Description | Water Supplier and Document | Calculation |
|---|---|---|
| Centralized Stormwater Recharge | Los Angeles Department of Water and Power staff | 15,000 AFY planned stormwater recharge |
| | Metropolitan Water District IRP (not including LADWP) | 10,000 AFY planned stormwater recharge |
| | | Subtotal: 15,000 AF + 10,000 AFY = 25,000 AFY |
| Decentralized Stormwater Recharge | Water Quality Targets (low priority) | Low priority capture capacity volumes (levels 1, 2): 3,400 AF + 2,900 AF = 6,300 AF per 0.75-in, 24-hour storm event<br>Assuming 3 storm events per year: 6,300 AF/storm * 3 storms/year = 18,900 AFY<br>Subtract stormwater capture and direct use (Table 17): 18,900 AFY – 7,350 AFY = 11,550 AFY |
| | **Total Upper Los Angeles River Stormwater Infiltration Target** | **37,000 AFY** |

**Table 33: Lower San Gabriel and Los Angeles Rivers Subregion, Stormwater Infiltration Target Development**

| Description | Water Supplier and Document | Calculation |
|---|---|---|
| Centralized Stormwater Recharge | Draft Groundwater Basins Master Plan, prepared for WRD | Planned rubber dam projects: Additional 3,600 AFY stormwater capture<br>Spreading ground interconnection pipeline: 1,300 AFY<br>Subtotal: 3,600 AF + 1,300 AFY = 4,900 AFY |
| Decentralized Stormwater Recharge | Water Quality Targets (low priority) | Low priority capture capacity volumes (levels 1, 2): 4,600 AF + 3,200 AF = 7,800 AF per 0.75-in, 24-hour storm event<br>Assuming 3 storm events per year: 7,800 AF/storm * 3 storms/year = 23,400 AFY<br>Subtract stormwater capture and direct use (Table 18): 23,400 AFY – 7,392 AFY = 16,008 AFY |
| | **Total Lower San Gabriel and Los Angeles Stormwater Infiltration Target** | **21,000 AFY** |

### *Recycled Water – Indirect Potable Reuse (IPR) Target*

The recycled water IPR target was developed based on current and projected recycled water use as presented in 2010 UWMPs and RWMPs. The IPR targets for each subregion were calculated in one of three ways:

1. Projected additional recycled water indirect potable reuse between 2010 and 2035 for each water supplier according to 2010 UWMPs
2. Projected additional recycled water indirect potable reuse between 2010 and 2035 according to RWMPs
3. Projected indirect potable reuse use from other recycled water planning documents

The following tables provide a breakdown of the documents and calculations used to estimate the indirect potable reuse target for each subregion. The totals have been rounded to the nearest thousand AFY.

**Table 34: South Bay Subregion, Recycled Water IPR Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| West Basin 2010 RUWMP | Increase in IPR= 20,480 AFY (2035) – 7,797 AFY (2010)= 12,700 AFY of recycled water to augment groundwater in the basin |
| **Total South Bay IPR Target** | **13,000 AFY** |

**Table 35: North Santa Monica Bay Subregion, Recycled Water IPR Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| ***No target is identified as groundwater quality and quantity are limited within the subregion.*** | |

**Table 36: Upper San Gabriel and Rio Hondo Subregion, Recycled Water IPR Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Raymond Basin: Pasadena 2010 RWMP, Table 3-8 | New groundwater recharge with recycled water projects of up to 2,640 AFY were identified. |
| Upper San Gabriel Valley MWD planning | An increase of 10,000 AFY (2045) - 0 AFY (2010) of recycled water to be used for groundwater recharge. |
| Six Basins: No plans found | Service area does not use recycled water for recharge, and does has no intention to use recycled water to augment groundwater in the basin. |
| **Total Upper San Gabriel and Rio Hondo IPR Target** | **13,000 AFY** |

**Table 37: Upper Los Angeles River Subregion, Recycled Water IPR Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Glendale 2010 UWMP | No intention to use recycled water to augment the groundwater basin. |
| Burbank 2010 UWMP | No intention to use recycled water to augment the groundwater basin. |
| City of Los Angeles 2010 UWMP | An increase of 30,000 AFY (2035) – 0 AFY (2010) to augment groundwater in the basin |
| **Total Upper Los Angeles River IPR Target** | **30,000 AFY** |

**Table 38: Lower San Gabriel and Los Angeles Rivers Subregion, Recycled Water IPR Target Development**

| Water Supplier and Document | Calculation |
|---|---|
| Approximate volume of imported water currently recharged in spreading basins which recharge the Central Basin. | An increase in 21,000 AFY of recycled water to augment groundwater in the basin |
| Long Beach 2010 UWMP | An additional 5,000 AFY of recycled water will be produced by Long Beach WD to inject into the sea water barrier. Estimated that 60% contributes to groundwater basin volume = 3,000 AFY |
| **Total Lower San Gabriel and Los Angeles IPR Target** | **24,000 AFY** |


# F. GLAC IRWMP Water Quality Objectives and Targets

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# GLAC-IRWMP
## Water Quality Objectives & Targets

### Introduction

The quality of water is one of the major water resources challenges for the Greater Los Angeles County (GLAC) Region, due in large part to the impact of dry and wet weather flows from heavily urbanized areas, which constitute a significant portion of the Region, and sensitive habitats and recreation demands. Because of this, the Los Angeles Regional Water Quality Control Board (LARWQCB) identified storm water and urban runoff as some of the leading sources of pollutants to waters in Southern California (LARWQCB 2002). Urban runoff-associated pollutants may contribute to a loss of beneficial uses of waterbodies in the Region. For instance bacteria, metals and nutrients have been found to directly impact human and/or ecosystem health, which may lead to significant economic costs in terms of health care, loss of productivity and tourism. This is particularly important for the GLAC Region which is well known for the recreational opportunities afforded by its wealth of natural resources. In addition, and, no less significant, is the negative impact urban runoff can have on the availability of the already-limited usable water supply in the Region.

Efforts to improve the quality of urban storm water runoff and mitigate dry weather flows, therefore, lead to improvements in water quality for water bodies as well as groundwater. This in turn can make these resources available for use as sources of water supply as well as, in the case of surface water, make them more suitable for recreational and habitat purposes.

For the GLAC IRWM Region, water quality targets were set in terms of establishing storm water capture and treatment capacity (i.e. available volume to capture the volume of runoff from the design storm), emphasizing areas identified as having a greater need, in order to address this major source of water quality degradation. These targets and the methodology used to arrive at them are presented in the following sections.

# Goal

*Improve the quality of dry and wet weather runoff to help meet beneficial use requirements for the region's receiving water bodies.*

# Objective

**Develop new stormwater capture capacity[1] (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[2].**

# Targets

Water quality targets for the GLAC IRWM Region were developed based on the goal of capturing and treating (see Footnote 1) runoff generated by a ¾" storm over the entire Region, excluding catchments that were greater than or equal to 98% vacant and less than or equal to 1% impervious, and focusing efforts on higher priority areas. Specifically, when applied to the NSMB subregion with scattered development throughout many subwatersheds, the method used results in an overestimated value of 4,290 AF. A simpler method of multiplying developed area by ¾" was used: the total amount of rain that would fall on the 11% developed area in a ¾" storm is 893 AF. Subject to the 2012 LARWQB's update of the NPDES MS4 Permit conditions, which includes new watershed management planning and coordinated watershed monitoring requirements, these assumptions may be revised.

High priority areas were identified based on weighting of the following inputs: 1) Wet weather priority areas; and 2) areas prioritized based on receiving water drainage.

<u>Wet weather priority areas</u>

Wet weather priority areas were identified using the Structural BMP Prioritization and Analysis Tool (SBPAT) which is a GIS-based decision support tool that may be used to identify optimal areas for placement of stormwater Best Management Practice (BMP) controls (see the SBPAT User's Guide for more information [Geosyntec 2008]). The identification of GLAC IRWM water quality targets utilized the first step of SBPAT, which is catchment prioritization. This step assigns priority

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1 Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75-inch, 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed).

2 High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.

levels to individual catchments in the Region through consideration of catchment-specific characteristics, namely pollutant generation and location.

Pollutant generation is determined based on rainfall, as well as the land use of the catchment, which provides information on average imperviousness, typical pollutants expected to be generated and pollutant Event Mean Concentrations (EMCs), which are concentrations of pollutants expected to be found in runoff from that land use. Location is used to flag those catchments that drain to impaired waterbodies, with catchments draining to waterbodies with approved TMDLs prioritized higher than those draining to waterbodies listed on the 303(d) list[3], which are in turn assigned a higher priority to those draining to waterbodies without impairments.

For purposes of prioritization, the GLAC region was split into major watersheds, with prioritization normalized according to these watersheds. In some Subregions, dividing by major watersheds divided individual Subregions into multiple subareas, however, with the exception of a few catchments, portions of different Subregions were not grouped together for normalization.

Receiving Water Analysis

Since the SBPAT analysis is primarily applicable to wet weather and emphasizes land use as a prioritization metric, an additional layer of analysis was added to give emphasis to dry weather flows as well as impacts to receiving waters.

The receiving water prioritization was based on catchment drainage, by producing maps showing 1) rankings of catchments based on the number of approved TMDLs in the waterbodies to which they drain, 2) rankings of catchments based on the number of 303(d) listings (without approved TMDLs) in the waterbodies to which they drain (see footnote 2), and, for those Subregions that have them, and 3) catchments that drain into "Areas of Special Biological Significance" (ASBS). Through work with each Subregion as well as discussions with the Water Quality Working Group, protection of ASBSs from urban stormwater runoff was identified as a high priority water quality concern. Not all Subregions contain ASBSs, however, so in those that do not contain them, only the first two maps were used to create a composite receiving water prioritization, with each given a weight of 45 and 20 respectively out of a total of 65 possible points. Catchments in Subregions that do contain ASBSs were prioritized by weighting all three maps 45, 20 and 35 out of a total of 100 possible points.

The composite Receiving Water map created from this prioritization scheme is shown in Figure 1.

Composite Prioritization

A final composite map was created by combining the wet weather and receiving water maps (Figure 2) in order to arrive at an overall prioritization for all catchments in the GLAC Region. The wet weather and receiving water analyses were given equal weight in this composite, and, as

[3] 303d impairments resulting from legacy pollutants and natural and non-urban runoff sources, exclusive of bacteria, were excluded from consideration, based on input provided by individual Subregions.

described earlier, catchments that were greater than or equal to 98% vacant and less than or equal to 1% impervious were excluded from the prioritization. Catchments were grouped into quantities and assigned a rank from 1 to 5, with 5 being the highest priority.

The cumulative prioritization map for the GLAC Region is shown in Figure 2, with maps of each Subregion shown in Figures 3 through 7.

IRWM water quality targets are presented in Table 1. As stated above, these targets were calculated based on the goal of creating capture and treatment capacity (see footnote 1) for the ¾" storm across the GLAC Region, excluding undeveloped catchments, and with an emphasis on high priority catchments. It should be noted that these targets do not take into account existing water quality projects or new information learned in water quality studies and new water quality models . Due to the large number of potential existing projects, determining the benefits of existing projects and subtracting them from the overall targets is left to the discretion of individual Subregions.

**Table 1. IRWMP Water Quality Targets**

| Management Capacity (AF/ ¾" storm)[1] | North Santa Monica Bay[2] | Upper Los Angeles River | Upper San Gabriel and Rio Hondo | Lower San Gabriel and Los Angeles Rivers | South Bay | Total |
|---|---|---|---|---|---|---|
| **Total** | **900** | **14,700** | **11,500** | **14,400** | **12,700** | **54,200** |
| **5 (highest priority)** | 310 | 2,500 | 1,600 | 1,700 | 2,800 | 8,910 |
| **4** | 270 | 3,400 | 1,600 | 2,600 | 3,500 | 11,370 |
| **3** | 130 | 2,500 | 1,700 | 2,300 | 2,900 | 9,530 |
| **2** | 100 | 2,900 | 2,500 | 3,200 | 1,900 | 10,600 |
| **1 (lowest priority)** | 90 | 3,400 | 4,100 | 4,600 | 1,600 | 13,790 |

[1]The calculation of ¾" storm capture capacity excludes all catchments greater than or equal to 98% vacant and less than or equal to 1% impervious.

[2] The calculation of North Santa Monica Bay priority ranking was based on modeling done using results from the primary regional method applied proportionally to the total from the alternate method for this subregion.

# References

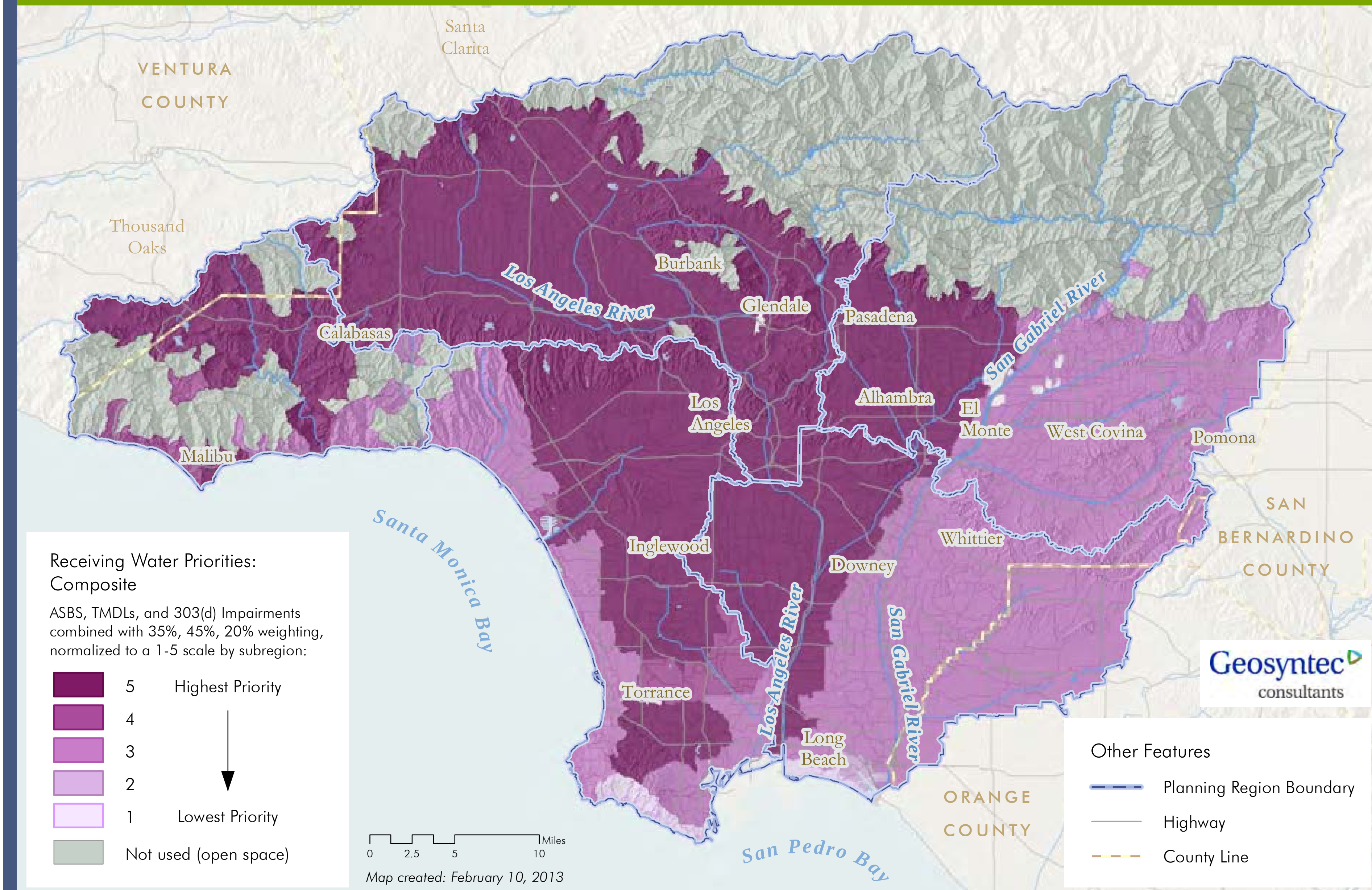
Geosyntec Consultants. 2008. A User's Guide for the Structural BMP Prioritization and Analysis Tool (SBPAT v1.0). December.

Los Angeles Regional Water Quality Control Board (LARWQCB). 2002. Municipal Storm Water Q&A. January

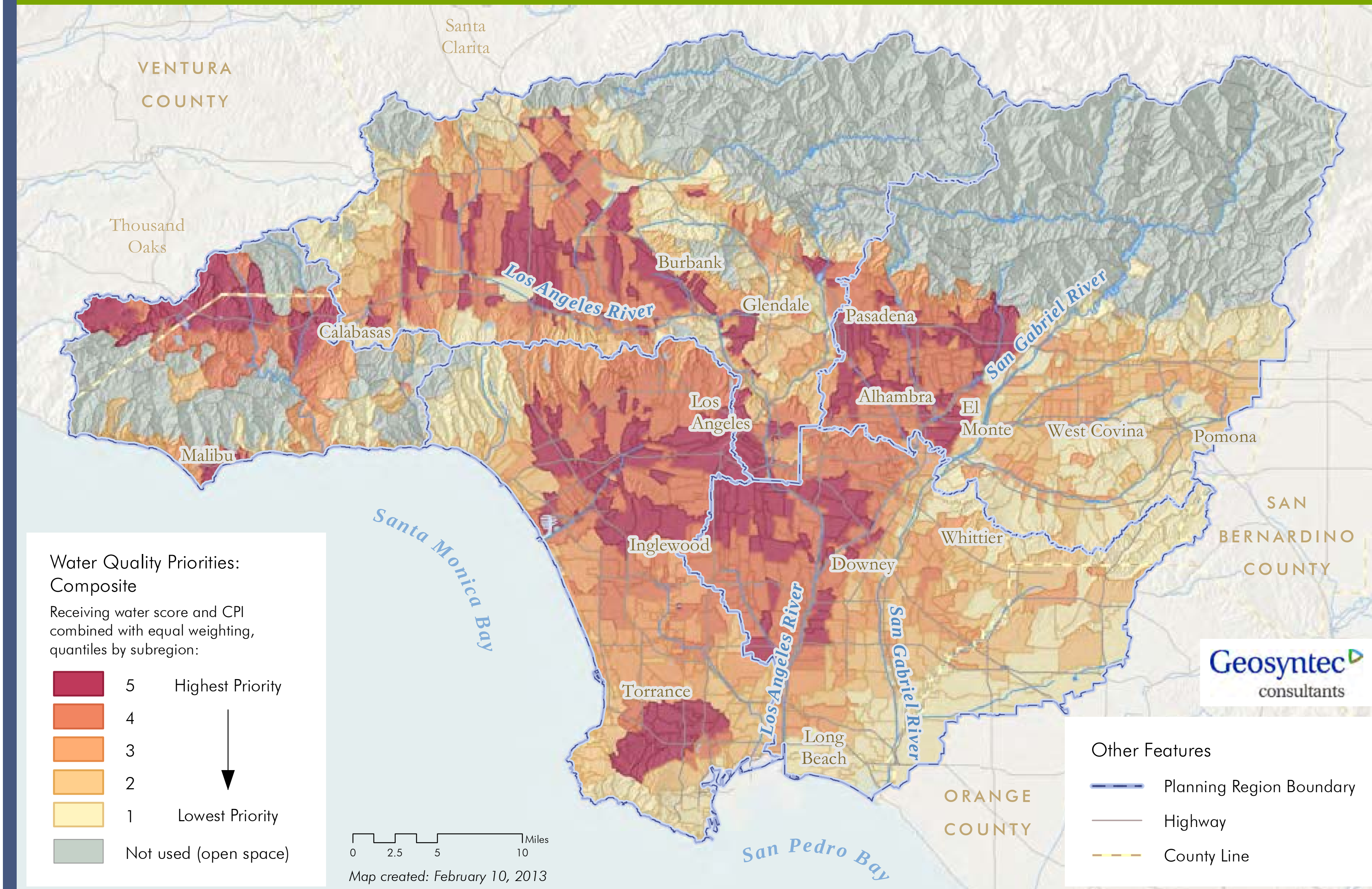
# Exhibit A – Maps of Water Quality Targets by IRWMP Subregion (Figures 1-7)

*Los Angeles Integrated Regional Water Management Plan Update*

# Figure 1: Receiving Water Prioritization: Composite

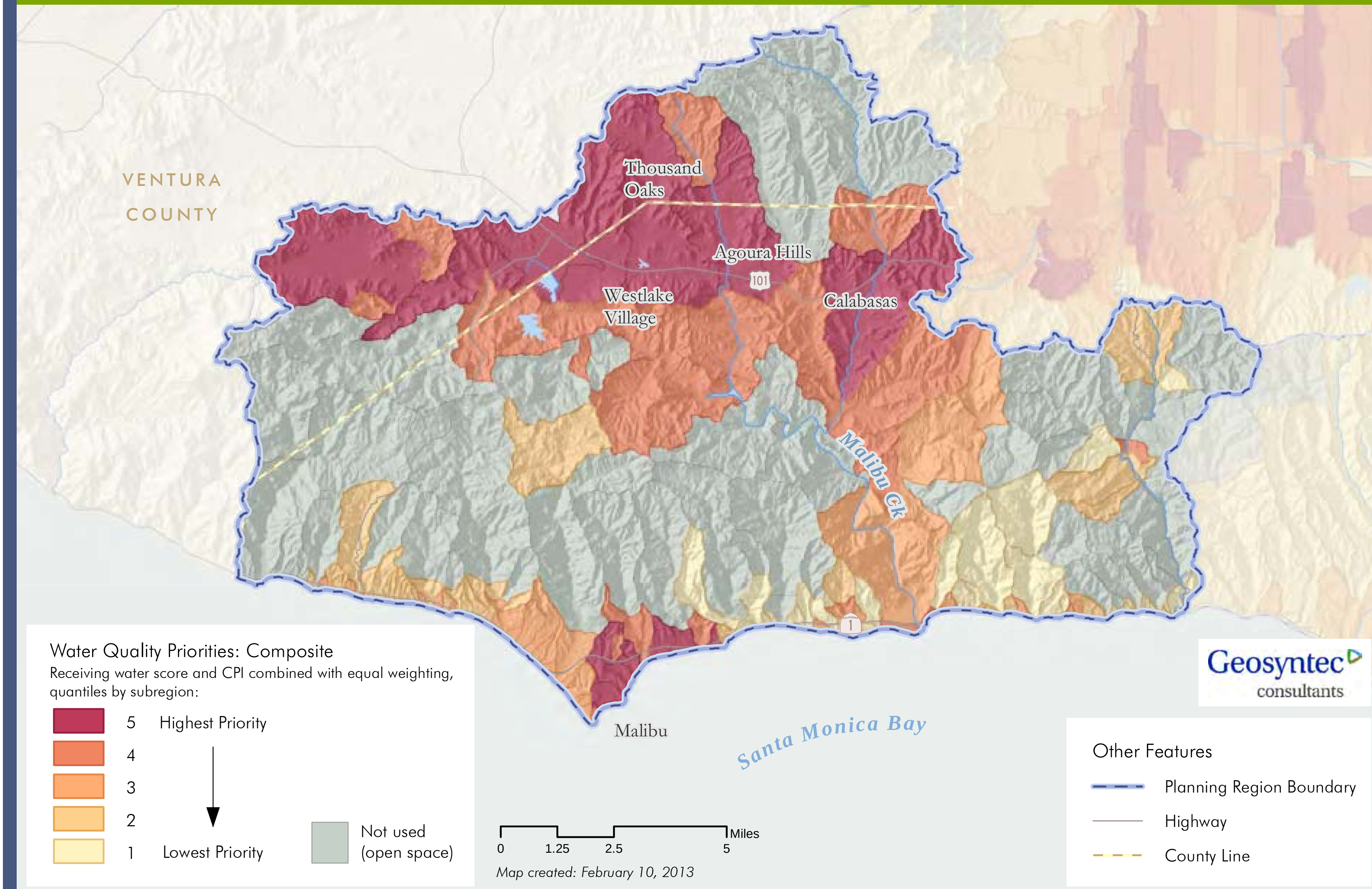


# Figure 2: Water Quality Prioritization: Composite (Equal Weighting)



# Figure 3: Water Quality Prioritization: Composite (Equal Weighting)

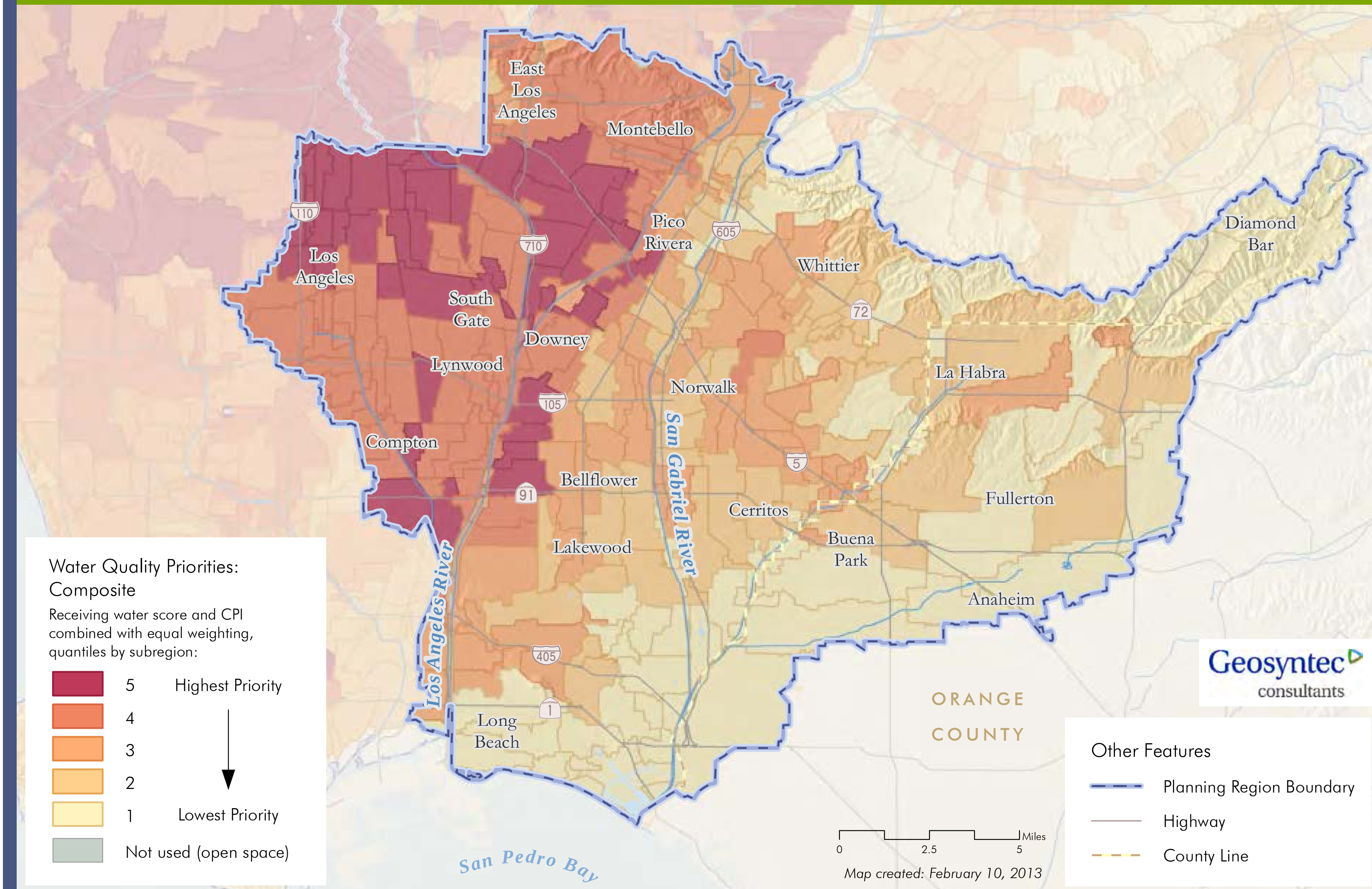
North Santa Monica Bay



*Los Angeles Integrated Regional Water Management Plan Update*

# Figure 4: Water Quality Prioritization: Composite (Equal Weighting)

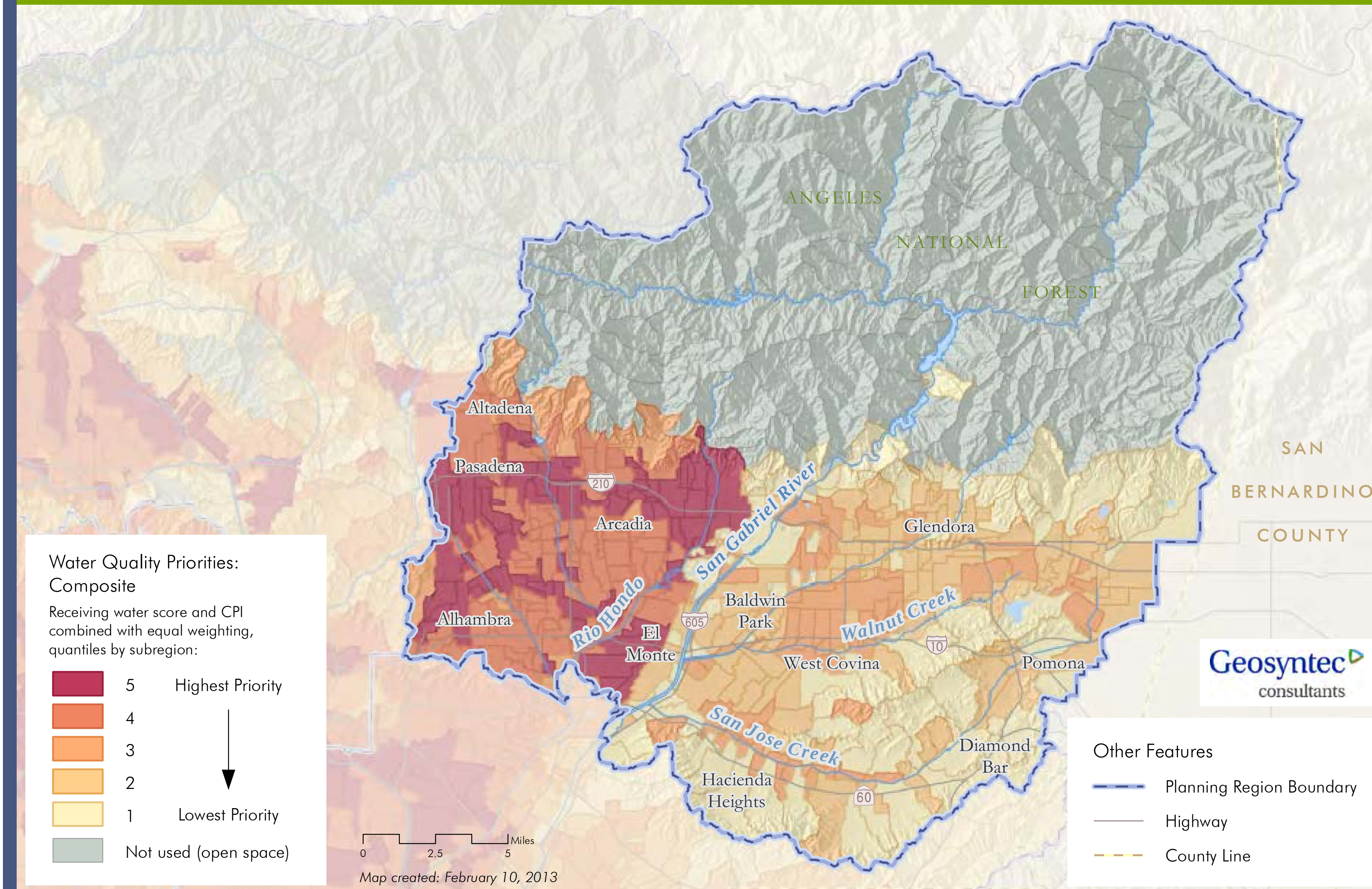
Lower Los Angeles and San Gabriel Rivers



*Los Angeles Integrated Regional Water Management Plan Update*

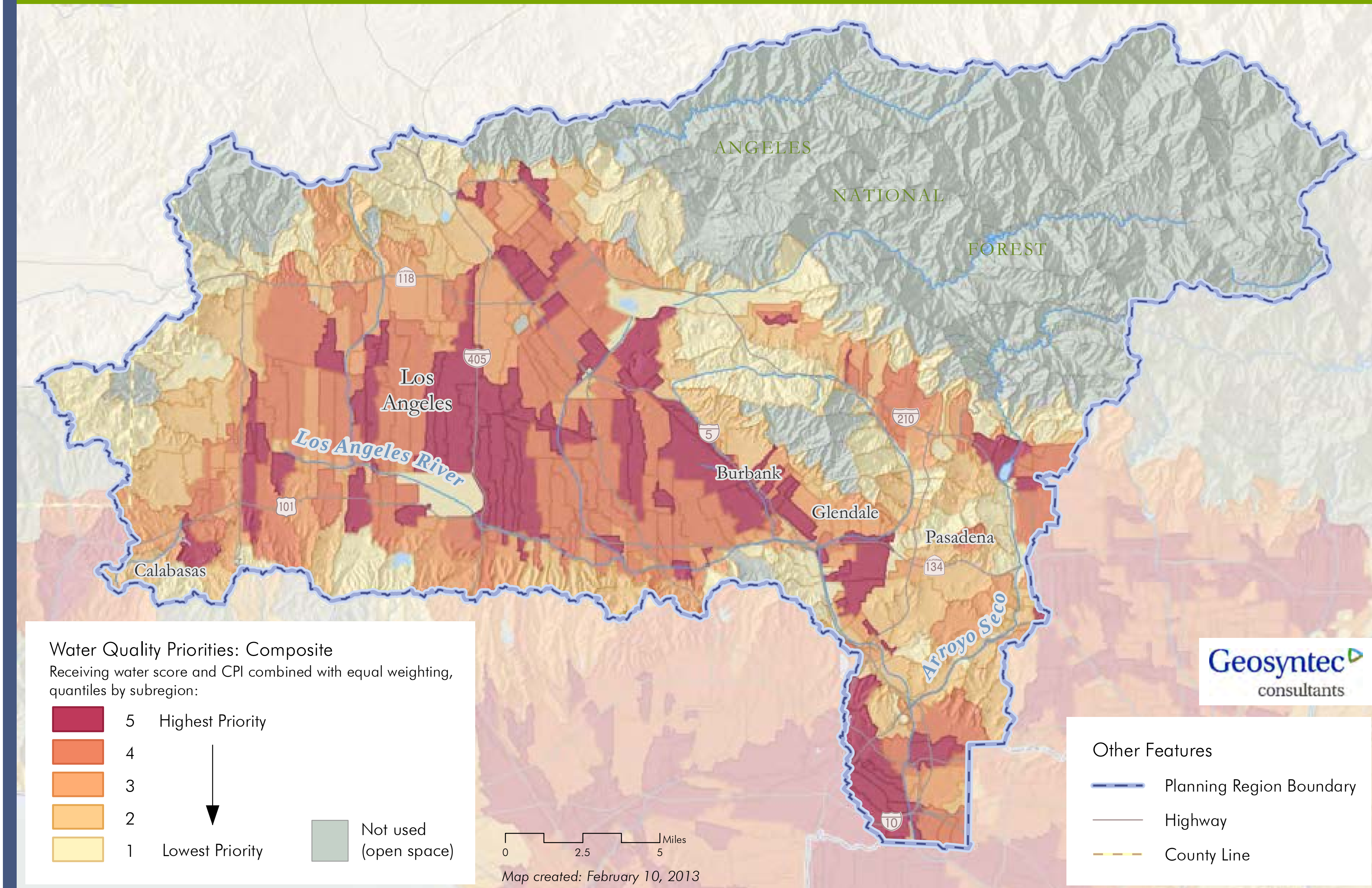
# Figure 5: Water Quality Prioritization: Composite (Equal Weighting)

Upper San Gabriel and Rio Hondo Rivers



# Figure 6: Water Quality Prioritization: Composite (Equal Weighting)

Upper Los Angeles River



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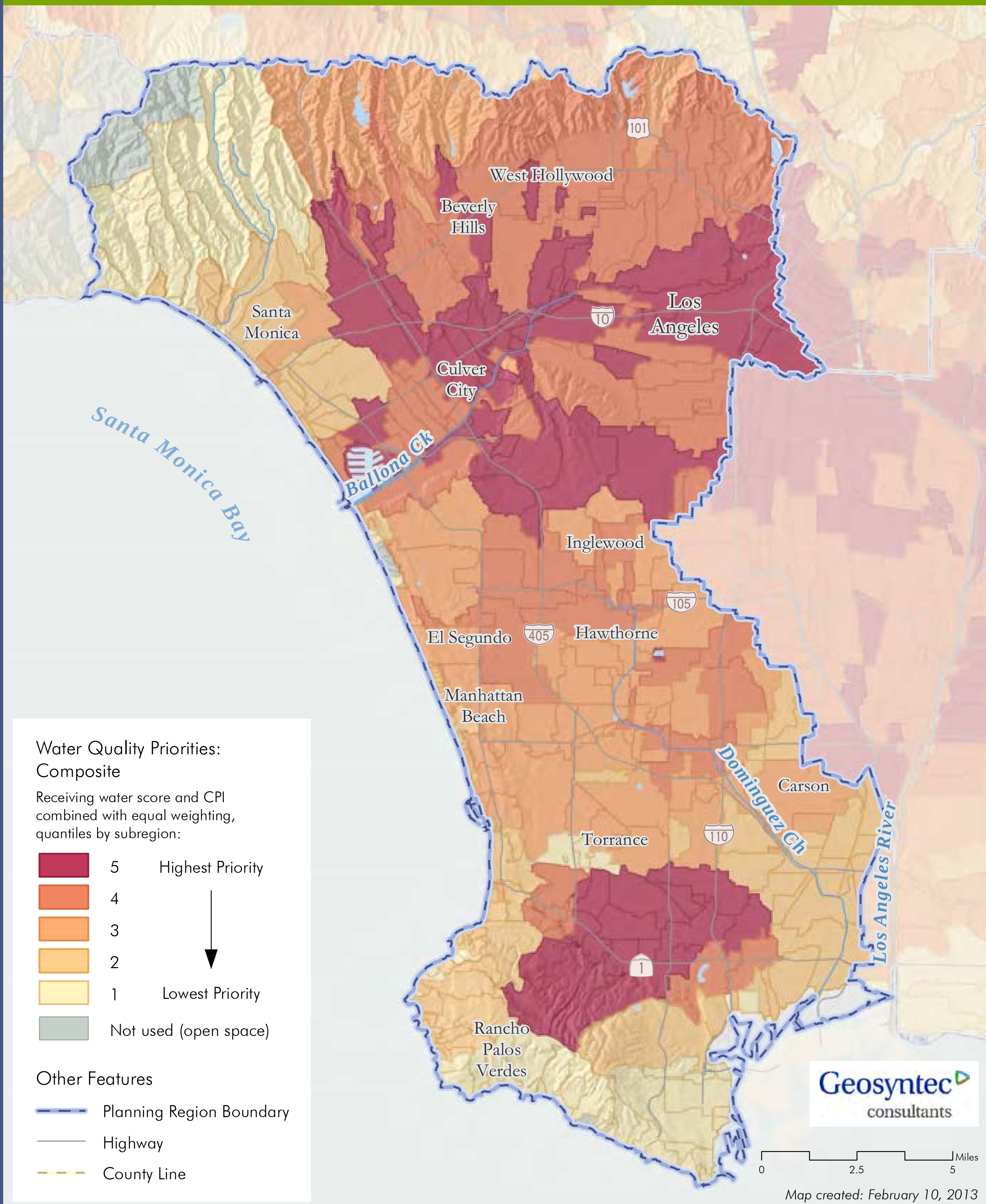
# Figure 7: Water Quality Prioritization: Composite (Equal Weighting)

South Santa Monica Bay




Map created: February 10, 2013

# APPENDIX G

## G. GLAC IRWMP Flood Management Objectives and Targets

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# GLAC-IRWMP
# Flood Management Objectives & Targets

## Introduction

Within the GLAC Region, the Los Angeles County Flood Control District (LACFCD), U.S. Army Corps of Engineers and many Los Angeles County cities share a joint responsibility in managing flood risk. The LACFCD is the main regional agency able to address large regional drainage needs and uses available funds to operate and maintain the existing flood control facilities and systems that transect various cities and other municipalities.

During years of heavy rainfall, the existing flood control system has largely prevented serious flooding that once plagued the Los Angeles area many years ago. Yet some areas may still experience flooding during heavy rainfall seasons. Within each subregion of the GLAC Region, there are areas with unmet drainage needs, especially in high risk flood prone areas. The unmet drainage needs could be caused by undersized or non-existing stormwater conveyance systems. In other instances, areas may have adequate sized drainage systems but are in low elevations that may require a stormwater retaining structure to retain water until receiving waters such as the ocean or river have subsided. However, availability of land for detention or retention ponds or basins may be a constraint. Other subregions may experience significant amounts of accumulated sediment over the course of the next 20 years which place subregions at risk of future flooding and/or reduced water conservation benefits.

Much of the existing stormwater infrastructure (i.e., storm drains, levees, pump stations, etc.) in the region is approaching or has exceeded its planned useful design life and will require billions of dollars in increased maintenance and repair activities to continue functioning. Often required maintenance is postponed until sufficient funding can be set aside, resulting in additional degradation of the systems and even higher repair costs. Planning efforts to rehabilitate flood control facilities should also consider other potential beneficial uses of those facilities which include environmental ecosystem restoration or recreation enhancements.

Moreover, the GLAC Region's water supply management agencies are actively pursuing strategies aimed at achieving water independence by maximizing local water resources such as stormwater, groundwater and recycling opportunities. The IRWM process will identify projects to simultaneously replace various existing impervious gray infrastructure with permeable green infrastructure such as Low Impact Designs (LIDs) and other groundwater infiltration/recharge methods where feasible.

Currently, the LACFCD and the Army Corps of Engineer operate dams that capture, store, and release stormwater for groundwater recharge providing a local water supply alternative to imported water. The LACFCD is the primary agency responsible for groundwater replenishment operations in Los Angeles County. Water supplies throughout Southern California are dependent on storm conditions which vary from year to year due to cycles of changing ocean temperatures and currents. The LACFCD and the U.S. Army Corps of Engineers have built the main infrastructure to conserve water and reduce flood risks in order to cope with these highly variable storm conditions and runoff. In typical years, the LACFCD infiltrates more than 270,000 acre-feet (AF) of captured stormwater, imported water, and recycled water into the various groundwater basins in Los Angeles County. In wetter years that number can exceed 700,000 AF and in drier years may be little more than 150,000 AF.

Some climate change predictions for the Southwestern United States advise that rainfall patterns will change, causing less snow in mountains and heavier rainfall periods and events that could potentially overwhelm the LACFCD system leading to less stormwater conservation, more property damage, and greater maintenance and operational demands. Working in conjunction with the Bureau of Reclamation, LACFCD is preparing "The LA Basin Stormwater Conservation Study" (Basin Study) that will address adaptation to climate change and become another foundation for future IWRM efforts and targets. Taking into account climate change and population growth projections, the Basin Study will identify alternatives, conduct trade-off analyses, and develop recommendations to help bridge the gap between current and future stormwater supply and water demands in the Los Angeles Basin (which overlaps many of the GLAC subregions). The Basin Study will evaluate modifications and operational changes to existing LACFCD facilities and analyze the potential for new facilities to capture additional stormwater for water supply. The LACFCD will be in a position to strategically partner with other agencies to seek funding to build flood prevention works such as retarding basins and pipe augmentation to allow stormwater to seep into the ground.

By identifying unmet drainage needs, sediment management activities, and other flood facility enhancements, flood management objectives and targets can be established to define the issue and provide a baseline for moving forward and from which to measure progress. The following sections provide the overall goal as well as objectives and discussion of targets.

## IRWM Goal: *Reduce flood risk to protect life and property using an integrated flood management approach.*

## Unmet Drainage Needs

### Objective: Reduce flood risk in flood prone areas by either increasing protection or decreasing needs[1] using integrated flood management approaches.

### Targets

[1] Increasing protection would be accomplished by providing physical management techniques, whereas decreasing risk might include purchasing flood prone properties and removing unnecessary structures that might otherwise be subject to flooding and/or flood insurance claims.

To identify a community's flood risk, the Federal Emergency Management Agency (FEMA) conducts a Flood Insurance Study. FEMA has already completed this study for some municipalities. The study includes statistical data for river flow, storm tides, hydrologic/hydraulic analyses, and rainfall and topographic surveys. FEMA uses this data to create the flood hazard maps that outline different flood risk areas. Land areas that are at high risk for flooding are called Special Flood Hazard Areas (SFHAs), or floodplains. These areas are indicated on Flood Insurance Rate Maps (FIRMs). Many private and public parcels as well as buildings on these parcels are within the SFHAs.

The targets were developed through a process using geospatial data that included the currently defined 2011 SFHAs (processed from FEMA FIRM maps)[2], parcel ownership, parcel land use categories, and whether buildings or structures are present. The target acreages listed in Table 1 consist of the sum of parcel areas in each subregion that intersect with refined SFHAs, which consisted of a subset of the 2011 SFHAs categorized as containing structures but not categorized as reservoirs, dams, lakes, debris basins, floodways, flood structures, detention basins, harbors, marina, tidal zones and a general water category. Land use data were compiled from 2005 and 2008 surveys for the Counties of Ventura, Los Angeles, and Orange. These geospatial coverages were clipped to the defined IRWMP drainage areas by subregion. Because the supplied SFHA layer did not, in all instances, match up with the land uses and/or aerial photography, some adjustments were necessary to determine land use category boundaries. Parcels that intersected the 2011 refined SFHA were selected to determine parcel area that is partially or wholly within the SFHA. The presence of structures was determined through development records and was defined as presence or absence of a structure. Because development records were not available for the counties of Ventura and Orange, the qualifying parcels that were at least partially within the SFHA, within the IRWMP boundaries, and had structures were identified using aerial imagery. Land use categories from the 2008 effort were used as the defined land uses. However, in some cases the 2008 land uses were further refined by using 2005 land use categories (e.g., single family residential to include high density and low density single family residential; agriculture to include animal husbandry and nurseries and vineyards; and open space and recreation to include golf courses).

Table 1 shows Unmet Drainage Needs targets, expressed in acres for each subregion which were calculated based on the method described below the table. These areas are shown in Figure 1 below, and in Figures A-1 through A-5 in Exhibit A. Total Regional acreage targeted as Unmet Drainage needs is about 11,380 acres. Each parcel, and the land upstream, provides a management opportunity in which drainage needs may be mitigated to reduce high flooding risk.

For integrated planning purposes, these areas could be considered as properties that may have risk to human safety and property. Properties with structures may have an increase in safety and property damage risk. By identifying these properties as targets within the plan, especially those with structures, a longer term solution can be developed to reduce this risk. Steps to further refine

[2] FEMA is currently revising the process for determining SFHAs. When new SFHAs are finalized by FEMA, the Flood Management maps and goals should be updated accordingly.

the objectives would be to conduct a risk and damage potential analysis that could help prioritize the parcel areas associated with the flooding hazard areas based upon their development, use and risk for damage and or level of damage that could occur.

In the interim, the LACFCD continues to prepare engineering studies, coordinate the revision of FIRMs, and assists the public on floodplain maters. Although most of the urban areas in the GLAC Region have been developed, there will be future opportunities during various development and redevelopment in the GLAC Region to reduce urban stormwater runoff by reducing impermeable surfaces. The LACFCD will guide and inspect new flood control facilities built by private developers in the unincorporated areas prior to transferring new flood facilities to the LACFCD for operation and maintenance. In addition, the LACFCD will continue to provide engineering services such as reviewing hydrology and preparing legal descriptions within the flood right-of-way. Such services include advising other planning authorities, such as cities, regarding appropriate land use and development within flood affected areas.

The NPDES MS4 Phase I permit requires all non-storm water runoff and all storm water runoff from the 85th percentile of a 24-hour storm event for drainage areas tributary to a Best Management Practice (BMP) or LID project to be captured and/or treated. Within each jurisdictional area and watershed, MS4 permittees (which includes cities, the unincorporated areas of Los Angeles County, and the LACFCD) can collaborate and form Enhanced Watershed Management Plans (EWMP) to comprehensively evaluate and prioritize opportunities to achieve these water quality requirements as well as other benefits including flood control and water supply, if warranted or feasible. Likewise, projects proposed by the GLAC IRWM include retrofitting parks, streets, single family homes and schools to hold stormwater as well as other regional water resource infrastructure projects.

However, most LID and BMP projects will not abate serious flooding and unmet drainage needs. The Basin Study will identify new facilities and operational modification at existing LACFCD water recharge and retention facilities to prevent flooding, conserve stormwater, and address unmet drainage needs. Stormwater from underground storm drains enters various retention/ recharge basins and slowly discharges to receiving waters or percolates into the groundwater. Drains designed to handle severe storms that outlet into receiving water may require acquisition of additional land and/or construction of new retention facilities to retain stormwater to alleviate flooding. The Basin Study will evaluate potential infiltration sites taking into account soil characteristics, geologic stability, groundwater basin condition, conveyance, diversion, outlet requirements, site remediation requirements, property valuation and availability, environmental impact, regulatory requirements, community impact, multi-use potential, and other factors deemed necessary. The LACFCD role in the GLAC IRWMP process will be to explore opportunities to partner with other municipalities and seek grants to acquire property and build new retention basins and improve or widen channels to alleviate flooding in the target areas and/or maximize the opportunities to remove impermeable surfaces.

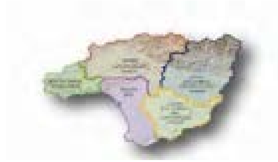
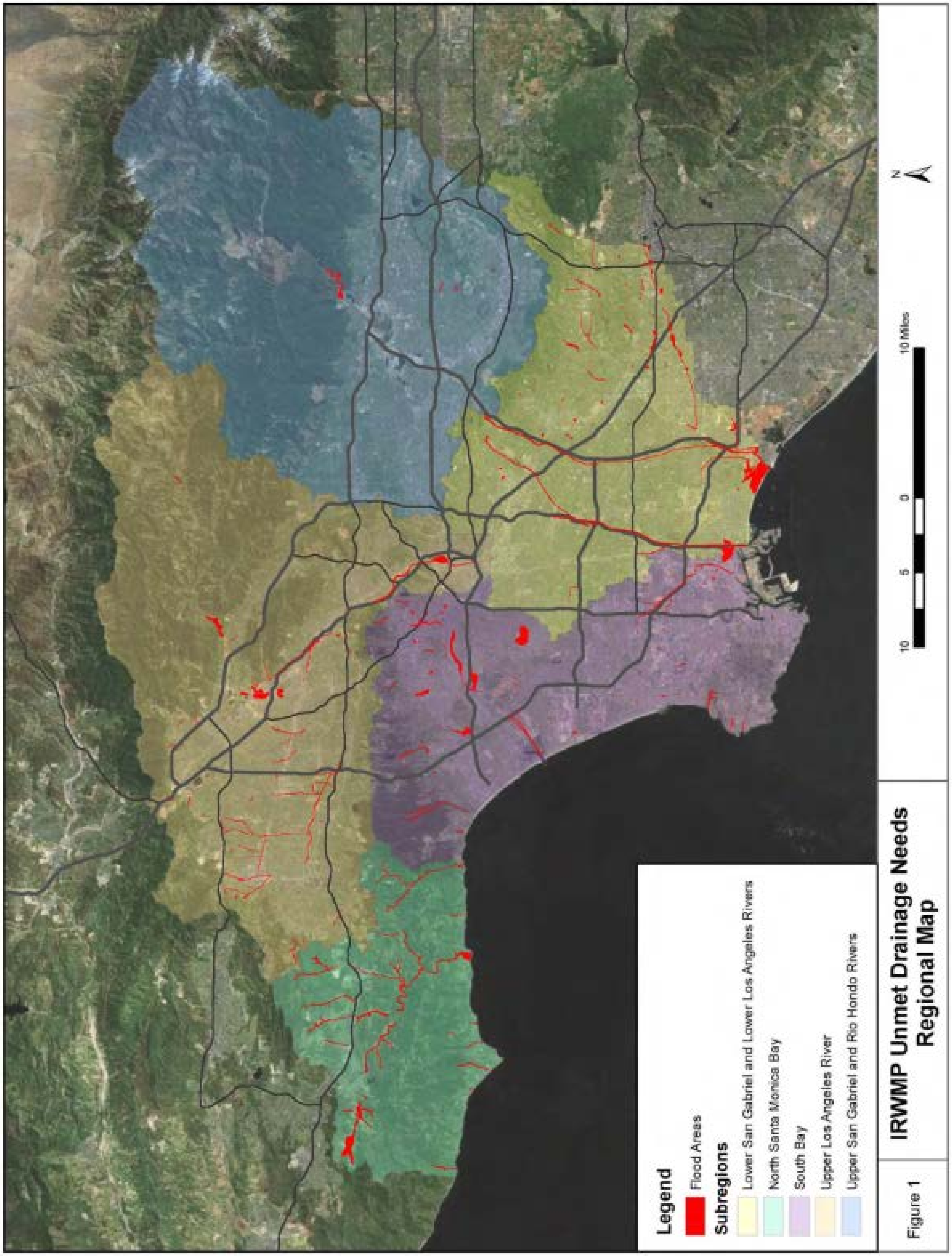


**Table 1. Unmet Drainage Needs Targets Reported by Subregion**

| Unmet Drainage Needs (Acres) | North Santa Monica Bay* | Upper Los Angeles River | Upper San Gabriel and Rio Hondo Rivers | Lower San Gabriel and Los Angeles Rivers* | South Bay* | **GLAC Region** |
|---|---|---|---|---|---|---|
| **Subregion Total** | **2,760** | **1,970** | **250** | **4,090** | **2,310** | **11,380** |

*Note that coastal flooding issues must also be addressed yet targets were not developed as part of this IRWMP update. See Section 4.4 for discussions on climate change.


Legend
Flood Areas
Subregions
Lower San Gabriel and Lower Los Angeles Rivers
North Santa Monica Bay
South Bay
Upper Los Angeles River
Upper San Gabriel and Rio Hondo Rivers
N
10 5 0 10 Miles
IRWMP Unmet Drainage Needs
Regional Map
Figure 1

# Sediment Management

## Objective: Manage sediment through removal and/or other techniques using integrated flood management approaches.

## Targets

Proper management of sediment is necessary to protect public safety, property, and ensure adequate quality of life and improve recreational opportunities at coastal beaches. The accumulation of sediment within reservoirs, debris basins and streams can reduce the storage capacity in those facilities which reduces the potential for providing water supply benefits and preventing flooding. When accumulation occurs within the stream channel, localized street flooding or inundation of public and private property may occur. Recent catastrophic fires in the region have also resulted in heavy sedimentation at downstream dam and debris basin facilities drastically reducing flood management and water storage capabilities. Sediment from the reservoirs and debris basins are hauled to various LACFCD sediment placement sites. These sediment placement sites are filling up as well and have reduced the capacity to take additional sediment.

Targets for sediment removal were provided by the LACFCD, based on 20-year projections presented in the agency's Sediment Management Plan for maintenance of regional reservoirs and debris basins. For reservoirs, planning quantities were based on a goal of no net increase in the amount of accumulated sediment in the reservoirs, which was determined based on historical records. For debris basins, historical records were used to estimate sediment inflow volumes over 20-year rolling periods. The planning quantity was the 80th percentile of these datasets, split up among the Flood Maintenance Areas (South, West, and East). The historical records include recent fire events such as the Station Fire. The reservoirs and debris basins were mapped and the projections were summed according to the subregion the reservoir or debris basin facility was located in to produce the targets presented below.

The following table provides the sediment targets determined in the Sediment Management Plan. Values include combined volumes of reservoirs and debris basins by subregion. The locations of these reservoirs and debris basins are shown in Figure 2 and Figures B-1 through B-5 in Exhibit B.

**Table 2. Sediment Management Targets Reported by Subregion**

| Sediment Management Needs (Million Cubic Yards) | North Santa Monica Bay* | Upper Los Angeles River | Upper San Gabriel and Rio Hondo Rivers | Lower San Gabriel and Los Angeles Rivers* | South Bay* | **GLAC Region** |
|---|---|---|---|---|---|---|
| Subregion Total | 0.23 | 27.6 | 39.7 | -- | -- | 67.5 |

*Note that coastal sediment management issues must also be addressed yet targets were not developed as part of this IRWMP update.

The total 20-year planning quantity for the target sediment management reduction is 67.5 MCY, with approximately 57.9 MCY resulting from reservoirs and 9.6 MCY from debris basins.



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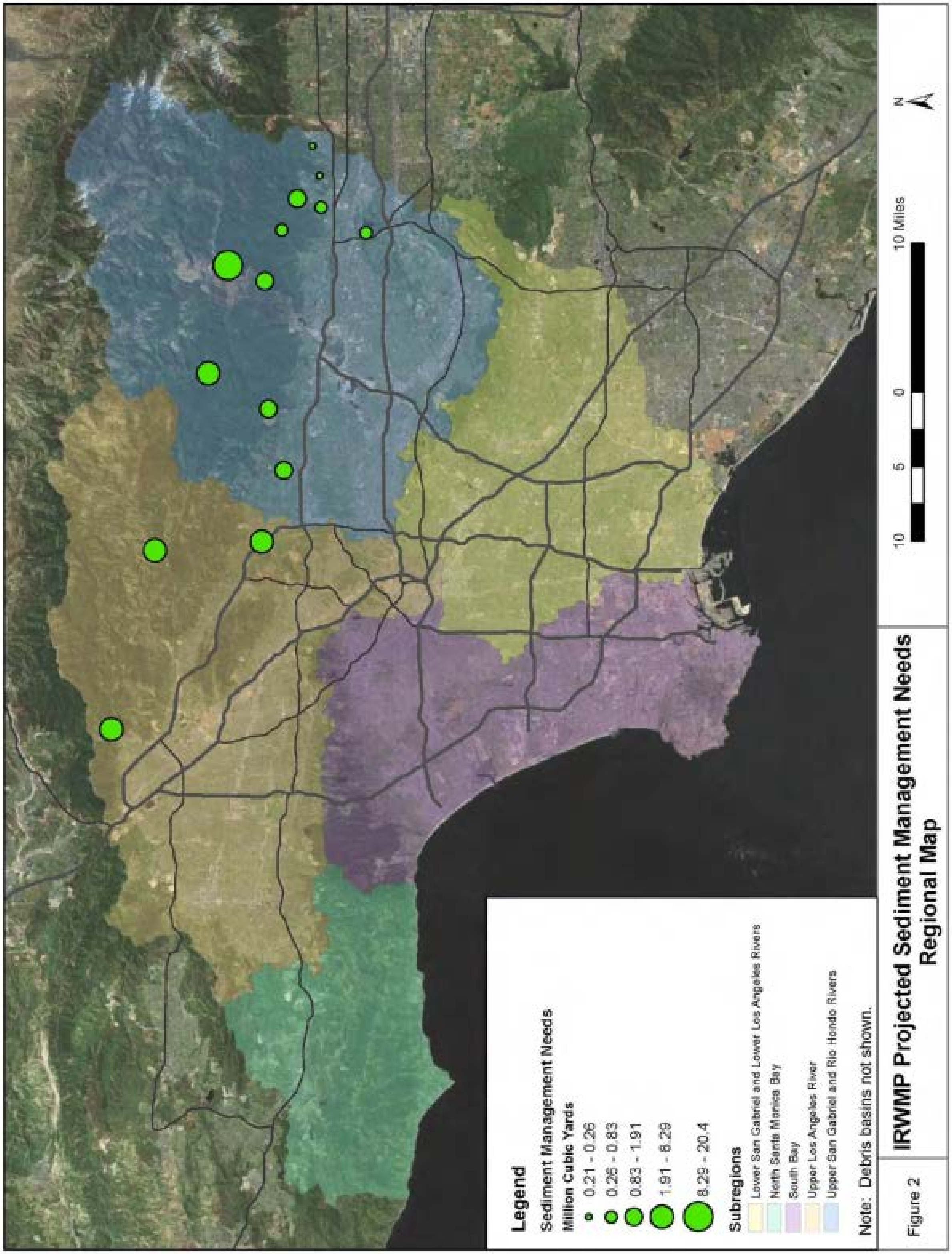
engineers | scientists | innovators

Comprehensive and integrated goals can be met at a local and regional level when considering existing plans for sediment management within the coastal environment, especially around creek and river mouths and shores. The Coastal Regional Sediment Management Plan – Los Angeles County which is in draft form is being authored by the Coastal Sediment Management Workgroup, the Army Corps of Engineers, and several other regional partners. The Army Corps of Engineers Planning Guidance Notebook (ACOE, 2000); and the Los Angeles County Sediment Management Plans (LACDPW and LACFCD, 2012) are also excellent planning resource documents.

The Sediment Management strategic plan outlines potential alternatives to achieve these targets. The alternatives will be explored in the future.


Legend
Sediment Management Needs
Million Cubic Yards
0.21 - 0.26
0.26 - 0.83
0.83 - 1.91
1.91 - 8.29
8.29 - 20.4
Subregions
Lower San Gabriel and Lower Los Angeles Rivers
North Santa Monica Bay
South Bay
Upper Los Angeles River
Upper San Gabriel and Rio Hondo Rivers
Note: Debris basins not shown.
10 5 0 10 Miles
N
IRWMP Projected Sediment Management Needs
Regional Map
Figure 2

## Development of Future Objectives and Targets

The LACFCD and U.S. Army Corps of Engineers have constructed a comprehensive system of infrastructure for the control and conservation of flood and storm waters, including dams, spreading grounds, debris basins, and an extensive flood control channel network.

Over time, additional objectives have emerged for the system beyond its original intended purpose. In an era when stewardship of local natural resources has become more prominent, public perception of the system has been trending towards its use for broader purposes such as recreational uses, open spaces, water quality enhancement, restored ecosystems, and habitats.

To address the desire for a broader range of usage, the LACFCD developed planning documents for the County's major rivers: Los Angeles River Master Plan (1996) and San Gabriel River Corridor Master Plan (2006). The purpose of these documents is to identify ways to revitalize the publicly-owned right-of-ways along the rivers into urban resources. Over the last 20 years, more than 24 miles of greenways and trails including the Tujunga Wash Greenway, multiuse facilities such as the Dominguez Gap Wetlands in Long Beach, and over 60 miles of bicycle trails along the rivers have been developed.

The LACFCD has adopted a regional approach in managing the system and has collaborated with local agencies, non-governmental organizations, and the public to achieve a more comprehensive and balanced system without compromising flood protection and water supply for the millions of residents in the greater Los Angeles area. The future of the system depends upon an alliance between these parties. The LACFCD and the Army Corps will need funding to carry out activities to improve efficiency of dams, take advantage of water storage opportunities, and provide multiple benefits such as increased water supply, ecosystem restoration, and the building of recreational greenways. The various agencies in the GLAC IRWM will also identify projects that replace various existing impervious gray infrastructure with permeable green infrastructure to recharge the groundwater supply. Once these assessments and prioritization efforts are established and targets have quantifiable figures, the LACFCD intends to add an additional objective and target which will address the use of the existing infrastructure.

The LACFCD is in the beginning phase of creating a new methodology to assess the condition of its infrastructure. Other municipalities may also need to begin or complete this exercise. Once this assessment is complete and an inventory of existing infrastructure deficiencies have been identified along with the completion of the Basin Study, the LACFCD will be in a position to prioritize infrastructure projects that will maximize future flood protection and water conservation. The LACFCD, municipalities and the Army Corps will need funding to carry out activities to improve efficiency of dams, take advantage of water storage opportunities, and provide multiple benefits such as increased water supply, ecosystem restoration, beach sediment replenishment and the building of recreational greenways. The various agencies in the GLAC IRWM Region will also identify projects that replace various existing impervious gray infrastructure with permeable green infrastructure to recharge the groundwater supply where feasible. Once these assessments and prioritization efforts are established and targets have quantifiable figures, the LACFCD intends to add an additional objective and target to the IRWM Plan which will address the condition of the existing infrastructure.

## References

Coastal Regional Sediment Management Plan – Los Angeles County. Draft Version. Excerpt provided by Heather Schlosser, May 15, 2012.

Los Angeles County Sediment Management Strategic Plan 2012-2032. County of Los Angeles Department of Public Works and the Los Angeles County Flood Control District. Draft April 23, 2012. http://dpw.lacounty.gov/lacfcd/sediment/stplan.aspx. Accessed May 9, 2012.

U.S. Army Corps of Engineers Planning - Planning Guidance Notebook. 22 April 2000. http://publications.usace.army.mil/publications/eng-regs/ER_1105-2-100/a-e.pdf. Accessed May 18, 2012.

*GIS and land use data provided by County of Los Angeles and the Southern California Association of Governments.*

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# Exhibit A – Maps of Unmet Drainage Need Targets by IRWMP Subregion

**The following pages contain the subregional maps showing Unmet Drainage Needs for:**

- **North Santa Monica Bay (A-1)**
- **Upper Los Angeles River (A-2)**
- **Upper San Gabriel and Rio Hondo (A-3)**
- **Lower San Gabriel and Los Angeles Rivers (A-4)**
- **South Santa Monica Bay (A-5)**

Note: The following maps show flood areas that extend into the flood plains around their respective channels but may appear like thick lines of unmet drainage given the scale of the maps.

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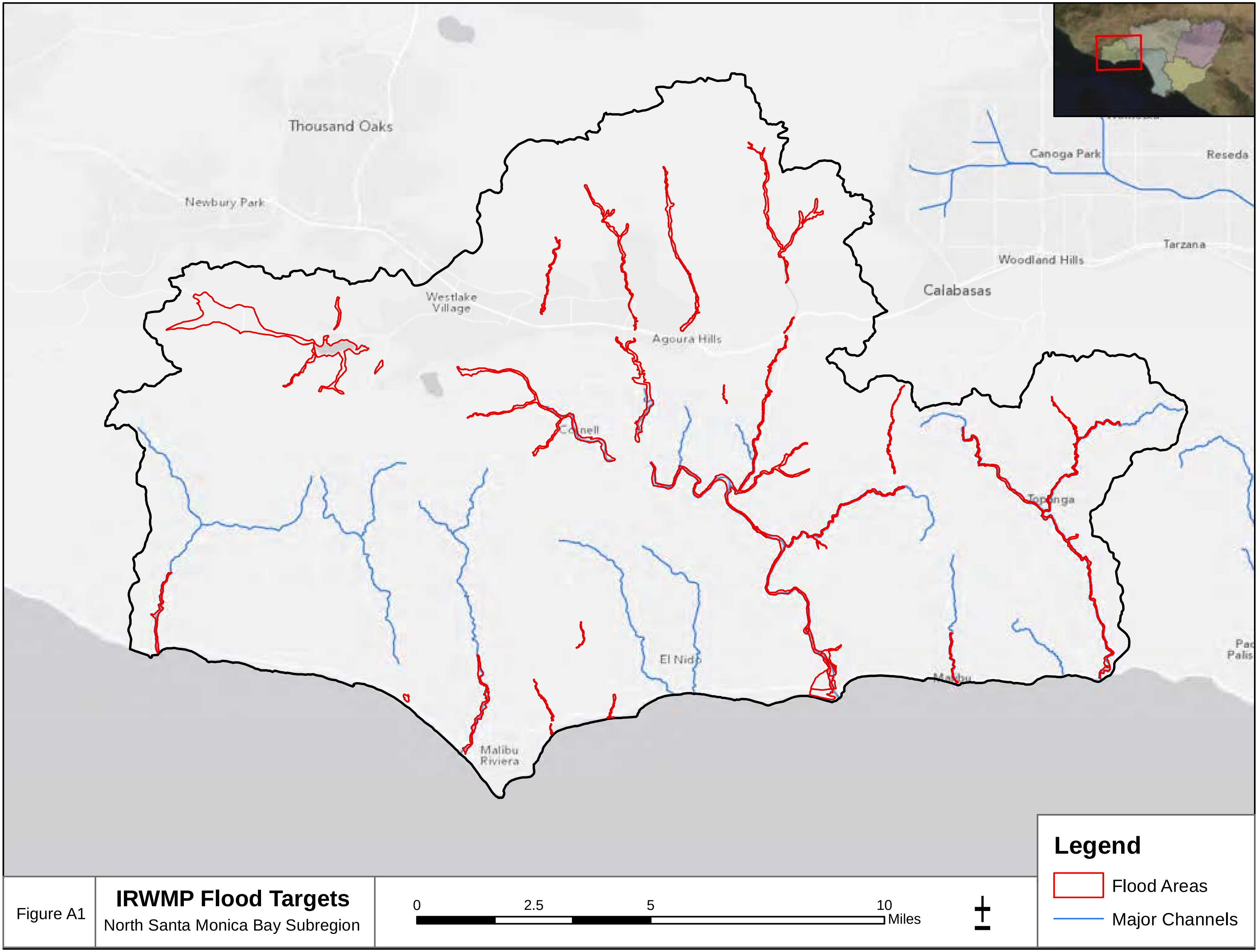



Figure A1

**IRWMP Flood Targets**

North Santa Monica Bay Subregion

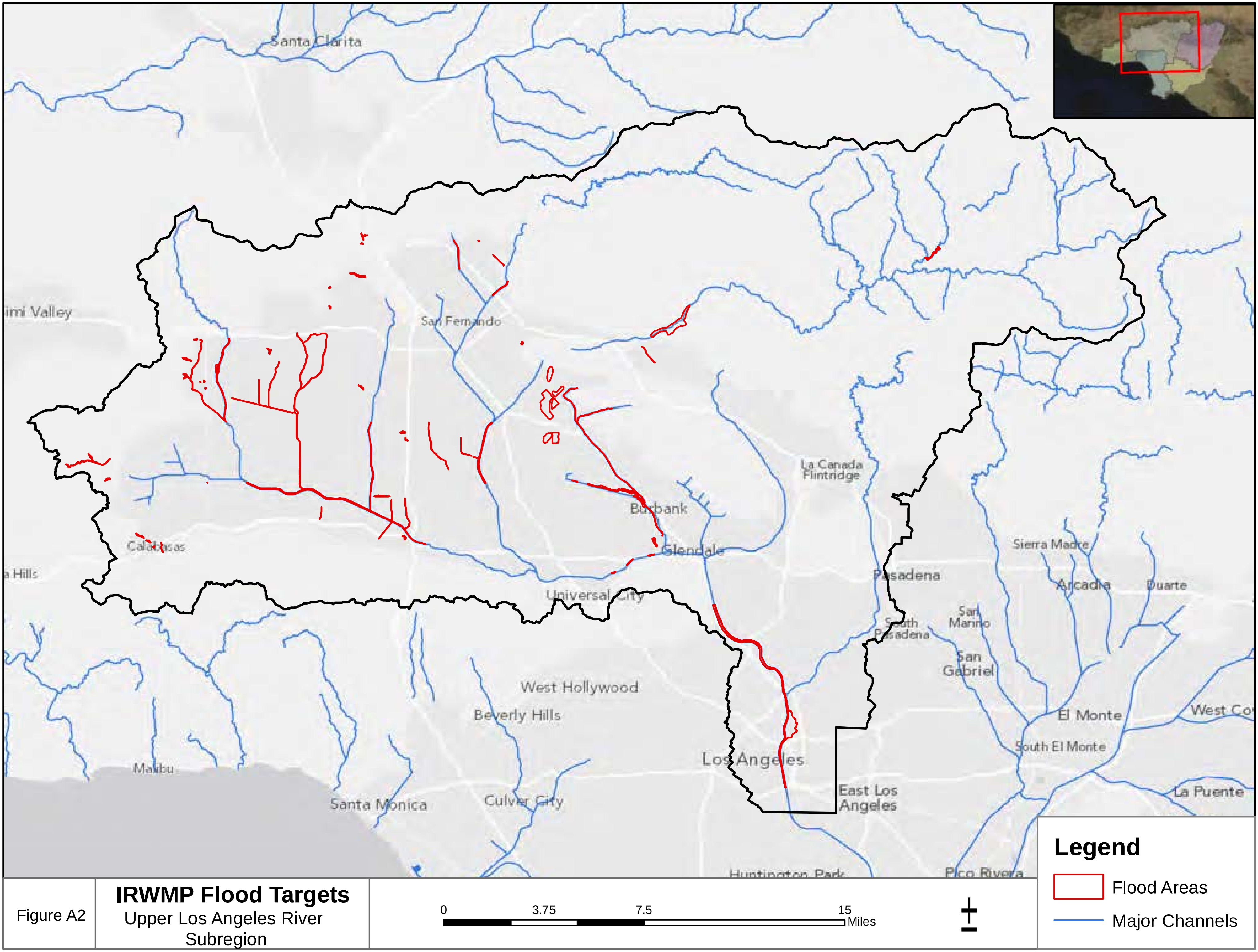



Figure A2

**IRWMP Flood Targets**
Upper Los Angeles River Subregion

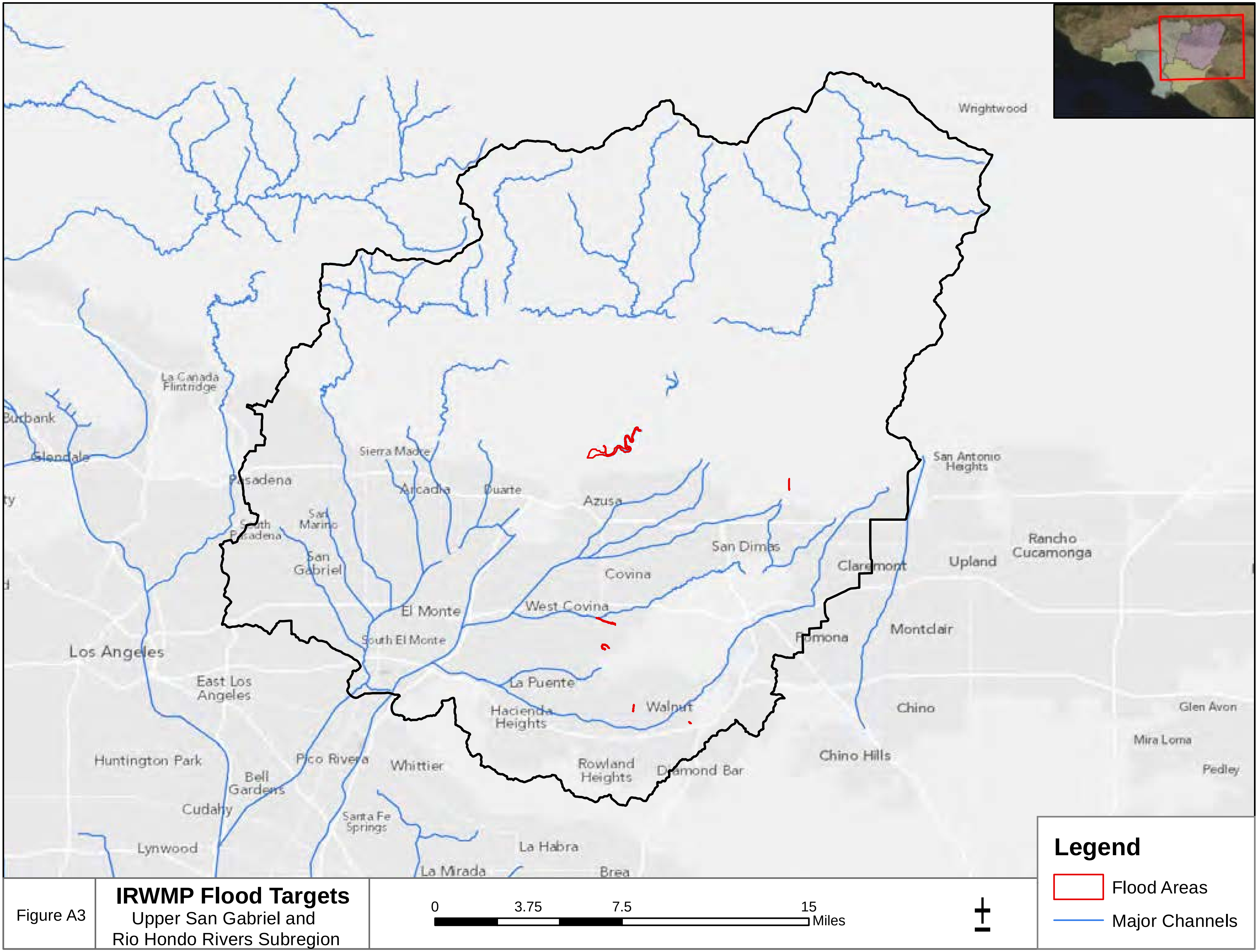
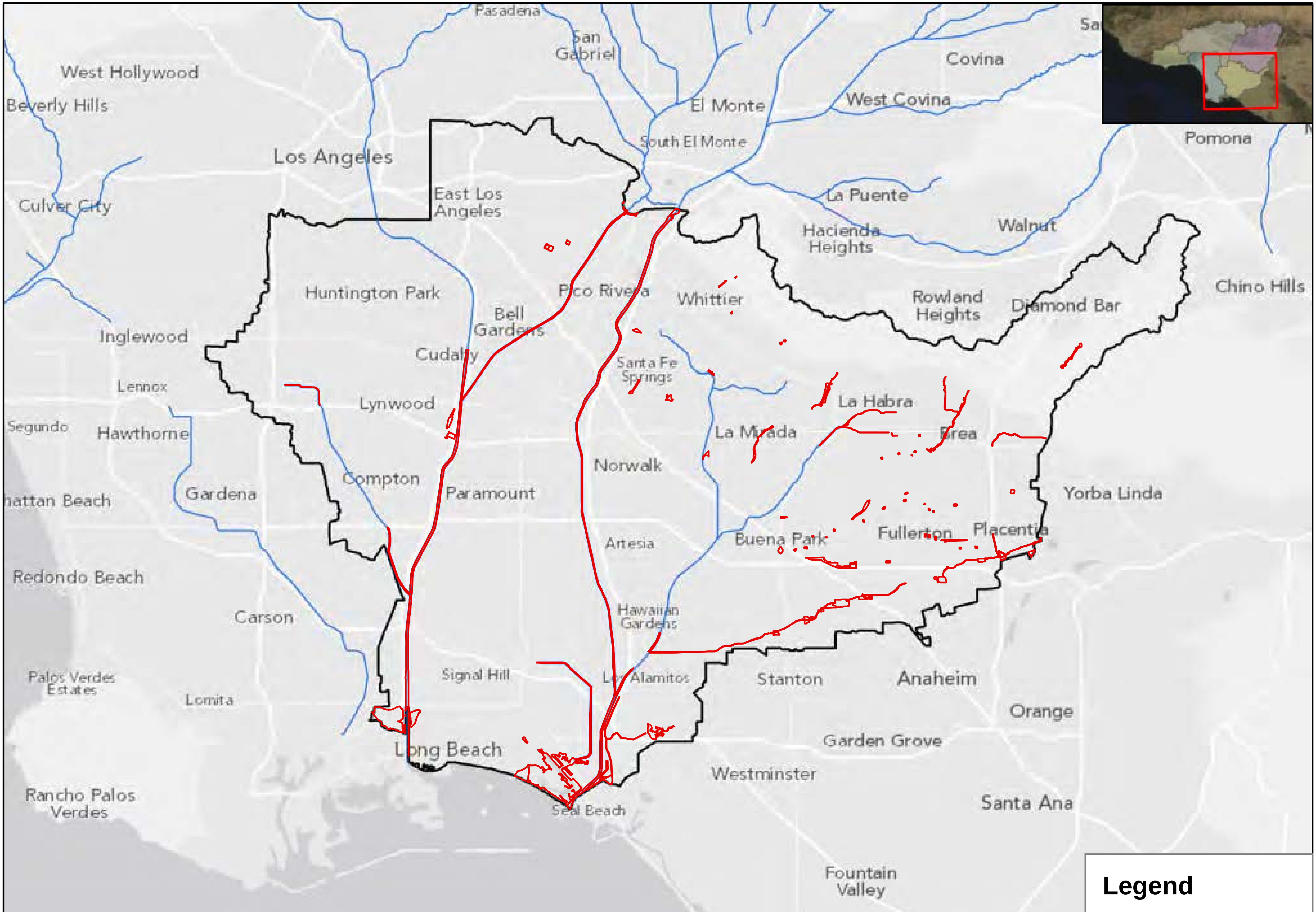



Figure A3

**IRWMP Flood Targets**
Upper San Gabriel and
Rio Hondo Rivers Subregion




## Legend

Flood Areas

Major Channels

| Figure A4 | **IRWMP Flood Targets**<br>Lower San Gabriel and<br>Lower Los Angeles Rivers Subregion | 0 3.75 7.5 15 Miles |
|---|---|---|

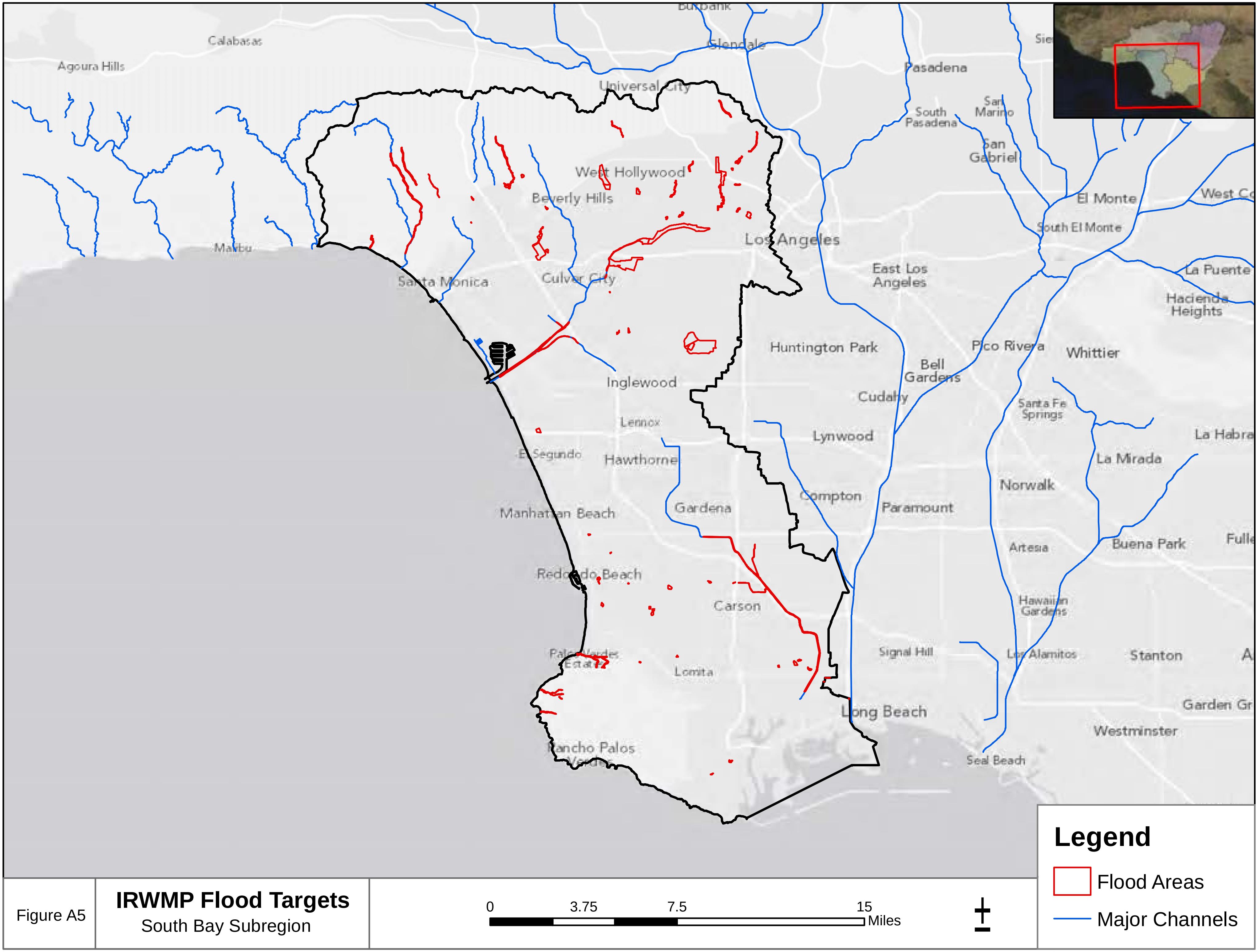



Figure A5

**IRWMP Flood Targets**

South Bay Subregion

0 3.75 7.5 15 Miles

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# Exhibit B – Maps of Sediment Management Targets by IRWMP Subregion

**The following pages contain the subregional maps showing locations of the Sediment Management Needs for:**

- **North Santa Monica Bay (B-1)**
- **Upper Los Angeles River (B-2)**
- **Upper San Gabriel and Rio Hondo (B-3)**
- **Lower San Gabriel and Los Angeles Rivers (B-4)**
- **South Santa Monica Bay (B-5)**

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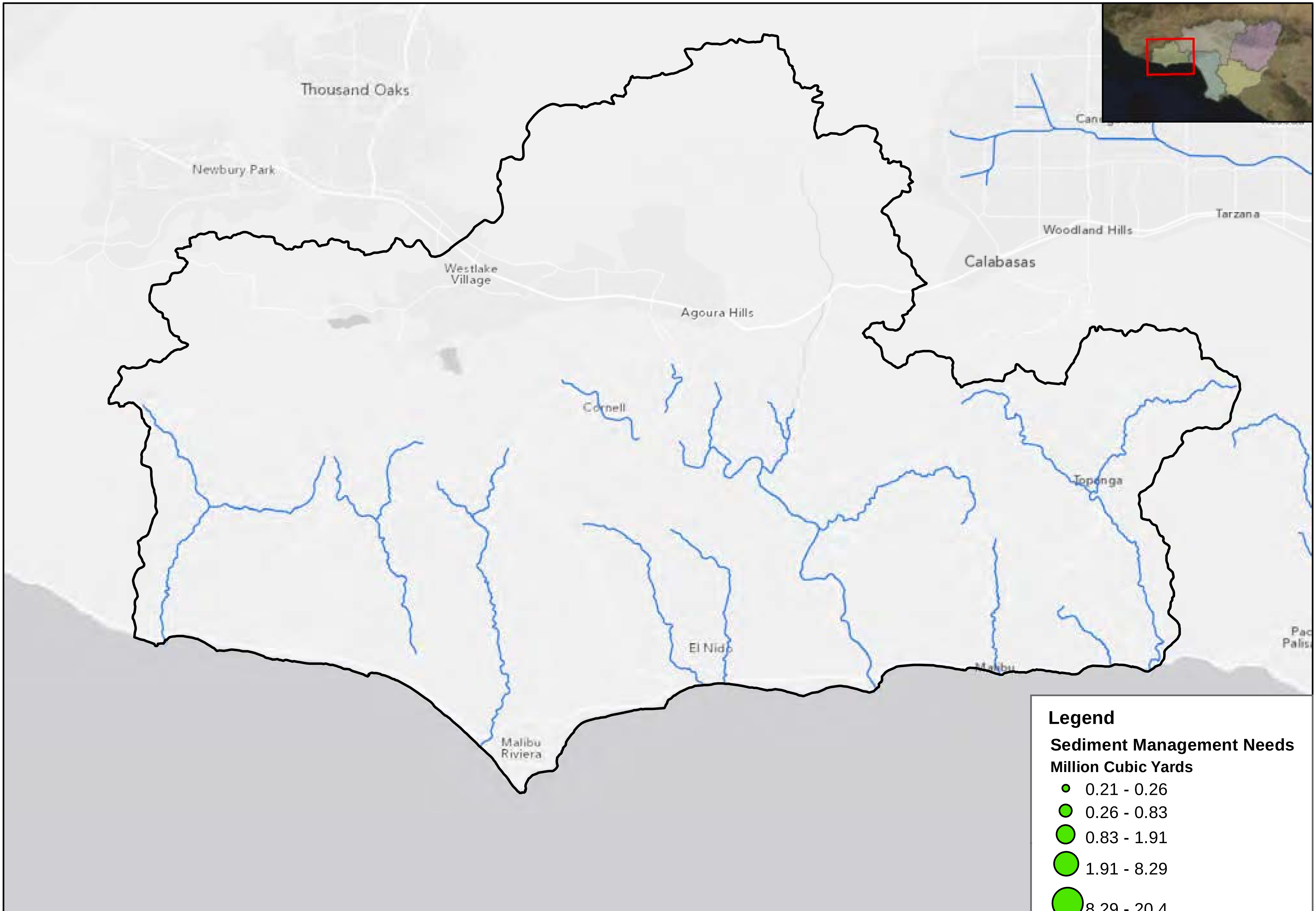


Figure B1

**IRWMP Projected Sediment Management Needs**

North Santa Monica Bay Subregion

0 1.25 2.5 5 Miles

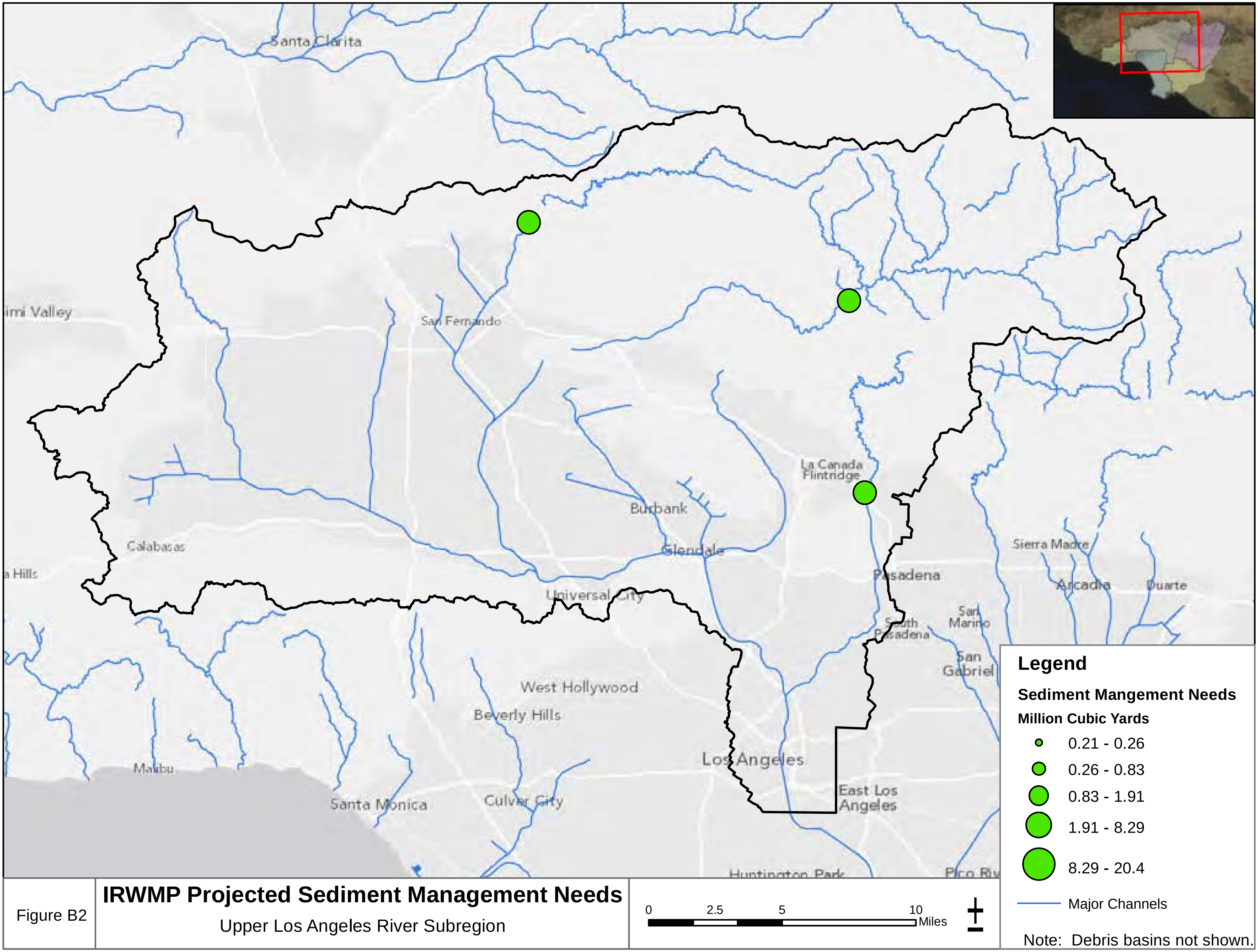


Figure B2

**IRWMP Projected Sediment Management Needs**

Upper Los Angeles River Subregion

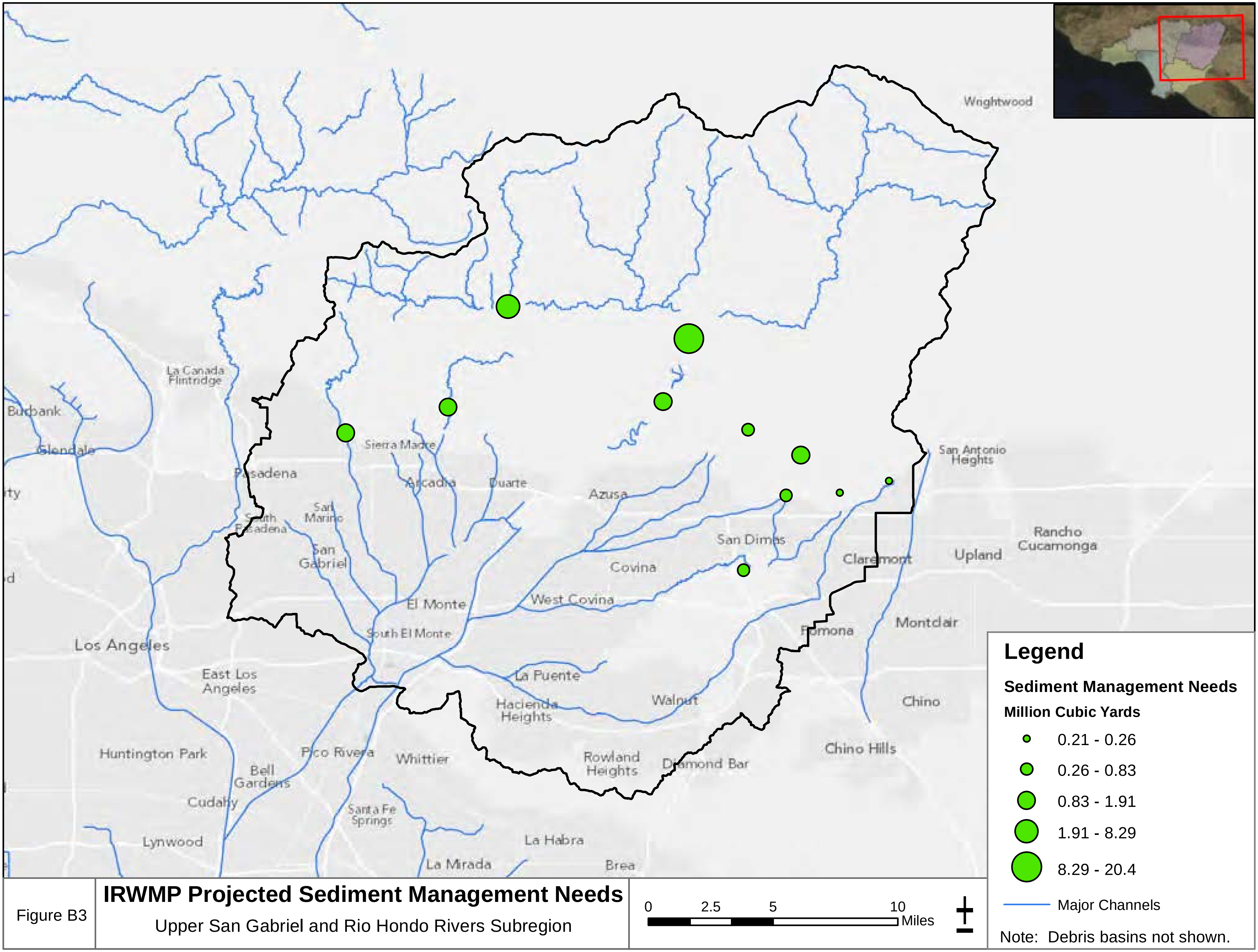


Figure B3

**IRWMP Projected Sediment Management Needs**

Upper San Gabriel and Rio Hondo Rivers Subregion

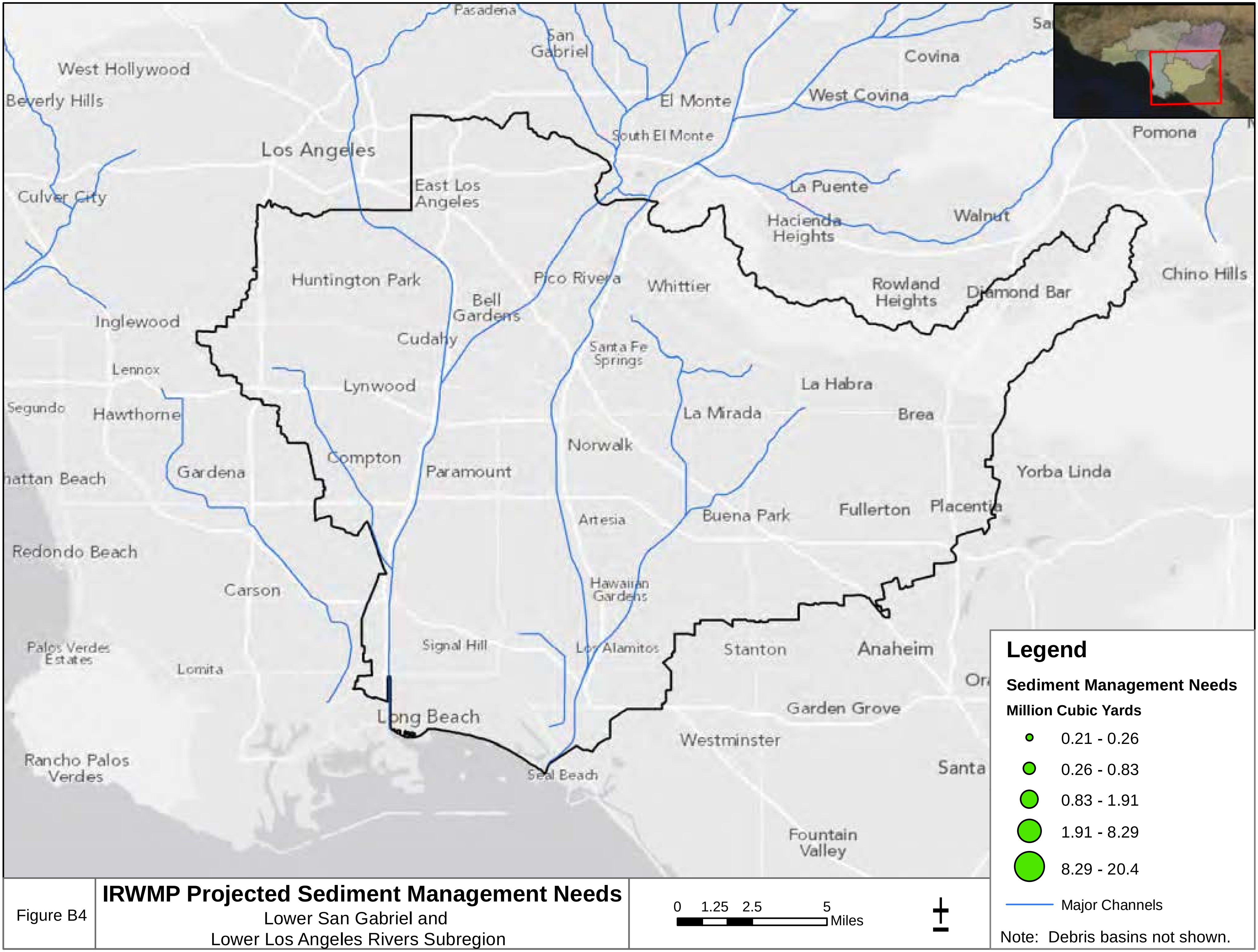


Figure B4

**IRWMP Projected Sediment Management Needs**

Lower San Gabriel and Lower Los Angeles Rivers Subregion

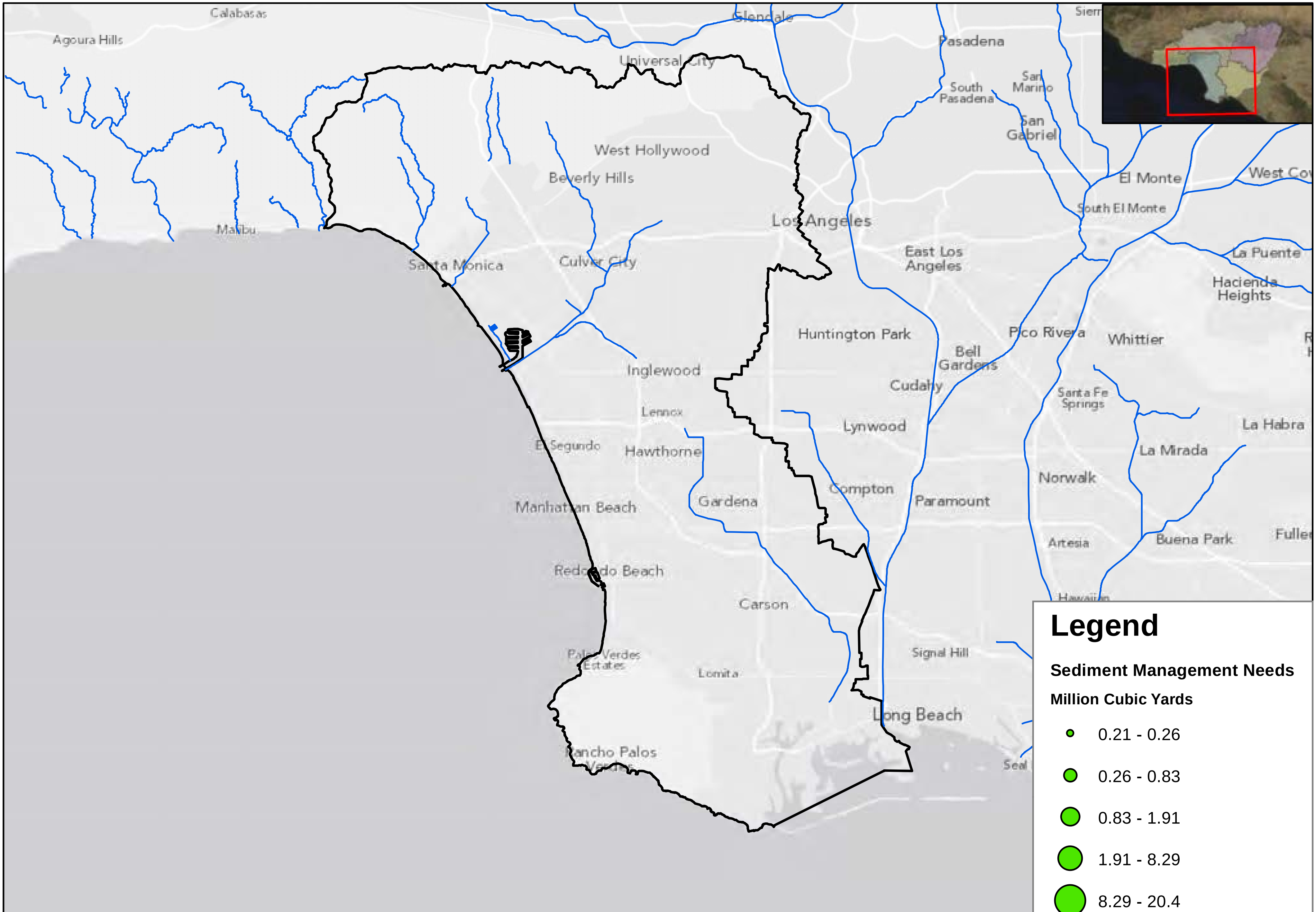


Figure B5

**IRWMP Projected Sediment Management Needs**

South Bay Subregion

# APPENDIX H

## H. The Greater Los Angeles County Open Space, Habitat and Recreation Technical Memorandum

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*Prepared for:*

**Greater Los Angeles County**
**Integrated Regional Water Management Plan**

# DRAFT FINAL
# The Greater Los Angeles County
# Open Space
# Habitat and Recreation
# Technical Memorandum

**(Integrated Regional Water Management Plan Update – 2013)**


***Prepared by:***

RMC Water and Environment

Geosyntec consultants

2M

Dr. Richard Ambrose

GreenInfo Network

SOLUTION strategies INTERNATIONAL

***& Aubrey Dugger***

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## LIST OF FIGURES

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# LIST OF EXHIBITS

## LIST OF ACRONYMS AND ABBREVATIONS

| | |
|---|---|
| AF | acre-feet |
| AF/yr | acre-feet/year |
| ASBS | Areas of Special Biological Significance |
| BMP | best management practices |
| CDFW | California Department of Fish and Wildlife |
| CEQA | California Environmental Quality Act |
| CESA | California Endangered Species Act |
| CRAM | California Rapid Assessment Methodology |
| CWA | Clean Water Act |
| EPA | United States Environmental Protection Agency |
| ESA | Endangered Species Act |
| FEMA | Federal Emergency Management Agency |
| GHG | greenhouse gas |
| GLAC | Greater Los Angeles County |
| Hazus | a geographic information system-based natural hazard loss estimation software package developed and freely distributed by FEMA. |
| HCP | Habitat Conservation Plan |
| HEP | Habitat Evaluation Procedures |
| HGM | Hydrogeomorphic Aquatic habitat Assessment Model |
| IBI | Index of Biological Integrity |
| IPCC | Intergovernmental Panel on Climate Change |
| IRWMP | Integrated Regional Water Management Plan |
| LSGLA | Lower San Gabriel and Los Angeles River Subregion |
| MPA | Marine Protected Area |
| NCCP | Natural Communities Conservation Planning |
| NEPA | National Environmental Protection Act |
| NOAA | National Oceanic and Atmospheric Administration’s National Marine Fisheries Service |
| NPDES | National Pollutant Discharge Elimination System |

## LIST OF ACRONYMS AND ABBREVATIONS (CONTINUED)

| | |
|---|---|
| NSMB | North Santa Monica Bay Subregion |
| NWI | National Wetlands Inventory |
| OSHARTM | Open Space, Habitat and Recreation Technical Memorandum |
| PDM | Post-Delisting Monitoring |
| Region | Greater Los Angeles County Region |
| RWQCB | Regional Water Quality Control Board |
| SAMP | Special Area Management Plans |
| SEA | Significant Ecological Area |
| SEATAC | Significant Ecological Area Technical Advisory Committee |
| SSMB | South Santa Monica Bay Subregion |
| TAR | Treatment Area Ratio |
| ULAR | Upper Los Angeles River Subregion |
| USACE | United States Army Corp of Engineers |
| USFWS | United States Fish and Wildlife Service |
| USGRH | Upper San Gabriel and Rio Hondo Subregion |
| WET | Aquatic habitats Evaluation Technique |



## EXECUTIVE SUMMARY

The Greater Los Angeles County (GLAC) region is 2,058 square miles and is one of the most densely populated, highly urbanized, and biologically diverse areas of the United States. Natural open space systems provide habitat and recreation opportunities, as well as other important functions related to water supply, water quality, and other services including flood management and climate adaptation. As the region has grown, much of these natural systems have been lost or fragmented.

The goal of the planning process is to provide direction for preserving, linking, restoring, and creating open space by providing a comprehensive regional framework for incorporating open space, both habitat and recreation, into water management project design features. To achieve this goal, this report presents information to assist water managers in more effectively including open space considerations in the development of water projects, as well as information for open space managers to easily incorporate water management objectives into their projects.

The Open Space, Habitat and Recreation Technical Memorandum (OSHARTM) builds on information provided in the 2006 Greater Los Angeles County Integrated Regional Management Plan (IRWMP) and other significant regional planning efforts. It was developed through collaboration with key agency stakeholders throughout the GLAC Region, including the Los Angeles County Flood Control District, the Council for Watershed Health, the Santa Monica Bay Restoration Commission, and various City, County, and State agencies that serve on the IRWMP Habitat and Open Space Ad Hoc Subcommittee.

This planning effort continued to recognize the five subregional IRWMP watershed planning areas established by the 2006 IRWMP. The subregions are as follows:

- North Santa Monica Bay Watershed (NSMB)
- Upper Los Angeles River Watershed (ULAR)
- Upper San Gabriel River and Rio Hondo Watersheds (USGRH)
- Lower San Gabriel River and Los Angeles River Watersheds (LSGLA)
- South Santa Monica Bay Watershed (SSMB)



**Objective of the Plan**

The objective of the OSHARTM planning process and report is to provide a framework for the GLAC Region's water and land managers to assist in the development of integrated projects for funding through the IRWMP. This plan re-defines the habitat and recreation goals for the GLAC IRWMP, details more meaningful objectives for those goals, and quantifies measureable targets. Having said that, the open space, habitat and recreation targets developed herein for the GLAC IRWMP reflect the best available information at this time, but are based on numerous assumptions and are subject to change as better information about the potential for actual implementation, including information about the cost of attaining the targets, is developed at the Subregional and Regional level. However, as other funding and planning opportunities arise, the methods contained herein can easily be used, when applicable, by others working to improve open space, habitat and recreation in the Region.

**Open Space**

Open space encompasses a continuum of uses from natural resource lands to urban parks. The habitat continuum extends from upland areas to riparian and freshwater aquatic habitat areas to coastal tidal aquatic habitats, while the recreation continuum extends from natural open space areas to greenways to park and urban recreation areas.

By viewing open space habitat and recreation as a continuum that changes depending on location and the needs of the region, multiple options can be considered in determining how these elements can work together and complement each other in meeting the other IRWMP objectives for water supply, water quality, and flood management. To develop targets, criteria, and methodologies, the Open Space Team first looked at the interconnectivity of open space throughout the region as a whole and then looked at each of the subregions.

In the foothill cities, open space is differentiated from developed urban parklands and focuses on natural, undeveloped lands that have been designated as environmentally and ecologically significant. On the other hand, for the more urbanized areas of Los Angeles County or cities that are built out and contain little or no undeveloped or undisturbed lands, open space emphasizes urban lands used for recreation. These lands include neighborhood and community parks, sports fields, school facilities, greenways, bikeways, green streets, medians, utility easements, etc.

*Open Space and Habitat*

Southern California, along with the entire GLAC Region is an area rich in natural resources. Due the scale of the threat to its biodiversity, many scientists, including noted biologist E.O. Wilson, have designated it as a “biological hotspot.” The objectives and targets for habitat seek to protect and restore these valuable natural resources in the context of water supply and management.

The objectives of the Open Space and Habitat section of the Plan are to increase the number of viable aquatic habitats within the region, to provide adequate buffers along aquatic systems, and to create wildlife linkages using riparian corridors and less densely populated hillsides. In addition, the establishment of wildlife linkages, allowing species to migrate as conditions change, will help address the effects of climate change.

*Aquatic habitats*

To simplify the presentation of aquatic habitat planning targets, aquatic habitats, as defined ecologically based on the National Wetlands Inventory, were classified into two general categories: (1) tidal aquatic habitats, (2) freshwater/riverine aquatic habitats. Three distinct types of aquatic habitat targets were developed: (1) protection of existing aquatic habitat, (2) enhancement of existing aquatic habitat, and (3) restoration or creation of aquatic habitat. For the GLAC Region, the total aquatic habitat area to be benefited by protection, enhancement, restoration or creation is 12,000 acres.

*Uplands*

Protection of water-dependent or aquatic habitat resources depends not only on managing the systems themselves, but also providing buffers to these systems and linkages through the landscape. Therefore, the provision of upland buffers and habitat linkages is important to maintaining habitat diversity. The targets for upland habitat acquisition and/or restoration were developed using Buffers and Buffer Zones (50 to 300-foot wide areas adjoining an aquatic habitat) and Wildlife Linkages or Corridors (wide areas of native vegetation that connect two or more large blocks of habitat). Targets are based on the acquisition and/or restoration of these two features. Targets for total potential linkage and buffer areas within the GLAC Region are 36,000 acres.

*Open Space and Recreation*

Over 9,000,000 people who live within the GLAC Region have access to more than 2,000 park and open space areas totaling 101,000 acres. In addition, there are almost 300,000 acres of public multi-use lands in the Angeles National Forest.

While there are many opportunities for recreation in the region, the recreation demand exceeds the supply. Recreation ranges from highly structured parks and recreation sites within communities, to regional parks that may offer developed active and undeveloped passive uses, to natural habitat and wildlands that contain trail-related hiking, biking, and equestrian uses, as well as outdoor/environment education opportunities. Three general recreation objectives were established to guide targets:

- Assist in providing urban neighborhood and community park areas that are accessible to underserved populations (and disadvantaged communities) based on average of 4 acres per thousand population.
- Enhance existing and planned greenways and regional trails within open space areas with outdoor recreation and environmental educational opportunities.
- Create or assure the preservation of 6 acres of open space lands per 1000 population that are available for passive public outdoor recreation and education purposes. These lands may incorporate: all or a portion of greenways; county, state, or national parks; US Forest Service lands; regional trails routes; and/or dedicated open space areas or any jurisdiction.

Based on existing standards, there is a need for approximately 16,500 acres of additional urban parkland (neighborhood and community parks). In addition, there is a need for approximately 30,000 to 45,000 acres of additional regional park and open space lands for recreation. The developed urban park targets can be improved to consider reasonable accessibility criteria in every subregion.

## Ecosystem Services

The benefits of open space lands within the region are extensive. In addition to water resource benefits, there is a full range of societal and economic benefits attributable to open space. Ecosystem services provide one approach for framing the values and benefits of open space.

Ecosystem services within the GLAC Region include, but are not limited to, the following benefits:

- Providing Fresh Water
- Infiltration and Groundwater Recharge
- Water Conservation
- Improving Water Quality
- Flood Management
- Preserving Biodiversity
- Providing Carbon Management
- Providing Aesthetics
- Cultural Values

Open space from a habitat perspective allows people to fulfill their desire to be connected to nature. This connection contributes to a greater sense of community. Recreation occurring in open space areas, whether it is passive or active, improves physical health, mental health, social function and youth development and provides environmental and economic benefits to people and communities.

*Surface and Groundwater Resources Management Benefits*

There are benefits to both surface and groundwater resource management that can be quantified using project-specific methodology. This methodology has been applied at the regional level using the assumption that the targets for habitat and recreation will be achieved. For example, there is an estimated potential to recharge an additional 28,000 acre feet of water per year on average throughout the GLAC Region if target habitat and recreation lands in areas with high recharge potential are developed or enhanced. As well, if the targets are met there is the potential to create 21,000 acre feet of storage for stormwater quality purposes if these open space lands are developed or enhanced with stormwater Best Management Practices (BMPs).

*Climate Benefits*

The effects of climate change are wide-reaching and must be incorporated into long-term planning efforts. There are a number of strategies that can be implemented within the

OSHARTM that will mitigate the effects of climate change. Climate benefits include carbon storage and sequestration by natural habitats (the carbon sequestration benefit will vary depending on the species planted); providing additional local recreation areas and “green” travel routes that encourage walking and cycling; and, creating habitat connectivity through wildlife linkages, corridors, and buffers.

## Evaluating Open Space Projects

The OSHARTM Ad-Hoc subcommittee felt that it would be valuable to develop scoring metrics to determine the suitability of proposed projects in meeting overall goals and objectives. While draft project evaluation criteria were developed, further vetting of these criteria and integration with criteria to evaluate other types of projects is necessary before the draft scoring metrics are finalized. Further work on the scoring metrics may be continued in the future, as necessary.

## Opportunities and Challenges

One of the main benefits to including open space for habitat and recreation metrics in the IRWMP is the opportunity it creates for a more connected region. The OSHARTM provides a mechanism for the County, cities, water resource agencies, conservancies, and stakeholders to work together to set region-wide goals and objectives. These goals and objectives can then be implemented at the subregional level through the IRWMP project grant program process.

The ability to form partnerships and collaborate to develop multi-purpose project and programs provides even greater opportunity to ensure the long-range success of the program. The 2006 IRWMP, as modified by subsequent updates, is considered a living document that will be reviewed and updated on a regular basis, which creates further opportunities to refine the criteria and targets developed during this planning effort as new information becomes available.

As with any undertaking that attempts to comprehensively address open spaces needs in a region the size of the GLAC there are challenges to be overcome. These include gaps in information, insufficient research, high levels of urbanization, and high land values. The OSHARTM includes a set of recommendations, which are intended to set forth strategies to reduce or overcome many of these challenges. Overall, one should be optimistic as challenges create opportunities.

# 1 INTRODUCTION

## 1.1 Background/Purpose

### 1.1.1 Overview of Integrated Regional Water Management Plan for the Greater Los Angeles County

The purpose of the 2006 Integrated Regional Water Management Plan (IRWMP) is to define a clear vision and direction for the sustainable management of water resources in the Greater Los Angeles County (GLAC). The plan provides a framework for the development of solutions that meet regional planning targets while integrating projects into other important issues that make up the urban context of the GLAC Region, including transportation, public education, land use, economic development, and quality of life. It also identifies the costs and benefits of those solutions to aid the GLAC in securing funding for the projects, both locally and with partners outside the region.

The IRWMP incorporates the following objectives to identify water resource management issues, increase the region's ecosystem services, and meet future water supply needs:

- Improve water supply
- Improve water quality
- Enhance open space for habitat and wildlands
- Enhance open space for recreation and greenways
- Sustain flood management

## 1.2 IRWMP Planning Areas

### 1.2.1 The Region

Given the size and complexity of the GLAC Region and the number of stakeholders and agencies, five subregional planning areas were established generally based on the watershed approach (Greater Los Angeles County Integrated Water Management Plan Region Acceptance Process Application, April 28 2009). Shown in Figure 1, the subregions are as follows:

1. North Santa Monica Bay Watersheds
2. Upper Los Angeles River Watersheds
3. Upper San Gabriel River and Rio Hondo Watersheds
4. Lower San Gabriel and Los Angeles Rivers Watersheds
5. South Santa Monica Bay Watersheds

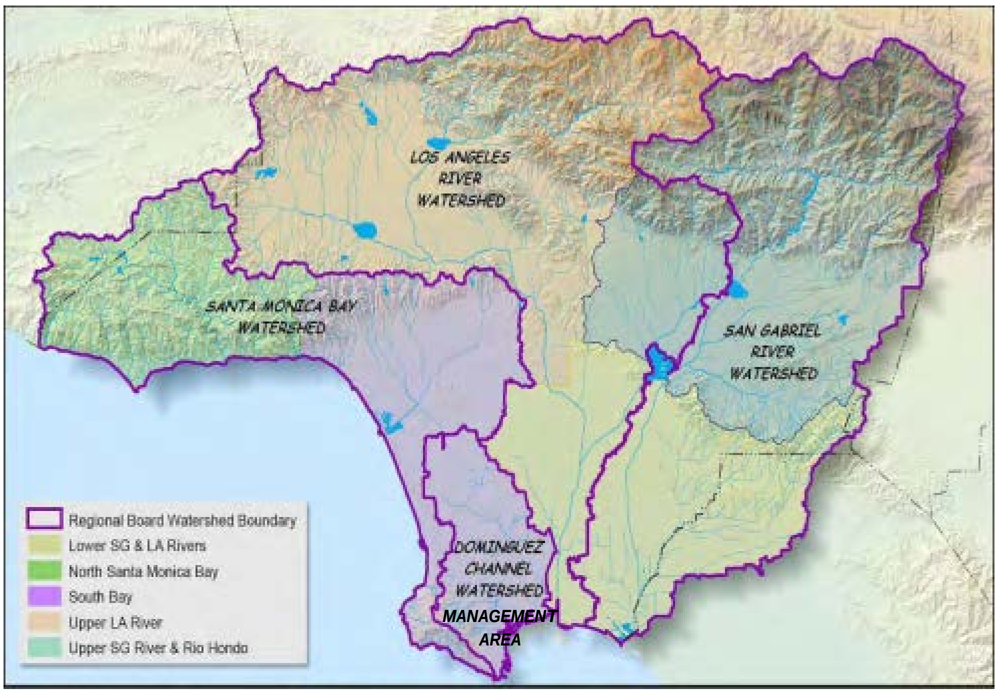


**Figure 1. GLAC Subregional and Watershed Boundaries**

## 1.3 <u>2012 IRWMP Update</u>

### 1.3.1 Living Document

The IRWMP is a living document. It is not intended to be filed away on a shelf, but rather to serve as the catalyst for solutions that can be implemented throughout the GLAC subregions.

The document is also intended to be reviewed regularly and updated as new information, technologies, and data become available.

### 1.3.2 IRWMP Planning Grant

The California Department of Water Resources (DWR) IRWM Program was created to encourage integrated regional strategies for managing water resources and to provide funding for both planning and implementation of projects that support management of water supply, water quality, environmental interests, drought protection, flood protections, and reduction of dependence on imported water. The current GLAC IRWM Plan was adopted in 2006.

In September 2010, the GLAC Region applied for $1,000,000 in Proposition 84 Planning Grant funds from DWR and on April 11, 2011, was awarded this sum. Funds from this grant are being used to update and expand the 2006 IRWMP.

### 1.3.3 Open Space Planning

One of the goals of the grant application was to develop a long-term open space, habitat and recreation TM vision for the GLAC Region that is supported by a clear rationale and based on the best available science and information.

The GLAC IRWMP Planning Grant Application stated that previous open space planning in the region had not been comprehensive. Instead it had focused on a geographic perspective and was often limited to specific areas or resources (e.g. the National Forest or coastal aquatic habitats). The IRWMP open space planning effort embodied in this TM is more comprehensive and addresses habitat conservation and restoration, human recreation, and water management in and around the urbanized areas at the scale of the GLAC IRWMP Region.

### 1.3.4 Landscape Scale Approach

To address the need to provide a comprehensive strategy for open space planning in the context of water resource management, the GLAC Open Space, Habitat and Recreation TM (OSHARTM) uses a landscape-scale approach to identifying opportunities to enhance aquatic and upland resources, improve planning for recreational opportunities, and facilitate the continuation of valuable ecosystem and cultural services across the region.

### 1.3.5 OSHARTM Component to the IRWMP

As stated earlier, developing the OSHARTM is part of the 2011-2013 IRWMP revision process. As mentioned in the GLAC IRWMP grant application, previous open space planning has not been comprehensive. The OSHARTM provides an opportunity to integrate open space resource management into the regional water management solutions.

To integrate habitat and recreation and other recognized ecosystem services into a comprehensive framework, the current OSHARTM builds on information provided in the 2006 IRWMP and other significant regional planning efforts.

By understanding how habitat and recreation support water quality and water supply and developing opportunities to incorporate the targets into the design of projects, the habitat and recreation objectives of the IRWMP can be realized. This will aid individual agencies, cities, and subregions in effectively implementing projects and programs that address more than one of the identified water management strategies.

## 1.4 OSHARTM Planning Process

In preparation for OSHARTM, many regional Los Angeles County planning efforts were examined. Exhibit A, Planning Documents Reviewed, details the projects, studies, and reports that were reviewed for references to watershed issues and habitat linkages.

The OSHARTM was developed through collaboration with key agency stakeholders throughout the GLAC Region, including the Council for Watershed Health, Santa Monica Bay Restoration Commission (see Table 1) and various city and county agencies, who comprised the IRWMP Habitat and Open Space Ad Hoc Subcommittee. This collaboration occurred primarily through monthly subregional meetings, as well as four Habitat and Open Space Subcommittee meetings that were held at the Los Angeles River Center on the following dates: September 27, 2011; November 14, 2011; December 21, 2011; and April 23, 2011. During these meetings, OSHARTM targets were developed through an iterative process, with targets presented and subsequent meetings used to further refine target methodology based on input from previous meetings. Subcommittee involvement also included additional in-person or phone meetings as requested by individual stakeholders, as well as email correspondence, to discuss methodology details. The draft OSHARTM was released on April 6, 2012 to the subcommittee for comment. Comments were received from multiple stakeholders throughout the GLAC Region, which were incorporated into the final version of the TM.

## Table 1. List of Participating Agencies/Groups and Representative(s)

| Organization | Representative |
|---|---|
| Army Corps of Engineers | Erin Jones |
| Arroyo Seco Foundation | Meredith McKenzie<br>Tim Brick |
| Cities of Agoura Hills and Westlake Village | Joe Bellomo |
| City of Los Angeles Planning | Claire Bowin |
| City of Malibu | Barbara Cameron |
| Council for Watershed Health | Blake Whittington<br>Nancy Steele |
| Los Angeles County | Timothy Pershing |
| Los Angeles County Flood Control | Phil Doudar<br>Russ Bryden<br>Rochelle Paras |
| Los Angeles County Parks and Recreation | Camille Johnson<br>Norma Garcia |
| Las Virgenes Municipal Water District | Jan Dougall<br>Randal Orton |
| Mountains Recreation and Conservation Authority | Dash Stolarz |
| Mountains Restoration Trust | Jo Kitz |
| Palos Verdes Peninsula Land Conservancy | Andrea Vona |
| Resource Conservation District of the Santa Monica Mountains | Clark Stevens<br>Melina Watts |
| Rivers and Mountains Conservancy | Belinda Faustinos<br>Mark Stanley<br>Marybeth Vergara |
| Regional Water Quality Control Board | Shirley Birosik |
| Santa Monica Bay Restoration Commission | Shelley Luce |
| State Water Resources Control Board | Guangyu Wang |
| Tree People | Rebecca Drayse |

## 2 THE OPEN SPACE CONTINUUM (NATURAL RESOURCE LANDS TO URBAN PARKS)

For general planning purposes, the definition of open space is "any parcel or area of land or water that is essentially unimproved and devoted to an open space use for the purposes of (1) the preservation of natural resources, (2) the managed production of resources, (3) outdoor recreation, or (4) public health and safety."[1] See Figure 2 for a visual description of the environmental Open Space Continuum from the region's mountains to the coast.

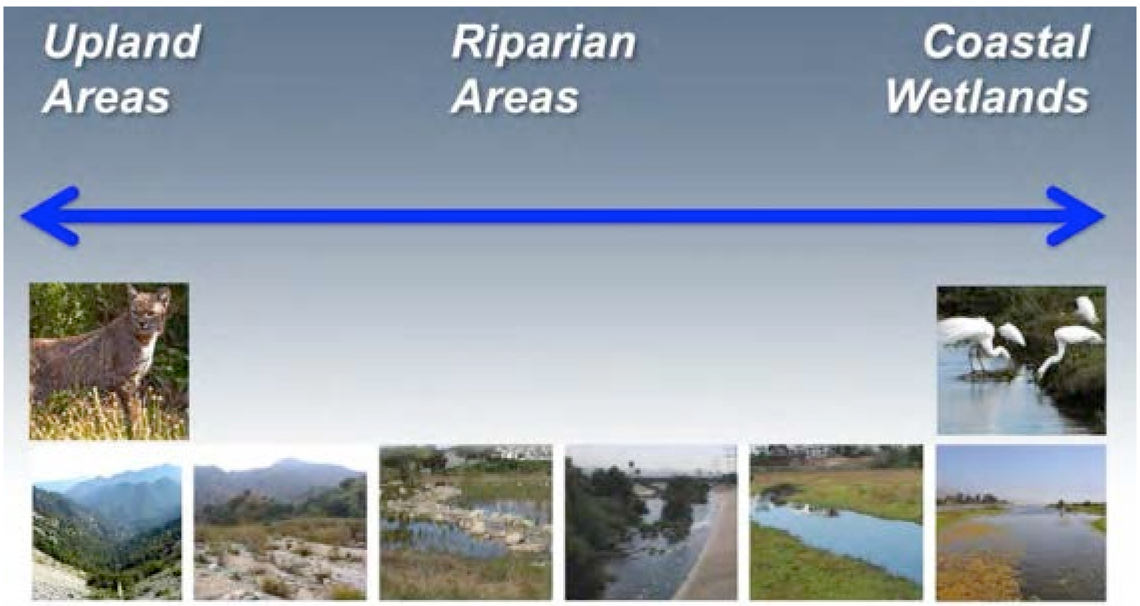


**Figure 2. The Open Space Continuum – From Uplands to the Coast**

From a planning perspective, open space conservation is typically addressed through state-required open space and conservation elements of General Plans. As a practical matter, the definition of open space is defined based on the community values of the individual jurisdiction and is therefore interpreted fairly widely by Los Angeles County and the nearly 84 cities within the GLAC Region. The variations between jurisdictions are generally due to

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[1] State of California, Governor's Office of Planning and Research. *State of California General Plan Guidelines*. 2003.

the interpretation of the phrase "essentially undeveloped," a relative term. See Figure 3 below for a visual description of the recreational Open Space Continuum.


**Figure 3. The Open Space Continuum – From Regional Lands to Urban Parks**

For the foothill cities, open space is differentiated from developed urban parklands and focuses on relatively natural undeveloped lands that have been designated as environmentally and ecologically significant as wildlife habitat areas and corridors, or areas that provide a visual backdrop and amenity. These lands often include substantial hillside areas and canyons and may include rural and agricultural lands. Open space in these instances applies to land that is typically publicly owned, though not always, and in some instances public access may be restricted. Some of these open space areas have developed visitor facilities and hold commercial events, which can in and of themselves cause impacts on these lands and areas.

The definition of open space as used by the State of California for the preparation of General Plans provides a broad framework that includes many public benefits. Some open space benefits include:

- Habitat preservation and opportunities for restoration:
  - Ecosystem diversity and services
  - Wildlife corridor connectivity
  - Endangered species habitat
- Outdoor recreation opportunities:
  - Passive uses
  - Active uses
- Water supply:
  - Surface
  - Groundwater
- Water quality maintenance
- Air quality maintenance
- Historic and cultural resource protection
- Agricultural opportunity
- Forest management
- Scenic quality preservation
- Control of urban sprawl and associated benefits:
  - Community image / rural character
  - Ambient healthful living conditions
  - Reduced greenhouse gas emissions (air quality)
  - Quality of life

On the other hand, for the more urbanized areas of Los Angeles County or cities that are essentially built out and contain little or no undeveloped or undisturbed landscapes, such as Burbank, Gardena, or Compton, the expression of open space contained in their General Plans emphasizes urban lands used for recreation purposes. These lands include neighborhood and community parks and sports fields. Urban open spaces may even include public school facilities, greenways, bikeways, green streets and landscaped medians, open areas occupied by utilities such as flood control channels and utility easements, and private recreational facilities. Alternatively, there are many open space and wilderness parks that are increasing the number of developed visitor facilities, number of commercial events and leasing properties for commercial purposes.

# 3 OPEN SPACE AND HABITAT

The GLAC Region is approximately 2,000 square miles located in coastal Southern California. The IRWMP project area is one of the most densely populated, highly urbanized, and biologically diverse areas of the United States. It is located within the Californian Floristic Province, which is a biodiversity hotspot. Designated a hotspot in 1996, it shares this distinction with 33 other places in the world.[2] Noted biologist E.O Wilson designated southern California as one of the world's eighteen "hotspots" – the only one in North America – because of the scale of the threat to its biodiversity. Climatically only two percent of the earth’s surface has the Mediterranean-type climate found in southern California.

The study area is part of a complex landscape where the geomorphic provinces of the Transverse Ranges and Peninsular Ranges come together. Major topographic features in the region include the San Gabriel Mountains, Santa Monica Mountains, Verdugo Hills, San Jose Hills, Puente-Chino Hills, and Palos Verdes Peninsula. The mountains, hills, and peninsula define the San Fernando and San Gabriel Valleys and other portions of the Los Angeles basin and coastal plain.

The San Jose and Puente-Chino Hills contain relatively low density urban development as compared to the Los Angeles Basin and still retain areas with significant open space. Areas in the southern San Gabriel foothills are also developed at a lower density than the highly urbanized areas in the valleys and coastal plains. These foothills function as the urban/wildland interface and provide wildlife connections to river and stream corridors.

The two largest watersheds of the region are the San Gabriel River Watershed and the Los Angeles River Watershed. The San Gabriel River watershed drains 660 square miles and has its headwaters in the San Gabriel Mountains. The river reaches the Pacific Ocean at Los Alamitos Bay. The Los Angeles River watershed drains 830 square miles of land from the Santa Monica Mountains, the San Gabriel Mountains, and the Los Angeles basin, reaching the Pacific Ocean in Long Beach. These two rivers formed the Los Angeles basin, a large floodplain and alluvial fan. The Rio Hondo River hydrologically connects the Los Angeles River and San Gabriel River watersheds at the Whittier Narrows Reservoir. Other major watersheds in the region include Malibu Creek, Topanga Creek, Ballona Creek (which drain to Santa Monica Bay), and the Dominguez Channel (which drains to San Pedro Bay). Dozens of smaller watersheds drain directly to Santa Monica or San Pedro Bays.

[2] www.calacademy.org/exhibits/California_hotspot/overview.htm

In the mountains and foothills, including many of the coastal watersheds, the streams have seasonal flows and high-quality habitat. Downstream, the river systems have been engineered to protect homes and businesses from flooding and to provide for water conservation. Moreover, the modifications that have been made contribute to water supply and other resource management strategies, so new projects to achieve open space, habitat and recreation goals must be developed in ways that work with those existing facilities and projects, so that the Region does not undermine attainment of other types of IRWMP goals, such as enhancement of locally-produced water supplies that are more sustainable.

In some areas of Los Angeles County, nearly all aquatic habitat areas that was present prior to European settlement has been developed or severely diminished in habitat value. Despite their altered state, these urbanized channels still serve as habitat for wildlife.

The diverse landscape of the study area contains examples from most of the vegetation types and wildlife that are found in Southern California today. From the high peaks of the San Gabriel Mountains to the low coastal plain south of the Puente-Chino Hills, differences in climate, soils, and geology set the stage for a wide array of plant communities. Common plant communities include coastal strands and bluffs, lagoons, coastal sage scrub, chaparral, foothill woodlands, and coniferous forests in the mountains. Chaparral is the dominant native plant community in the study area.

Many of the region's native plant communities have been displaced due to grazing, agriculture, and urban development. Almost all of the native plant communities that remain contain sensitive, rare, or endangered flora and fauna. The GLAC Region is also home to 51 species that hold federal endangered, threatened, candidate for listing, or subject for post delisting monitoring (PDM) status. Table 2 below provides a list of federal endangered and threatened species found in the project area.[3]

[3] http://www.fws.gov/carlsbad/SpeciesStatusList/CFWO_Species_Status_List.htm

## Table 2. Federally Listed Species Occurring within the GLAC Region

| Scientific Name | Common Name | Federal Status |
|---|---|---|
| **PLANTS** | | |
| *Acmispon (Lotus) dendroideus* var. *traskiae* | San Clemente Island lotus | Endangered |
| *Arenaria paludicola* | marsh sandwort | Endangered |
| *Astragalus brauntonii* | Braunton's milk-vetch | Endangered |
| *Astragalus pycnostachyus* var. *lanosissimus* | Ventura marsh milk-vetch | Endangered |
| *Astragalus tener* var. *titi* | coastal dunes milk-vetch | Endangered |
| *Berberis nevinii* | Nevin's barberry | Endangered |
| *Brodiaea filifolia* | thread-leaved brodiaea | Threatened |
| *Castilleja grisea* | San Clemente Island Indian paintbrush | Endangered |
| *Cercocarpus traskiae* | Catalina Island mountain mahogany | Endangered |
| *Cordylanthus maritimus* (subsp.*maritimus)* | salt marsh bird's beak | Endangered |
| *Chorizanthe parryi* var. *Fernandina* | San Fernando Valley spineflower | Candidate |
| *Delphinium variegatum* subsp. *kinkiense* | San Clemente Island larkspur | Endangered |
| *Dodecahema (Centrostegia) leptoceras* | slender-horned spineflower | Endangered |
| *Dudleya cymosa* subsp. *Ovatifolia* | Santa Monica Mountains dudleya | Threatened |
| *Helianthemum greenei* | Island rush-rose | Threatened |
| *Lithophragma maximum* | San Clemente Island woodland star | Endangered |
| *Malacothamnus clementinus* | San Clemente Island bush mallow | Endangered |
| *Navarretia fossalis* | spreading navarretia | Threatened |
| *Orcuttia californica* | California Orcutt grass | Endangered |
| *Pentachaeta lyonii* | Lyon's pentachaeta | Endangered |
| *Phacelia stellaris* | Brand's phacelia | Candidate |
| *Rorippa gambellii* | Gambel's watercress | Endangered |
| *Sibara filifolia* | Santa Cruz Island rock-cress | Endangered |
| **INVERTEBRATES** | | |
| *Euphilotes battoides allyni* | El Segundo blue butterfly | Endangered |
| *Glaucopsyche lygdamus* | Palos Verdes blue butterfly | Endangered |

| Scientific Name | Common Name | Federal Status |
|---|---|---|
| *palosverdesensis* | | |
| *Streptocephalus woottoni* | Riverside fairy shrimp | Endangered |
| **FISH** | | |
| *Catostomus santaanae* | Santa Ana sucker | Threatened |
| *Gasterosteus aculeatus williamsoni* | unarmored threespine stickleback | Endangered |
| *Oncorhynchus mykiss* | southern steelhead (So Cal DPS) | Endangered |
| **AMPHIBIANS** | | |
| *Anaxyrus californicus (Bufo microscaphus c.)* | arroyo toad (a. southwestern t.) | Endangered |
| *Rana draytonii* | California red-legged frog | Threatened |
| *Rana muscosa* | mountain yellow-legged frog (So Cal DPS) | Endangered |
| **REPTILES** | | |
| *Xantusia riversiana* | island night lizard | Threatened |
| **BIRDS** | | |
| *Amphispiza belli clementeae* | San Clemente sage sparrow | Threatened |
| *Brachyramphus marmoratus* | marbled murrelet | Threatened |
| *Charadrius alexandrinus nivosus* | western snowy plover | Threatened |
| *Coccyzus americanus* | yellow-billed cuckoo | Candidate |
| *Empidonax traillii extimus* | southwestern willow flycatcher | Endangered |
| *Gymnogyps californianus* | California condor | Endangered |
| *Haliaeetus leucocephalus* | bald eagle | PDM |
| *Lanius ludovicianus mearnsi* | San Clemente loggerhead shrike | Endangered |
| *Pelecanus occidentalis* | brown pelican | PDM |
| *Phoebastria albatrus* | short-tailed albatross | Endangered |
| *Polioptila californica californica* | coastal California gnatcatcher | Threatened |
| *Rallus longirostris levipes* | light-footed clapper rail | Endangered |
| *Sternula (Sterna) antillarum browni* | California least tern | Endangered |
| *Vireo bellii pusillus* | least Bell's vireo | Endangered |
| **MAMMALS** | | |
| *Dipodomys merriami parvus* | San Bernardino kangaroo rat | Endangered |
| *Enhydra lutris nereis* | southern sea otter | Threatened |
| *Perognathus longimembris pacificus* | Pacific pocket mouse | Endangered |
| *Urocyon littoralis catalinae* | Santa Catalina Island fox | Endangered |

The region's lagoons and freshwater marshes are especially important to over wintering and migratory songbirds and waterfowl on the Pacific Flyway in addition to providing year round habitat and critical resources for resident species.

Within all five subregions, there are special designated areas called "critical habitat" that protect listed plant and animal species. The United States Fish and Wildlife Service (USFWS) through the Endangered Species Act (ESA) defines critical habitat as "a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery." A critical habitat designation typically has no impact on property or developments that do not involve a Federal agency, such as a private landowner developing a property that involves no Federal funding or permit. However, when such funding or permit is needed, the impacts to critical habitat are considered during the consultation with the USFWS. Each of the five subregions contain areas designated as critical habitat. Table 3 shows the designated critical habitat for each species across the subregions by acreage.

**Table 3. Designated Critical Habitat for Federally Listed Species**

| Critical Habitat Acreage by Subregion | | | | | |
|---|---|---|---|---|---|
| **Species** | **Lower San Gabriel and Lower Los Angeles Rivers** | **North Santa Monica Bay** | **South Bay** | **Upper Los Angeles River** | **Upper San Gabriel and Rio Hondo Rivers** |
| Arroyo toad | 0 | 0 | 0 | 1,190.0 | 0 |
| Brauton's milk-vetch | 0 | 710 | 510 | 270 | 280 |
| California red-legged frog | 0 | 4,950 | 0 | 4 | 0 |
| Coastal California gnatcatcher | 9,350 | 0 | 5,040 | 9,920 | 4.580 |
| Lyon's pentachaeta | 0 | 1,970 | 0 | 0 | 0 |
| Mountain yellow-legged frog | 0 | 0 | 0 | 0 | 3,240 |
| Palos Verdes blue butterfly | 0 | 0 | 90 | 0 | 0 |

The location of the designated critical habitat is provided in Figure 4.

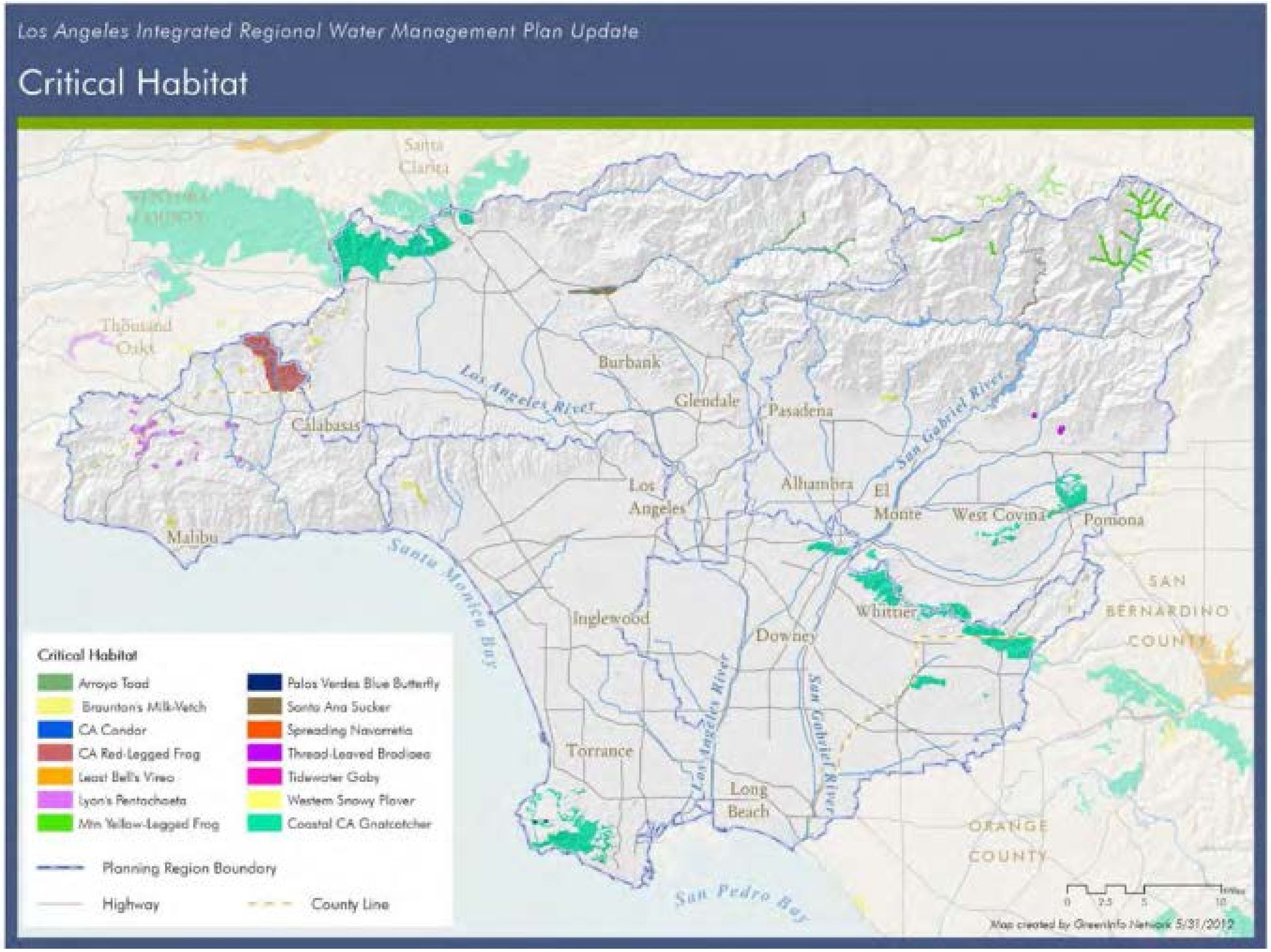


**Figure 4. USFWS Designated Critical Habitat Areas**

## 3.1 Regulatory Context

### 3.1.1 National Environmental Protection Act (NEPA)

NEPA, adopted in 1969 (42 U.S.C. Section 4321 et seq.), establishes a framework for protecting the national environment. “NEPA’s basic policy is to assure that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment.”[4] All projects and activities that involve federal activities or property must comply with NEPA.

### 3.1.2 California Environmental Quality Act (CEQA)

CEQA, adopted in 1970 (Public Resource Code Section 21000 et seq.), is California's broadest environmental law. It guides local and state agencies in protecting the environment through the issuance of permits and approval of projects. “CEQA applies to all discretionary projects proposed to be conducted or approved by a California public agency, including private projects requiring discretionary government approval.”[5] Any proposed project or activity by an individual or state governmental entity that impacts the environment is subject to CEQA regulations.

### 3.1.3 United States Army Corps of Engineers (USACE)

*Regulatory Program*

The USACE has regulatory permit authority from Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act of 1899. Section 404 gives the USACE jurisdiction over all water of the United States including aquatic habitats, perennial and intermittent streams, ponds, and lakes. The USACE is responsible for the day-to-day administration and permit review and the United States Environmental Protection Agency (EPA) provides program oversight. Any person or public agency proposing to discharge dredged or fill material into waters of the United States is required to obtain a permit. Any work in traditionally navigable waters also requires a permit. “Permit review and issuance follows a sequence process that encourages avoidance of impacts, followed by minimizing

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[4] epa.gov/lawsregs/laws/nepa.html
[5] http://dfg.ca.gov/habcon/ceqa/

impacts and, finally, requiring mitigation for unavoidable impacts to the aquatic environment."[6]

*Special Area Management Program (SAMP)*

Special Area Management Plans (SAMPs) provide a comprehensive review of aquatic resources in an entire watershed rather than the USACE's traditional project-by-project review pursuant to its regulatory program. Potential watershed impacts are analyzed over time in order to identify priority areas for preservation, identify potential restoration areas, determine the least environmentally damaging locations for proposed projects, and establish alternative permitting processes appropriate for the SAMP area.

The goal of a SAMP is to achieve a balance between aquatic resource protection and reasonable economic and infrastructure development. Geographic areas of special sensitivity under intense development pressure are well-suited for this planning process. These comprehensive and complex efforts require the participation of multiple local, state, and federal agencies, as well as public and stakeholder involvement.

*Mitigation Banking*

The regulatory program provides a preference for the use of mitigation banking to offset unavoidable impacts to jurisdictional areas (33 CFR 332 et seq.). A mitigation bank is created when a government agency, corporation, nonprofit organization, or other entity undertakes providing mitigation for itself or others under a formal agreement with a resource or regulatory agency. Mitigation banks are a form of "third-party" compensatory mitigation, in which the responsibility for compensatory mitigation implementation and success is assumed by the bank operator rather than by the project developer. The bank operator is responsible for the design, construction, monitoring, ecological success, and long-term protection of the bank site (Mitigation Banking Factsheet, US EPA). To offset impacts to aquatic habitats, streams, lakes, and other aquatic sites, mitigation banks must be approved by the USACE. This and other mitigation requirements are discussed in the USACE rule regarding mitigation for the loss of aquatic resources (33 CFR 332 et seq.).

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[6] http://www.fws.gov/habitatconservation/cwa.html

### 3.1.4 United States Fish and Wildlife Services

*Endangered Species Act (ESA)*

USFWS and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA) administer the ESA. "The ESA provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found."[7] The law requires consultation with federal agencies (e.g. USFWS and/or NOAA) to ensure that actions they authorize, fund, or carry out are not likely to impact the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. ESA prohibits any action that causes a "taking" of any listed species of fish or wildlife.[8]

*Habitat Conservation Plans*

The ESA, under section 10(a)(1)(B), also outlines a habitat conservation planning process that subsequently allows for USFWS and NOAA to issue incidental take permits for otherwise lawful activities. Projects impacting listed species and/or their habitat that do not have a federal project nexus (i.e. do not partner with a federal agency or use federal funds) are required to go through the 10(a)(1)(B) process and prepare a Habitat Conservation Plan (HCP). The HCP process ensures that a project, when finally approved by the agencies, adequately minimizes and mitigates impacts to listed species to the maximum extent possible. The size and scope of HCPs vary depending on the project proponent (i.e. HCPs can be developed for a single project or can be large-scale and multijurisdictional in nature and cover a variety of project types) (USFWS, 1996).

*Conservation Banking*

A conservation bank is similar to a mitigation bank. It too is a form of "third-party" compensatory mitigation created when an entity undertakes providing mitigation for itself or others under a formal agreement with a resource or regulatory agency. The conservation bank operator then becomes responsible for the design, construction, monitoring, ecological success, and long-term protection of the bank site. To offset impacts to aquatic habitats, streams, lakes, and other aquatic sites, mitigation banks must be approved by the USACE.

[7] http://www.epa.gov/lawsregs/laws/esa.html
[8] http://www.epa.gov/lawsregs/laws/esa.html

The difference is that the conservation bank is to offset impacts to listed species and their habitat.

### 3.1.5 Regional Water Quality Control Board (RWQCB)

*California's Porter-Cologne Act*

Under this Act adopted in 1969, the RWQCB has the authority over California water rights and water quality policy. It has jurisdiction over all of California's aquatic resources. The Act established the nine RWQCBs throughout the State of California to oversee water quality at the local and regional level. Each regional board prepares and updates Basin Plans, issues permits to control pollution and regulate all pollutant or nuisance discharges impacting surface water or groundwater.[9]

*Section 401 of the Clean Water Act Certification*

If a project requires a Section 404 permit, a Section 401 certification from the RWQCB is also needed. The federal CWA, in Section 401(a)(1), specifies that states must certify that any activity subject to a permit issued by a federal agency meets all state water quality standards:

> *"This program protects all waters in its regulatory scope, but has special responsibility for aquatic habitats, riparian areas, and headwaters because these water bodies have high resource value, are vulnerable to filling, and are not systematically protected by other programs. The Program encourages basin-level analysis and protection, because some functions of aquatic habitats, riparian areas, and headwater streams - including pollutant removal, flood water retention, and habitat connectivity - are expressed at the basin or landscape level"*[10]

Depending on the location of the project or activity, a Section 401 certification is obtained by applying to the applicable RWQCB region in which the project is located. The RWQCB also requires that the project file all other required permits and showing of compliance with NEPA and CEQA.

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[9] http://ceres.ca.gov/aquatic habitats/permitting/
[10] http://www.waterboards.ca.gov/water_issues/programs/cwa401/

*National Pollutant Discharge Elimination System (NPDES) Permits*

Under the U.S. Environmental Protection Agency, each of the nine RWQCBs has the responsibility of granting CWA NPDES permits for certain point-source discharges. NPDES permits set specific requirements managing the characteristics of the discharged water based on national technology-based effluent limitations and water quality standards. The permits establish the level of performance the permittee or discharger is required to maintain and specify monitoring, inspection, reporting requirements and additional actions necessary to achieve compliance with NPDES regulations. "Point source" is defined as any discernible, confined and discrete conveyance, such as a pipe, ditch, channel, tunnel, conduit, discrete fissure, or container."[11] Each Regional Boards has different waste discharge requirements and other regulatory actions.[12]

*Areas of Special Biological Significance (ASBS)*

In the mid-1970s, thirty-four areas on the coast of California were designated as areas requiring protection by the State Water Resources Control Board and were called Areas of Special Biological Significance (ASBS). The Public Resources Code states that point source waste and thermal discharges into ASBS are prohibited or limited by special conditions, and nonpoint sources discharging into ASBSs must be controlled to the extent practicable. There is one ASBS, the Mugu Lagoon to Latigo Point ASBS, within the study region.

### 3.1.6 California Department of Fish and Wildlife

*Streambed Alteration Agreements (Section 1600 of the Fish and Wildlife Code)*

The CDFWCDFW Code (Sections 1600-1616) regulates activities that would alter the flow, bed, banks, channel, or associated riparian areas of a river, stream, or lake. The law requires any person, state or local governmental agency, or public utility to notify CDFWCDFW before beginning an activity that will substantially modify a river, stream, or lake. These

[11] http://www.campuserc.org/virtualtour/grounds/drains/Pages/NPDES-Overview.aspx
[12] http://ceres.ca.gov/aquatic habitats/permitting/

activities also must be consistent with any other applicable environmental laws such as Section 404 and 401 of the Clean Water Act and CEQA.[13]

*California Endangered Species Act (CESA)*

CESA, adopted in 1970, "expresses the state's concern over California's threatened wildlife, defined rare and endangered wildlife," and gave authority to CDFWCDFW to "identify, conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat in California."[14] This Act (Fish and Wildlife Code Section 2050, et seq.) prohibits the "taking" of California listed species unless a permit is obtained from the CDFWCDFW.[15] Many of the endangered and/or threatened species are similar to those listed under the federal ESA.

*Natural Communities Conservation Planning (NCCP) Program*

In 1991, the Natural Community Conservation Planning (NCCP) Act was added to CESA (Fish and Wildlife Code Section 2800-2840). The State of California is the only state to enact a law that closely complements the habitat conservation planning process of ESA. The NCCP Act encourages the development of multi-species, ecosystem-based plans that provide for the conservation and recovery of both listed and unlisted species within the plan area. The NCCP Act requires a plan to provide for the conservation of covered species, and includes independent scientific input and significant public participation. When applied together, the ESA and NCCP Act bring their complementary strengths to conservation planning to provide greater conservation benefits than either Act alone.

*Marine Protected Areas*

On December 15, 2010, the California Fish and Game Commission adopted regulations to create a suite of marine protected areas (MPAs) in southern California (Point Conception to the California/Mexico border). This network of 50 MPAs and two special closures (including 13 MPAs and two special closures previously established at the northern Channel Islands) covers approximately 354 square miles of state waters and represents approximately 15 percent of the region. There are four designated MPAs in the study region:

[13] http://ceres.ca.gov/aquatic habitats/permitting/
[14] http://www.energy.ca.gov/glossary/
[15] http://ceres.ca.gov/wetlands/permitting.htm

- Point Dume State Marine Conservation Area
- Point Dume State Marine Reserve
- Point Vicente State Marine Conservation Area
- Abalone Cove State Marine Conservation Area.

All take is prohibited in the Point Dume State Marine Reserve and the Point Vicente State Marine Conservation Area, except for remediation activities associated with the Palos Verdes Shelf Operable Unit of the Montrose Chemical Superfund Site in Point Vicente. Take is restricted in the other State Marine Conservation Areas, although some fishing for pelagic finfish and coastal pelagic species is allowed.

*Environmentally Sensitive Habitat Areas*

Sensitive ecological areas within the City of Malibu have been modified with additional field studies that either retained or modified the County SEAs. The Malibu Local Coastal Plan and Local Implementation Plan for Coastal Development Permits were adopted on September 13, 2002. ESHA maps are considered as a reference to designate areas that need special study with a site-specific biological resource study. The ESHA maps and other environmental resources may be found at: http://www.malibucity.org/documentcenter/view/4420 (Public Access, Public Beaches, Parklands & Trails (Amended in 2011 http://www.malibucity.org/documentcenter/view/1340), ESHA as of 2001. There have been amendments, if more details are needed.)

### 3.1.7 County of Los Angeles

*Significant Ecological Areas*

The concept of a ‘significant ecological area’ (SEA) is unique to Los Angeles County. Los Angeles County developed the concept in the 1970s in conjunction with adopting the original General Plan for the County.

The Significant Ecological Area (SEA) Program is a component of the Los Angeles County Conservation/Open Space Element in their General Plan. This program is a resource identification tool that indicates the existence of important biological resources. SEAs are not preserves, but are areas where the County deems it important to facilitate a balance between limited development and resource conservation. Limited development activities are reviewed closely in these areas where site design is a key element in conserving fragile resources such as streams, oak woodlands, and threatened or endangered species and their habitat.

Proposed development is governed by SEA regulations. The regulations, currently under review, do not to preclude development, but to allow limited, controlled development that does not jeopardize the unique biotic diversity within the County. The SEA conditional use permit requires development activities be reviewed by the Significant Ecological Area Technical Advisory Committee (SEATAC). Additional information about regulatory requirements is available on the Los Angeles County website.[16]

[16] http://planning.lacounty.gov/sea/faqs

# 4 OBJECTIVES AND PLANNING TARGETS FOR HABITAT

The following sections describe the 20-year planning targets that were developed for the habitat section of the OSHARTM through the collaborative process described in Section 1.4. These targets are intended to serve as a quantitative measure of progress towards the overall IRWMP habitat goals, as well as to guide project proponents in effectively incorporating habitat into proposed IRWMP projects.

## 4.1 Objectives

Natural open space systems provide habitat and recreation opportunities, as well as other important functions related to water supply and water quality. California and the GLAC Region have lost a great amount of its natural systems and for aquatic habitats systems more than any other state (Dahl, 1990).

The objective in this planning process is to help reverse this trend and to have open space, habitat and recreation considered in the planning of water supply and water quality projects. While opportunities for coastal aquatic habitat restoration are limited by extensive development, as well as by geologic and topographic constraints, opportunities to preserve and restore aquatic habitat (i.e. stream corridors and riparian habitat) are numerous. Upland habitat blocks, buffers, and linkages also are in need of preservation and restoration.

The objective is to increase the acreage of aquatic within the region, to provide adequate buffers along aquatic systems, and to create wildlife linkages using riparian corridors and less densely populated hillsides. In addition, the establishment of wildlife linkages, allowing species to migrate northward as conditions change, will help address the effects of climate change.

## 4.2 Habitat Planning Targets – Aquatic Habitat

### 4.2.1 Aquatic Habitat

Although southern California is a relatively dry region, the greater Los Angeles area historically contained abundant and diverse aquatic habitat because of its aquatic habitat resources (Rairdan, 1998; Stein et al., 2007; Dark et al., 2011). Much of the original aquatic habitat in the region has been destroyed or converted to other habitat (including concrete-lined rivers), and much of the remaining aquatic habitats have been degraded by poor water quality or other human activities. The goals of the aquatic habitat targets are to protect, restore (re-establish or rehabilitate), and/or enhance existing aquatic habitat and to create new aquatic habitat in the region.

*Terminology*

There are many different ways to categorize or define aquatic habitats, including approaches based on various ecological or regulatory perspectives. For this project, rather than use the term “wetland”, which might have unintended associations, the term “aquatic habitat” was used to refer to land transitional between terrestrial and aquatic systems where the water table is usually at or near ground surface or the land is covered by shallow water. For purposes of this classification, aquatic habitat must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

For the purposes of this report, many man-made habitats are considered to be aquatic habitat/wetlands while the aquatic habitat regulatory definition considers man-made habitats developed as stormwater Best Management Practices as a separate category. Man-made detention basins, swales, and depressional areas are generally not considered aquatic habitats/wetlands for regulatory purposes even though they may provide ecosystem benefits.

To simplify the presentation of aquatic habitat planning targets, aquatic habitat was categorized into three general categories: (1) tidal aquatic habitat, (2) freshwater and (3) riverine aquatic habitat based on categories defined by the National Wetlands Inventory (NWI). Although incomplete, the NWI is a very important source of information for the present aquatic habitat conditions with the GLAC. Larger, regional areas that function as off-system detention and storage would be considered freshwater aquatic habitat. While it is recognized that rivers and stream beds are not always considered aquatic habitats, for they do provide some aquatic habitat value, and therefore are considered for this study. The definition for each of these categories is as follows:

- *Tidal aquatic habitats* include aquatic habitats that are inundated by tides, either seasonally or year-round. Marine harbors, a man-made habitat, are also considered tidal aquatic habitats. In the NWI mapping system, the three categories included in tidal aquatic habitats are estuarine and marine deepwater, estuarine and marine aquatic habitat, and tidal aquatic habitats.

- *Freshwater aquatic habitats* include aquatic habitats such as depressional marshes, lakes, and ponds. The NWI category "freshwater aquatic habitats" include freshwater emergent aquatic habitat, freshwater forested/shrub aquatic habitat, freshwater ponds and lakes, and also considers man-made habitats such as flood control basins and ponds which may include areas of freshwater aquatic habitats. It is an important distinction that although spreading grounds and some stormwater Best Management Practices, such as detention basins, swales, and depressional areas, also provide ecosystem benefits, they belong under a separate category and should not be subject to the same protection criteria. This category includes vegetated streams as well.
- *Riverine aquatic habitats* include the streambed and associated riparian areas, including upper and lower riverine habitats. Man-made habitats considered riverine aquatic habitats include concrete-lined channels and soft-bottomed channels. Note that "riparian" is sometimes used to mean riverine aquatic habitats. Because of its common usage, the terms are used interchangeably here. However, strictly speaking, riparian refers to the vegetated habitat adjacent to streams, rivers, lakes, reservoirs and other inland aquatic systems.

Because many existing freshwater aquatic habitats in the GLAC region would be considered vegetated streams which are similar to riverine aquatic habitats, targets for these two aquatic habitats are combined.

Three distinct types of aquatic habitat targets were also developed.

1. Protection of existing aquatic habitat
2. Enhancement of existing aquatic habitat
3. Restoration or creation of aquatic habitat

These activities could occur on public or private lands and include some of the following activities:

- *Protection* entails acquiring existing aquatic habitat not previously protected from destruction or degradation or otherwise adding protection measures to prevent an existing aquatic habitat from destruction or degradation.
- In *enhancement,* management actions are taken to improve the functions or values of an existing aquatic habitat. Enhancement actions could include improving the timing or amount of water source to an aquatic habitat, planting native aquatic habitat plants, controlling invasive species, and so forth.

Improving the quality of water entering an aquatic habitat alone would generally not be considered enhancement.

- *Restoration and creation* involve activities of either restoring or creating aquatic habitat in an area that does not currently contain aquatic habitat. The distinction is that if the activity occurs in an area that once contained that type of aquatic habitat it is considered to be restoration or re-establishment, whereas creation occurs in an upland area, converting it to aquatic habitat. In both restoration and creation, the focus should be on reintroducing the physical processes and geomorphic form necessary to support a self-sustaining aquatic habitat ecosystem.

*Methodology*

Protection, enhancement, and restoration/creation targets were calculated for each aquatic habitat type (tidal, freshwater/riverine). Figure 5 summarizes the general approach to calculating aquatic habitat targets, with more details about the methodology in Exhibit A, Aquatic Habitat Methodologies.

For each category, the percentage used to establish numeric targets was chosen after discussion with the Habitat and Open Space Plan Ad Hoc Subcommittee. The goal was to develop a numeric target that balanced the benefits of protecting, enhancing or restoring aquatic habitats against the practical constraints of undertaking these projects. The general philosophy used to develop these targets was to establish targets that were challenging, yet reasonably attainable.

The restoration/creation habitat targets are based on the area of wetlands lost in each subregion. The current (1986) and historical (1870) extent of wetlands in the Region (derived from Rairdan, 1998) is shown in Figure 6. While the total acreage of historical wetlands was used to establish targets, the locations of historical wetlands are shown merely for informational purposes, and are not intended to mandate where restoration/creation targets should be achieved.

Because the Rairdan data does not cover the NSMB region, the National Wetlands Inventory (NWI) was used to supplement. Maps showing wetlands for the remainder of this report display Rairdan data where it exists and NWI wetland data where no Rairdan data exists.

More detail about wetland data sources and aquatic habitat target development is provided in Exhibit A), shown in Figure 7.

Protection Target = Privately held existing habitat x 20%

Enhancement Target = Existing habitat x 25%

Restoration/Creation Target = [ Lost habitat x 10% ] + [ Converted habitat x 10% ]

**Figure 5. Summary of Approach to Calculating Aquatic Habitat Targets**

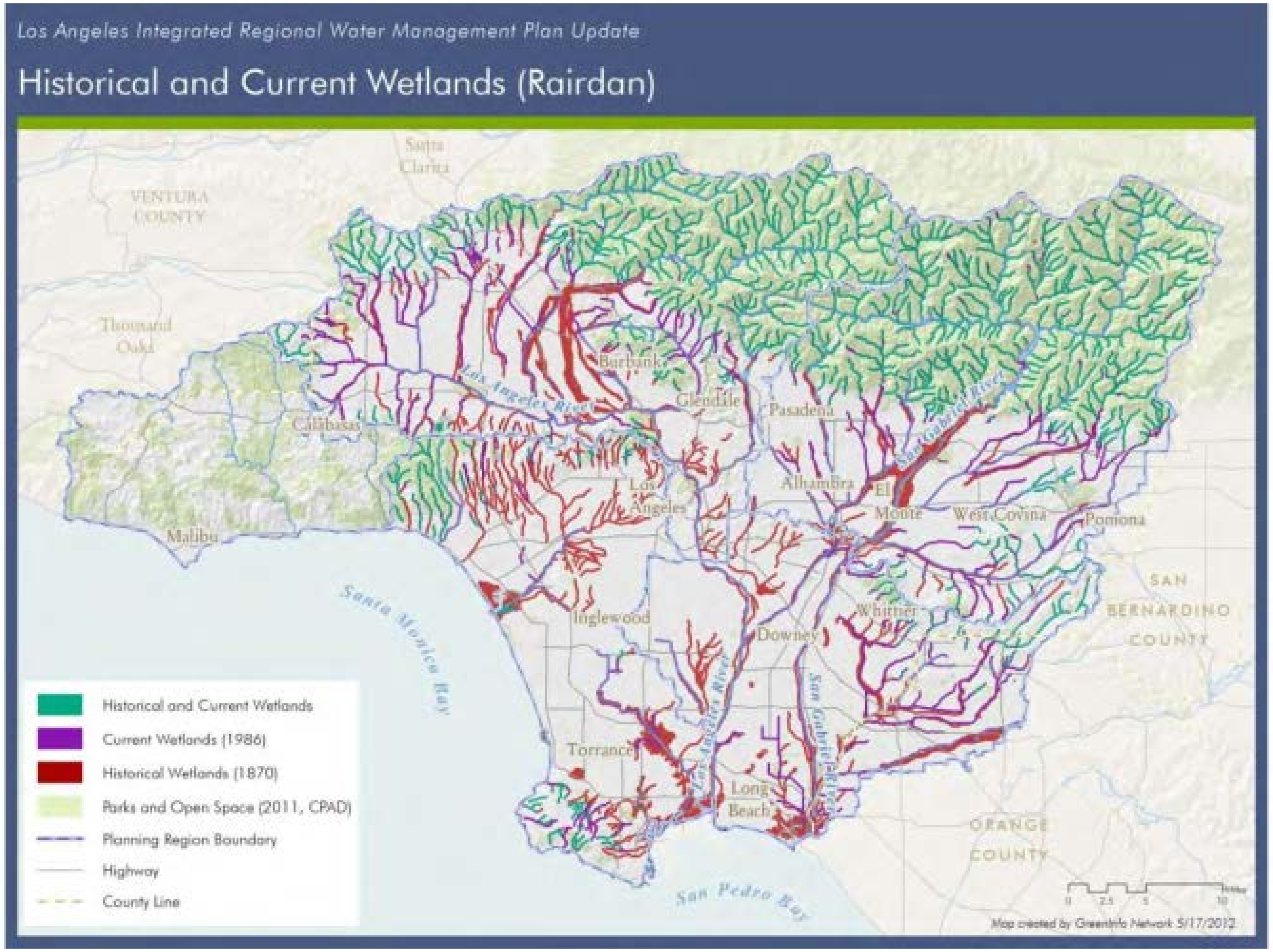


**Figure 6. Historical and Current Wetlands (Rairdan) (GLAC Region, except NSMB Subregion)**

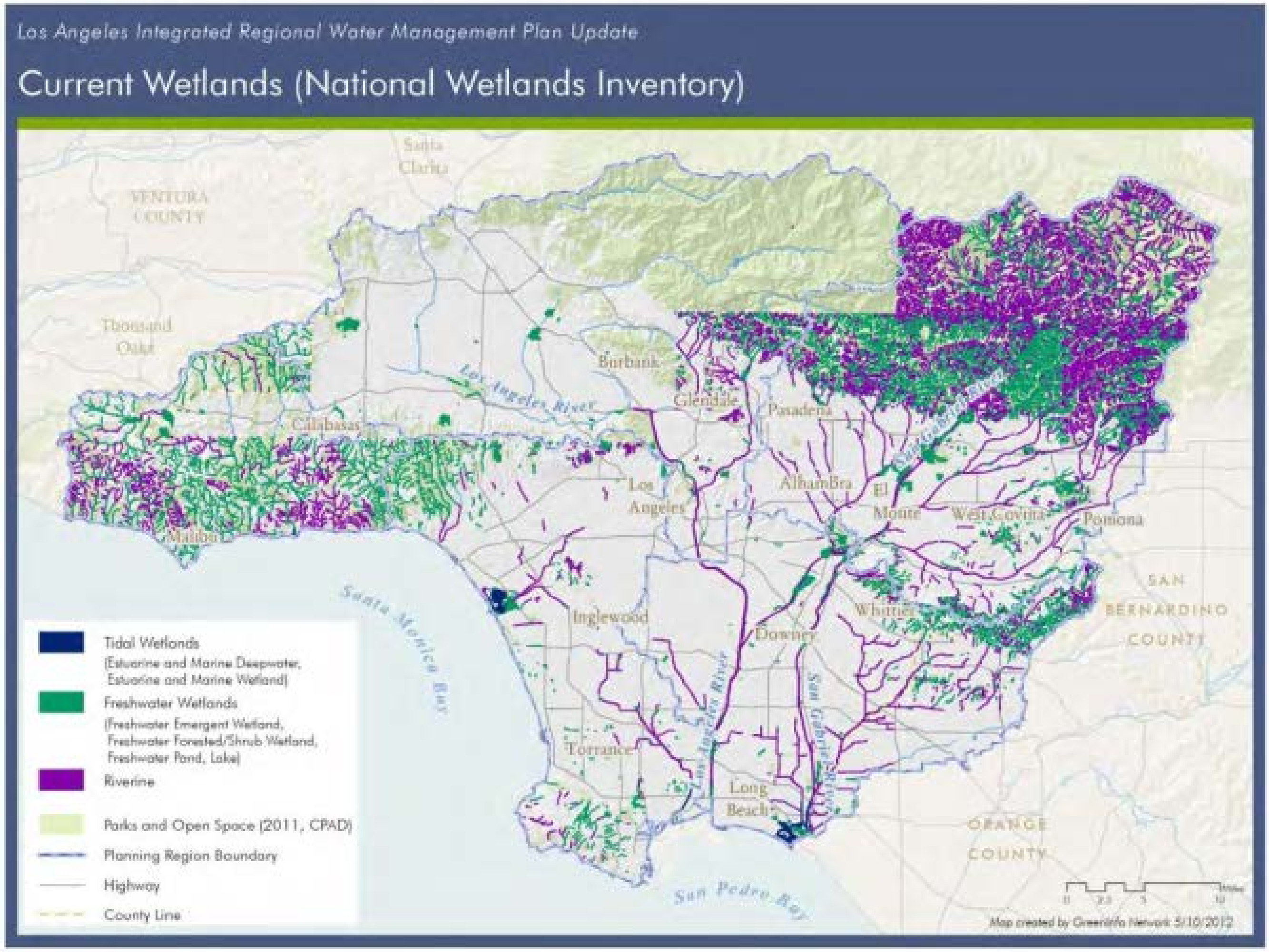


**Figure 7. Current Wetlands (NWI) (GLAC Region)**

*Aquatic Habitat Targets*

Table 4 below provides a breakdown of the aquatic habitat targets.

**Table 4. Aquatic Habitat Targets (Acres)**

| GLAC Target | Tidal Aquatic habitat | Freshwater/Riparian Aquatic habitat | Total |
|---|---|---|---|
| **Protection or Preservation** | 200 | 1,800 | **2,000** |
| **Enhancement** | 300 | 5,700 | **6,000** |
| **Restoration or Creation** | 760 | 3,300 | **4,000** |
| **TOTAL AQUATIC HABITAT BENEFITS** | | | **12,000** |

## 4.3 Habitat Planning Targets – Uplands

Urbanization of the Greater Los Angeles County area has caused the loss of aquatic habitat and upland communities and the fragmentation of the remaining habitat blocks. The disruption of animal movement by habitat fragmentation presents problems for the region's wildlife ranging from direct mortality on roadways to the genetic isolation of fragmented populations. Protection of water-dependent or aquatic habitat resources depends not only on managing the systems themselves, but also providing buffers to these systems and linkages through the landscape. Therefore, the provision of upland buffers and habitat linkages is important to maintaining habitat diversity.

An abundance of scientific research published since the 1970s documents the value of establishing, maintaining, and enhancing vegetated buffers along aquatic habitats. Aquatic habitat buffers provide important benefits including water quality improvement, streambank stabilization, flood control, wildlife habitat, and groundwater recharge (USDA, 2003; Castelle et al., 1992; EOR, 2001; Wenger, 2000; Correll, 1996). Aquatic habitat buffers also provide significant social and economic benefits by improving aesthetics and increasing property values (Lovell and Sullivan, 2005; Qui et al., 2006). The effects of habitat fragmentation and mitigation by identifying and protecting areas that wildlife use for movement (i.e. the protection of wildlife linkages or wildlife corridors) has been identified more recently (Beier and Noss, 1998; Bennett, 1999; Haddad et al., 2003; Eggers et al., 2009; Gilbert-Norton, 2010).

An aquatic habitat buffer is the vegetated transition zone between an upland area and the aquatic ecosystem, and depending on the definition, the buffer may include portions of both riparian and upland zones. This unique position in the landscape enables buffers to mitigate certain impacts of upland land use on adjacent aquatic habitats. In the absence of aquatic habitat buffers, these impacts are typically magnified and become more damaging.

Aquatic habitat buffers can vary in size based on factors such as adjacent land use, land ownership, topography, aquatic habitat area, and ecological functions. Generally speaking, buffers that are wider, longer, and more densely vegetated with herbaceous, shrub, and tree layers will provide more benefits than buffers that are narrower, shorter, and sparsely vegetated with only herbaceous species. Likewise, wildlife corridors can vary in size. Generally, however, they are larger or wider than buffer zones and provide essential life-support functions for the wildlife using the area.

Ridgelines, canyons, riparian areas, cliffs, swaths of forest or grassland, and other landscape or vegetation features can serve as wildlife linkages. Animals may also move across a relatively broad area rather than through a well-defined corridor, a type of wildlife linkage known as a diffuse movement area. Wildlife linkages are most effective when they connect (or are located within) relatively large and unfragmented areas referred to as habitat blocks (also called wildland blocks).

Areas adjacent to active stream channels can serve as buffers or corridors depending on their design. They can protect the stream and provide lateral connectivity between the streams and adjacent floodplains and uplands, as well as longitudinal connectivity up and down stream. It is the goal of this plan to provide for the acquisition and/or restoration of these vitally important components of the landscape.

Recommendations on buffer width are provided in Table 5 (Center for Watershed Protection, 2005). Recommendations regarding a minimum width of 1,000 feet for wildlife linkages (corridors) are based on Principles of Wildlife Corridor Design (Bond, 2003). However, it is realized that achieving this recommended width may not be possible and pinch-points and breaks in a linkage may occur.

## Table 5. Recommended Habitat Buffers

| Function | Special Features | Recommended Minimum Width (feet) |
|---|---|---|
| Sediment reduction | Steep slopes (5-15%) and/or functionally valuable aquatic habitat | 100 |
| | Shallow slopes (<5%) or low quality aquatic habitat | 50 |
| | Slopes over 15% | Consider buffer width additions with each 1% increase of slope (e.g., 10 feet for each 1% of slope greater than 15%) |
| Phosphorus reduction | Steep slope | 100 |
| | Shallow slope | 50 |
| Nitrogen (nitrate) reduction | Focus on shallow groundwater flow | 100 |
| Biological contaminant and pesticide reduction | N/A | 50 |
| Wildlife habitat and corridor protection | Unthreatened species | 100 |
| | Rare, threatened, and endangered species | 200-300 |
| | Maintenance of species diversity | 50 in rural area<br>100 in urban area |
| Flood control | N/A | Variable, depending on elevation of flood waters and potential damages |

### *Methodology*

For purposes of this plan, the targets for upland habitat acquisition and/or restoration were developed using the following definitions of upland areas:

- *Buffers and Buffer Zones* are 50- to 300-foot wide areas adjoining aquatic habitat, channel, or upland linkage or wildlife corridor that is in a natural or semi-natural state. For aquatic habitat and riparian systems, a buffer is to provide a variety of other functions including maintaining or improving water quality by trapping and removing various non-point source pollutants from both overland and shallow subsurface flows, providing erosion control and water temperature control, reducing flood peaks, and serving as groundwater recharge points and habitat. Buffer zones occur in a variety of forms, including herbaceous or grassy areas, grassed waterways, or forested riparian buffer strips. They also may provide for limited passive recreation.

- *Wildlife Linkages or corridors* are wide areas of native vegetation that connect, or have the potential to connect, two or more large patches of habitat on a landscape or regional scale through which a species will likely move over time. The move may be multi-generational; therefore, a linkage should provide both wildlife connectivity and biological diversity. A Wildlife Linkage should be a minimum of 1,000 feet in width, vegetated with native vegetation, and have little or no human intrusion. The goal is to ensure north-south and east-west linkages to mitigate for climate change.

Because of the largely linear nature of buffers and linkages and the major difference being their width, these two areas were combined for the development of the upland target. The target is based on the acquisition and/or restoration of these two features. For the development of upland linkage and corridor targets, regional linkages that have been previously identified or potential linkages between identified habitat blocks (i.e., the County's Significant Ecological Areas and habitat designated as critical by the U.S. Fish and Wildlife Service) were proposed.

Figure 8 shows the general location of the identified linkages along streams as red arrows and identified and potential upland linkages with black arrows.[17] The red arrows also locate areas where buffers are needed.

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[17] Figure adapted from http://criticalhabitat.fws.gov/crithab


**Figure 8. Habitat Linkages**

For reference, these linkages are shown with critical habitat and land ownership in Figure 9 and Figure 10)

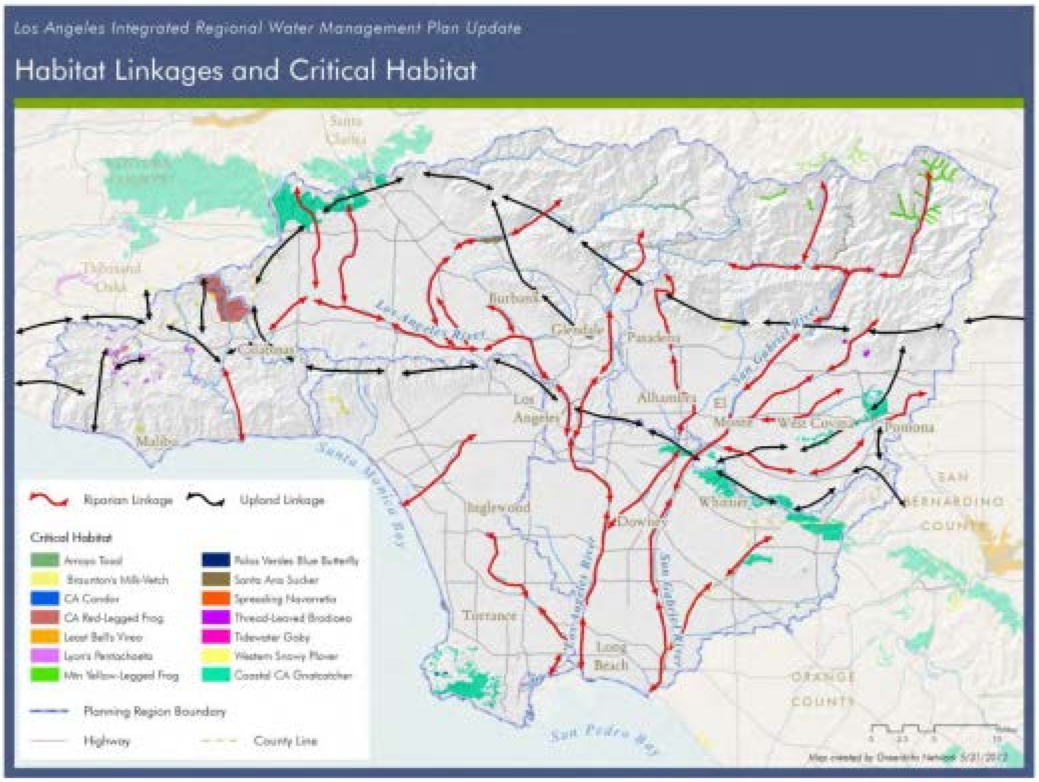


**Figure 9. Habitat Linkages with USFWS Designated Critical Habitat Areas (May 2012)**


**Figure 10. Habitat Linkages with Land Ownership**

<u>*Upland Targets*</u>

For the purpose of developing the upland targets, polygons were created by buffering along the continuous length of the drainages and upland areas with a width of 1,000 feet. Acreage associated with these polygons was then determined. This information is provided in Table 6 below.

**Table 6. Measurement of Potential Linkage Areas within the GLAC Region**

| Linear Feet | Acres |
|---|---|
| **1,585,000** | **36,000** |

It should be noted that 1,000 feet is a minimum width for a linkage and some of the targeted lands are within open space or public ownership. While it is recognized that this may not provide for an accurate measurement of habitat needs, it is a starting point for providing protection to the region's aquatic habitat systems.

The provision of acquisition and/or restoration of these targets include the provision of buffer zones.

# 5 OPEN SPACE AND RECREATION

The over 9,000,000 people who live within the GLAC Region have access to more than 2,000 park and open space land parcels that offer a variety of public outdoor recreation opportunities. These lands, totaling approximately 101,000 acres, are owned and managed by a myriad of agencies and organizations. In addition, there are almost 300,000 acres of public multiple-use lands of the Angeles National Forest and the 2,249 school district sites that may also have playgrounds and other outdoor recreation amenities.

## 5.1 Recreation Overview

Recreation occurring in open space areas, whether it is passive or active or a combination of the two, improves physical health, mental health, social function, and youth development and provides environmental and economic benefits to people and communities.

The physical health benefits of open space projects that provide for outdoor recreation are well documented and include:

- Making the individual less prone to obesity
- Improving cardiovascular condition
- Diminishing the risk of chronic diseases
- Boosting the immune system
- Increasing life expectancy

The mental health benefits of outdoor recreation include:

- Alleviating depression
- Increasing positive moods by reducing stress and anxiety
- Increasing productivity
- Improving quality of life through elevated self-esteem, personal and spiritual growth, and overall life satisfaction

While more and more people are migrating to cities, the desire to still feel connected to the natural environment remains strong. From a sociological perspective, when people are connected to nature, it contributes to feeling less isolated and less focused on them. As a result, they may become more eager to form connections with their neighbors. A greater sense of community and social ties emerge, as do increases in generosity, volunteerism, trust, and civic-mindedness. Loneliness, aggression, and crime may consequently decrease.

Recreational activities that include physical activity also help the aging population lead independent and satisfied lives, helping them remain mobile, flexible, and able to maintain their cognitive abilities.

Recreation assists in overall youth development. Recreation activities help develop decision-making skills, cooperative behaviors, positive relationships and empowerment. Young people explore strategies for resolving conflicts while recreating and playing. They learn to act fairly, plan proactively, and develop a moral code of behavior. This play also helps enhance their cognitive and motor skills. Individuals with more highly developed motor skills tend to be more active, popular, calm, resourceful, attentive and cooperative.

The open space resources of the GLAC Region provide exceptional learning opportunities for students. Case studies of educational facilities that adopted environment-based education as the central focus of their academic programs showed: 1) improvement in reading and mathematics scores; 2) better performance in science and social studies; 3) declines in classroom discipline problems; and 4) high level learning opportunities equalized among students.

Conserving resource lands is an investment in future economic development. Community image is enhanced. Businesses frequently relocate where their top talent wants to live, and that is most often in places of natural beauty. New homebuyers value trails and natural areas above any other amenity. When resource land is protected, the adjacent land often increases in value, with homes selling at a faster rate and for 10 to 20 percent return more than comparable homes without access to parks and open areas.

The California Legislature has summarized the need for parks and open space areas that provide outdoor recreation benefits, as presented in the box below:

**Summary on the Need for Parks and Open Space Areas**

The California Legislature has nicely summarized the need for parks and open space areas that provide outdoor recreation benefits by declaring:

- The demand for parks, beaches, recreation areas and recreational facilities, and historical resources preservation projects in California is far greater than what is presently available, with the number of people who cannot be accommodated at the area of their choice or any comparable area increasing rapidly. Further, the development of parks, beaches, recreation areas and recreational facilities, and historical resources preservation projects has not proceeded rapidly enough to provide for their full utilization by the public.
- The demand for parks, beaches, recreation areas and recreational facilities, and historical resources preservation projects in the urban areas of our state is even greater since over 90 percent of the present population of California reside in urban areas; there continues to be a serious deficiency in open space and recreation areas in the metropolitan areas of the state; less urban land is available, costs are escalating, and competition for land is increasing.
- There is a high concentration of urban social problems in California's major metropolitan areas which can be partially alleviated by increased recreational opportunities.
- California's coast provides a great variety of recreational opportunities not found at inland sites; it is heavily used because the state's major urban areas lie, and 85 percent of the state's population lives, within 30 miles of the Pacific Ocean; a shortage of facilities for almost every popular coastal recreational activity exists; and there will be a continuing high demand for popular coastal activities such as fishing, swimming, sightseeing, general beach use, camping, and day use. Funding for the acquisition of a number of key coastal sites is critical at this time, particularly in metropolitan areas where both the demand for and the deficiency of recreational facilities is greatest. Development pressures in urbanized areas threaten to preclude public acquisition of these key remaining undeveloped coastal parcels unless these sites are acquired in the near future.
- Increasing and often conflicting pressures on limited coastal land and water areas, escalating costs for coastal land, and growing coastal recreational demand require, as soon as possible, funding for, and the acquisition of, land and water areas needed to meet demands for coastal recreational opportunities.
- Cities, counties, and districts must exercise constant vigilance to see that the parks, beaches, recreation areas and recreational facilities, and historical resources they now have are not lost to other uses; they should acquire additional lands as such lands become available; they should take steps to improve the facilities they now have.

*Source: CA Public Resource Code 5096.143*

The parks and open spaces of the GLAC Region are well used, operating at capacity, and in some cases the recreation demand simply outstrips the supply.

The landscape character of these recreation lands ranges from highly structured parks and recreation sites within urban areas, to regional parks that may offer a combination of developed active and undeveloped passive recreation use, to relatively natural habitat areas and wildlands that contain trail-related recreation with minimal development.

Figure 11 illustrates the following for the GLAC Region:

- Existing developed urban park and recreation areas
- School sites
- Open space areas available for passive recreation
- Existing greenways and those subject to sea-level rise
- Planned greenway concepts
- Existing and planned County trail routes

Trail routes are illustrated on Figure 11 and were identified in the draft Los Angeles County 2035 General Plan. [18] Most of the identified urban greenways include multiple-use trails that also serve transportation functions. Most of these are inter-city proposals, and thus could be considered regionally significant. In addition, many of the 84 cities within the GLAC Region, such as the cities of Malibu, Monrovia, and Pasadena, have proposed or adopted local trail plans for recreation and transportation access within their jurisdictions. In many cases, these trails tie into and complement the county-wide trail network. As an ongoing process, once adopted, some or all of these local trail routes should be added to the IRWMP data base. Those trail routes that branch from the regional trail system and create loop opportunities for recreation, or local trails that directly connect urban areas with the regional trail system should be specifically identified and included in the regional recreation targets.

[18] Due to the map scale, not all layers are visible in all locations of this map.


**Figure 11. Existing and Planned Parks, Recreation Areas, Open Spaces Areas, and Greenways**

Exhibit D lists individual parcels, by subregion, which are accessible to the public for outdoor recreation and environmental education purposes and categorizes them by developed park and recreation areas, passive recreation areas (including National Forest Lands), greenways, and other public lands such as historic sites, cemeteries, botanic gardens, and other similar spaces. While such inventories of existing local and regional park lands exist, there is no complementary information for land areas at school sites used for outdoor recreation and environmental education.

Table 7 summarizes the existing acreages of these available recreation lands. Also provided are existing (2010) and projected (2035) populations.

### Table 7. Existing Recreation Lands

| Developed Urban Park and Recreation Area (acres) | Passive Recreation Area | | | Greenway (acres) | Other / Misc (acres) | Existing <u>Population</u> Projected Population |
|---|---|---|---|---|---|---|
| | Riparian / Upland / Aquatic habitat (acres) | Beach / Estuary (acres) | National Forest (acres) | | | |
| 19,000 | 124,000 | 1,800 | 298,000 | 3,200 | 2,300 | <u>9,630,000</u><br>10,990,000 |

(1) Existing populations based on 2010 census data. Population projections based on SCAG data indicating that for cities within the GLAC area an average population increase of 5.9% between 2008 and 2020, or approximately 5% when scaled from 2010, then 8.7% between 2020 and 2035 could be anticipated.

### 5.1.1 Types of Recreation Areas

A wide range of outdoor recreational and environmental educational opportunities exist. No two park or recreation areas are the same. There is no simple system to classify the variability of development that exists. The following describes the major types of recreational open space areas found in the GLAC Region. Targets were established for each of these three recreation types.

***Developed Urban Park Areas:*** Developed lands consist of neighborhood parks, community parks, and sports complexes that are generally less than 20 acres in size and offer active recreation activities such as playground equipment or sports fields, as well as passive recreation. Most secondary or primary schools or institutions of higher learning are designed as a park-like setting. Many have playgrounds and athletic fields associated with them and are open to the public after hours. School grounds typically provide opportunities for active recreation, such as playgrounds and sports fields, but are sometimes not included in park and recreation inventories.

***Passive Recreation Areas:***

- Habitat Areas or Wildlands: The majority of these resource lands are managed by cities, the County, special districts, and joint powers authorities for their natural qualities. Developed facilities generally are limited and focus on safe public access (staging areas, trails, limited visitor support facilities, wildlife sanctuaries, nature centers, and natural areas) for outdoor passive recreation and environmental education. In some cases open space recreation lands may be a component of a city-wide or regional park, a golf course, or greenway.

- Angeles National Forest: The mission of the United States Department of Agriculture, Forest Service, the agency that administers the Angeles National Forest, is to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people. To the millions of Los Angeles-area residents within the GLAC Region and to visitors from all over the world, the Angeles National Forest provides a variety of outdoor recreation opportunities.

***Greenways:*** These are linear areas that are generally located around rivers and creeks but sometimes along countywide trail routes, major utility corridors (such as transmission lines), or abandoned rail routes to provide for a wide variety of trail-related recreation. Greenways, while they can provide habitat linkages, also can provide for active and passive recreation serving many of the same functions as neighborhood and community parks, depending on how they are developed.

These linear recreation lands would typically connect a series of urban park and recreation areas. They also may connect natural landscape components, including aquatic habitat, riparian, and upland associations. Countywide trail routes could also be considered in this category as they may connect major parks or open space areas such as the Santa Monica Mountains with the San Gabriel Mountains. Greenways provide opportunities for passive recreation. There are no specific park standards related to greenways, as these are generally opportunities afforded by the landscape setting.

### 5.1.2 Open Space, Park, and Recreation Agencies

There are over 140 agencies that provide public outdoor recreation and environmental education opportunities within the region, not including schools. These include federal, state, regional, county, city park departments, special recreation and park districts, open space districts, joint power authorities, water agencies, and land conservation organizations.

<u>*Regional Agencies*</u>

A list of federal, state, private, and special districts and associations that provide regional recreation within the region is found in Table 8.

## Table 8. Federal, State, County, Special District, and Private Organizations Providing Public Recreation Opportunities within the Region

| Federal Agencies |
|---|
| United States Army Corps of Engineers |
| United States Bureau of Land Management |
| United States Coast Guard |
| United States Forest Service |
| United States National Park Service |
| **State Agencies** |
| California Department of Fish and Wildlife |
| California Department of Parks and Recreation |
| California State Coastal Conservancy |
| California State Lands Commission |
| Santa Monica Mountains Conservancy |
| University of California |
| **Counties** |
| Los Angeles |
| Orange |
| Ventura |
| **Special Districts** |
| Conejo Open Space Conservation Agency |
| Conejo Recreation and Park District |
| Hawthorne School District |
| Kinneloa Irrigation District |
| Las Virgenes Municipal Water District |
| Los Angeles County Flood Control District |
| Metropolitan Transportation Authority |
| Metropolitan Water District of Southern California |
| Miraleste Recreation and Park District |
| Mountains Recreation and Conservation Authority |
| Native Habitat Preservation Authority |
| Puente Hills Habitat Authority |
| Rancho Simi Open Space Conservation Agency |
| Rancho Simi Recreation and Park District |
| Ridgecrest Ranchos Recreation and Park District |

| |
|---|
| Rose Hills Memorial Park Association |
| Rossmore Community Services District |
| San Dimas-La Verne Recreational Facilities Authority |
| San Gabriel County Water District |
| San Gabriel River Water Committee |
| Watershed Conservation Authority |
| Westfield Recreation and Park District |
| Wilmington Public Cemetery District |
| **Other** |
| El Monte Cemetery Association |
| Fond Land Preservation Foundation |
| Glendora Community Conservancy |
| Huntington Library and Botanical Gardens |
| Mountains Restoration Trust |
| Palos Verdes Peninsula Land Conservancy |
| Pasadena Cemetery Association |
| Roosevelt Memorial Park Association |
| San Gabriel Cemetery Association |
| Sierra Madre Cemetery Association |
| Trust for Public Land |
| Amerige Heights Community Association |

*Municipal Park and Recreation Departments / Districts*

A list of municipal agencies that provide neighborhood and community parks within the region is found in Table 9.



## Table 9. Cities Providing Public Recreation Opportunities within the Region

| Cities | | | |
|---|---|---|---|
| Agoura Hills | Cypress | Lawndale | Rolling Hills |
| Alhambra | Diamond Bar | Lomita | Rosemead |
| Anaheim | Downey | Long Beach | San Dimas |
| Arcadia | Duarte | Los Alamitos | San Fernando |
| Artesia | El Monte | Los Angeles | San Gabriel |
| Azusa | El Segundo | Lynwood | San Marino |
| Baldwin Park | Fullerton | Malibu | Santa Fe Springs |
| Bell Gardens | Gardena | Manhattan Beach | Santa Monica |
| Bell | Glendale | Maywood | Seal Beach |
| Bellflower | Hawaiian Gardens | Monrovia | Sierra Madre |
| Beverly Hills | Hawthorne | Montebello | Signal Hill |
| Brea | Hermosa Beach | Monterey Park | South El Monte |
| Buena Park | Huntington Park | Norwalk | South Gate |
| Burbank | Inglewood | Palos Verdes Estates | South Pasadena |
| Calabasas | Irwindale | Paramount | Temple City |
| Carson | La Canada Flintridge | Pasadena | Thousand Oaks |
| Cerritos | La Habra Heights | Pico Rivera | Torrance |
| Chino Hills | La Habra | Placentia | Walnut |
| Claremont | La Mirada | Pomona | West Covina |
| Commerce | La Palma | Rancho Palos Verdes | West Hollywood |
| Compton | La Puente | Redondo Beach | Westlake Village |
| Covina | La Verne | Rolling Hills Estates | Whittier |
| Culver City | Lakewood | | |

# 6 OBJECTIVES AND PLANNING TARGETS FOR RECREATION

The following sections describe the 20-year planning targets that were developed for the recreation section of the OSHARTM through the collaborative process described in Section 1.4. These targets are intended to serve as a quantitative measure of progress towards the overall IRWMP recreation goals, as well as to guide project proponents in effectively incorporating recreation into proposed IRWMP projects.

## 6.1 Objectives

General recreation objectives are to:

- ***Developed urban parks:*** Assist in providing developed urban park areas that are accessible to underserved populations (and DAC communities) based on average of 4 acres per 1,000 population.
- ***Passive recreation:*** Create or assure the preservation of 6 acres of open space lands per 1,000 population that are available for passive recreation. These lands may incorporate: all or a portion of greenways; county, state, or national parks; US Forest Service lands; regional trails routes; and/or dedicated open space areas or any jurisdiction.
- ***Greenways:*** Enhance existing and planned greenways as shown in Table 9 and regional trails within open space areas with outdoor recreation and environmental educational opportunities.

## 6.2 Methodology

The methodology used for calculating recreation targets and establishing priority areas is described in detail in Exhibit C.

## 6.3 Developed Urban Park Targets

Recreation services may be addressed in the mandatory Conservation and Open Space element of a General Plan, in a discretionary Parks and Recreation element of a General Plan, or through a Parks Master Plan that may be referenced in the General Plan or as a stand-alone policy. On average, most municipalities within the entire GLAC Region use a standard of 4 acres of parkland per 1,000 population for providing neighborhood and community parks that offer both active and passive recreation opportunities. The Los

Angeles County General Plan reflects this goal. Often these standards are complemented with a proximity goal of a park being within a ¼ to ½ mile radius of all residents. Not meeting one or both of these standards is often the definition of "underserved communities" from a parkland provision perspective.

For the purposes of this work, targets were based on acres of additional urban parkland required to meet the standard of 4 acres of parkland per 1,000 population, using projected population for 2035. Targets are shown in Table 10.

**Table 10. Developed Urban Park Targets**

| Existing Open Space Lands Available for Recreation (1)<br><br>(acres) | Existing Population<br>Projected Population(2) | Total Area Required to Meet Goal (3)<br><br>(acres) | Targets (4)<br><br>(acres) |
|---|---|---|---|
| **18,800** | **9,630,000**<br>**10,990,000** | **38,500**<br>**43,900** | **19,700**<br>**25,100** |

(1) See Exhibit C.
(2) Existing populations based on 2010 census data. Population projections based on SCAG data indicating that for cities within the GLAC area an average population increase of 5.9% between 2008 and 2020, or approximately 5% when scaled from 2010, then 8.7% between 2020 and 2035 could be anticipated.
(3) 4 acres of parkland per 1,000 population.
(4) Additional open space lands required to meet goal.

A number of additional factors need to be considered during the process to implement these targets. For neighborhood or community parks that provide active and/or passive recreation, the order of priority should be as follows:

- High Priority: projects within urban areas with less than 1 acre of available park and recreation area per 1,000 population.
- Moderate Priority: projects within urban areas with between 1 to 3.9 acres of available park and recreation area per 1,000 population.
- Low Priority: projects within urban areas with greater than 4 acres of available park and recreation area per 1,000 population.

Figure 12 shows the distribution of these urban park priority areas throughout the region. This figure is not intended to show proposed locations for future parks, rather it is intended to provide information that could help guide the implementation of targets.

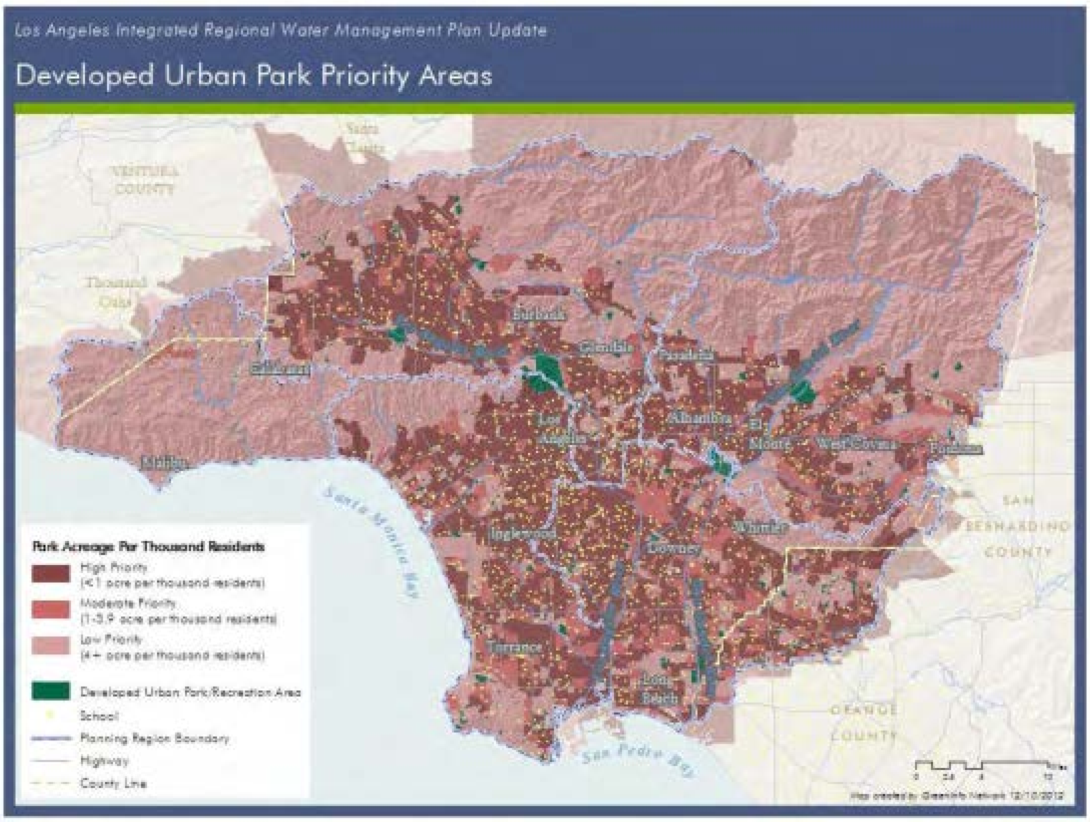


**Figure 12. Developed Urban Park Priority Areas**

## 6.4 Passive Recreation Targets

Most cities do not have standards for open space lands that afford passive recreation opportunities. The Los Angeles County General Plan cites a standard ratio of 6 acres per 1,000 people for regional parks and open space lands that would principally offer passive outdoor recreation and environmental education opportunities. These standards accommodate the needs of a regional population and therefore should only be evaluated on a regional basis not limited by al boundaries.

For the purposes of this work, targets were based on acres of open space required to meet the standard of 6 acres of open space per 1,000 population, using projected population for 2035. Targets are shown in Table 11.

**Table 11. Passive Recreation Targets for Existing Populations**

| GLAC Region | Existing Open Space Lands Available for Recreation (1)<br><br>(acres) | Existing Population<br><br>Projected Population(2) | Total Area Required to Meet Standard (3)<br><br>(acres) | Targets (4)<br><br>(acres) |
|---|---|---|---|---|
| **Excluding Angeles National Forest Lands** | 13,000 | **9,630,000**<br>**10,990,000** | 58,000<br>65,926 | 45,000<br>53,000 |
| **Including Angeles National Forest Lands** | 27,000 | **9,630,000**<br>**10,990,000** | 58,000<br>66,000 | 30,000<br>38,000 |

(1) This number assumes that approximately 5% of the total open space land acreage is accessible and developed for recreation access and/or outdoor recreation purposes. This would include staging areas, trailhead enhancements, trails, and associated visitor serving facilities for recreation and outdoor education.

(2) Existing populations based on 2010 census data. Population projections based on SCAG data indicating that for cities within the GLAC area an average population increase of 5.9% between 2008 and 2020, or approximately 5% when scaled from 2010, then 8.7% between 2020 and 2035 could be anticipated.

(3) Based on 6 acres / 1000 population. Open Space is a regional amenity and is not defined by sub-region.

(4) Additional open space lands required to meet standard.

Distance and time to get to these recreation resources is used as a determinant of need. These open space lands could be portions of the regional park system, open space preserves, state parks, or U.S. Forest Service lands and could include lands surrounding planned County trail routes.

One key to the usability of open space for outdoor recreation is accessibility. Studies of use in open space areas have shown that approximately 90% of visitors arrive by automobile while approximately 10% come by alternative transport modes (walking, bicycling, jogging or on horseback) (USC Sustainable Cities Program and the National Park Service).

Accessibility, in terms of distance and time it takes to access a regional open space area directly relates to its level of use. Living closer to an open space recreation opportunity means that opportunity to enjoy its benefits is more likely to be used. Proximity to an open space area starting at about 1 mile up to a distance of about 10 miles is fairly proportional to a decrease in visitor frequency. Visitation reaches its lowest levels at approximately 22 miles where travel becomes problematic for most recreationists. This limiting distance pattern is reflected in Los Angeles County's service areas for Community Regional Parks (20 miles) and Regional Parks (25 miles).

For resource recreation areas that provide passive recreation or environmental education opportunities, the order of priority should be as follows:

- High Priority: projects more than a 3 miles from an existing open space area or greenway or projects that help complete the County trail system
- Moderate Priority: projects between 1 and 3 miles from an existing open space area or greenway
- Low Priority: projects from between 0 and 1 mile from an existing open space area or greenway

Lands within the County trail system should also be considered as a high priority. This system provides for passive recreation opportunities for both near-to-home recreation and for visitors to southern California from throughout the world. An important justification, from a recreation perspective, for additional open space land acquisition and conservation that will serve the recreation interests of both residents within the GLAC Region and visitors from outside the region is tied to the planned Los Angeles County regional trail system. Completion of this system will require significant land and/or easement acquisition; therefore, the County trail system is also identified as high priority.

There also are other opportunities to accommodate local and area-wide recreation demand for resource lands. These opportunities are found in undeveloped but privately held parcels that, if in public ownership, would provide a direct link between the region's urban populations to existing regional resource lands, including those within the Santa Monica Mountains, the Angeles National Forest, and other regional-serving open space areas such as the Puente or San Jose Hills. No priority is proposed for these resource areas.

Figure 13 illustrates the areas with highest need for passive recreation opportunities. This figure is not intended to show proposed locations for future parks, rather it is intended to provide information that could help guide the implementation of targets.

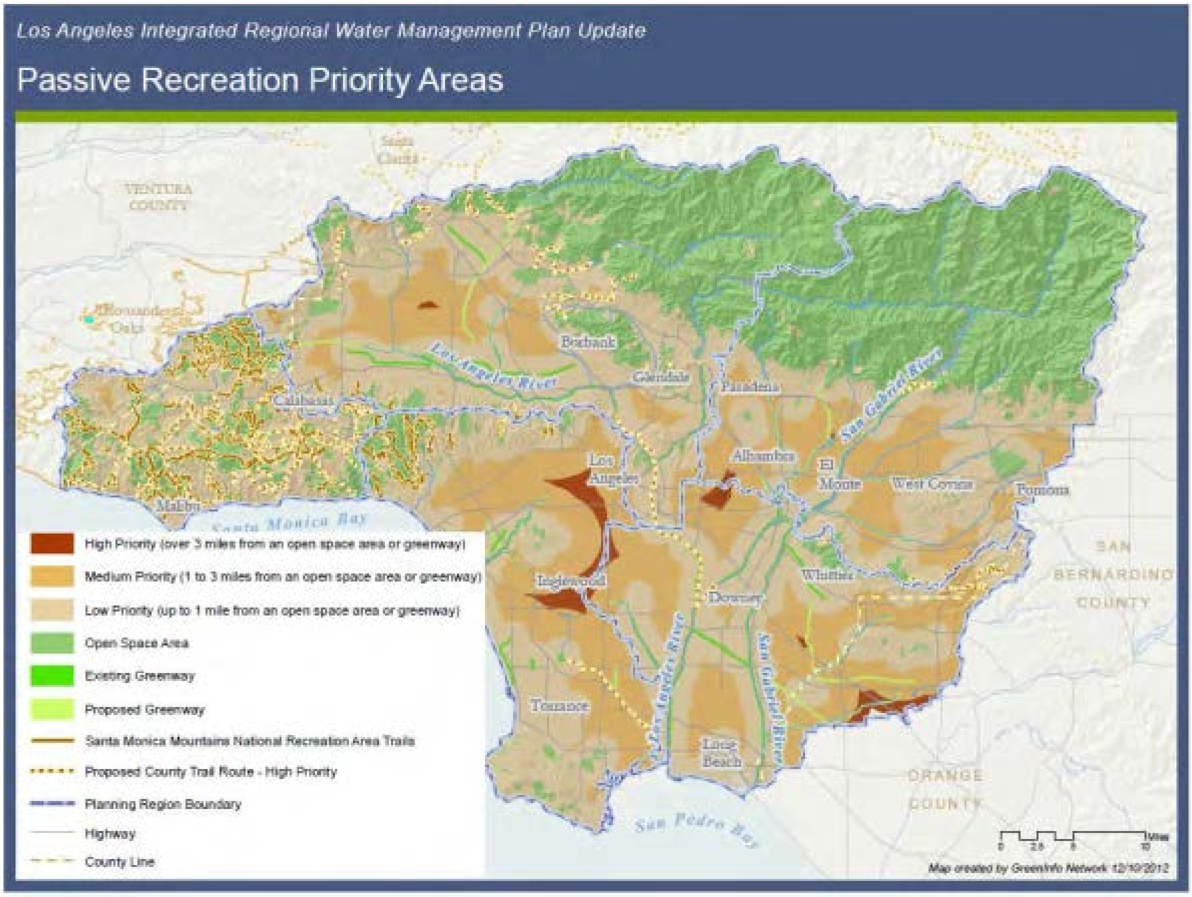


**Figure 13. Passive Recreation Priority Areas**

## 6.5 Greenway Targets

There are no specific park standards related to Greenways, as these are generally opportunistic based on a linear landscape setting typically along creeks, major transportation corridors, or utility corridors. Development of a new greenway could contribute to meeting the active and passive recreation target. To serve as a developed urban park, active recreation amenities could be included as part of the greenway design. Because additional acreage of greenway is included in the recreation targets, the greenway targets were not set as additional acreage, but rather as a goal to enhance existing or proposed greenway designs so to incorporate active recreation amenities.

Existing and proposed greenways are shown above in Figure 13 and a detailed list is provided in Exhibit D.

# 7 OPEN SPACE AND ECOSYSTEM SERVICES

The benefits of open space lands within the region, whether in public or private ownership, are numerous. Evaluation of habitat and recreation benefits only as they are related to water management practices results in an isolated perspective that does not nearly demonstrate the full integration of societal benefits attributable to open space. Additionally, the physical benefits of open space are complemented with economic benefits that open space provides to those who live near open space lands and to entire communities. There are numerous models and studies that have demonstrated the economic values of open space preservation. The justification for the preservation and maintenance of open space lands therefore cannot be solely related to any single benefit but should be viewed as the cumulative effect of many benefits, the management of water resources being only one of them.

Ecosystem services provide one approach for framing the values and benefits of open space. Ecosystem services are the benefits people obtain from ecosystems. The Millennium Ecosystems Assessment (2005) has presented a scheme for classifying ecosystem services using four general categories:

- *Provisioning services* such as food, water, timber, and fiber
- *Regulating services* that affect climate, floods, disease, wastes, and water quality
- *Cultural services* that provide recreational, aesthetic, and spiritual benefits
- *Supporting services* such as soil formation, photosynthesis, and nutrient cycling

Aquatic habitats provide services in all four categories, as is shown in Table 12 (Vymazal, 2011). Aquatic habitat ecosystems reduce flood damage to human communities, sequester carbon, and reduce pollutants in runoff entering streams (Brauman et al., 2007). Aquatic habitats support consumptive uses such as hunting and fishing as well as non-consumptive uses such as bird watching. Zedler and Kersher (2008) consider four of the many functions performed by aquatic habitats to have global significance and value as ecosystem services: biodiversity support, water quality improvement, flood abatement, and carbon management.

## Table 12. Examples of Services Provided by Aquatic habitats, Organized According to the Millennium Ecosystem Assessment Framework.

| | |
|---|---|
| **Provisioning Services** | |
| Food | Production of fish, wild game, fruits, grains |
| Fresh water | Storage and retention of water for domestic, industrial and agricultural use |
| Fiber and fuel | Production of logs, fuel-wood, peat, fodder |
| Biochemical | Extraction of medicines and other materials from biota |
| Genetic materials | Genes for resistance to plant pathogens, ornamental species, and so on |
| **Regulating Services** | |
| Climate regulation | Source of and sink for greenhouse gases; influence local and regional temperature, precipitation, and other climate processes |
| Water regulation (hydrological flows) | Groundwater recharge/discharge; flow attenuation |
| Water purification and waste treatment | Retention, recovery, and removal of excess nutrients and other pollutants |
| Erosion regulation | Retention of soils and sediments |
| Natural hazard regulation | Food control; storm protection |
| Pollination | Habitat for pollination |
| **Cultural Services** | |
| Spiritual and inspirational | Source of inspiration; many religions attach spiritual and religion values to aspects of aquatic habitat ecosystems |
| Recreational | Opportunities for recreational activities |
| Aesthetic | Many people find beauty or aesthetic value in aspects of aquatic habitat ecosystems |
| Educational | Opportunities for formal and informal education and training |
| **Supporting Services** | |
| Soil formation | Sediment retention and accumulation of organic matter |
| Nutrient cycling | Storage, recycling, processing, and acquisition of nutrients |

Upland habitats also provide a wide range of ecosystem services. As with aquatic habitats, uplands provide biodiversity support and support consumptive uses such as hunting as well as non-consumptive uses such as recreation and education.

The following sections discuss some of the ecosystem services provided by open space lands.

### 7.1 Providing Fresh Water

The GLAC Region is diverse in its hydrology and geology. As shown in Figure 14, the general flow of water is from north to south; however, geologic conditions can force flows in an east-west direction and in some areas allow for aquifer recharge. When overlaying existing and future open space projects and programs with the Region's hydrologic and geologic characteristics, some generalized conclusions can be made. For the purposes of the GLAC IRWMP planning process, these conclusions focus on the facts that open space projects, if appropriately designed and sited, have the ability to influence groundwater levels, improve surface water quality, and improve flood management by either attenuating storm flows or by being developed where unmet drainage needs exist, possibly removing the need altogether.

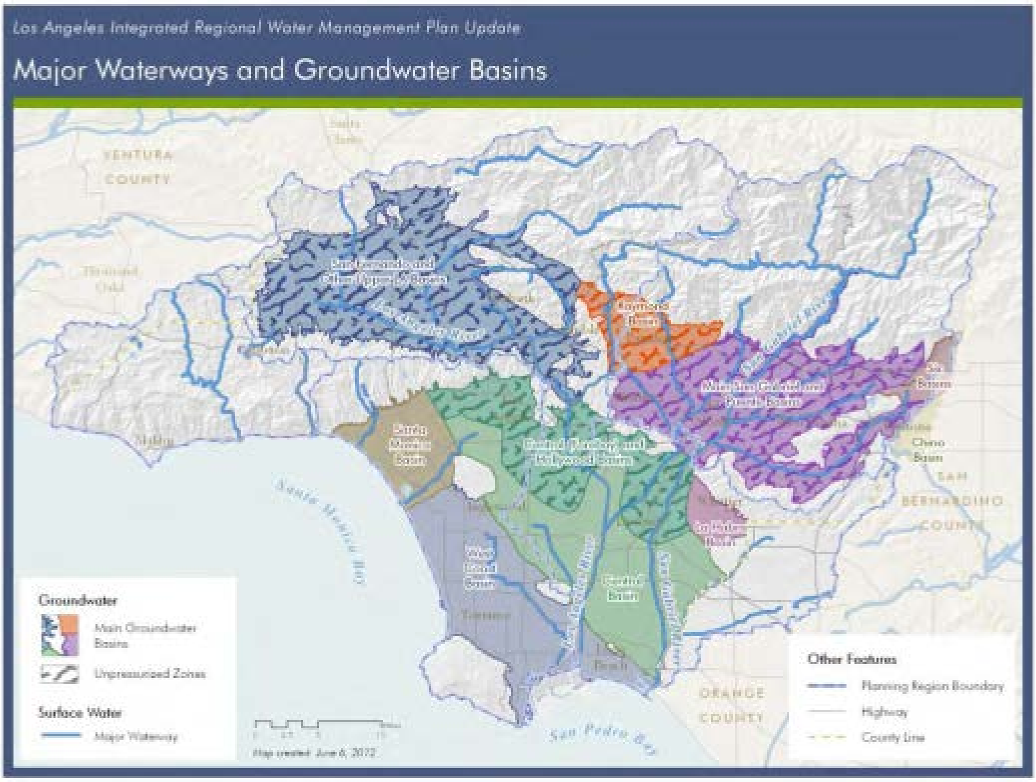


**Figure 14. Major Waterways and Groundwater Basins (GLAC Region)**

***Infiltration and Potential Groundwater Recharge:*** Preserving or enhancing infiltration for potential groundwater recharge improves water supply reliability and overall water quality. When open space projects are treated as multiple-use, best management practices (BMP) can be incorporated to achieve multiple water management objectives.

Quantifying the water supply benefit that could be achieved by a proposed project will be a necessary component of project prioritization and meeting water supply targets. To assist planners in this effort, a spreadsheet tool was developed that provides an estimate of annual average infiltration potential of projects using regional climatic data and a generalized hydraulic model. A background for this tool is presented in Exhibit E, and the spreadsheet will be made available to planners via the GLAC IRWMP website.

While this tool can provide a rough estimate for planners, it should be understood that it is for planning purposes only. To ensure that the estimated water supply and water quality benefits are realized, professional design assistance should be employed.

***Water Conservation:*** Designing open space projects with water conservation practices, such as appropriate plant palettes, efficient irrigation design, and use of recycled water, can help reduce demands on the region's potable water supplies. Water conservation practices should apply to all designed landscapes within the GLAC Region. For any developed park or outdoor recreation area, demands on water supply are directly affected by planting and irrigation design practices. New parks could be expected to use BMPs to minimize water demand. Additionally, all developed park and recreation areas, like any capital improvement, have a life cycle. Therefore, there remains great opportunity with many older sites that, with rehabilitation and BMPs, further reduction in demands on water supply is possible.

## 7.2 Improving Water Quality

Natural habitats can improve water quality by capturing and removing pollutants, including nutrients and pathogens. Aquatic habitats are particularly renowned for improving water quality. Some pollutants, particularly metals and many organic compounds are removed when the suspended particles to which they are adsorbed settle out in aquatic habitats. Some pollutants are transformed by processes occurring within aquatic habitats, such as denitrification for the removal of excess nitrogen. Other pollutants, including bacteria, are deactivated by solar radiation while being retained in aquatic habitats. The water quality improvement services of natural aquatic habitats are often exploited when aquatic habitats are constructed specifically to treat wastewater (including stormwater)

In addition to water quality improvement by natural habitats, designed habitats can also improve water quality. Requiring BMPs to capture wet and dry weather flows from on-site and potentially off-site improves stormwater management and helps to keep pollutants out of receiving water bodies. This would be applicable to both stormwater and irrigation water runoff. BMPs could include use of rain gardens, constructed aquatic habitats, water quality swales, and/or stormwater retention/detention basins to enhance capture rates, filter and improve water quality and, when appropriately sited, enhance groundwater levels. It should be noted that designing BMPs to provide habitat value requires careful consideration, and more work needs to be done similar to the technical report "Habitat Value of Constructed and Natural Wetlands Used to Treat Urban Runoff" (Sutula and Stein, 2003) to guide BMP designers in the development of BMPs for habitat enhancement.

These BMPs will contribute to meeting water quality targets for the region. Water quality targets are expressed as an overall capacity (volume) of these systems throughout the region. This capacity is based on systems designed to capture the ¾-inch storm. While additional volume could be provided and may achieve additional water quality benefits, only the volume needed to capture the ¾-inch storm can be counted towards water quality targets. The spreadsheet tool described in Section 7.1 (with additional background provided in Exhibit E) also has the capacity to estimate potential to contribute to water quality targets for a proposed BMP. As stated above, this tool is to be used for planning purposes only, and a design professional should be employed to ensure the estimated benefits are achieved.

Also important to note is the consequences to water quality should open spaces be lost to development. While building codes require some level of treatment of the increased pollution generated due to the development, developers are not required to treat existing pollution from tributary areas. When open spaces are maintained with a multiple benefit approach, they not only generate less pollution than developed lands, but are capable of improving water quality from off-site. Thus, increased development on previously open space lands leads to an overall degradation in water quality.

## 7.3 Flood Risk Reduction

Managing storm events by retaining significant volumes of rainfall before it becomes runoff can assist in reducing demands on the storm drain network. As well, developing open space projects that are able to flood, and potentially placing them in areas that are repeatedly inundated, has the potential to reduce the GLAC Region's overall risk to flooding.

## 7.4 Preserving Biodiversity

Open space projects provide a wide variety of ecological benefits, including the conservation benefits of providing habitat to native species and the protection and enhancement of biodiversity.

Virtually all developed urban park and recreation areas include some form of green space. Depending on the percentage of vegetated area, vegetative species present, overstory canopy, cover density, and forage opportunity, each of these areas could enhance urban wildlife habitat values and species diversity. The larger the urban park, recreation area, or golf course, the greater the opportunity for hosting a variety of resident species.

The most obvious habitat conservation benefits of open space projects accrue to aquatic and upland habitats and species. Although the Los Angeles area today, especially its urban areas, seems largely devoid of aquatic ecosystems, historically the region supported an abundance of diverse aquatic habitats (Rairdan, 1998; Stein et al., 2007; Dark et al.; 2011). From an ecological perspective, riparian areas are critically important in the semi-arid and arid southwest United States, where they provide rare, mesic habitat corridors and contribute disproportionately to regional biodiversity (Knopf et al., 1988). For example, although riparian habitats comprise only one percent of the land area of the Santa Monica Mountains, they are the primary habitat for nearly 20 percent of the native plant flora (Rundel and Sturmer, 1998). Management of these vital habitats is especially critical because 95-97 percent of the original riparian habitat in southern California has been lost (Faber et al., 1989).

The conservation value of aquatic ecosystems has increased as the region developed and aquatic habitats were lost and/or degraded. Habitat modification, weedy exotic species introductions, stream channel modification, and heavy recreational use all appear to lead to sharp reductions in plant species diversity (Rundel and Sturmer, 1998). These ecosystems provide habitat for a large number of sensitive species including the southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), arroyo toad (*Bufo californicus*), California red-legged frog (*Rana draytonii*), and western pond turtle (*Emys [Actinemys] marmorata*) among others (Abell, 1989; Jennings and Hayes, 1994; Thomson et al., 2012).

Besides the obvious effects of habitat destruction and modification, aquatic ecosystems in the region have been influenced by many anthropogenic factors. Hydromodification through changes in the impervious surface of watersheds (Hawley and Bledsoe, 2011) or stream bank alteration can have significant ecological effects (White and Greer, 2006), often called the "urban stream syndrome" (Walsh et al., 2005). Altered stream flow can influence many taxa, including fish, macroinvertebrates, and amphibians (Poff and Zimmerman, 2010). Changes in water quality can also have negative effects on aquatic communities (Paul and Meyer, 2001).

### 7.5 Providing Carbon Management

Aquatic habitats are particularly important in carbon management because they can sequester significant amounts of carbon (Chmura et al., 2003; Bridgham et al., 2006). This is particularly true in saltwater aquatic habitats, whose high productivity results in some of the highest carbon sequestration rates of all habitats. Moreover, salt marshes do not emit methane, which is emitted at relatively high rates by some freshwater aquatic habitats. Because methane is a potent greenhouse gas, the greenhouse gas mitigation potential for salt marshes is generally higher than for freshwater aquatic habitats. Nonetheless, riparian forests sequester substantial amounts of carbon in their aboveground biomass.

## 7.6 Providing Aesthetic and Cultural Values

Aquatic habitats provide a variety of aesthetic and cultural values. Aquatic habitats are important tourism destinations because of their aesthetic values and high biodiversity (Millenium Ecosystem Assessment, 2005b). The many unique plants and animals, including a disproportionate number of endangered species, make aquatic habitats valued places for viewing birds and other wildlife and plants. Aquatic habitats are also popular for a number of recreational activities, including fishing and boating, although in GLAC these activities are largely restricted to estuaries and lakes or reservoirs. Aquatic habitats provide opportunities for education and scientific research. Aquatic habitats provide aesthetic values to people who appreciate natural features. This value is particularly important in urbanized settings such as much of GLAC, where aquatic habitats provide views and open space that provide a relief from urban environments. Similarly, aquatic habitats provide spiritual and inspirational services, where personal feelings and well-being can be supported (Millenium Ecosystem Assessment, 2005b).

Many of these same services are provided by non-aquatic habitats. Transitional and upland habitats provide many recreational activities, including hiking and biking. Transitional and upland habitats also provide important aesthetic values and spiritual and inspirational services. Many people value the “sense of place” associated with recognized features of their environment, including aspects of the ecosystem (Millenium Ecosystem Assessment, 2005a).

As discussed earlier, open space includes a continuum from natural habitats valued largely for habitat to man-made habitats valued largely for recreation. The aesthetic and cultural services vary similarly along a continuum, spiritual/inspirational and aesthetic services predominating at the natural end of the continuum, and recreational services predominating at the other.

# 8 POTENTIAL SURFACE WATER AND GROUNDWATER RESOURCES MANAGEMENT BENEFITS OF OPEN SPACE PROJECTS

As described above, the benefits of open space, habitat and recreation are many and include ecosystem and cultural services such as biodiversity and public health, yet these are difficult to accurately quantify. A method was developed for quantifying water quantity and water quality benefits for individual projects; however, applying this to the entire region without specific proposed projects presents obvious challenges. Regardless, estimating and quantifying these benefits on a regional scale have been attempted in recently completed and currently ongoing studies. The methodology is described in detail in Exhibit F, and the results are presented below.

## 8.1 Stormwater Infiltration and Potential Groundwater Recharge Benefits

Results from the methodology described in Exhibit F show that there is a potential to recharge 47,000 AF/yr throughout the GLAC Region if the target habitat and recreation lands in areas with high recharge potential are developed and/or enhanced with BMPs (Table 13). Figures 15 and 16 show recreation and habitat targets with potential recharge benefits.

**Table 13. Infiltration and Potential Groundwater Recharge Benefits from Open Space Projects**

| Potential Groundwater Recharge Capacity (AF/yr) | | |
|---|---|---|
| **Habitat** | **Recreation** | **Total** |
| 6,000 | 41,000 | 47,000 |

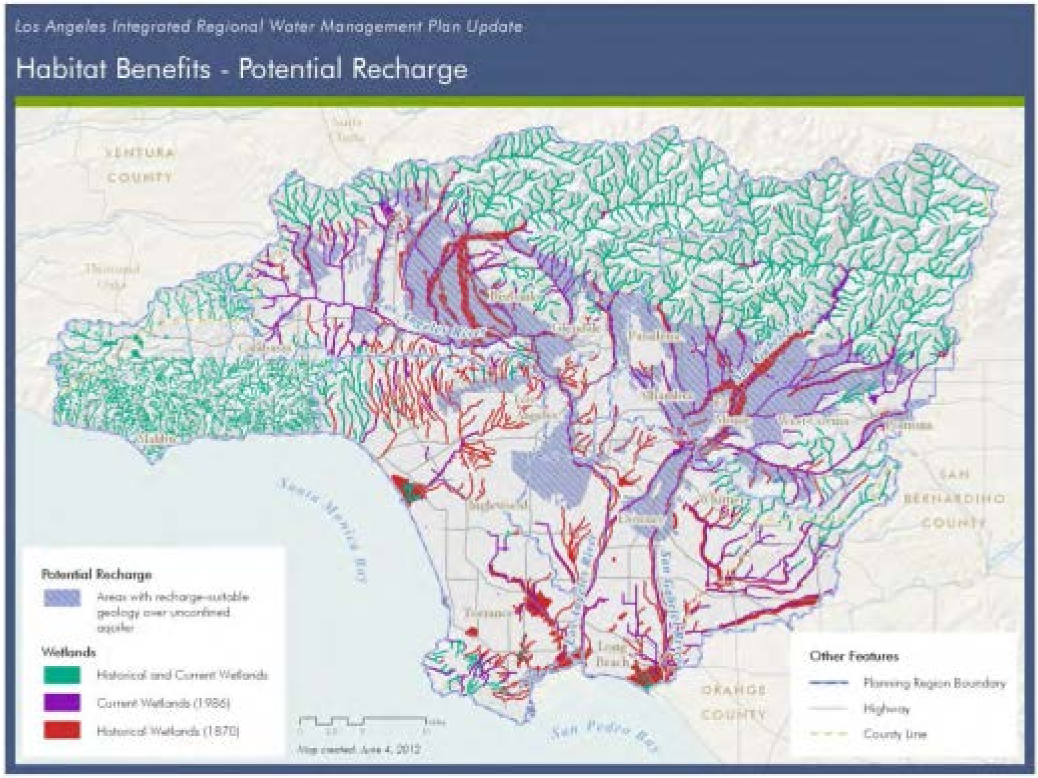


**Figure 15. Habitat Targets and Potential Recharge Benefits (GLAC Region)**

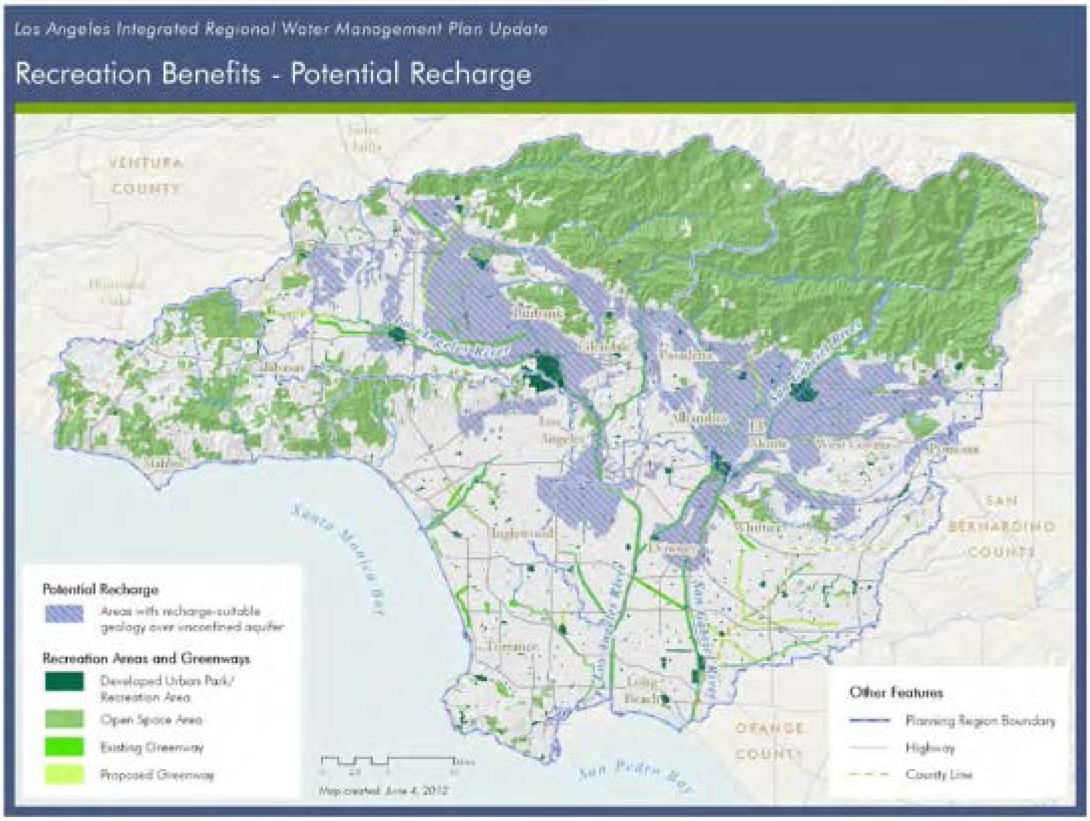


**Figure 16. Recreations Targets and Potential Recharge Benefits (GLAC Region)**

## 8.2 Stormwater Quality

Results show that there is a potential to create 21,000 AF of storage for water quality purposes, out of a target of 57,000 AF of storage throughout the GLAC Region if the target habitat and recreation lands are developed and/or enhanced with BMPs (Table 14).

## Table 14. Potential Stormwater Quality Benefits from Open Space Projects

| Potential Capture Capacity (AF/yr) | | |
|---|---|---|
| **Habitat** | **Recreation** | **Total** |
| 3,600 | 17,000 | 21,000 |

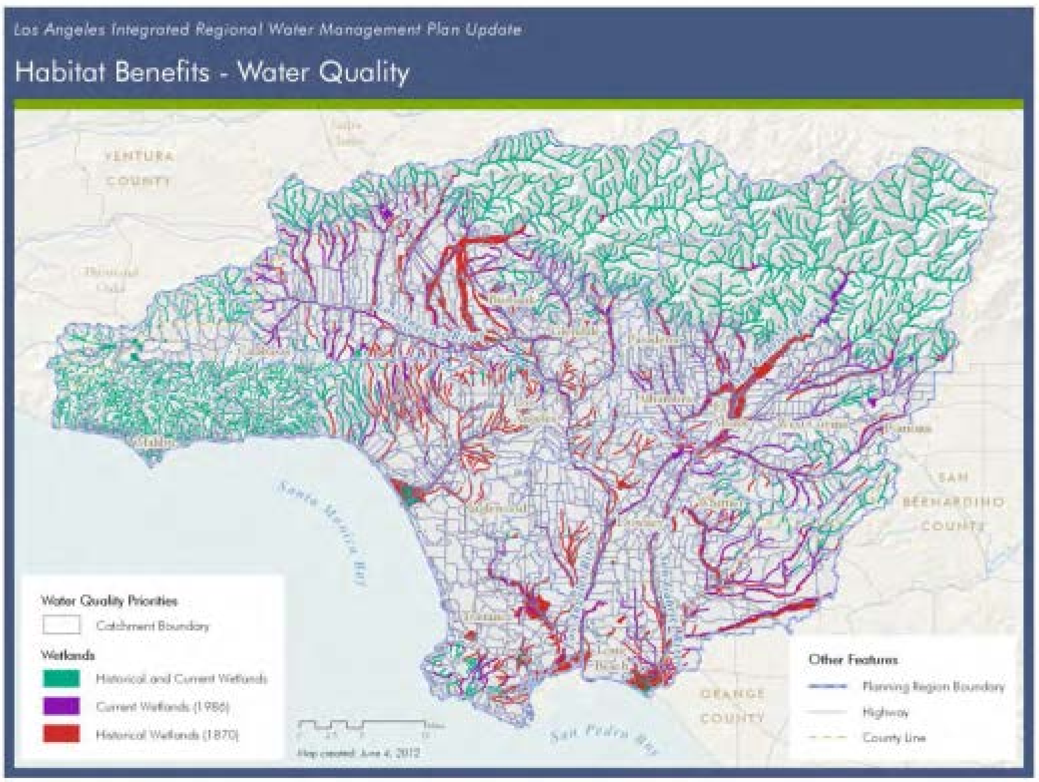


Figure 17. Habitat Targets and Stormwater Quality Benefits (GLAC Region)


**Figure 18. Recreation Targets and Stormwater Quality Benefits (GLAC Region)**

# 9 POTENTIAL CLIMATE BENEFITS OF OPEN SPACE PROJECTS

## 9.1 Projected Impacts of Climate Change

The effects of climate change are wide-reaching and must be incorporated into long-term planning efforts. According to California Climate Change Center's 2006 Summary Report on California's Changing Climate (Luers et al., 2006) temperatures are expected to rise substantially over the next century. Scientific models, based on the level of greenhouse gas (GHG) emissions, project three different climatic scenarios for California. Under the lower GHG emission scenario, temperature is anticipated to rise between 3 and 5.5°F. The medium GHG emission scenario anticipates a rise in temperature between 5.5 and 8°F. The high GHG emission scenario predicts that temperature may rise between 8 and 10.5°F (Luers et al., 2006).

Unlike temperature projections, there is less of a consensus on the effects that climate change will have on the amount of precipitation in California. Some models predict that there will be little change in the total annual precipitation, while others do not show any consistent trend over the next century. The Mediterranean seasonal precipitation pattern, with most precipitation falling during the winter months and from north pacific storms, is expected to continue. However, some models predict wetter winters while others project a 10 to 20 percent decrease in precipitation (Luers et al., 2006). One of the many anticipated effects of climate change is that more precipitation will fall as rain rather than snow. This could lead to a drastic reduction in the annual snow pack (70 to 90 percent), which will pose challenges for water resource managers, winter recreational activities, and the environment.

Another effect of climate change is increased oceanic temperatures and sea level rise. The California Department of Boating and Waterways commissioned an analysis on the economic costs to sea-level rise to California beach communities. The report, released in September 2011, cites various studies projecting the amount California sea-levels may rise. These studies predict that mean sea level in California could rise between 3 feet and 6 feet by 2100 (King et al., 2011). While a rise in sea level of more than 6 feet could mean the inundation of coastal infrastructure and facilities, the most significant coastal damages will most likely occur from extreme storms and episodic events, which are projected to occur more frequently under a changing climate. Coastal erosion is also projected to accelerate in the coming century and will threaten ecosystem services, including shoreline storm buffering capacities and recreational opportunities (King et al., 2011).

Climate change will also have dramatic effects on species and their habitats over the next century. Already, research has linked climate change with observed changes in species behaviors and species habitat (Parmesan, 2006). For example, the migration cycles of migratory songbirds are shifting as birds begin to migrate north earlier in the year. The change in migration cycle has resulted in a decoupling between the birds arrival date at their breeding ground and the availability of food they need for successful reproduction (the birds are arriving prior to the emergence of their food supply) (USFWS 2010).

The latitudinal and elevational ranges of species will shift as the climate warms (Tingley et al., 2009). Species (both plant and animal) are expected to move to higher elevational gradients as lower elevations become too warm or dry to be habitable (Kelly and Goulden, 2008). Warmer temperatures will also increase the risk and size of wildfires, insect outbreaks, pathogens, disease outbreaks, and tree mortality. The IPCC's Fourth Assessment Report estimates that approximately 20 to 30 percent of the world's plant and animal species will have an increased risk for extinction (IPCC, 2007).

In aquatic ecosystems, increased water temperatures will negatively impact cold and cool-water fish. Rising sea levels will also inundate critical coastal habitats that serve as nurseries for fish populations as well as other wildlife (USFWS, 2010).

Overall climate change is likely to cause abrupt ecosystem changes and species extinctions (Beliard et al., 2012). It will reduce our natural systems' ability to provide valuable ecosystem services—including reducing the availability of clean water—and impact our local and regional economy.

A benefit of greenways with multi-use bicycle paths is that they will be used for transportation purposes and will incrementally slow the pace of global warming. Nationally, the development of trails is seen as one avenue to reduce the nation's obesity epidemic, its dependency on oil, and its contribution to global warming. Fewer autos on the regional highway network means less carbon emissions that are driving global warming. Expanding use of bicycles further reduces emissions and, though marginal, increases the time available for society to respond to major climatic changes.

Within the region, the direct impact of climate change on physical recreation resources is principally related to the potential effects of sea level rise. It could be argued that the greatest open space resource of the GLAC Region is the Pacific Ocean, its public beaches, estuaries, and the public parks and trails along the shoreline. The economic benefits of these fabled southern California resources are significant. The impacts of sea level rise may be nothing short of cataclysmic to some of these beach and coastal estuary resources. These at-risk lands account for approximately 1,600 acres of Developed Urban Parks and Recreation Areas or Open Space Resource Areas. Although climate change adaptation techniques such as managed retreat have already been adopted at some southern California locations, the ability to clear urbanized lands to accommodate sea level rise is challenging at best, if simply not feasible economically. The ability to manage inland flooding from sea level rise is likely possible with multiple-use design solutions that incorporate levees, sea walls, or other engineered containment facilities with public access to trails and linear habitat corridors. These facilities may be designed to include provisions for particular recreation features such as the coastal trail or retention of piers, but other recreation resources will only be replaced with the acquisition of sufficient existing upland areas that are essentially now fully developed.

## 9.2 Recommended Criteria and Planning Strategies to Address Climate Change

### 9.2.1 Climate Change Adaptation

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as "an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (USFWS 2010, 14). Climate change adaptation seeks to reduce or ameliorate the effects of climate change that may occur.

Historically, California's Mediterranean climate has been known for its naturally variable temperatures and periodically recurring droughts. As a result, many species and ecosystems developed mechanisms to adapt to naturally occurring variations in temperature and water availability. However, with the accelerated warming trends predicted by climate change scientists, there is a high-level of uncertainty as to whether species and ecosystems will be able to adapt adequately enough to survive.

There are a number of adaptation strategies that could be adopted to conserve biodiversity and targeted species. Conservation planning, especially in the design of nature reserves, can be undertaken with a view towards future climate change (Bernazzani et al., 2012). This could include establishing reserves with high diversity of microhabitats (to accommodate on-site shifting of species distributions in response to climate change) to adopting a flexible-boundary approach, perhaps in conjunction with buffers or conservation zoning around a reserve.



The principal adaptation approach being used by the USFWS is the application of landscape-scale approach to conservation. Landscape-scale conservation includes the strategic conservation of terrestrial, freshwater, and marine habitats within sustainable landscapes. With the conservation of strategic habitat areas, it is also equally important to restore linkages and corridors between large habitat areas to facilitate the movement of fish and wildlife species responding to climate change. The fundamental goal of the USFWS program is to conserve target populations of species, or suites of species, and the ecological functions that sustain them (USFWS, 2010).

Although landscape-scale conservation planning, including strategic placement of reserves and corridors, is an essential element of climate change adaptation, in many cases species will not be able to migrate fast enough to keep up with climate change. A more active adaptation strategy is “assisted migration” (or assisted colonization) where target species are actively moved to a new location outside of their current distribution to anticipate the loss of suitable habitat where they currently occur (Vitt et al., 2010). Although there is some evidence of limited success with assisted migration, this strategy is controversial because of the many conservation issues it creates.

One of the most serious threats to coastal communities, both ecological and human, is sea level rise (Herberger et al., 2011). To improve the GLAC Region’s understanding of the threat of climate change, a multi-sectoral, multi-jurisdictional assessment of shoreline vulnerability and risk is needed. This assessment of the shoreline and estuarine areas would be conducted on a subregion basis. Local community and stakeholder interest and capacity for participation, the diversity of shoreline features, and presence of regionally significant infrastructure and resources would be considered.

The vulnerability and risk of asset categories would include, but not be limited to: river estuaries, community land use including parks and recreation resources, shoreline protection, and stormwater and wastewater infrastructure. To address assessment frames, a social vulnerability analysis, a broad socio-economic analysis using FEMA’s HAZUS methodology, and an analysis of environmental and economic costs due to potential disruption and loss of services could be completed. The goal would be to identify regional and local adaptation strategies to improve resilience features that address the vulnerabilities present. The assessment should also consider the social inequities likely to be reinforced or increased with future climate change (Shonkoff et al., 2011).

Because of the uncertainties associated with predicting future climate change, it is critical that adaptive management strategies be built into long-term planning initiatives. The US Department of Interior defines adaptive management as:

> *A decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contribution to ecological resilience and productivity. It is not a 'trial and error' process, but rather emphasizes learning while doing. Adaptive management does not represent and end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders.* (US DOI, 2009)

Implementation of effective adaptive management strategies provides resource managers, recreation planners, and site planners with a mechanism to address the uncertainties of our changing climate.

### 9.2.2 Climate Change Mitigation

Climate change mitigation refers to reducing GHG concentrations by either reducing the source of GHG emissions or increasing GHG sinks. Mitigation measures include carbon storage and sequestration, fossil fuel and material substitution, food production, and providing additional local recreation areas and green travel routes to encourage walking and cycling.[19] Reducing the production of greenhouse gases will result in immediate improvements to the regional environment while contributing to better health and economic efficiencies in households and businesses.[20]

The most obvious mitigation measure is to reduce GHG emissions by reducing fossil fuel combustion, since that is the largest source of GHGs. Alternative energy sources and energy conservation are often mentioned as obvious means of reducing fossil fuel consumption.

[19] http://www.opengreenspace.com/
[20] http://ccir.ciesin.columbia.edu/nyc/ccir-ny_q4a.html

More fuel-efficient transportation, including bicycling and walking, can contribute to that goal. There are important opportunities to encourage these activities in GLAC.

One important class of GHG mitigation strategies is geoengineering. Geoengineering encompasses a wide range of activities, from reducing the level of solar radiation by introducing chemicals or objects in the atmosphere or into space, to sequestering carbon by industrial activities, enhancing ocean productivity, or enhancing carbon sequestration in natural habitats by reforestation (Scheilnhuber, 2011). Many of these activities are extremely controversial, partially because of doubts about their effectiveness and partially because of concerns about potentially large unintended and undesirable consequences.

Besides strategies to reduce fossil fuel consumption, there are a number of climate mitigation strategies that would be implemented in GLAC. One of the most effective would be carbon sequestration by natural habitats. Aquatic habitats can be excellent habitats for carbon sequestration, especially coastal aquatic habitats (Chmura et al., 2003; Vymazal, 2011), so the GLAC aquatic habitats could be managed to maximize carbon sequestration whenever feasible; this would include both aquatic habitat protection, which would preserve existing carbon stores, and aquatic habitat creation, which could increase carbon sequestration. The organization Restore America's Estuaries has done work developing standards and estimating climate benefits for aquatic habitat enhancement/creation through their Verified Carbon Standard Program.[21]

[21] https://www.estuaries.org/climate-change.html

# 10 INTEGRATING HABITAT AND RECREATION TARGETS

As discussed earlier, open space encompasses a continuum of uses from natural resource lands to urban parks. Although habitat and recreation targets were calculated separately using different methodological approaches, in fact they are related. However, they are not additive.

A particular project may be useful for both habitat and recreation, in which case the uses would be completely complementary, or on the other extreme it could be useful for one or the other only (i.e., exclusive). Projects that focus on habitat or recreation, even to the exclusion of the other use, are valuable, but of course it is ideal if a project can accommodate both uses.

The total Open Space target for the region will be some combination of the habitat targets and the recreation targets. If habitat and recreation were exclusive, then the total Open Space target would be the sum of the habitat and recreation targets.

While it is recognized there is a potential that at least some of the habitat and recreation targets may overlap because of the open space continuum, for the purpose of this plan, the total Open Space target is the sum of the habitat and recreation target values. No analysis has been done to determine if the total target number can be reduced because of the continuum. The total Open Space target is shown along with all targets described earlier in this document in Table 15.

### Table 15. Summary of Target Tables – Aquatic habitats, Uplands, and Recreation

| **Type** | **Target (acre)** |
|---|---|
| Aquatic Habitat Protection or Preservation<br>(Tidal Aquatic Habitat, Freshwater/Riverine Aquatic Habitat) | 2,000 |
| Aquatic Habitat Enhancement<br>(Tidal Aquatic habitat, Freshwater/Riverine Aquatic Habitat) | 6,000 |
| Targets for Aquatic Habitat Restoration or Creation<br>(Tidal Aquatic Habitat, Freshwater/Riverine Aquatic Habitat) | 4,000 |
| Upland Habitat<br>(Buffers and Linkages) | 36,000 |
| Developed Urban Parks | 19,700-25,100 |
| Passive Recreation | 30,000-53,000 |
| **Total Open Space Target** | **115,700-144,100** |

# 11 IMPLEMENTATION OF THE OPEN SPACE, HABITAT AND RECREATION OBJECTIVES

The IRWMP serves as a blueprint that guides a regional approach to developing, protecting, and preserving water resources within the GLAC region. The blueprint seeks to integrate targets, methodologies, and criteria for assessing water resource projects. One goal of this integration is to generate well-designed water resource projects that meet multiple water resource management needs and objectives, including the provision of open space, habitat and recreation. Another goal is to optimize successful grant-funding opportunities within the state's IRWMP program.

## 11.1 Opportunities and Challenges

*Opportunities*

The benefits of considering habitat and open space in the IRWMP are numerous. Investing in the preservation, enhancement, and restoration/creation of open space features creates a vision for a more connected region, protecting biodiversity from the uncertain effects of climate change, and maintaining the region's recreational opportunities. The wildlife buffers, linkages, corridors and ample recreation opportunities recommended by the plan will help ensure that people, plants, and animals can move across the landscape to adapt to warming temperatures. It also will allow people to understand the connection between open space and improved environmental management.

The protection, enhancement, and restoration/creation of aquatic habitats systems and their associated buffer zones throughout the region will protect valuable watershed functions. These activities will provide not only critical habitat to species as they move across the landscape, but will also help preserve water quality and quantity. In coastal areas, the preservation, enhancement, and/or restoration/creation of tidal aquatic habitats will help mitigate the effects of rising sea levels.

The IRWMP serves as a broad planning framework that can serve the Region's agencies, and other stakeholders as they work together. The establishment of regional goals and objectives allows these entities to build upon each other's visions and projects. In addition, the process for Plan updates provides a means for goals and objectives to be measured and adjusted as progress is made.

In addition to meeting the goals and objectives of the state's IRWMP program, targets developed in the OSHARTM were developed in a manner that is consistent with current regulatory standards of other state and federal permitting agencies. This was done to ensure efficient use of project funds by agencies competing for grant funding.

*Challenges*

There are many challenges in developing and implementing the goals, objectives, and targets of the OSHARTM. Some issues that must be further explored and analyzed to inform future iterations of open space, habitat and recreation planning include the following:

- **This analysis was insufficiently tailored to the local and Subregional level.** This plan developed targets and evaluation criteria for the region. In the future, each subregion may choose to develop their own strategy for setting targets, and for contributing to meeting the targets. Subregions may choose to use the methodologies presented in this report, or they may choose to develop different methods that meets the specific needs of their region. Subregional implementation will require planning agencies and city planning departments within each region to evaluate or interpret the targets compared to land use to determine opportunities and constraints in their local areas, subregions, and then throughout the region.
- **There is currently insufficient research on evaluating and assigning value to ecosystem services.** Evaluation of ecosystem services is a relatively new area of study that has yet to achieve consensus on assessment methodologies. As research in this area advances, the OSHARTM will be able to more precisely assess the benefits of open space.
- **Inequitable access to existing open space resources for outdoor recreation and environmental education purposes needs to be addressed.** Access is chiefly dependent on proximity and transportation factors that are outside the scope of the IRWMP. While there may be ways of transporting people to open space, there are limited opportunities to bring open space to people within many urban areas of the GLAC Region. The urban areas are essentially built out and the opportunities for land acquisitions and redevelopment and/or restoration are considered to be limited. The cost of land also may be considered too prohibitive if the justification for acquisition is only related to recreation values. Multipurpose projects may aid in addressing this issue to some extent.

- **The high level of urbanization and land values within the GLAC Region presents a significant challenge in implementing open space conservation and the targets developed in this TM.** Open space conservation is needed for the region to protect its biodiversity and help mitigate the effects of climate change. By implementing environmental solutions that address water resource management needs such as flood attenuation and water quality improvement, society will receive multiple benefits. It is recognized that these solutions tend to be more complex than "traditional" engineered approaches and should be encouraged.

- **There is a concern that project proponents may fail to consult property owners, including public agency landowners, prior to developing project concepts and adding these projects into the IRWMP project database.** The project addresses this criticism by providing a framework for partnering and collaboration throughout the GLAC region.

- **Oftentimes the development of open space decreases local government revenue by taking properties "off the tax rolls", while increasing costs through increased enforcement/oversight for recreational users and/or requiring funds for natural resource management and maintenance.** Such funding is typically not readily available. New resource management tools need to be assessed to address this issue. For example, public agency mitigation or conservation banking could not only provide compensatory mitigation for important public infrastructure projects, but also protect/restore habitat and provide adequate funding for the long-term management.

- **The acquisition of open space or creation/enhancement/restoration of habitat adjacent to existing neighborhoods may place an increased burden on local government services including the potential of fire, flood hazards, and police and rescue services.** These environmental activities also may negate the benefits of existing infrastructure, impact water rights, and/or significantly alter long-established operations and maintenance procedures. If any of these are identified as an issue during the project review process, they should be addressed at that time.

*Strategies to Work with Agencies to Ensure Consistency with the IRWMP*

The development of the IRWMP has served as a mechanism for discussions between agencies and other stakeholders regarding ways to increase integrated water resource management planning within the GLAC Region. Some of these discussions led to the identification of issues and needs that must be further explored. This exploration should take place during future revisions of this IRWMP. This IRWMP Update should serve as a catalyst for further evaluation of regional issues and the means to resolve those issues through a collaborative process. Case studies on the Santa Barbara County and the Santa Ana Watershed approach may be useful in further refining a collaborative process.

Stakeholder and agency partnerships have been created during the development of the IRWMP. By establishing these relationships, these entities can effectively coordinate planning with each other, exchange innovative ideas and methods, and increase coordination to undertake studies and projects. Agencies and non-governmental organizations might even collaborate to work on issues of common interest and identify consensus on broad goals, as exemplified by the working arrangement between the Los Angeles Department of Water and Power and TreePeople. By partnering, both the individual strengths of each organization, and the benefits from implemented projects, will expand.

Given the large number of agencies with jurisdiction in the GLAC Region, there are a broad range of interests and issues. Many of the interests and issues extend beyond water resource management. Ongoing planning between agencies should increase opportunities to focus on common themes to protect water supply and water quality as well as to address other environmental issues and to provide more parks and open space. Through ongoing planning, agencies can work together to plan and develop multi-purpose projects and programs that fulfill their mandates and meet larger regional needs while also helping to enhance water supplies and improve water supply reliability (GLAC IRWMP Acceptance Process Application, April 28 2009).

### 11.2 <u>Gaps in Knowledge</u>

The revised IRWMP is based on the best available science to date. However, information updates (i.e., research, science, and public policies) are needed and these updates must be disseminated. Obtaining, assessing, and disseminating high-quality data often is difficult. Without an agreement as to the basic information, it can be difficult to determine accurate baselines, make projections, and set targets in implementing water-related projects (Bliss and Bowe, 2011). The effectiveness of the knowledge itself may pose another gap because it often takes several years of implementation, practice, and monitoring to determine an outcome.

While regional inventories of park and recreation lands exist, the complementary information for outdoor areas at school sites used for outdoor recreation and environmental education throughout the entire region does not. Many elementary, middle, and high schools in the urban areas of Los Angeles County are not park-like; instead, they have minimal recreational amenities and contain asphalt rather than vegetated surfaces. Information that should be inventoried includes: condition of outdoor recreation / physical education areas, accessibility to neighborhood areas (open or closed to public use after school hours), and existence of joint use agreements with public recreation providers.

Trail routes illustrated on the recreation and open space target maps are proposed regional trails as identified in the draft Los Angeles General Plan 2035, as well greenways identified by stakeholders during the outreach efforts for the development of the OSHARTM. Many of the 84 cities within the GLAC region, such as the Cities of Malibu, Monrovia, and Pasadena, as well as other agencies and joint power authorities that provide outdoor recreation opportunities have adopted or proposed local trail plans that complement the county-wide trail network. As an ongoing process, once adopted, these trail routes may be added, as appropriate, to the IRWMP database. Those trail routes that create loops stemming from the regional trail system, connect regional trail routes within lands that are outside of existing public lands, or directly connect urban areas with the regional trail system should be specifically identified.

Inventories are also needed to characterize and evaluate the region’s wildlands. Besides potential buffer and identified linkage areas, additional habitat core areas may be identified.

Standardized statistics about the use, appeal, and value of the open spaces of the GLAC Region, and the passive recreation that take places in them, do not exist. The GLAC Region hosts industries, climate, and landscapes that are known locally, statewide, nationally, and internationally. However, the open spaces of the region are not all the same. Beaches, river greenways, and a variety of mountain settings offer a myriad of open space opportunities. Added to that variety, there is a great disparity in the way the different agencies that own or manage open space areas maintain statistics about visitors and use within those resources. Conducting a comprehensive open space inventory and use analysis that employs a standardized approach applied evenly over the region, and that identifies the economic value of open space to the region would greatly benefit the OSHARTM because of the sensitivity of the metrics applied to open space.

## 11.3 <u>Recommendations</u>

The IRWMP is a living document. It is not intended to be filed away on a shelf, but rather to serve as the catalyst for solutions that can be implemented throughout the GLAC subregions. The OSHARTM is also intended to be reviewed regularly and updated as new information, technologies, and data become available. The following recommendations for the OSHARTM will assist in:

- Incorporating new open space data and information in the IRWMP
- Identifying and prioritizing important habitat and recreation needs
- Refining targets, methodologies and project evaluation
- Fostering regional partnerships.

It is recommended that stakeholders conduct an inventory of planned or existing projects within the GLAC region that meet the intent of the IRWMP. The information sources currently available are disjointed and in many different formats, including specific plans, periodicals, newsletters, and occasionally contained within usable GIS databases.

While in the process of finalizing the updated Significant Ecological Area Program, Los Angeles County could amend it to identify linkages and give them the same priority as protection of large habitat blocks.

The aquatic habitat targets are based on data about historical and current extent of aquatic habitats and ownership of parcels with aquatic habitats. The best available data were used for calculating the targets, but additional work could be done to improve all of these databases. Recommendations include:

- **Aquatic habitat loss**. Rairdan (1998) was used to determine the loss of aquatic habitats in the region. Rairdan's historical aquatic habitat analysis has been supplanted by historical ecology studies in two sections of GLAC (Stein et al., 2007 for the San Gabriel River and Dark et al. 2011 for the Ballona Creek watershed). The recent historical ecology studies use more modern, detailed methods than Rairdan used, but their limited geographic scope precluded their use for establishing GLAC targets. The creation/restoration targets would be improved if a historical ecology study was completed for the entire GLAC region.
- **Current aquatic habitat extent**. The National Wetlands Inventory (NWI) was used to indicate the current extent of aquatic habitats in GLAC. Unfortunately, the current NWI maps do not cover the entire GLAC region. The protection

and enhancement targets would be improved if there were NWI maps for the entire region. Moreover, the NWI mapping should be done at a level that includes as many local aquatic habitat types as possible, including small ephemeral aquatic habitats and streams.

- **Ownership**. Aquatic habitat ownership was determined using the California Protected Area Database (CPAD). However, not all publicly owned lands are included in the CPAD. It would be possible to develop a more accurate estimate of private ownership by searching ownership on a parcel-by-parcel basis; however, an effort such as this was beyond the scope of this project. The protection targets could be refined by determining ownership using a parcel-by-parcel analysis.

The habitat targets could be improved by considering ecosystem services as well as aquatic habitat extent. It was originally planned to incorporate ecosystem services more thoroughly into the targets. However, there is no readily applicable method for quantifying ecosystem services at present, and there is an almost complete lack of information on the ecosystem services being provided by existing aquatic habitats. The importance of assessing ecosystem services has only recently been recognized, and this is an area of active research. The development of methods to assess ecosystem services should be monitored and applied to GLAC aquatic habitats when a suitable method has been developed. A detailed understanding of the ecosystem services provided by existing aquatic habitats is critical for developing improved aquatic habitat targets.

As an ongoing process, once adopted, some or all of these local trail routes should be added to the IRWMP data base. Those trail routes that branch from the regional trail system and create loop opportunities for recreation, or local trails that directly connect urban areas with the regional trail system should be specifically identified and included in the regional recreation targets.

And finally, essential to any truly integrated effort, as part of the IRWMP, the GLAC Region should develop and publicize its strategic focus and willingness to invest in feasible, multi-beneficial, collaboratively developed projects.

This report was released for public review, and comments received identified further areas of continued work that would build upon this work. These include the following:

- Present historical aquatic habitats with overlays of development, and especially port development and flood channel development, to provide a more clear assessment of where potential aquatic habitat restoration would be most feasible.

- Goals for aquatic habitat protection do not include the definition for the mechanism by which the aquatic habitat would be protected. While acquisition of privately held aquatic habitat areas is one potential method, this could be infeasible. Future work will include establishing specific strategies for protection of aquatic habitats that will include alternatives to acquisition.
- Targets for protection and enhancement of existing aquatic habitats could be refined based on the quality of the existing habitat. It would not make sense to select concrete lined flood control channels for the protection target, as they provide minimal habitat value. Future work should rank existing aquatic habitat areas by their habitat value and use that information to inform guide protection and enhancement targets.
- Future work should be done to describe the specific needs and constraints throughout the region. Once the needs and constraints were adequately assessed, projects could be evaluated taking this into consideration.
- Improve the Water Source/Supply & Hydroperiod section of the scoring sheets to take into account more complex mechanisms of hydromodification, such as impacts of increased impervious cover.
- Incorporate OSHARTM targets into the General Plans generated by the Governor's Office of Planning and Research.
- Refine list of linkages to reflect the constraints. For instance, channels that undergo regular maintenance or rivers where it would not be feasible to provide a 1,000-foot buffer should be removed from this list.
- Develop a methodology for counting projects that serve both recreation and habitat goals towards the targets.
- Coastal Sediment is a major climate change issue. The California Coastal Sediment Workgroup just issued a draft Beach Sediment Report. Further work on Open Space targets should include a review of this report and incorporate relevant findings.
- Develop a more accurate assessment of usable park land in large open spaces within the region to more accurately assess how well passive recreation standards are met and refine targets.
- Critical habitat areas should be updated with each update of the plan, as they are continuously being revised.

## 12 REFERENCES AND SOURCE DOCUMENTS

American Rivers, Clean Water Action, Defenders of Wildlife, Earthjustice, Endangered Species Coalition, Environment America, Environmental Defense Fund, Izaak Walton League, Land Trust Alliance, National Parks Conservation Association, National Wildlife Federation, The Nature Conservancy, Sierra Club, Trust for Public Land, The Wilderness Society, and World Wildlife Fund. *Program Proposal from Conservation and Environmental Organizations: A Landscape-scale Conservation Initiative for the U.S.* Washington, D.C.: Land Trust Alliance, 2010.

Bellard, C., C. Bertelsmeier, P. Leadley, W. Thuiller, and F. Courchamp. 2012. Impacts of climate change on the future of biodiversity. Ecology Letters 15:365-377.

Bernazzani, P., B. Bradley, and J. Opperman. 2012. Integrating Climate Change into Habitat Conservation Plans Under the U.S. Endangered Species Act. Environmental Management 49:1103-1114.

Bliss, Katherine E. and Katryn F. Bowe. *Bridging Knowledge Gaps in Water Management: Integrating Approaches to Food, Water, Energy, and the Environment*. Washington, DC: Center for Strategic and International Studies, 2011.

Bond, Monica. 2003. *Principles of Wildlife Corridor Design*. Center for Biological Diversity.

Brauman, Kate A., Gretchen C. Daily, T. Ka'eo Duarte, and Harold A. Mooney. "The Nature and Value of Ecosystem Services: An Overview Highlighting Hydrologic Services." *Annual Review of Environment and Resources* 32 (2007): 67-98.

Bridgham, S., J. Megonigal, J. Keller, N. Bliss, and C. Trettin. 2006. The carbon balance of North American Wetlands. Wetlands 26:889-916.

Brown and Caldwell. *Integrated Water Management Strategy*. Prepared for the Greater Los Angeles County Region. Los Angeles, CA: 2006.

"California Department of Fish and Wildlife." Wikipedia. Web. 22 Jan. 2012. <http://en.wikipedia.org/wiki/California_Department_of_Fish_and_Wildlife>.

California Department of Water Resources. *California Water Plan Update 2009: Integrated Water Management*. Bulletin 160-09. Sacramento, CA: CADWR, 2009.

California Department of Water Resources. *Climate Change in California*. Sacramento, CA: CADWR, 2007.

California Energy Commission. Energy Glossary: Letter C. Web. 22 Jan. 2012. <http://www.energy.ca.gov/glossary/glossary-c.html>.

California Environmental Protection Agency. State Water Resources Control Board. Dredge/Fill (401) and Wetlands Program. Web. 22 Jan. 2012. <http://www.waterboards.ca.gov/ water_issues/programs/cwa401>.

California National Resources Agency. California Environmental Resources Evaluation System. California Wetlands Information System: How to Get a Wetlands Permit. Web. 22 Jan. 2012. <http://ceres.ca.gov/ wetlands/permitting.html >.

California Resources Agency. California Wetlands Information System: Summary of the Porter-Cologne Water Quality Control Act. Web. 22 Jan. 2012. <http://ceres.ca.gov/wetlands/permitting/Porter_summary.html>.

California State Parks. Department of Parks and Recreation. *California Outdoor Recreation Plan 2008: An Element of the California Outdoor Recreation Planning Program*. Sacramento, CA: California State Parks, 2009.

California State Parks. Department of Parks and Recreation. *The Health and Social Benefits of Recreation: An Element of the California Outdoor Recreation Planning Program*. Sacramento, CA: California State Parks, 2005.

Campus ERC. NPDES Overview. Web. 22 Jan. 2012. http://www.campuserc.org/virtualtour/grounds/drains/Pages/NPDES-Overview.aspx.

Center for Watershed Protection, 2005. *Wetlands and Watersheds: Adapting Watershed Tools to Protect Wetlands*

Climate Change Information Resources. Web. June 2012. < http://ccir.ciesin.columbia.edu/nyc/ccir-ny_q4a.html>.

CDFW. CEQA: The Department of Fish and Wildlife's Role in Environmental Review. Date accessed January 22, 2012. <http://www.dfg.ca.gov/habcon/ceqa/>.

CDFW. Natural Community Conservation Planning (NCCP). Web. 22 Jan. 2012. <http://www.dfg.ca.gov/habcon/nccp>.

Charles, Cheryl, Richard Loub, Lee Bodner, Bill Guns, and Dean Stahl. Children and Nature Network. *Children and Nature 2009: A Report on the Movement to Reconnect Children to the Natural World*. Santa Fe, NM: C&NN, 2009.

Chmura, G. L., S. C. Anisfeld, D. R. Cahoon, and J. C. Lynch. 2003. Global carbon sequestration in tidal, saline wetland soils. Global Biogeochem. Cycles 17.

Chmura, G. L., S. C. Anisfeld, D. R. Cahoon, and J. C. Lynch. 2003. Global carbon sequestration in tidal, saline wetland soils. Global Biogeochem. Cycles 17.

CIRIA Open Space. Web. June 2012. < http://www.opengreenspace.com>

City of Los Angeles Department of Recreation and Parks. *2009 Citywide Community Needs Assessment: Executive Summary*. Los Angeles, CA: LA Department of Recreation and Parks, 2009.

County of Santa Barbara. *Santa Barbara Countywide Integrated Regional Water Management Plan*. Prepared for the County of Santa Barbara County Water Agency. Santa Barbara, CA: 2007.

Dahl, Thomas E. *Wetlands Losses in the United States 1780's to 1980's*. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service, 1990. 13.

Dark, Shawna, Eric D. Stein, Danielle Bram, Joel Osuna, Joseph Monteferante, Travis Longcore, Robin Grossinger, and Erin Beller. "Historical Ecology of the Ballona Creek Watershed." *Southern California Coastal Water Research Project Technical Publication* 671. 2011: 75.

Faber, Phyllis M., E. Keller, A. Sands, and B.W. Massey. *The Ecology of Riparian Habitats of the Southern California Coastal Region: a Community Profile*. U.S. Fish and Wildlife Service Biological Report 85 (7.27), 1989. 152.

Hawley, Robert J. and Brian P. Bledsoe. "How Do Flow Peaks and Durations change in Suburbanizing Semi-Arid Watersheds? A Southern California Case Study." *Journal of Hydrology* 405 (2011): 69-82.

Heberger, M., H. Cooley, P. Herrera, P. Gleick, and E. Moore. 2011. Potential impacts of increased coastal flooding in California due to sea-level rise. Climatic Change 109:229-249.

Hong, Stuart, Alex Stehl and Laura Westrup. *Trends Worth Talking About*. California State Parks. California Park & Recreation Society Annual Conference. March 2006.

Jennings, Mark R. and Marc P. Hayes. *Amphibian and Reptile Species of Special Concern in California*. Rancho Cordova, CA: California Department of Fish and Wildlife, Inland Fisheries Division, 1994.

Kelly, A. E. and M. L. Goulden. 2008. Rapid shifts in plant distribution with recent climate change. Proceedings of the National Academy of Sciences 105:11823-11826.

Knopf, Fritz L., R. Roy Johnson, Terrel Rich, Fred B. Samson, and Robert C. Szaro. "Conservation of Riparian Ecosystems in the United States." *The Wilson Bulletin* 100.2 (1988): 272-284.

LADPW. Leadership Committee of Greater Los Angeles County Integrated Water Management Plan. Los Angeles County Flood Control District. *Greater Los Angeles County Integrated Regional Water Management Plan Region Acceptance Process Application*. Los Angeles: LADPW, 2009.

LADPW. Leadership Committee of the Greater Los Angeles County Integrated Regional Water Management Plan. *Greater Los Angeles County Integrated Regional Water Management Plan*. Los Angeles, CA: LADPW, 2006.

Lamberti, Gary A., Stan V. Gregory, Linda R. Ashkenas, Randall C. Wildman, and Alan D. Steinman. “Influence of Channel Geomorphology on Retention of Dissolved and Particulate Matter in a Cascade Mountain Stream.” *Californian Riparian Systems Conference; September 22-24, 1988; Davis, California*. Ed. Dana Abell. Berkeley, CA: USDA Forest Service, 1989.

Lilien, J.P. 2001. Cumulative impacts to riparian habitat in the Malibu Creek watershed. D. Env. Dissertation, University of California, Los Angeles.

Los Angeles County Department of Regional Planning. *Los Angeles County General Plan 2035*. Public Review Draft. Los Angeles, CA: LA County DRP, 2011.

Luers, A.L, D.R. Cayan G. Franco, M. Hanemann and B. Croes. 2006. Our Changing Climate: Assessing the Risks to California. Summary Report from the California Climate Change Center.

Mann, Lori, & Hensley, Ed. *Education and the Environment: Strategic Initiatives for Enhancing Education in California*. Sacramento, CA: California Department of Education Press, 2002.

Millennium Ecosystem Assessment. 2005a. Ecosystems and well-being: Synthesis. Island Press, Washington, D.C.

Millennium Ecosystem Assessment. 2005b. Ecosystems and human well-being: Wetlands and water. Synthesis. World Resources Institute, Washington, D.C.

National Parks Second Century Commission. *Advancing the National Park Idea: National Parks Second Century Commission Report*. Washington, D.C.: National Parks Conservation Association, 2009.

New England Governor’s Conference. *Report of the Blue Ribbon Commission on Land Conservation*. Boston, MA: NEGC, 2009.

Obama, Barack. Presidential Memorandum: America’s Great Outdoors. 16 April 2010. Web. <http://www.whitehouse.gov/the-press-office/presidential-memorandum-americas-great-outdoors.>

Outdoor Resources Review Group. *Great Outdoors America: The Report of the Outdoor Resources Review Group*. ORRG, 2009.

Parmesan, C. 2006. Ecological and Evolutionary Responses to Recent Climate Change. Annual Review of Ecology, Evolution, and Systematics 37:637-669.

Paul, Michael J. and Judy L. Meyer. “Streams in the Urban Landscape.” *Annual Review of Ecology and Systematics* 32 (2001): 333-365.

Poff, N. Leroy and Julie K.H. Zimmerman. “Ecological Responses to Altered Flow Regimes: A Literature Review to Inform the Science Management of Environmental Flows.” *Freshwater Biology* 55 (2010): 194-205.

PRBO Conservation Science. *Projected Effects of Climate Change in California: Ecoregional Summaries Emphasizing Consequences for Wildlife*. Version 1.0. Petaluma, CA: PRBO, 2011.

Rairdan, C. 1998. Regional restoration goals for wetland resources in the Greater Los Angeles Drainage Area: A landscape-level comparison of recent historic and current conditions using Geographical Information Systems. Dissertation. University of California, Los Angeles.

Rundel, Philip Roy and S.B. Sturmer. “Native Plant Diversity in Riparian Communities of the Santa Monica Mountains, California.” *Madrono* 45 (1998): 93-100.

Salazar, K. *Addressing the Impacts of Climate Change on America’s Water, Land, and Other Natural and Cultural Resources*. Secretarial Order No. 3289, Amendment No. 1. Washington, D.C.: Department of the Interior, 2010.

Schellnhuber, H. J. 2011. Geoengineering: The good, the MAD, and the sensible. Proceedings of the National Academy of Sciences 108:20277-20278.

Shonkoff, S., R. Morello-Frosch, M. Pastor, and J. Sadd. 2011. The climate gap: environmental health and equity implications of climate change and mitigation policies in California—a review of the literature. Climatic Change 109:485-503.

State of California Governor’s Office of Planning and Research. *State of California General Plan Guidelines*. Sacramento, CA: Governor’s OPR, 2003.

Stein, E., S. Dark, T. Longcore, R. Grossinger, N. Hall, and M. Beland. 2010. Historical Ecology as a Tool for Assessing Landscape Change and Informing

Wetland Restoration Priorities. Wetlands 30:589-601.

Straub, Noelle. "U.S. Forest Service to Adapt Woodland Management to Climate Change." *Scientific American*. 30 Nov. 2009.

Sutley, N.H. *Statement before the Committee on Appropriations, Subcommittee on Interior, Environment, and Related Agencies*. Washington, DC: U.S. House of Representatives, 2009.

Sutula, Martha and Stein, Eric. "Habitat Value of Constructed and Natural Wetlands Used to Treat Urban Runoff". California Coastal Conservancy Technical Report 388. 2003.

The California Resources Agency, San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy, and Santa Monica Mountains Conservancy. *Common Ground from the Mountains to the Sea: Watershed and Open Space Plan San Gabriel and Los Angeles Rivers*. 2001.

Thomson, Robert C., Amber Wright, and Brad Shaffer. (in revision) *California Amphibian and Reptile Species of Special Concern*.

Tingley, M. W., W. B. Monahan, S. R. Beissinger, and C. Moritz. 2009. Birds track their Grinnellian niche through a century of climate change. Proceedings of the National Academy of Sciences 106:19637-19643.

USACOE. 2005. *Regulatory Guidance Letter* No. 05-09. 7 Dec. 2005.

USC Sustainable Cities Program and the National Park Service. *Santa Monica Mountains National Recreation Area: Recreational Trail Use Survey*. 2003.

USDOC. National Oceanic and Atmospheric Administration. Ocean and Coastal esource Management. Special Area Management Plans. Date accessed January 22, 2012. <http://coastalmanagement.noaa.gov/special.html>.

USEPA. Mitigation Banking Factsheet: Compensating for Impacts to Wetlands and Streams. Web. 22 Jan. 2012. <http://www.epa.gov/owow/wetlands/facts/fact16.html>.

USEPA. Summary of the Endangered Species Act. Web. 22 Jan. 2012. <http://www.epa.gov/lawsregs/laws/esa.html>.

USEPA. Summary of the National Environmental Policy Act. Web. 22 Jan. 2012. <http://epa.gov/lawsregs/laws/nepa.html>.

USFWS. Endangered and Threatened Species for Los Angeles County. Web. 25 Jan. 2012. <http://www.fws.gov/carlsbad/TEspecies/CFWO_Species_List.htm>.

USFWS. Clean Water Act Section 404. Web. 22 Jan. 2012. <http://www.fws.gov/habitatconservation/cwa.html>.

USFWS. Critical Habitat for the County of Los Angeles. Web. Dec. 2011. <http://criticalhabitat.fws.gov/crithab>.

USFWS. *Habitat Conservation Planning and Incidental Take Permit Processing Handbook*. 4 Nov. 1996.

Vilsack, Tom. 2009. "National Vision for America's Forests." Seattle, WA. 14 Aug. 2009. Keynote Address.

Vitt, P., K. Havens, A. T. Kramer, D. Sollenberger, and E. Yates. 2010. Assisted migration of plants: Changes in latitudes, changes in attitudes. Biological Conservation 143:18-27.

Vymazal, J. 2011. Enhancing ecosystem services on the landscape with created, constructed and restored wetlands. Ecological Engineering 37:1-5.

Walsh, Christopher J., Allison H. Roy, Jack W. Feminella, Peter D. Cottingham, Peter M. Groffman, and Raymond P. Morgan. "The Urban Stream Syndrome: Current Knowledge and the Search for a Cure." *Journal of the North American Benthological Society* 24 (2005): 706-723.

Western Governor's Association. *Wildlife Corridors Initiative*. Jackson, WY: WGA, 2008.

White, Michael D. and Keith A. Greer. "The Effects of Watershed Urbanization on the Stream Hydrology and Riparian Vegetation of Los Peñasquitos Creek, California." *Landscape and Urban Planning* 74 (2006): 125-138.

Zedler, Joy B. and Suzanne Kercher. "Wetland Resources: Status, Trends, Ecosystem Services, and Restorability." *Annual Review of Environment and Resources* 30 (2005): 39-74.

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# Exhibit A

## Aquatic Habitat Target Methodology

This exhibit provides a more detailed description of how the aquatic habitat targets were determined.

To the extent possible, all aquatic habitat targets were calculated in a transparent manner using quantitative data sources. Inevitably, there are limitations in the data used to calculate these targets; some of these limitations are described below. Two specific examples where future work could dramatically improve the data sources are (1) the historical extent of aquatic habitats, and (2) the National Wetland Inventory of current aquatic habitat extent. As better data become available, the habitat targets could easily be updated to reflect these data by applying the methods described here.

### <u>Databases used</u>

Three main databases were used as the foundation for calculating aquatic habitat targets. These databases are described in the following sections.

### California Protected Area Database

The California Protected Area Database (CPAD) is a mostly parcel-based data set that tracks all known parks and open space lands in the state. Land ownership categories in the CPAD include city, county, state, federal, special district, and non-profit. We used CPAD Release 1.7, from September 2011). More detailed metadata about the CPAD is available at http://www.calands.org/data.php.

CPAD may not accurately reflect private ownership. For example, CPAD does not include the majority of lands owned by agencies such as the Los Angeles County Flood Control District for the primary purpose of flood control. It would be possible to obtain a more accurate estimate of private ownership by searching ownership on a parcel-by-parcel basis; however, an effort such as this was beyond the scope of this project. To the extent that the CPAD database includes public lands, the targets for protection will be too high.

### National Wetlands Inventory

Current aquatic habitat extent was determined using the National Wetlands Inventory (NWI), September 2011 release, from the USFWS. Metadata for the NWI database are available at http://www.fws.gov/aquatic habitats/Data/metadata.html. The NWI database reports aquatic habitat extent in acres. Although the NWI database represents the best data for aquatic habitat extent in the region, it has definite limitations. NWI data are not precise; detailed mapping would require on-the-ground mapping using a Global Positioning System (GPS). Not all aquatic habitats are included in normal NWI mapping. NWI maps include aquatic habitats that can be identified by experienced photointerpreters from aerial photographs, but may not include some ephemeral aquatic habitats or other habitats that are not visually distinct from non-aquatic habitats. Some of the areas in the GLAC region have been mapped using an enhanced NWI methodology. Ideally, the enhanced NWI methodology would be applied for all areas in the region, but these data were not available when the present targets were calculated.

NWI categorizes aquatic habitats according to the Cowardin aquatic habitats classification scheme. The classification scheme is shown in Figure 1. Note that NWI uses two high-level classifications that include marine and estuarine habitats: Estuarine and Marine Deepwater, and Estuarine and Marine Aquatic habitat. For tidal aquatic habitats, we included all estuarine habitats, both subtidal and intertidal, which cut across both of the high-level classifications. There may be some aquatic habitat types included in estuarine habitats that would not typically be considered tidal aquatic habitats, but these would be very minor in this region.

**Rairdan (1998)**

The calculation of aquatic habitat losses requires a data source with consistent data for current and historical aquatic habitat extent for the region. There are no available data for the entire region, but Rairdan (1998) presented data for all subregions except North Santa Monica Bay (NSMB). For the other four regions, losses were calculated using data layers provided by Rairdan (U.S. Army Corps of Engineers, Sacramento, CA). The historical extent was based on maps and other sources from circa 1870; current extent was in 1986. To calculate loss, the two layers for each subregion were overlaid to show the difference between the current extent and historical extent. This allowed the identification of areas that historically supported aquatic habitats but no longer do, areas that historically supported aquatic habitats and still do, and areas that did not historically support aquatic habitats but currently do.

Rairdan's riverine data are presented as miles instead of acres. Arguably, miles better represent the extent of linear features such as rivers and streams, especially because the lateral extent of these systems can vary considerably from year to year and can be difficult to discern from maps. However, in order to maintain consistency with NWI data, riverine extent was converted to acres. To make this conversion, a current aquatic habitat extent from the Rairdan data (presented in miles) and the NWI data (presented in acres) was compared. The ratio of miles to acres between these two data sources was as a conversion factor Rairdan's historical data.

Although Rairdan's data provide a valuable resource for calculating habitat targets, there are limitations in the data. Rairdan could only include data for aquatic habitats that were reliably mapped. Vernal pools, for example, are important in the region but not well mapped. Rairdan (1998) indicated general locations of notable vernal pool complexes but could not provide quantitative estimates of their extent.

Perhaps more importantly, Rairdan completed his analysis nearly 15 years ago and more modern, detailed historical ecology analyses can be completed today. There have been some recent historical ecology studies done in the region (e.g., Stein et al. 2007 for the San Gabriel River watershed; Dark et al. 2011 for the Ballona Creek watershed). Although these provide much more detailed information for their particular study areas, that level of detail is not available for the entire region, or even an entire subregion, and so they cannot be used to establish targets.

There are also more detailed data available for the current extent of aquatic habitats (i.e., the most recent NWI maps). However, the current NWI maps were not used in the estimate of aquatic habitat losses because the methods used to generate these maps differed from the methods used by Rairdan. For consistency, we used Rairdan's data for both historical and current (1986) aquatic habitat extent.

The use of Rairdan's data for establishing habitat targets needs to be viewed in the context of its use. The calculation of habitat targets does not require detailed information about the extent and location of historical and current aquatic habitats, just a reasonable estimate of the loss of different aquatic habitat types. Rairdan's data provide a reasonable estimate of loss, as well as being the only estimate currently available for most of the region. If future studies provide more detailed estimates of loss for the entire region, the targets can be adjusted appropriately. Additionally, it should be noted that while the total acreage of historical aquatic habitats was used to establish targets, the locations of historical aquatic habitats are shown merely for informational purposes, and are not intended to mandate where restoration/creation targets should be achieved.

## <u>Protection</u>

The target for protection of existing aquatic habitat was calculated as 20 percent of the privately held aquatic habitats.

The target is based on privately held aquatic habitats because it was assumed that aquatic habitats already in public or non-profit ownership are protected from destruction or degradation. This might not always be the case, but there is no database available to categorize the level of protection for each aquatic habitat in the region. We used the CPAD to determine ownership.

Current aquatic habitat extent was determined using the National Wetlands Inventory (NWI).

To calculate the extent of existing aquatic habitats in private ownership, the NWI and CPAD data layers were intersected in each of the five subregions. Any lands not in CPAD (that is, not city, county, state, federal, special district, or non-profit) were assumed to be private. Thus, the basis for the calculation of protection targets is acres of each aquatic habitat type in private ownership.

**Enhancement**

The target for the enhancement of existing aquatic habitat was calculated as 25 percent of the existing aquatic habitat area.

The enhancement target was based on the current extent of existing aquatic habitats in each region. Current extent, in acres, was provided by the NWI database. For the enhancement targets, we did not consider ownership since enhancement could be appropriate in privately or publicly owned aquatic habitats. In addition, actual enhancement projects would only focus on degraded aquatic habitats, but there is no regional database that characterizes the condition of all the aquatic habitats in the region. It is believed, however, that many aquatic habitats are moderately to severely degraded in the region, so there is no doubt much more than 25 percent of the existing aquatic habitats could benefit from enhancement projects. Because the NWI database includes a large acreage of "lakes," many if not all of which are man-made, we did not include lakes when calculating the enhancement target.

Adjustments to the aquatic habitat extent data had to be made for USGRH and ULAR subregions because the NWI mapping did not cover the entire subregions. (Note: these adjustments were not made for the Protection targets because the adjustments were based on Angeles National Forest land, which is publically owned.)

For the USGRH subregion, 172,405 acres (96% of the Angeles National Forest area in the subregion) was mapped and 6,408 acres (4%) was not mapped. All of the subregion that was not mapped was in the mountains of the Angeles National Forest. The extent of aquatic habitats missed in the unmapped area was estimated by calculating the fraction of the mapped area that was covered by aquatic habitats. There were 3,398 acres of freshwater aquatic habitats in the mapped area, indicating approximately 126 acres in the unmapped area. The 126 acres was added to the freshwater aquatic habitat extent in the subregion to get an adjusted total extent of freshwater aquatic habitats. There were 2,940 acres of riverine aquatic habitats in the mapped area, indicating approximately 109 acres in the unmapped area. The 109 acres was added to the riverine aquatic habitat extent in the subregion to get an adjusted total extent of freshwater aquatic habitats.

The adjustment for the ULAR subregion followed the same procedure, with the complication that not all of the unmapped area was mountains in the Angeles National Forest. Although we could apply the same procedure for the Angeles National Forest area, there were additional "flatlands" for which aquatic habitat extent could not be estimated. Comparing the ULAR and USGRH maps, it is apparent that the vast majority of the aquatic habitats are in the mountainous regions, but there are some aquatic habitats of both types (freshwater and riverine) in the flatlands. In addition, there are some mountainous areas (e.g., the hills north of Burbank and hills around the western and southern borders of the subregion) that are not part of the Angeles National Forest. Thus, our calculation of additional aquatic habitats underestimates the true extent of aquatic habitats in the unmapped area of the subregion. To account for this underestimate, we added 20% to the calculation based on the Angeles National Forest unmapped area. Finally, we applied the fraction of mapped area covered by aquatic habitats from the USGRH subregion because it was based on a much larger mapped area (172,405 acres compared to 8,883 acres). This procedure resulted in estimates of an additional 2,628 acres of freshwater aquatic habitat and 2,274 acres of riverine aquatic habitat for the ULAR.

## Restoration or Creation

The goal of aquatic habitat restoration or creation in the region is to increase the extent of functioning aquatic habitats to partially compensate for the losses that have occurred in the past. Thus, the restoration/creation targets are based on the extent of aquatic habitat losses. Two kinds of losses are considered: (1) aquatic habitats that were destroyed and replaced by non-aquatic habitat, and (2) aquatic habitats that were converted from natural aquatic habitat to man-made aquatic habitat, such as a flood control basin or a concrete lined channel. The target for the restoration or creation of aquatic habitat was calculated as 10 percent of lost aquatic habitat plus 10 percent of converted habitats. Creation would occur in historical aquatic habitat areas that have been destroyed, while restoration would occur in the converted aquatic habitat areas.

The loss of aquatic habitats was calculated using data from Rairdan (1998). Figures 6 and 7 of the main report show the historical and current extent of aquatic habitats for the entire region except NSMB where historical information is not available. Several regional trends are apparent. Some of the greatest losses occurred in the Upper Los Angeles River and Upper San Gabriel and Rio Hondo Rivers subregions, where extensive dry washes have been eliminated. There were also substantial losses of tidal aquatic habitats in the Lower San Gabriel and Los Angeles Rivers and the South Santa Monica Bay subregions. The South Bay subregion also lost a large area of depressional marsh/ephemeral lake. Note that there is no image for the North Santa Monica Bay subregion as the data for comparing historical to current extent are not available. A discussion on how the analyses and targets were set for this subregion can be found later in this section.

We used Rairdan's data to calculate the extent of natural aquatic habitats converted to man-made aquatic habitats. For tidal marsh, the converted aquatic habitat calculation was based on the current extent of harbors and marinas. For freshwater aquatic habitats, the converted aquatic habitat calculation was based on the current extent of flood control basins and spreading grounds. Two man-made aquatic habitat types, constructed lake/pond and reservoir/recreational lake, were not included in the calculation of converted freshwater aquatic habitats because they likely represent the construction of new aquatic habitat types rather than a conversion of natural aquatic habitats. For riverine aquatic habitats, the converted aquatic habitat calculation was based on concrete-lined channels and soft-bottom channels.

Although the aquatic habitat restoration/creation targets were generally calculated as 10 percent of the lost aquatic habitat plus 10 percent of converted habitats, there are a few exceptions. On principle, the acreage was adjusted to include known large restoration projects in the late stages of planning since setting a target below current plans for the subregion did not seem useful. For example, in the South Bay, the calculated tidal marsh target was 389 acres. However, the Ballona Aquatic habitats restoration will be approximately 400 acres (the actual acreage of the project is not yet determined), so the South Bay target was set at 400 acres. The Lower San Gabriel and Los Angeles Rivers tidal aquatic habitat target was calculated as 332 acres. A restoration project is being planned for the Los Cerritos aquatic habitat, which may match the size of the subregion's restoration target acreage. However, at this time, the project's plans are still in the early stages and there is not enough information available to quantify the project's full extent. Due to this uncertainty, the subregion's target was not adjusted to include the project.

As noted previously, Rairdan's data did not cover the NSMB subregion, so a different approach was used to calculate aquatic habitat restoration/creation targets. We describe the approaches below:

- For **tidal marsh,** the target was set at 25 acres based on the planned Malibu Lagoon restoration and other possible lagoon restoration projects, including the tidal aquatic habitat at Topanga.

- For **freshwater aquatic habitats**, a quantitative analysis is difficult because there are no data on the loss of freshwater aquatic habitats in the subregion. The NWI data indicate there currently are 1,152 acres of freshwater aquatic habitats in the subregion (excluding lakes). Although there have been no studies of impacts to freshwater aquatic habitats in the region, Lilien (2001) conducted a comprehensive analysis of impacts to riverine aquatic habitats in Malibu Creek watershed. It is reasonable to assume the same proportional loss of riverine and freshwater aquatic habitats since they are mainly impacted by the same types of activities; freshwater aquatic habitats may be slightly more likely to be impacted because they are flat areas and not located in the active stream channel, but they are not channelized, which was the dominant impact to riverine aquatic habitats. If we assume the loss of freshwater aquatic habitats has been equivalent to riverine aquatic habitats, with the riverine losses determined as described below based on Lilien (2001), then we assume a loss of 25% of the original freshwater aquatic habitats. Thus, we estimate there was originally 1,536 acres of freshwater aquatic habitats, with a loss of 384 acres. Therefore, the freshwater aquatic habitat restoration/creation target was calculated as 10% of 384 acres, or 38 acres. We did not adjust this estimate for converted habitats because Lilien included these conversions in his analysis.

- For **riverine aquatic habitats**, there was little quantitative information on which to base the target, particularly because riverine aquatic habitats are so extensive in the subregion. The most detailed study of impacts to riverine aquatic habitats is the region is Lilien (2001), which provides a comprehensive assessment of impacts to riverine habitats in the Malibu Creek watershed. Lilien documented over 200 projects undertaken in the Malibu Creek watershed that impacted 54 km of riparian habitat, approximately 50% of the total length of the catchment's major tributaries. Many of the documented impacts did not destroy the affected habitat, however, since they included activities such as vegetation clearing. However, 14 channelization projects accounted for over 13 km of impacts. Other substantial impacts were caused by recreation facilities including golf course, lakes, and reservoirs, transportation projects, bank stabilization projects, and residential and commercial development. The substantial impacts documented by Lilien comprised 26.3 km of impacts, or approximately 25% of the major tributaries in the watershed. As Lilien notes, this is likely an underestimate because of limitations in the data he had available for his analysis. According to the NWI database, there are currently 590 acres of riverine habitat in the North Santa Monica Bay subregion. If we assume that habitat impacts for the Malibu Creek watershed are representative of the entire subregion, then the existing riverine habitat is 75% of the original riverine habitat in the subregion. The assumption that 25% of all existing habitat was lost may be high, since there is more development in the Malibu Creek watershed than in most other areas in the subregion. On the other hand, Lilien identifies a number of reasons why his analysis underestimates impacts, including the fact that early impacts were not documented and he only recorded impacts along the main tributaries, whereas most of the impacts have occurred along the smaller tributaries. The impact to smaller tributaries likely overwhelms the other factors, but we have no quantitative estimate of their extent. Thus, 25% seems like the best estimate we have at the moment. Therefore, we estimate that there were originally 787 acres of riverine habitat, and 197 acres have been lost. The target we set at 10% of 197 acres, or 20 acres. We did not adjust this estimate for converted habitats because Lilien included these conversions in his analysis.

Figure 1. Classification scheme used in the National Wetlands Inventory.

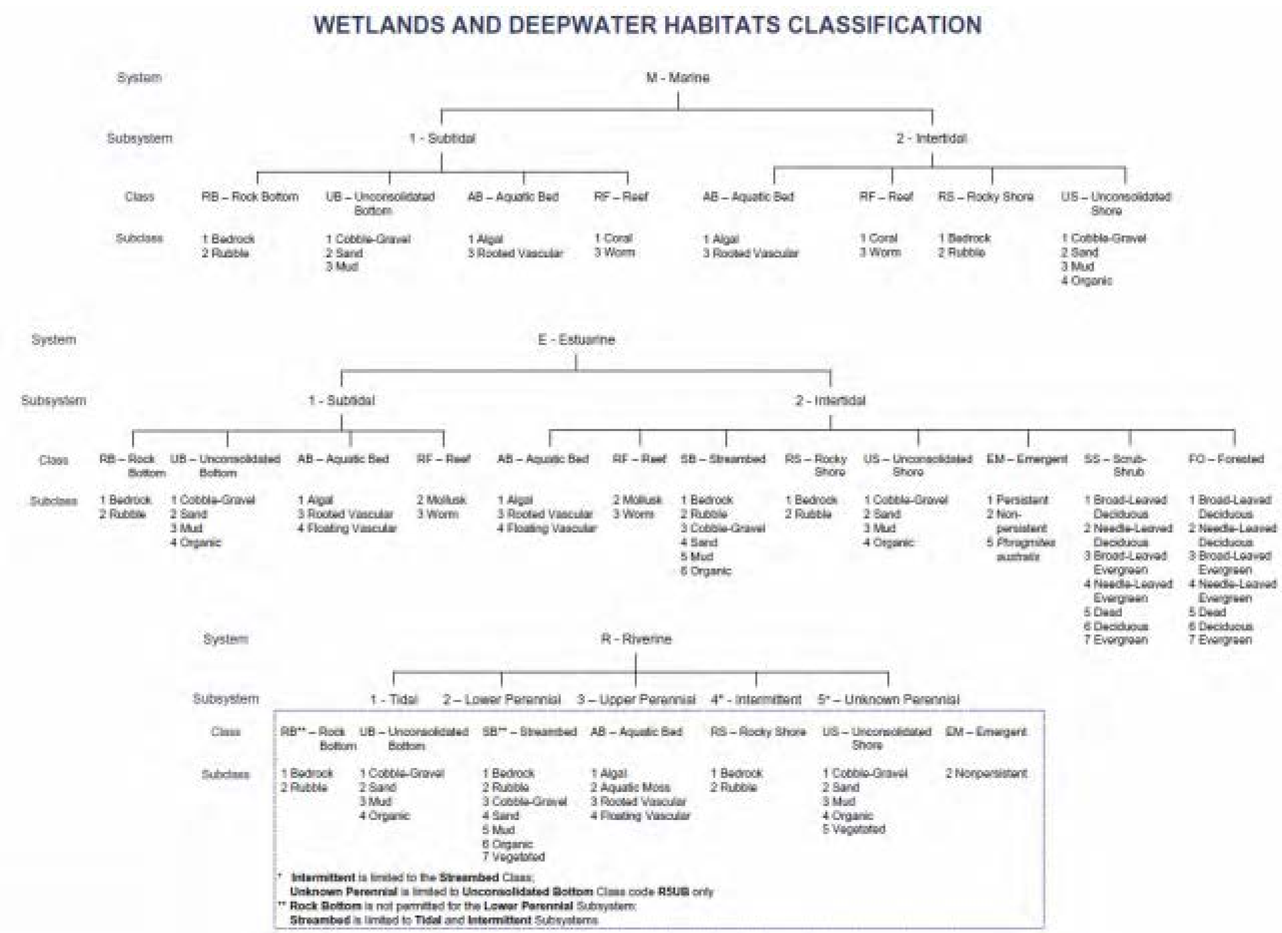

Table 1. Values used for the calculation of aquatic habitat targets for the North Santa Monica Bay Subregion.

| Target for Protection or Preservation: | Current Extent of Privately Held Areas | Calculated Target | Target | Basis |
|---|---|---|---|---|
| Tidal Wetland (acres) | 2 | 0 | 0 | 20% of privately held habitat, NWI and GPAD data |
| Freshwater Wetland (acres) | 840 | 168 | 168 | 20% of privately held habitat |
| Riverine (acres) | 262 | 52 | 52 | 20% of privately held habitat. |

| Targets for Enhancement | Current Extent | Calculated Target | Target | Basis |
|---|---|---|---|---|
| Tidal Wetland (acres) | 38 | 9 | 9 | 25% of existing habitat, NWI data |
| Freshwater Wetland (acres) | 1152 | 288 | 288 | 25% of existing freshwater wetlands minus lakes, NWI data |
| Riparian (riverine)(acres) | 590 | 147 | 147 | 25% of existing riverine habitat. |

| Targets for Restoration or Creation | Loss | Calculated Target | Previously Converted Wetland | Calculated Target based on Converted Wetland | Target | Basis |
|---|---|---|---|---|---|---|
| Tidal Wetland (acres) | 0 | 0 | | | 25 | General target is 10% of lost tidal marsh, but in the absence of this information the target is based on the planned Malibu Lagoon restoration and other possible lagoon restoration projects |
| Freshwater Wetland (acres) | 384 | 38 | 0 | 0 | 38 | General target is 10% of depressional wetland and ephemeral lake and pond (data do not include historical extent of vernal pools), but in the absence of that information, using an estimate of 384 acres of freshwater wetland habitat lost based on Lilien (2001)'s estimate of riverine wetland loss. |
| Depressional marsh | NA | NA | | | NA | |
| Ephemeral lake/pond | NA | NA | | | NA | |
| Riparian (riverine)(acres) | 197 | 20 | 0 | 0 | 20 | General target is 10% of lost braided, upper and lower riverine and dry wash, but in the absence of that information, using an estimate of 190 acre of riverine habitat lost based on Lilien (2001). |
| Braided lower riverine (acres) | NA | NA | | | NA | |
| Lower riverine (acres) | NA | NA | | | NA | |
| Upper riverine (acres) | NA | NA | | | NA | |
| Dry wash (acres) | NA | NA | | | NA | |

Table 2. Values used for the calculation of aquatic habitat targets for the Upper Los Angeles River Subregion.

| Target for Protection or Preservation: | Current Extent of Privately Held Areas | Calculated Target | Target | Basis |
|---|---|---|---|---|
| Tidal Wetland (acres) | 0 | 0 | 0 | 20% of privately held habitat |
| Freshwater Wetland (acres) | 569 | 114 | 114 | 20% of privately held habitat |
| Riverine (acres) | 342 | 68 | 68 | 20% of privately held habitat. |

| Targets for Enhancement | Current Extent | Calculated Target | Target | Basis |
|---|---|---|---|---|
| Tidal Wetland (acres) | 0 | 0 | 0 | 25% of existing habitat, NWI data |
| Freshwater Wetland (acres) | 3262 | 816 | 816 | 25% of existing freshwater wetlands minus lakes, NWI data adjusted to account for the area not mapped |
| Riparian (riverine)(acres) | 2815 | 704 | 704 | General target is 25% of existing riverine habitat adjusted to account for the area not mapped |

| Targets for Restoration or Creation | Loss | Calculated Target | Previously Converted Wetland | Calculated Target based on Converted Wetland | Target | Basis |
|---|---|---|---|---|---|---|
| Tidal Wetland (acres) | 0 | 0 | 0 | 0 | 0 | 10% of lost tidal marsh |
| Freshwater Wetland (acres) | 15 | 1 | 2440 | 244 | 245 | 10% of depressional wetland and ephemeral lake and pond. Note the this does not include historical extent of vernal pools. Plus 10% of previously converted wetland. |
| Depressional marsh | 15 | 1 | | | 1 | |
| Ephemeral lake/pond | 0 | 0 | | | 0 | |
| Riparian (riverine)(acres) | 7507 | 751 | 833 | 83 | 834 | 10% of lost braided, upper and lower riverine and dry wash, plus 10% of previously converted wetland. Used conversion factor to convert from miles to acres for riverine habitats. |
| Braided lower riverine (acres) | 50 | 5 | | | 5 | |
| Lower riverine (acres) | 505 | 50 | | | 50 | |
| Upper riverine (acres) | 303 | 30 | | | 30 | |
| Dry wash (acres) | 6650 | 665 | | | 665 | |

Table 3. Values used for the calculation of aquatic habitat targets for the Upper San Gabriel and Rio Hondo Subregion.

| Target for Protection or Preservation: | Current Extent of Privately Held Areas | Calculated Target | | | Target | Basis |
|---|---|---|---|---|---|---|
| Tidal Wetland (acres) | 0 | 0 | | | 0 | 20% of privately held habitat |
| Freshwater Wetland (acres) | 2121 | 424 | | | 424 | 20% of privately held habitat |
| Riverine (acres) | 1376 | 275 | | | 275 | 20% of privately held habitat. |
| **Targets for Enhancement** | **Current Extent** | **Calculated Target** | | | **Target** | **Basis** |
| Tidal Wetland (acres) | 0 | 0 | | | 0 | 25% of existing habitat, NWI data |
| Freshwater Wetland (acres) | 4981 | 1245 | | | 1245 | 25% of existing freshwater wetlands minus lakes, NWI data adjusted to account for the Angeles National Forest area not mapped |
| Riparian (riverine)(acres) | 4716 | 1179 | | | 1179 | 25% of existing riverine habitat, NWI data adjusted to account for the Angeles National Forest area not mapped |
| **Targets for Restoration or Creation** | **Loss** | **Calculated Target** | **Previously Converted Wetland** | **Calculated Target based on Converted Wetland** | **Target** | **Basis** |
| Tidal Wetland (acres) | 0 | 0 | 0 | 0 | 0 | 10% of lost tidal marsh |
| Freshwater Wetland (acres) | 17 | 2 | 2002 | 200 | 202 | 10% of depressional wetland and ephemeral lake and pond. Note the this does not include historical extent of vernal pools. Plus 10% of previously converted wetland. |
| Depressional marsh | 0 | 0 | | | 0 | |
| Ephemeral lake/pond | 17 | 2 | | | 2 | |
| Riparian (riverine)(acres) | 8080 | 808 | 757 | 76 | 884 | 10% of lost braided, upper and lower riverine and dry wash. Plus 10% of previously converted wetland. Used conversion factor to convert from miles to acres. |
| Braided lower riverine (acres) | 3 | 0 | | | 0 | |
| Lower riverine (acres) | 414 | 41 | | | 41 | |
| Upper riverine (acres) | 139 | 14 | | | 14 | |
| Dry wash (acres) | 7525 | 752 | | | 752 | |

Table 4. Values used for the calculation of aquatic habitat targets for the Lower San Gabriel and Los Angeles River Subregion.

| Target for Protection or Preservation: | Current Extent of Privately Held Areas | Calculated Target | | | Target | Basis |
|---|---|---|---|---|---|---|
| Tidal Wetland (acres) | 557 | 111 | | | 111 | 20% of privately held habitat, NWI and GPAD data |
| Freshwater Wetland (acres) | 1200 | 240 | | | 240 | 20% of privately held habitat, NWI and GPAD data |
| Riverine (acres) | 1686 | 337 | | | 337 | 20% of privately held habitat, NWI and GPAD data |
| **Targets for Enhancement** | **Current Extent** | **Calculated Target** | | | **Target** | **Basis** |
| Tidal Wetland (acres) | 659 | 165 | | | 165 | 25% of existing habitat, NWI data |
| Freshwater Wetland (acres) | 1711 | 428 | | | 428 | 25% of existing freshwater wetlands minus lakes, NWI data |
| Riparian (riverine)(acres) | 1901 | 475 | | | 475 | 25% of existing riverine habitat, NWI data |
| **Targets for Restoration or Creation** | **Loss** | **Calculated Target based on Loss** | **Previously Converted Wetland** | **Calculated Target based on Converted Wetland** | **Target** | **Basis** |
| Tidal Wetland (acres) | 2885 | 289 | 439 | 44 | 332 | 10% of lost tidal habitat. Plus 10% of previously converted wetland. (Note: Los Cerritos restoration may be about this area.) |
| Freshwater Wetland (acres) | 357 | 36 | 2524 | 252 | 288 | 10% of depressional wetland and ephemeral lake and pond. Note the this does not include historical extent of vernal pools. Plus 10% of previously converted wetland. |
| Depressional marsh | 0 | 0 | | | 0 | |
| Ephemeral lake/pond | 357 | 36 | | | 36 | |
| Riparian (riverine)(acres) | 2576 | 258 | 730 | 73 | 331 | 10% of lost braided, upper and lower riverine and dry wash. Plus 10% of previously converted wetland. Used conversion factor to change miles to acres for riverine habitats. |
| Braided lower riverine (acres) | 156 | 16 | | | 16 | |
| Lower riverine (acres) | 638 | 64 | | | 64 | |
| Upper riverine (acres) | 80 | 8 | | | 8 | |
| Dry wash (acres) | 1703 | 170 | | | 170 | |

Table 5. Values used for the calculation of aquatic habitat targets for the South Santa Monica Bay Subregion.

| Preservation: | Privately Held Areas | Target | Target | Basis |
|---|---|---|---|---|
| Tidal Wetland (acres) | 491 | 98 | 98 | 20% of privately held habitat |
| Freshwater Wetland (acres) | 309 | 62 | 62 | 20% of privately held habitat |
| Riverine (acres) | 322 | 64 | 64 | 20% of privately held habitat. |

| Targets for Enhancement | Current Extent | Calculated Target | Target | Basis |
|---|---|---|---|---|
| Tidal Wetland (acres) | 634 | 158 | 158 | 25% of existing habitat, NWI data |
| Freshwater Wetland (acres) | 1057 | 264 | 264 | 25% of existing freshwater wetlands minus lakes, NWI data |
| Riparian (riverine)(acres) | 575 | 144 | 144 | 25% of existing riverine habitat. |

| Targets for Restoration or Creation | Loss | Calculated Target | Previously Converted Wetland | Calculated Target based on Converted Wetland | Target | Basis |
|---|---|---|---|---|---|---|
| Tidal Wetland (acres) | 3285 | 328 | 610 | 61 | 400 | Target based on Ballona Wetlands restoration plan (approximately 400 ac). |
| Freshwater Wetland (acres) | 2813 | 281 | 0 | 0 | 281 | 10% of depressional wetland and ephemeral lake and pond. Note the this does not include historical extent of vernal pools. Plus 10% of previously converted wetland. |
| Depressional marsh | 1243 | 124 | | | 124 | |
| Ephemeral lake/pond | 1571 | 157 | | | 157 | |
| Riparian (riverine)(acres) | 1175 | 118 | 288 | 29 | 146 | 10% of lost braided, upper and lower riverine and dry wash. Plus 10% of previously converted wetland. Used conversion factor to convert from miles to acres for riverine habitats and dry wash. |
| Braided lower riverine (acres) | 0 | 0 | | | 0 | |
| Lower riverine (acres) | 448 | 45 | | | 45 | |
| Upper riverine (acres) | 409 | 41 | | | 41 | |
| Dry wash (acres) | 318 | 32 | | | 32 | |

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# Exhibit B

## Upland Habitat Target Methodology

For purposes of this plan, the targets for upland habitat acquisition and/or restoration were created for the following characteristics:

- *Buffers and Buffer Zones* are 50- to 300-foot wide areas adjoining a wetland, channel, or upland linkage or wildlife corridor that is in a natural or semi-natural state. For wetland and riparian systems, a buffer is to provide a variety of other functions including to maintain or improve water quality by trapping and removing various non-point source pollutants from both overland and shallow subsurface flows, to provide erosion control and water temperature control, to reduce flood peaks, and to serve as groundwater recharge points and habitat. Buffer zones occur in a variety of forms, including herbaceous or grassy areas, grassed waterways, or forested riparian buffer strips. They also may provide for limited passive recreation.

- *Wildlife Corridors or Linkages* are wide areas of native vegetation that connect or have the potential to connect two or more large patches of habitat on a landscape or regional scale through which a species will likely move over time. The move may be multi-generational; therefore, a linkage should provide both wildlife connectivity and biological diversity. A Wildlife Linkage should ideally be a minimum of 1,000 feet in width (but may be less), be vegetated with native vegetation, and have little or no human intrusion. The goal is to ensure north-south and east-west linkages to mitigate for climate change and genetic isolation.

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# Exhibit C

## Recreation Targets and Priorities Methodology

<u>Existing Recreation Areas</u>

An evaluation of the existing recreational areas in the GLAC region relied on the California Protected Area Database (GreenInfo Network) also known as CPAD which is an inventory of all protected park and open space lands in California.

Each public park and open space lands within the GLAC region that appeared in the database was categorized using the following categories:

- **Developed Urban Parks:** Developed lands consist of neighborhood parks, community parks, and sports complexes (including public lands)
- **Open Space:** Generally any parcel that is essentially unimproved and devoted to an open space use for the purposes of the preservation of natural resources and provides passive outdoor recreation opportunities. These parcels may include developed parking/staging areas and include trail systems and minor visitor amenity features within them. There are two types of open space areas identified as there is a relationship between these and IRWMP targets for habitat.
  - **Beach / Estuary:** Low lying habitat areas of the GLAC region
  - **Riparian/Upland /Wetland:** All other open space areas including riparian and upland habitats.
  - **US Forest Service:** Lands owned by the United States that provide open space and passive recreation opportunities, among other functions.
  - **Greenway:** Linear open spaces established along a corridor, such as a river, and that provide habitat, recreation, or alternative transportation benefits. While greenways could serve as developed urban park depending on their design, it was assumed for this analysis that greenways provided only passive recreation opportunities.

Generally if the name of the unit included the term “Open Space” or “Resource Parkland” it was categorized as open space. Many regional parks were evaluated using internet based photo and map imagery to estimate a percentage of “developed urban” vs. “open space lands” contained within that unit. That unit was then prorated appropriately

The data set is created at the parcel level (whenever possible), meaning many parks are represented by many polygons. Parks that cross major jurisdictional lines are also split into multiple pieces. Therefore, there may be more than one data entry for an individual park or open space area.

<u>Targets</u>

Targets were established by comparing the existing recreation areas in the GLAC Region to the following standards:

- Developed Urban Parks: 4 acres per 1,000 population;
- Passive Recreation: 6 acres of passive recreation area per 1,000 population.

The target was set as the additional acreage required to meet the standards.

Methodology

- Developed Urban Parks: Areas of need were developed using census tracts. Each tract was evaluated according to the following standards:
    - High Priority: projects within urban areas with less than 1 acre of available park and recreation area per 1,000 population.
    - Moderate Priority: projects within urban areas with between 1 to 3.9 acres of available park and recreation area per 1,000 population.
    - Low Priority: projects within urban areas with greater than 4 acres of available park and recreation area per 1,000 population.
- Passive Recreation Areas: Areas of need were evaluated according to the following standards:
    - High Priority: projects more than a 3 miles from an existing open space area or greenway or projects that help complete the County trail system
    - Moderate Priority: projects between 1 and 3 miles from an existing open space area or greenway
    - Low Priority: projects from between 0 and 1 mile from an existing open space area or greenway

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# Exhibit D

## Existing and Proposed Greenways, Parkways, and Bikeways

| | **Linear Urban Greenways / Parkways / Bikeways** | **Projects (existing or proposed)** | **Source** |
|---|---|---|---|
| **1** | **Los Angeles River** | partially existing | Los Angeles County Departments of Public Works, Parks and Recreation, and Regional Planning, Los Angeles River Master Plan. 1996. http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| **2** | **Arroyo Seco** | existing | |
| **3** | **Bell Creek Greenway** | proposed | http://acmela.org/images/Bell_Creek_Greenway_Project_Trust_for_Public_Land_Presentation_Sept_22_of_2009.pdf |
| **4** | **Tujunga Wash** | proposed | http://www.lamountains.com/parks.asp?parkid=671 http://ladpw.org/apps/news/pdf/2380_2618.pdf |
| **6** | **Burbank Western Channel** | proposed | http://www.ci.burbank.ca.us/index.aspx?page=900 |
| **8** | **San Gabriel River** | partially existing | Moore Iacofano Goltsman, Inc. for the County of Los Angeles Department of Public Works. *A Common Thread Rediscovered- San Gabriel River Corridor Master Plan*. June, 2006. http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| **9** | **Compton Creek Regional Garden Park** | partially existing | Freedman, Zack D. for the Santa Monica Mountains Conservancy. *Grounds for Renewal: The Revitalization of Compton Creek.* 2003 |
| **10** | **Rio Hondo (Emerald Necklace)** | partially existing | Amigo de los Rios. Moore Iacofano Goltsman, Inc. for the County of Los Angeles Department of Public Works. *A Common Thread Rediscovered- San Gabriel River Corridor Master Plan*. June, 2006. |
| **11** | **Santa Anita Wash** | proposed | Amigos de los Rios. Emerald Necklace Green Infrastructure - Los Angeles County. 2005 |
| **12** | **Eaton Wash** | proposed | Amigos de los Rios. Emerald Necklace Green Infrastructure - Los Angeles County. 2005 |
| **13** | **Rubio Wash** | proposed | Amigos de los Rios. Emerald Necklace Green Infrastructure - Los Angeles County. 2005 |
| **14** | **Alhambra Wash** | proposed | Amigos de los Rios. Emerald Necklace Green Infrastructure - Los Angeles County. 2005 |
| **15** | **Coyote Creek** | partially existing | Trails4All. *Coyote Creek Trail Master Plan.* April. 2008 . Moore Iacofano Goltsman, Inc. for the County of Los Angeles Department of Public Works. *A Common Thread Rediscovered- San Gabriel River Corridor Master Plan*. June, 2006. http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| **16** | **Carbon Creek** | existing | Trails4All. *Coyote Creek Trail Master Plan.* April 2008 |
| **17** | **Brea Creek** | existing | Trails4All. *Coyote Creek Trail Master Plan.* April 2008 |
| **19** | **La Canada Verde Creek** | existing | Trails4All. *Coyote Creek Trail Master Plan.* April 2008 |
| **20** | **Fullerton Creek** | existing | Trails4All. *Coyote Creek Trail Master Plan.* April. 2008 . |
| **21** | **Whittier Greenway Trail** | existing | http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |

| | Linear Urban Greenways / Parkways / Bikeways | Projects (existing or proposed) | Source |
|---|---|---|---|
| 22 | **Walnut Creek** | proposed | Amigos de los Rios. Emerald Necklace Green Infrastructure - Los Angeles County. 2005 |
| 23 | **San Jose Wash** | proposed | Amigos de los Rios. Emerald Necklace Green Infrastructure - Los Angeles County. 2005Moore Iacofano Goltsman, Inc. for the County of Los Angeles Department of Public Works. *A Common Thread Rediscovered- San Gabriel River Corridor Master Plan.* June, 2006. http://www.ice.ucdavis.edu/nrpi/project.asp?ProjectPK=08915 |
| 25 | **Ballona Creek** | partially existing | Restoration Design Group for the Bay Restoration Foundation and the California Coastal Conservancy. *Ballona Creek Greenway Projects*. January, 2011 http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| 26 | **Sepulveda Channel** | proposed | Restoration Design Group for the Bay Restoration Foundation and the California Coastal Conservancy. *Ballona Creek Greenway Projects*. January, 2011 |
| 27 | **Arroyo la Cienaga** | proposed | Restoration Design Group for the Bay Restoration Foundation and the California Coastal Conservancy. *Ballona Creek Greenway Projects*. January, 2011 |
| 28 | **Dominguez Channel** | proposed | County of Los Angeles Department of Public Works. *Dominguez Watershed Management Master Plan*. April, 2004. |
| 29 | **Long Beach Greenbelt** | existing | http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| 30 | **Santa Monica Beach and South Bay Bike Path** | existing | http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| 31 | **Shoreline Pedestrian Bikeway** | existing | http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| 32 | **Duarte Bike Trail** | existing | http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| 33 | **Metro Orange Line Bike Path** | existing | http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| 34 | **Chandler Bikeway** | existing | http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |
| 35 | **Malibu Civic Center Linear Park** | partially existing | City of Malibu Parks and Recreation Master Plan 2013 and Department of Public Works Capital Improvement Projects. |
| 36 | **Mission City Bike Trail** | existing | http://www.traillink.com/trailsearch.aspx?tn=&st=CA&ct=Los+Angeles&sp=N |

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# Exhibit E

## Benefits Evaluation Tool

This section presents a methodology for evaluating a BMP project on the basis of its ability to contribute to water quality and groundwater recharge targets. This methodology was incorporated into an easy to use spreadsheet tool which will be made available on the IRWMP website. It applies to infiltration BMPs which capture stormwater in a storage basin and allow it to infiltrate into the ground over time, and flow through BMPs which filter and treat stormwater and then release it to a receiving water body. Some BMPs may not fit into these categories and would require individualized modeling in order to quantify their water quality and groundwater recharge benefits.

### Water Quality

Because the water quality targets are presented as capacity of BMPs the water quality benefit is simply the volume of the proposed BMP (footprint multiplied by depth). However, because these targets are based on BMPs designed to treat the ¾-inch storm, only volumes less than or equal to the volume that would be produced by a ¾-inch storm can be counted towards meeting water quality targets. This volume is a function of the area draining to the BMP and its tendency to shed water. For preliminary design purposes, the tendency to shed water can be determined from the percent impervious cover of the area tributary to the BMP.

If the proposed BMP site can support a larger volume, this will have additional water quality benefits, but these benefits cannot count toward the proposed targets. There is the potential however for these additional water quality benefits to be used to garner additional funds for the proposed project. Additionally, this extra volume could contribute to water supply targets.

### Groundwater Recharge

Water supply benefits are usually estimated using complex hydraulic time step models, which require technical expertise, time, and resources to develop and evaluate. To create a tool that could be used by planners to screen projects, a spreadsheet was developed that uses SWWM model runs for a generic watershed and local precipitation data that allows the user to input basic information regarding the proposed project to get a reasonable estimate of average annual volume infiltrated.

Without supporting evidence to the contrary, only BMPs in “High Recharge Potential Areas” as should be considered as having the potential to augment groundwater supplies. While projects in areas with low recharge potential may not help meet water supply targets, the percent of annual runoff captured has implications for water quality improvement, even if the infiltrated or treated water does not reach groundwater aquifers.

*Evaluation Tool Technical Background*

Stormwater BMPs can be conceptualized as having a storage volume and a treatment rate, in various proportions. Both are important in the long-term performance of the BMP under a range of actual storm patterns, depths, and inter-event times. Long-term performance is measured by the operation of a BMP over the course of multiple years, and provides a more complete metric than the performance of a BMP during a single event, which does not take into account antecedent conditions, including multiple storms arriving in short timeframes. A BMP that draws down (infiltrates) more quickly would be expected to capture a greater fraction of overall runoff (i.e. long-term runoff) than an identically sized BMP that draws down more slowly. This is because storage is made available more quickly, so subsequent storms are more likely to be captured by the BMP. In contrast a BMP with a longer drawdown time (infiltrates slowly) would stay mostly full, after initial filling, throughout periods of sequential storms. The volume in the BMP that draws down more quickly is more “valuable” in terms of long term performance than the volume in the one that draws down more slowly.

An evaluation of the relationships between BMP design parameters and expected long term capture efficiency has been conducted to assist in planning and assessment of various alternative projects. Relationships have been developed through a simplified continuous simulation analysis of precipitation, runoff, and routing, that relate BMP design volume and storage recovery rate (i.e., drawdown time) to an estimated long term level of performance.

*Modeling Methodology*

The USEPA Stormwater Management Model Version 5.0 (SWMM5.0) was used to simulate the long term average capture efficiency for a range of general BMP design configurations over several decades. SWMM was selected for this analysis as it is a relatively simple, open source, continuous simulation model that has well-demonstrated capability for simulation of rainfall-runoff processes in urban environments and simulating transient storage mechanisms in BMPs. A relatively simple representation of BMPs was used to develop the general relationships that conceptualized all BMPs as having a storage volume and a treatment or drawdown rate. While this representation does not account for the nuances of BMP designs, it is appropriate for planning level assessment. Assumed SWMM input parameters are provided in Table 1. Sensitivity analyses demonstrated that the only inputs with significant sensitivity within typical input ranges were the precipitation and ET inputs and the BMP configurations. These were selected to be representative of several locations in Los Angeles County. Results are interpreted to allow scaling across the various rainfall regimes of the County.

| SWMM Parameters | Units | Values |
|---|---|---|
| Period of Simulation | years | 10/01/1948 to 10/01/2008<br>(except Lechuza Patrol Station, through 1997) |
| Wet time step | seconds | 900 |
| Wet/dry time step | seconds | 900 |
| Dry time step | seconds | 14,400 |
| Precipitation | inches | Hourly precipitation data from:<br>COOP 045114 – Los Angeles Airport<br>COOP 044867 – Lechuza Patrol Station<br>COOP 047762 – San Fernando 3<br>COOP 041194 – Burbank Airport<br>See Table 2 for statistics |
| Impervious Manning's n | | 0.012 |
| Hypothetical drainage area | acres | 50 (not significantly sensitive to results) |
| Shape | | Rectangular, 500 ft flow path length; representing typical overland flow to reach a channelized or piped conveyance (not significantly sensitive parameter). |
| Impervious fraction modeled | | 100% |
| Slope | ft/ft | 0.05 |
| Evaporation | inches | Monthly Normal ET from CIMIS ET Zones Map × 60% Crop Coefficient<br>LAX and Lechuza: Zone 4<br>Burbank Airport: Zone 6<br>San Fernando 3: Zone 9<br>See Table 3 for monthly normal ETo |
| Depression storage, impervious | inches | 0.05, based on Table 5-14 in SWMM manual (James and James, 2000) |
| Runoff coefficient used to convert precipitation depth to design volume | unitless | 0.95 (approximately consistent with modeled runoff in SWMM) |
| Design capture storm depth ($85^{th}$ percentile, 24-hour depth) calculated from Irvine Gage | inches | Varied over continuous range from 0.025 to 5 inches |
| BMP Storage Volume | cu-ft | Calculated based on design storm and tributary area.<br>V = depth × runoff coeff × area × conversion factors<br>Example: V (cu-ft) = 1.0 inches × 0.95 × 50 ac × 43,560 sq-ft × (1 ft/12 inches) = 172,400 cu-ft |

| SWMM Parameters | Units | Values |
|---|---|---|
| Drawdown Time | hours | Varied over continuous range from 0.1 hour to 2,400 hours |
| BMP Discharge | cfs | Calculated based on design volume and drawdown time.<br>Q (cfs) = V(cu-ft) / Drawdown time (s)<br>Example: 172,400 cu-ft / (48 hr × 3600 s/hr) = 0.997 cfs |
| Period of Simulation | years | 10/01/1948 to 10/01/2008<br>(except Lechuza Patrol Station, through 1997) |
| Wet time step | seconds | 900 |
| Wet/dry time step | seconds | 900 |
| Dry time step | seconds | 14,400 |
| Precipitation | inches | Hourly precipitation data from:<br>COOP 045114 – Los Angeles Airport<br>COOP 044867 – Lechuza Patrol Station<br>COOP 047762 – San Fernando 3<br>COOP 041194 – Burbank Airport<br>See Table 2 for statistics |
| Impervious Manning's n | | 0.012 |
| Hypothetical drainage area | acres | 50 (not significantly sensitive to results) |
| Shape | | Rectangular, 500 ft flow path length; representing typical overland flow to reach a channelized or piped conveyance (not significantly sensitive parameter). |
| Impervious fraction modeled | | 100% |
| Slope | ft/ft | 0.05 |
| Evaporation | inches | Monthly Normal ET from CIMIS ET Zones Map × 60% Crop Coefficient<br>LAX and Lechuza: Zone 4<br>Burbank Airport: Zone 6<br>San Fernando 3: Zone 9<br>See Table 3 for monthly normal ETo |
| Depression storage, impervious | inches | 0.05, based on Table 5-14 in SWMM manual (James and James, 2000) |
| Runoff coefficient used to convert precipitation depth to design volume | unitless | 0.95 (approximately consistent with modeled runoff in SWMM) |
| Design capture storm depth | inches | Varied over continuous range from 0.025 to 5 inches |

| SWMM Parameters | Units | Values |
|---|---|---|
| (85th percentile, 24-hour depth) calculated from Irvine Gage | | |
| BMP Storage Volume | cu-ft | Calculated based on design storm and tributary area.<br>V = depth × runoff coeff × area × conversion factors<br>Example: V (cu-ft) = 1.0 inches × 0.95 × 50 ac × 43,560 sq-ft × (1 ft/12 inches) = 172,400 cu-ft |
| Drawdown Time | hours | Varied over continuous range from 0.1 hour to 2,400 hours |
| BMP Discharge | cfs | Calculated based on design volume and drawdown time.<br>Q (cfs) = V(cu-ft) / Drawdown time (s)<br>Example: 172,400 cu-ft / (48 hr × 3600 s/hr) = 0.997 cfs |

| Rainfall Statistics, Modeled Gages | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station ID | Name | Data Temporal Resolution | Data Depth Resolution (in.) | Modeled POR | Missing & Accumulated Fraction of Record (not simulated) | Calculated Avg. Annual Rainfall (in.) | Calculated 85th, 24-hr (Events > 0.1", MIT 6 hrs) |
| 41194 | BURBANK WB AP | Hourly | 0.01 | WY 1949-2008 | 6% | 13.67 | 1.35 |
| 44867 | LECHUZA PTRL ST FC352B | Hourly | 0.01 | WY 1949-1997 | 5% | 19.17 | 1.70 |
| 45114 | LOS ANGELES WSO AP | Hourly | 0.01 | WY 1949-2008 | 1% | 12.16 | 1.02 |
| 47762 | SAN FERNANDO PH 3 | Hourly | 0.01 | WY 1949-2008 | 8% | 16.70 | 1.43 |

| Monthly Normal ETo | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CIMIS ET Zone | Reference ET | | | | | | | | | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Normal |
| Zone 4 | 1.86 | 2.24 | 3.41 | 4.50 | 5.27 | 5.7 | 5.89 | 5.58 | 4.50 | 3.41 | 2.40 | 1.86 | 46.6 |
| Zone 6 | 1.86 | 2.24 | 3.41 | 4.80 | 5.58 | 6.3 | 6.51 | 6.2 | 4.80 | 3.72 | 2.40 | 1.86 | 49.7 |
| Zone 9 | 2.17 | 2.80 | 4.03 | 5.10 | 5.89 | 6.6 | 7.44 | 6.82 | 5.70 | 4.03 | 2.70 | 1.86 | 55.1 |

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# Exhibit F

## Estimating Regional Water Supply and Water Quality Benefits Methodology

The following two sections present the methodology employed to estimate the water supply and water quality benefits that could be achieved through meeting the habitat and recreation targets presented in the main section of this report. The assumption is that with a multi-benefit approach, creation or enhancement of habitat and recreation areas would incorporate stormwater best management practices (BMPs) which have the potential to both recharge aquifers and improvement stormwater quality.

While it is straightforward to estimate infiltration or pollution removal potential for a given BMP in a particular site, determining this capacity over a region with no specific BMPs planned requires a taking a generalized approach based on the overarching characteristics of the region, BMP performance data studies, and best professional judgment.

The benefits for water supply and water quality are calculated in similar, but distinct methods, because water supply targets are rate based (acre-ft per year), and water quality targets are volume based (acre-ft). Therefore water supply benefits are estimated by determining the annual average stormwater volume entering the BMP multiplied by an efficiency factor, while water quality benefits are estimated by multiplying a design storm over the contributing area. It should be noted that many projects will have both water supply and water quality benefits.

### Water Supply

Only open space areas with high potential for aquifer recharge were considered to contribute to aquifer recharge. For an area to be considered a high recharge potential area, two general qualities must be met:

1. The open space locations are situated above unconfined aquifers. Though groundwater recharge may also serve to support plant life and river flow, this analysis specifically looks at benefits of groundwater recharge to water supply;

2. The open space areas are situated above geologic sedimentary deposits most conducive to percolating infiltrated water to the aquifer. Recent studies, such as the one being undertaken by the Water Replenishment District of Southern California (in progress) indicate that these include the following:

- Younger Quaternary from the Holocene age made up of medium grained material (sand),
- Younger Quaternary from the Holocene age made up of coarse grained material (gravel),

- Younger Quaternary from the Holocene age made up of very coarse grained material (boulders),

- Older Quaternary from the Pleistocene age made up of course grained material (gravel), or

- Older Quaternary from the Pleistocene age made up of very course grained material (boulders).

The areas where these two criteria are met are considered “Areas of High Recharge Potential”. There are shown in Figures 15 and 16 of main report.

*Habitat*

The estimation of potential benefits of habitat projects is applied to the creation and enhancement targets for freshwater wetlands and riverine wetlands (HCTfw, HETfw, HCTrw, and HETrw) which occur within the Areas of High Recharge Potential. The entirety of these areas will not be suitable for infiltration BMPs. Therefore, the target habitat area is multiplied by the estimated percent of the area that will be suitable for an infiltration BMP (SAh) (Green Solutions, 2008). This returns a reduced area where infiltration and potential recharge may occur.

$$Total\ Treatment\ Area = (HCTfw + HETft + HCTrw + HETrw) * SAh$$

Treatment BMPs have capacities to treat certain tributary areas that are a function of their size the character of their tributary areas. One study evaluated BMPs in recreation and habitat areas and presented generalized ratios for tributary area to treatment area for BMPs in these settings. The ratio for habitat areas (TARh) can be applied to the total treatment area, to give an estimate of contributing area (Green Solutions, 2008). The tributary area is capped at either the total treatment area multiplied by the TARh, or the tributary area to the site, whichever is less.

The total annual average volume of water the tributary area contributes is calculated multiplying the tributary area by the average annual precipitation in the subregion (Pavg) where the project is located.

Finally, two factors are applied to this value.  The first factor is the guideline for the percent capture (C) of the annual average precipitation for *flow based* stormwater best BMPs (which is consistent with the current Los Angeles County MS4 permit, Orange County Technical Guidance, the CASQA BMP Handbook, and even the Newhall Ranch Specific Plan, among many other MS4 permits across the state) and the second is an expected efficiency for these systems in habitat areas (Eh).  When the average precipitation is input in feet per year, the output from this method is in acre feet per year.

### *Recreation*

The method for estimating potential recharge from recreation lands is similar when applied to recreation and greenway creation and enhancement targets (RCTrg, RETrg). Different factors are used for recreation lands as opposed to habitat lands for the estimated percent recreation area that will be suitable for an infiltration BMP (SAr) and the estimated treatment area ratio for recreation (TARr), and the expected efficiency of these systems in recreation areas (Er).

The factors used and their sources are as follows:

**Variables Used For Estimation of Stormwater Infiltration and Potential Recharge**

| | **Item** | **Habitat** | **Recreation** | **Source** |
|---|---|---|---|---|
| HCTfw, HCTrw, HETfw, HCTrw | Habitat Creation and Enhancement Targets for Freshwater Wetlands and Riverine Wetlands | various | N/A | OSHARTM |
| RCTrg, RETrg | Recreation Creation and Enhancement Targets for Recreation and Greenways | N/A | various | OSHARTM |
| C | Percent Capture of Annual Average Precipitation for flow-based stormwater BMPs | 75% | | Stormwater Guidelines |
| Eh, Erg | Expected Capture Efficiencies for flow-based stormwater BMPs | 0.25 | 0.25 | Estimates |
| SAh, SAr | Estimated % Suitable Area for Habitat and Recreation | 45% | 50% | Green Solutions |
| TARh, TARr | Estimated Treatment Area Ratio for Habitat and Recreation | 45 | 30 | Green Solutions |
| Pavg | Annual Average Precipitation (in feet) | Subregionally specific | | N/A |

**Stormwater Quality**

The benefits of open space projects to stormwater quality can be estimated in a manner similar to estimating water supply benefits, using generalized factors for the region.

*Habitat*

The estimation of potential benefits of habitat projects is applied to the creation and enhancement targets for freshwater wetlands and riverine wetlands (HCTfw, HETfw, HCTrw, and HETrw). While water supply benefits were attributed only to open space projects within High Recharge Potential Areas, water quality benefits are counted for all open space areas.

The entirety of these areas will not be suitable for water quality BMPs. Therefore, the target habitat area is multiplied by the estimated percent of the area that will be suitable for a BMP (SAh) (Green Solutions, 2008). This returns a reduced area where water quality capacity may exist.

$$Total\ Treatment\ Area = (HCTfw + HETft + HCTrw + HETrw) * SAh$$

As described in the methodology for calculating infiltration benefits, a tributary area to treatment area ratio for habitat areas (TARh) is applied to determine the area that can be treated by the total treatment area (Green Solutions, 2008). This tributary area is capped at either the total treatment area multiplied by the TARh, or the actual tributary area to the site, whichever is less.

The total capacity is calculated multiplying the tributary area by the selected design storm event (D). When the design storm event is input in feet, the output from this method is in acre feet.

*Recreation*

The method for estimating water quality capacity from recreation lands is similar when applied to recreation and greenway creation and enhancement targets (RCTrg, RETrg). Different factors are used for recreation lands as opposed to habitat lands for the estimated percent recreation area that will be suitable for an infiltration BMP (SAr) and the estimated treatment area ratio for recreation (TARr).

The values used in the above equations are as follows:

| **Variables Used For Estimation of Stormwater Quality Capture Volumes** | | | | |
|---|---|---|---|---|
| | **Item** | **Habitat** | **Recreation** | **Source** |
| HCTfw, HCTrw, HETfw, HCTrw | Habitat Creation and Enhancement Targets for Freshwater Wetlands and Riverine Wetlands | various | N/A | OSHARTM |
| RCTrg, RETrg | Recreation Creation and Enhancement Targets for Recreation and Greenways | N/A | various | OSHARTM |
| D | Design Storm for Volume Based BMPs (in feet) | 0.0625 ft (0.75“) | | LID Manuals, MS4 |
| SAh, SAr | Estimated % Suitable Area for Habitat and Recreation | 45% | 50% | Green Solutions |
| TARh, TARr | Estimated Treatment Area Ratio for Habitat and Recreation | 45 | 30 | Green Solutions |

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# Exhibit G

## Glossary

**401 Certification:** Requirement of Section 401 of the federal Clean Water Act (CWA) that provides States must certify that any activity subject to a permit issued by a federal agency meets all state water quality standards.

**404 Permit:** Requirement of Section 404 of the CWA requires the US Army Corps of Engineers to have issued a permit before dredged or fill material are discharged into waters of the United States, including adjacent wetlands.

**Adaptive Management:** The development of a management strategy that anticipates likely challenges associated with mitigation projects and provides for the implementation of actions to address those challenges, as well as unforeseen changes to those projects. It requires consideration of the risk, uncertainty, and dynamic nature of mitigation projects and guides modification of those projects to optimize performance.

**Biodiversity:** The number and variety of different organisms in the ecological complex in which they naturally occur (i.e., within a given species, ecosystem, biome, or the planet). It is a measure of the health of an ecosystem

**Biodiversity Hotspot:** A biogeographic region with a significant reservoir of biodiversity that is under threat from humans.

**Biotic Structure:** Describes the way organisms interact within an ecosystem.

**Buffer Zones:** An area adjoining a wetland, channel, or upland linkage or wildlife corridor that is in a natural or semi-natural state and not dedicated to anthropogenic uses that would severely detract from its ability to contain contaminants, discourage visitation into the habitat area by people and non-native predators, and/or protect the habitat area from stress and disturbance. For wetland and riparian systems, a buffer is to maintain or improve water quality by trapping and removing various non-point source pollutants from both overland and shallow subsurface flows, provide erosion control, provide water temperature control, reduce flood peaks, serve as groundwater recharge points, etc. Buffer zones occur in a variety of forms, including herbaceous or grassy buffers, grassed waterways, or forested riparian buffer strips.

**California Floristic Province:** A floristic province with a Mediterranean climate located on the Pacific Coast of North America with a distinctive flora that bears similarities to floras found in other regions experiencing hot, dry summers and cool, wet winters. One of the biodiversity hotspots in the world as defined by Conservation International due to an unusually high concentration of endemic plants (approximately 3,400 of the 8,000 species found in the province) and to having lost over 70 percent of its native vegetation.

**Climate Change:** Climate change refers to the buildup of man-made gases in the atmosphere that trap the sun's heat, causing changes in weather patterns on a global scale. The effects include changes in rainfall patterns, sea level rise, potential droughts, habitat loss, and heat stress.

**Channel or Drainage:** An open conduit either naturally or artificially created which periodically or continuously contains moving water or which forms a connecting link between two bodies of standing water.

**Community Park:** Land with full public access intended to provide recreation opportunities beyond those supplied by neighborhood parks. Community parks are larger in scale than neighborhood parks but smaller than regional parks.

**Condition:** The relative ability of a resource to support and maintain a community of organisms having a species composition, diversity, and functional organization comparable to those in the region.

**Connectivity:** The state of being functionally linked by movement of organisms (i.e., to feed, move, reproduce, rest, winter, etc.), materials, or energy.

**Conservation:** The use, protection, and improvement of natural resources according to principles that will ensure their highest economic or social benefits.

**Conservation Easement:** An easement restricting a landowner to land uses that are compatible with long-term conservation and environmental values.

**Critical Habitat:** A specific geographic area(s) designated by the US Fish and Wildlife Service that contains features essential for the conservation of a threatened or endangered species and may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery

**Dredge & Fill Material:** "Dredge" is material that is excavated or dredged from waters of the United States. "Fill material" means any material used for the primary purpose of replacing an aquatic area with dry land or changing the bottom elevation of a water body. The term "fill material" does not include any pollutant discharged into the water primarily to dispose of waste, as that activity is regulated under section 402 of the CWA.

**Ecological:** Relating to the interrelationships of organisms and their environment.

**Ecosystem:** The interacting synergism of all living organisms in a particular environment; every plant, insect, aquatic animal, bird, or land species that forms a complex web of interdependency.

**Ecosystem Services:** Ecosystem services provide one approach for framing the values and benefits of open space. The Millennium Ecosystems Assessment (2005) has presented a scheme for classifying ecosystem services using four general categories: provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling.

**Environmental Education:** Focuses on environmental “literacy” and on using the environment to engage students in their education through “real-world” learning experiences, with the goals of helping them achieve an understanding of and appreciation for the environment, caring for the total environment, understanding how humans interact with and are dependent on natural ecosystems, and developing critical-thinking skills to resolve environmental issues.

**Ephemeral Stream:** An ephemeral stream has flowing water only during and for a short duration after precipitation events in a typical year. Ephemeral streambeds are located above the water table year-round. Groundwater is not a source of water for the stream; runoff from rainfall is the primary source of water for stream flow.

**Establishment:** The manipulation of the physical, chemical, or biological characteristics present to develop an resource that did not previously exist at a site. Establishment results in a gain in resource area and functions.

**Estuarine:** Tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land.

**Floristic Resource Value:** An assessment of the richness or diversity of native plant community, a measure of habitat integrity.

**Freshwater Wetlands:** Non-saline lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. NWI categories considered freshwater wetlands include freshwater emergent wetland, freshwater forested/shrub wetland, freshwater pond and lake.

**Functional capacity:** The degree to which a resource area performs a specific function.

**Functions:** The physical, chemical, and biological processes that occur in ecosystems.

**Impact:** Adverse effect.

**Geomorphic Provinces:** Naturally defined geologic regions that display a distinct landscape or landform.

**Greenway:** A linear area maintained as open space in order to conserve natural and cultural resources and to provide recreational opportunities, aesthetic and design benefits, and linkages. More specifically, a coordinated system of open space that links existing facilities using streets, railroad rights-of-way, utility easements, and natural features such as stream corridors and drainage channels.

**Ground Water Management:** The planned and coordinated management of a groundwater basin or portion of a groundwater basin with a goal of long-term sustainability of the resource.

**Groundwater:** Water that occurs beneath the land surface and fills the pore spaces of the alluvium, soil, or rock formation in which it is situated.

**Habitat Connectivity:** The degree to which the landscape facilitates animal movement and other ecological flows.

**Habitat Conservation:** A land management practice that seeks to conserve, protect and restore habitat areas for native plants and animals, especially conservation reliant species, and prevent their extinction, fragmentation of their habitat, or reduction in range.

**Habitat Conservation (Plans):** A plan prepared under Section 10(a)(1)(B) of the federal Endangered Species Act to provide for the lawful take of a listed wildlife species by conserving the ecosystems upon which the listed species depend, ultimately contributing to their recovery.

**Habitat Enhancement:** The manipulation of the physical, chemical, or biological characteristics of a community or ecosystem to heighten, intensify, or improve a specific resource function(s). Enhancement results in the gain of the selected resource function(s), but may also lead to a decline in others.

**Headwater:** The upper watershed area where streams generally begin; typically consists of 1st- and 2nd-order streams.

**Hydrological:** The distribution and cycle of surface and underground water.

**Hydrology:** A science related to the occurrence and distribution of natural water on the earth including the annual volume and the monthly timing of runoff.

**Intermittent Stream:** A stream that has flowing water only during certain times of the year, when groundwater provides water for stream flow. During dry periods, flowing water may not be present. Runoff from rainfall is a supplemental source of water for stream flow.

**Lacustrine System:** Wetlands and deepwater habitats that are situated in a topographic depression or a dammed river channel.

**Landscape Linkage:** Large, regional connections between habitat blocks ("core areas") meant to facilitate animal movement and other essential flows between different sections of a landscape (taken from Soulé and Terborgh 1999). These linkages are not necessarily constricted, but are essential to maintain connectivity function in the ecoregion.

**Mitigation:** The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of natural resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization measures for a project has been achieved.

**Mitigation Banking:** Created when a government agency, corporation, nonprofit organization, or other entity undertakes providing mitigation for itself or others under a formal agreement with a resource or regulatory agency. Mitigation banks are a form of "third-party" compensatory mitigation, in which the responsibility for compensatory mitigation implementation and success is assumed by the bank operator rather than by the project developer. The bank operator is responsible for the design, construction, monitoring, ecological success, and long-term protection of the bank site.

**Multiple Use Area:** A land management area where several environmental, recreational, economic, historical, cultural and/or social values are located in the same geographic area in a compatible and sustainable manner.

**Multiple-Use (Multi-Use) Trail:** A trail that permits more than one user group at a time (e.g., horse, hiker, mountain bicyclist, etc.).

**National Trails System:** A network of trails (National Scenic, Historic, or Recreation) throughout the country authorized by the National Trails System Act (16 U.S.C. 1241-51).

**Neighborhood Park:** City- or County-owned land intended to serve the recreation needs of people living or working within one-half mile radius of the park.

**Open Space:** Any parcel or area of land or water that is essentially unimproved and devoted to an open space use for the purposes of (1) the preservation of natural resources, (2) the managed production of resources, (3) outdoor recreation, or (4) public health and safety.

**Outdoor Recreation:** Leisure activities involving the enjoyment and use of natural resources primarily outside of structures.

**Palustrine System:** A nontidal wetland dominated by trees, shrubs, persistent emergents, emergent mosses or lichens.

**Park:** Any area that is predominately open space with natural vegetation and landscaping used principally for active or passive recreation.

**Perennial Stream/Pond/Lake:** A river, stream or lake that has continuous surface flows in parts of its bed all year round during years of normal rainfall.

**Perennial Yield:** The maximum quantity of water that can be annually withdrawn from a groundwater basin over a long period of time (during which water supply conditions approximate average conditions) without developing an overdraft condition.

**Point-Source Discharge:** Any discernible, confined and discrete conveyance, such as a pipe, ditch, channel, tunnel, conduit, discrete fissure, or container

**Pollution (of water):** The alteration of the physical, chemical, or biological properties of water by the introduction of any substance into water that adversely affects any beneficial use of water.

**Preservation:** The removal of a threat to, or preventing the decline of, a resource by an action in or near those resources. The term includes activities commonly associated with the protection and maintenance of resources through the implementation of appropriate legal and physical mechanisms such as acquisition, placement of a deed restriction or conservation easement, etc. Preservation does not result in a gain of resource area or functions.

**Re-establishment:** The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to the former resource or community. Re-establishment results in rebuilding a former resource and results in a gain in that type of resource area and functions.

**Rehabilitation:** The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded natural resource. Rehabilitation results in a gain in resource function, but does not result in a gain in area.

**Recreation:** The refreshment of body and mind through forms of play, amusement, or relaxation; usually considered any type of conscious enjoyment that occurs during leisure time.

**Recreation, Active:** A type of recreation or activity that requires the use of organized play areas including, but not limited to, softball, baseball, football and soccer fields, tennis and basketball courts, and various forms of children’s play equipment.

**Recreation, Passive:** Type of recreation or activity that does not require the use of organized play areas.

**Regional Park:** A park typically 150 to 500 acres in size focusing on activities and natural features not included in most other types of parks and often based on a specific scenic or recreational opportunity.

**Restoration:** The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded resource. Restoration is divided into two categories: re-establishment and rehabilitation.

**Riparian:** Lands adjacent to streams, rivers, lakes, and estuarine-marine shorelines. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality.

**Riparian (Riverine) Wetlands:** The wetlands associated with rivers and streams, including upper and lower riverine habitats and dry washes.

**Riverine Systems:** All waters, wetlands, and other plant communities living within a river or stream, including the adjacent wetland and riparian areas along their banks. Man-made habitats considered part of a riverine system include concrete-lined channels and soft-bottomed channels.

**Riverine Wetland:** Riverine wetlands include wetlands and deepwater habitats contained within a channel, except those areas dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens.

**School District Lands:** Properties owned by public school districts and used for environmental, recreational, and administrative purposes.

**Stakeholder:** Individuals or groups who can affect or be affected by an organization's activities; or individuals or groups with an interest or "stake" in what happens as a result of any decision or action. Stakeholders do not necessarily use the products or receive the services of a program.

**Storm Water Quantity: S**torm water (runoff) **–** Water which is originated during a precipitation event which may collect and concentrate diffused pollutants and carry them to water courses causing degradation. Runoff in the urban environment, both storm-generated and dry weather flows, has been shown to be a significant source of pollutants to the surface waters of the nation. In California, the authority to regulate urban and storm water runoff under the NPDES system has been delegated by EPA to the State Water Resources Control Board and the nine Regional Water Quality Control Boards. See Volume 2, Chapter 19 Urban Runoff Management RMS.

**Streambed Alteration Agreement - Section 1600:** Regulates activities that would alter the flow, bed, banks, channel, or associated riparian areas of a river, stream, or lake.  The law requires any person, state, local governmental agency or public utility to notify CDFG before beginning an activity that will substantially modify a river, stream, or lake. These activities also must be consistent with any other applicable environmental laws such as Section 404 and 401 of the Clean Water Act and CEQA.

**Surface Water:** As defined under the California Surface Water Treatment Rule, CCR, Title 22, Section 64651.83, means “all water open to the atmosphere and subject to surface runoff..." and hence would include all lakes, rivers, streams and other water bodies. Surface water thus includes all groundwater sources that are deemed to be under the influence of surface water (i.e., springs, shallow wells, wells close to rivers), which must comply with the same level of treatment as surface water.

**Tidal Wetlands:** Wetland habitats that are inundated by tides, either seasonally or year-round. Marine harbors, a man-made habitat, are also considered tidal wetlands. In the National Wetland Inventory (NWI) mapping system, the three categories included in tidal wetlands are estuarine and marine deepwater, estuarine and marine wetland, and tidal wetlands.

**Transverse Ranges:** An east-west trending series of steep mountain ranges and valleys. The east west structure of the Transverse Ranges is oblique to the normal northwest trend of coastal California, hence the name "Transverse." The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz islands. Its eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault.

**Uplands:** An area of the terrestrial environment that does not have direct interaction with surface waters.

**Water Quality:** Description of the chemical, physical, and biological characteristics of water, usually in regard to its suitability for a particular purpose or use.

**Water Quality Standards:** A law or regulation that consists of the beneficial designated use or uses of a water body or a segment of a water body and the water quality criteria that is necessary to protect the use or uses of that particular water body. Water quality standards also contain an anti-degradation policy. The water quality standard serves a twofold purpose: (a) it establishes the water quality goals for a specific water body and (b) it is the basis for establishing water quality-based treatment controls and strategies beyond the technology-based levels of treatment required by sections 301(b) and 306 of the Clean Water Act, as amended by the Water Quality Act of 1987.

**Watershed:** A land area that drains to a common waterway, such as a stream, lake, estuary, wetland, or ultimately the ocean.

**Watershed Approach:** An analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs.

**Wetlands:** Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

**Wildlife Linkages:** A wide area of native vegetation that connects or has the potential to connect two or more large patches of habitat on a landscape or regional scale through which a species will likely move over time. The move may be multi-generational; therefore, a linkage should provide both wildlife connectivity and biological diversity. A Wildlife Linkage should be a minimum of 1,000 feet in width, be vegetated with native vegetation, and have little or no human intrusion.


# I. Lower San Gabriel and Los Angeles Rivers Subregional Plan

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# Lower San Gabriel and Los Angeles Rivers Subregional Plan

# Final

**Prepared by:**

RMC
Water and Environment

In Association with:

Geosyntec
consultants

**October 2013**

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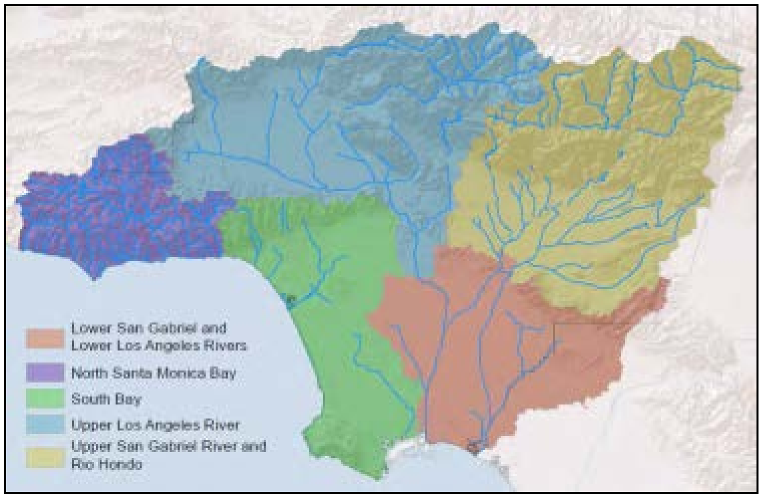
# 1 Background and Purpose of Subregional Plan

The Lower San Gabriel and Los Angeles River Subregional plan is one of five Subregional plans that make up the Greater Los Angeles County Integrated Regional Water Management Plan (GLAC IRWM Plan). This Subregional plan describes the Lower Los Angeles and San Gabriel's physical setting, sources of water supply, water quality, environmental resources, planning objectives and targets, and partnership and multi-benefit opportunities. The purpose of the Lower San Gabriel and Los Angeles River Subregional plan is to outline its expected contribution to meeting the GLAC regional planning goals, objective, and targets.

# 2 Lower San Gabriel and Los Angeles River Description

## 2.1 Physical Setting

**Figure 1: GLAC Subregional and Watershed Boundaries**




The Lower San Gabriel and Los Angeles River Subregion of the GLAC IRWM Region is located in the Southwest portion of the Los Angeles County urbanized area (Figure 1). The Subregion is also comprised of several dozen water agencies/companies and other entities which have an interest in a variety of water management issues. In addition, the Subregion overlaps with the Santa Ana Watershed Project Authority IRWM Region where Orange County overlaps with the San Gabriel River watershed. The Los Angeles Gateway Region IRWMP JPA, which is comprised of a number of cities, also overlaps with the southern portion of the Subregion.

The large expanses of urban and suburban development are home to approximately 3 million residents. Further, it has the most densely developed commercial and industrial land uses coupled with the least amount of open space on a per acre basis in the GLAC. Population projections from the Southern California Area Governments (SCAG) estimate that the population within the Subregion could increase to over 3.4 million residents by 2035. (SCAG, 2012; U.S. Census Bureau, 2012)

The Subregion has one of the greatest water recharge capacities in the GLAC due to the Montebello Forebay recharge basins located just downstream of the Whittier Narrows Gap. This Subregion is in the lower reaches of a vast metropolitan area and therefore has significant water quality issues along with tremendous opportunities for conjunctive use and recycled water use, desalination and aquatic habitat restoration in the estuaries of the San Gabriel and Los Angeles Rivers.

*Political Boundaries*

The Subregion consists of 39 cities and several unincorporated areas of Los Angeles County. Figure 2 depicts the city and community boundaries of the Lower San Gabriel and Los Angeles River Subregion.

**Figure 2: Cities and Communities in the Lower San Gabriel and Los Angeles River Subregion**


*Climate, Temperature, and Rainfall*

The Subregion is within the Mediterranean climate zone, which extends from Central California to San Diego. Summers are typically dry and hot while winters are wet and cool. Precipitation typically falls in a few major storm events between November and March.

*Geography and Geomorphology*

The geography of the Lower San Gabriel and Los Angeles River Subregion is made up of the coastal plain. The area is generally of low elevation, stretching from the Pacific Ocean in the south to the Puente Hills in the north.

### 2.1.1 Watersheds and Water Systems

*Watersheds*

The Subregion primarily consists of the lower San Gabriel River watershed and the Los Angeles River watershed (Figure 3). The San Gabriel River watershed begins in the San Gabriel River Mountains, and stretches across the San Gabriel Valley, then down to the Pacific Ocean. The Los Angeles River watershed begins from the Santa Monica Mountains on the east to the San Gabriel Mountains to the west and encompasses the entire path of the Los Angeles River which flows across the coastal plain into the San Pedro Bay. The Lower San Gabriel River watershed is made up of a number of tributaries, including: the Upper San Gabriel River watershed, Coyote Creek, La Mirada Creek, Fullerton Creek, Brea Creek, and Carbon Creek. Tributaries to the lower Los Angeles River watershed include: the Upper Los Angeles River watershed, Rio Hondo, and Compton Creek.

### *Flood Management and Infrastructure*

Flood management is important to protect human lives and property, particularly in the Lower San Gabriel and Los Angeles River where flooding has been an issue in the past due to the growth of population and pressure for development in the lower watersheds. The Los Angeles County Flood Control District manages and maintains most of the Subregion's flood infrastructure, such as storm drains, culverts, stormwater management ponds, and flood control channels.

Within the Subregion, the primary flood control management measure has been to line channels. Upstream of the Subregion, a system of dams, debris basins, reservoirs and flood control channels has been constructed through the years by the Los Angeles County Flood Control District and the U.S. Army Corps of Engineers as development encroached upon more flood prone areas and increased impervious area caused more runoff. Dams and reservoirs upstream of the Subregion often operate secondarily as water conservation facilities. The only major flood control reservoir within the Subregion is located at the Whittier Narrows Dam which stretches across both the San Gabriel River and Rio Hondo near to where they enter the Subregion. The main San Gabriel and Los Angeles Rivers, and their many tributary stream channels often have concrete banks and bottoms constructed to reduce the risk of flooding. Portions of the Los Angeles River and San Gabriel River have not been lined to allow for percolation and recharge of groundwater basins. (RWQCB, 2000)

### *Water Suppliers and Infrastructure*

A number of water suppliers exist in the Subregion, consisting over thirty retailers and wholesalers. Those that have the largest service areas include Central Basin MWD, Compton, Long Beach, and Fullerton, in addition to portions of Anaheim and the Municipal Water District of Orange County. These suppliers use a combination of imported water, recycled water, and groundwater to serve potable and non-potable demand in their service areas. A map of wholesale water suppliers is shown in Figure 4, and a map of retail water suppliers is shown in Figure 5. Each of these major suppliers has written a comprehensive 2010 Urban Water Management Plan (UWMP) to estimate future water supply demand and availability. These data were utilized in the estimation of supplies later in this plan.

**Figure 3: Watersheds of the Subregion**

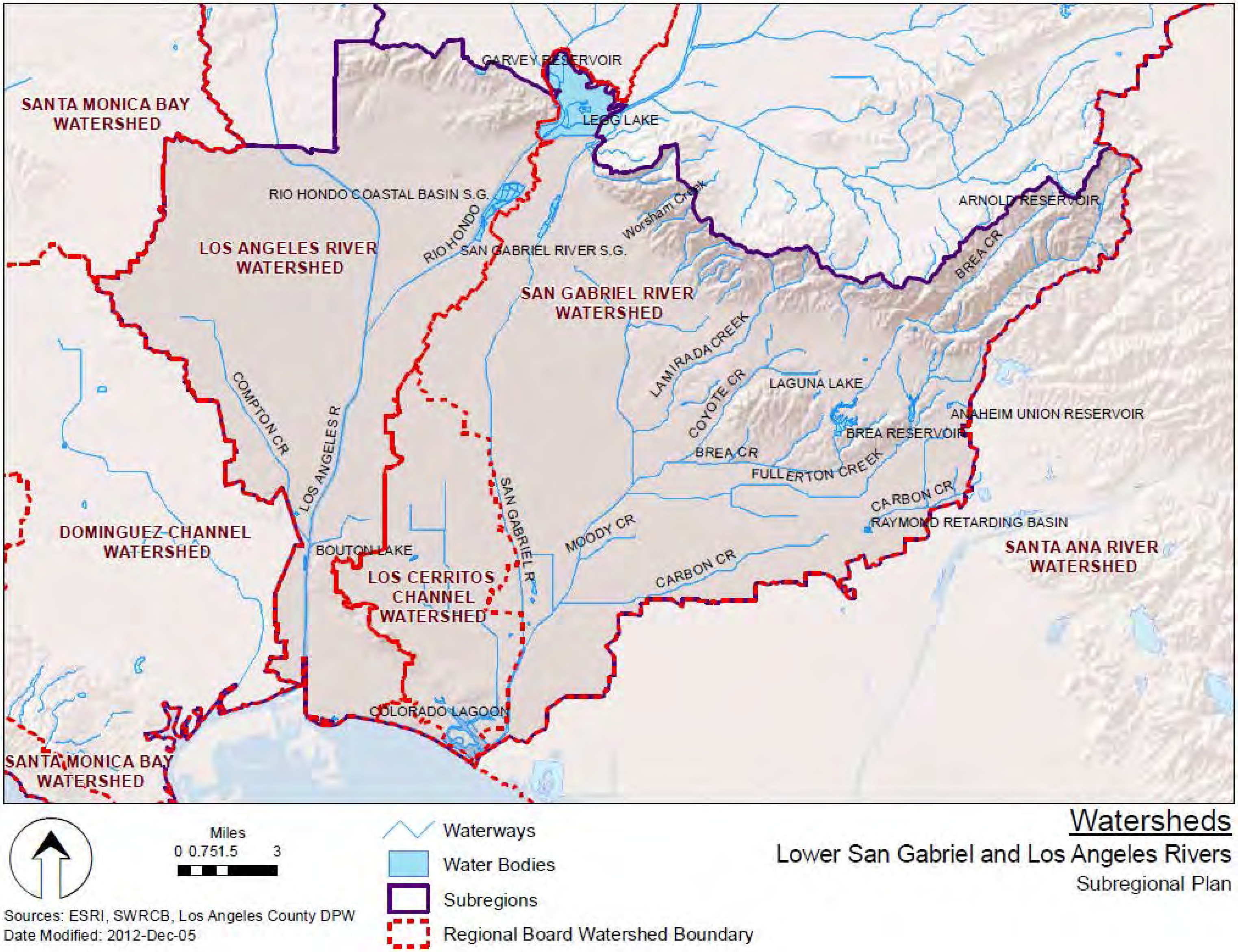


**Figure 4: Wholesale Water Suppliers**

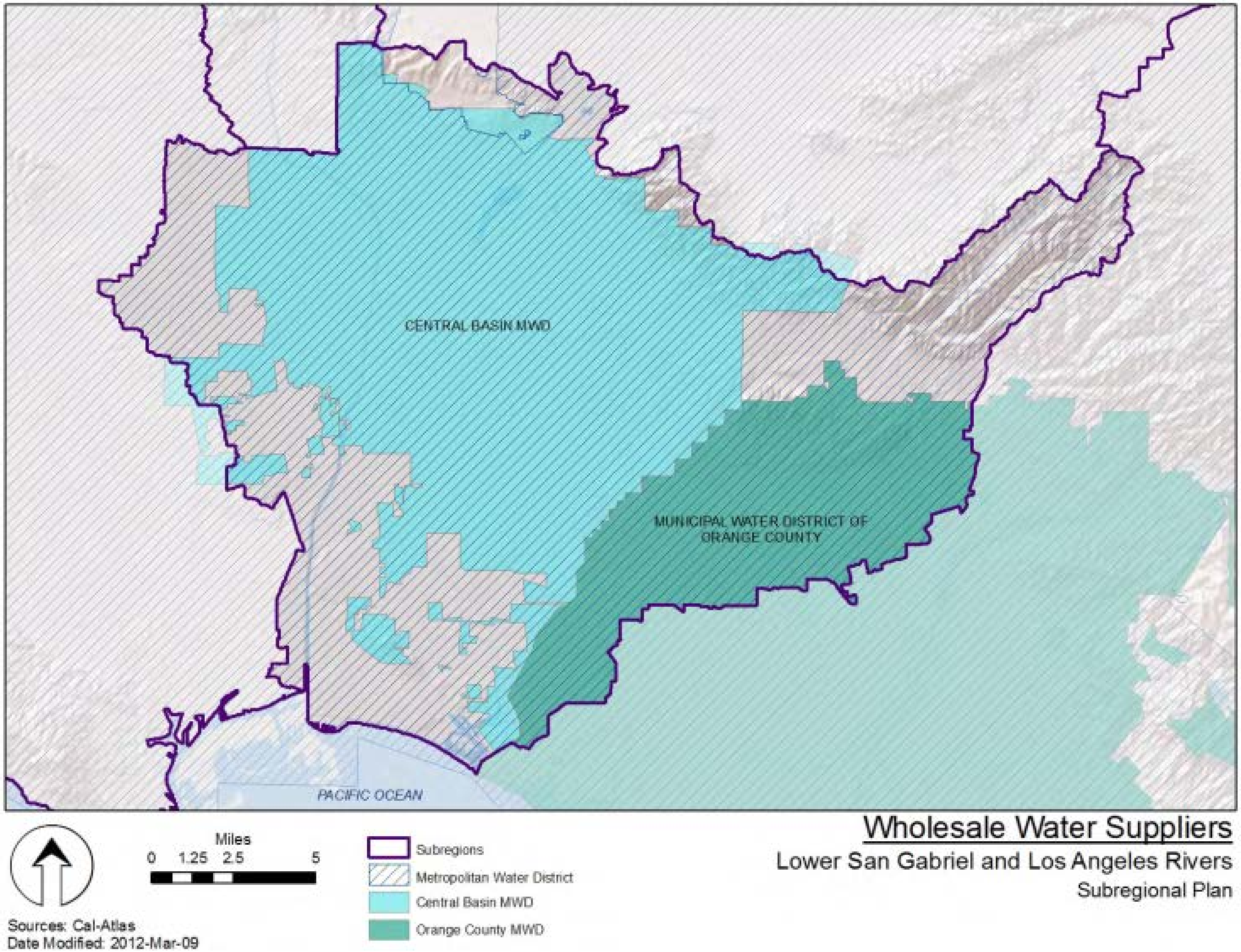
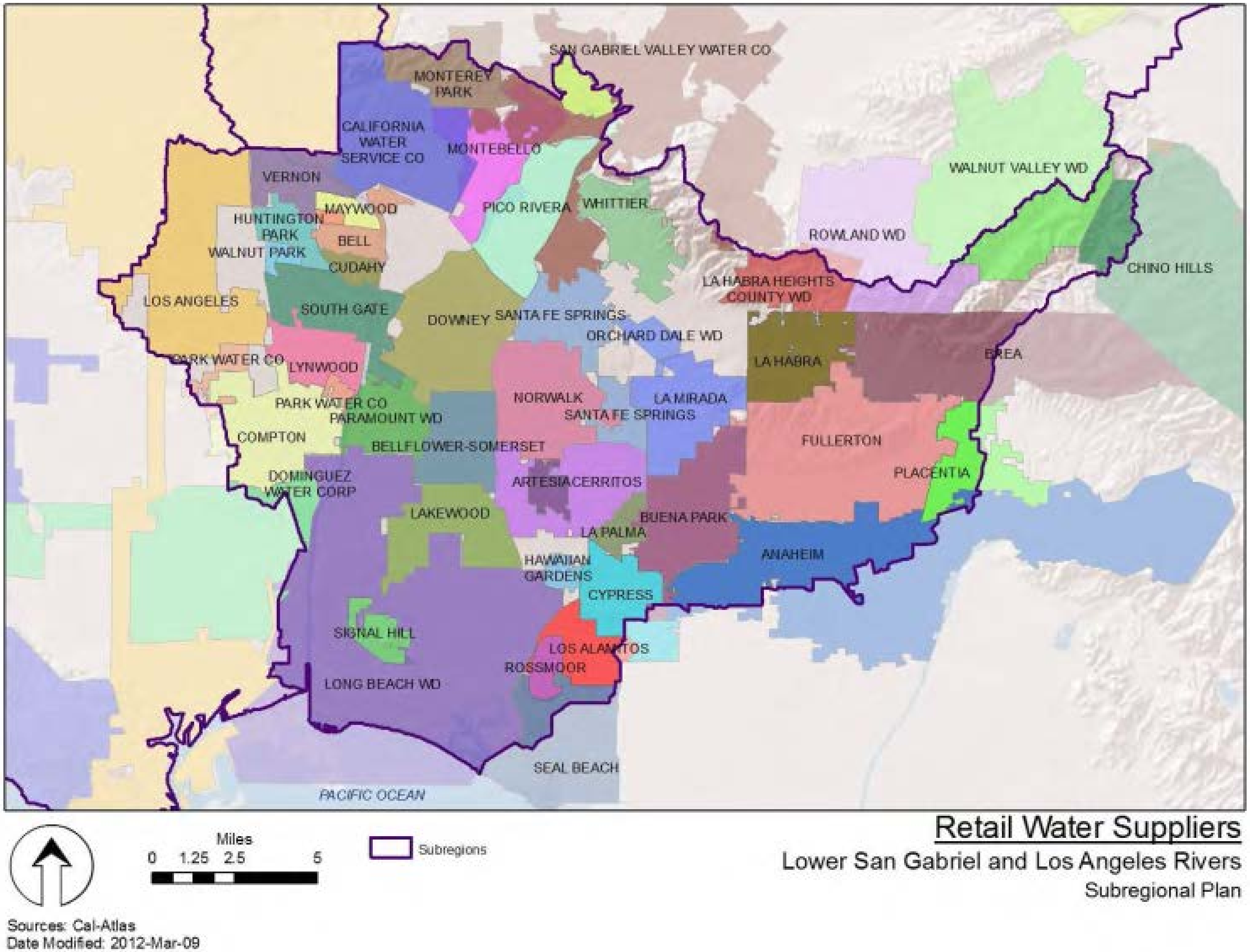


**Figure 5: Retail Water Suppliers**



## 2.2 Sources of Water Supply

The Lower San Gabriel and Los Angeles River Subregion depends primarily on groundwater, imported water and recycled water to meet its water demands. Water is imported through the California State Water Project (SWP), the Colorado River Aqueduct, and the Los Angeles Aqueducts. Major water supply sources are described below.

Sources of retail supply vary throughout the Subregion, as shown in Table 1. This table was developed based on 2010 Urban Water Management Plans (UWMPs) from a composite of wholesale and retail agencies whose service areas cover a majority of the Subregion. These agencies include:

- City of Los Angeles (portion within Subregion)
- City of Long Beach
- City of Fullerton
- Central Basin MWD

In addition to retail supply, replenishment supply is needed to replenish the Central Coast groundwater basin and to use with injection wells serving as sea water barriers. Table 2 shows the actual supplies to be used to meet replenishment needs.

**Table 1: Actual Supplies (acre-feet per year)**

| Supply | 2010 |
|---|---|
| **GW** | 270,000 |
| **IW** | 117,000 |
| **RW** | 30,000 |
| **Desalination** | - |
| **Conservation** | <1,000 |
| **Stormwater Capture and Direct Use** | - |
| **Surface Water Diversions** | - |
| **Total** | **417,000** |

**Table 2: Actual Replenishment Supplies (acre-feet per year)[1]**

| | 2010 |
|---|---|
| **Imported Water** | 23,000 |
| **Recycled Water** | 41,000 |
| **Stormwater** | 52,000 |
| **Total** | **116,000** |

[1] Replenishment supplies based on 10-year average of replenishment in Coastal Plain area as reported in Los Angeles County Hydrologic reports. Included are groundwater basin recharge (100% contribution to groundwater supply) and sea water barrier injection (60% contribution to groundwater supply)

## Surface Water

There is no direct potable use of surface water within this Subregion; however, surface water flow from the Los Angeles River, Rio Hondo and the San Gabriel River are used to recharge groundwater at spreading grounds which are discussed further in the groundwater section.

## Groundwater

Groundwater is a major water supply in this Subregion, representing approximately 55% of water supplies in 2010. The primary groundwater basin is Central Basin, in addition to the West Coast Basin, La Habra Basin and Orange County Basin.

The Central Basin is adjudicated through the Central Basin Judgment, with the total amount of allowable extraction rights set at 217,367 AFY. The California Department of Water Resources serves as Watermaster for the Central Basin, while the Water Replenishment District (WRD) of Southern California is responsible for ensuring an adequate supply of replenishment water to offset groundwater production through monitoring, and various groundwater reliability programs and projects.

Groundwater recharge in the Central Basin occurs via existing and restored natural channel bottoms, percolation of rainwater (natural recharge), underflow from neighboring basins, irrigation, and other incidental recharge; however, natural recharge is typically insufficient to maintain basin water levels and current pumping levels due to the extent of impervious surfaces. To augment the groundwater which naturally recharges Central Basin, artificial recharge using river water, imported water, recycled water and runoff augments and blends with groundwater, and is eventually extracted for potable use. Artificial recharge facilities in the Central Basin include the following (LACDPW, 2011):

- Dominguez Gap Spreading Grounds – recharge controlled flows from the Los Angeles River and uncontrolled flows from storm drains
- Rio Hondo Coastal Spreading Grounds – recharge controlled releases from San Gabriel Canyon Dams, Santa Fe Dam and Whittier Narrows Dam, uncontrolled runoff via San Gabriel River and Rio Hondo channel, and imported and recycled water
- San Gabriel Coastal Spreading Grounds – recharge controlled and uncontrolled releases from San Gabriel Canyon Dams, Santa Fe Dam and Whittier Narrows Dam, and imported and recycled water
- San Gabriel River at Montebello Forebay – in-river recharge controlled releases from San Gabriel Canyon Dams, Santa Fe Dam and Whittier Narrows Dam, uncontrolled runoff via San Gabriel River, and imported and recycled water
- Alamitos Gap Barrier Project – injects imported water and recycled water to prevent seawater intrusion

The West Coast Basin, also adjudicated, lies mostly in the South Bay Subregion to the west, but a small portion lies in the Lower San Gabriel and Los Angeles Rivers Subregion. Like Central Basin, West Coast Basin is managed by the California Department of Water Resources and WRD. This basin is hydrologically connected to Central Basin, receiving underflow at the Dominguez Gap. Groundwater basin recharge can occur via existing and restored natural channel bottoms, percolation of rainwater irrigation, and other native incidental recharge; however natural recharge is typically insufficient to maintain basin water levels and current pumping levels due to the extent of impervious surfaces and the presence of clay soils in parts of the Subregion. There are currently injection wells in place in the West Coast Basin which inject recycled water and imported water along the coast to form barriers to seawater intrusion in two locations (the Dominguez Gap and West Coast Basin Barriers). (West Basin MWD, 2011)

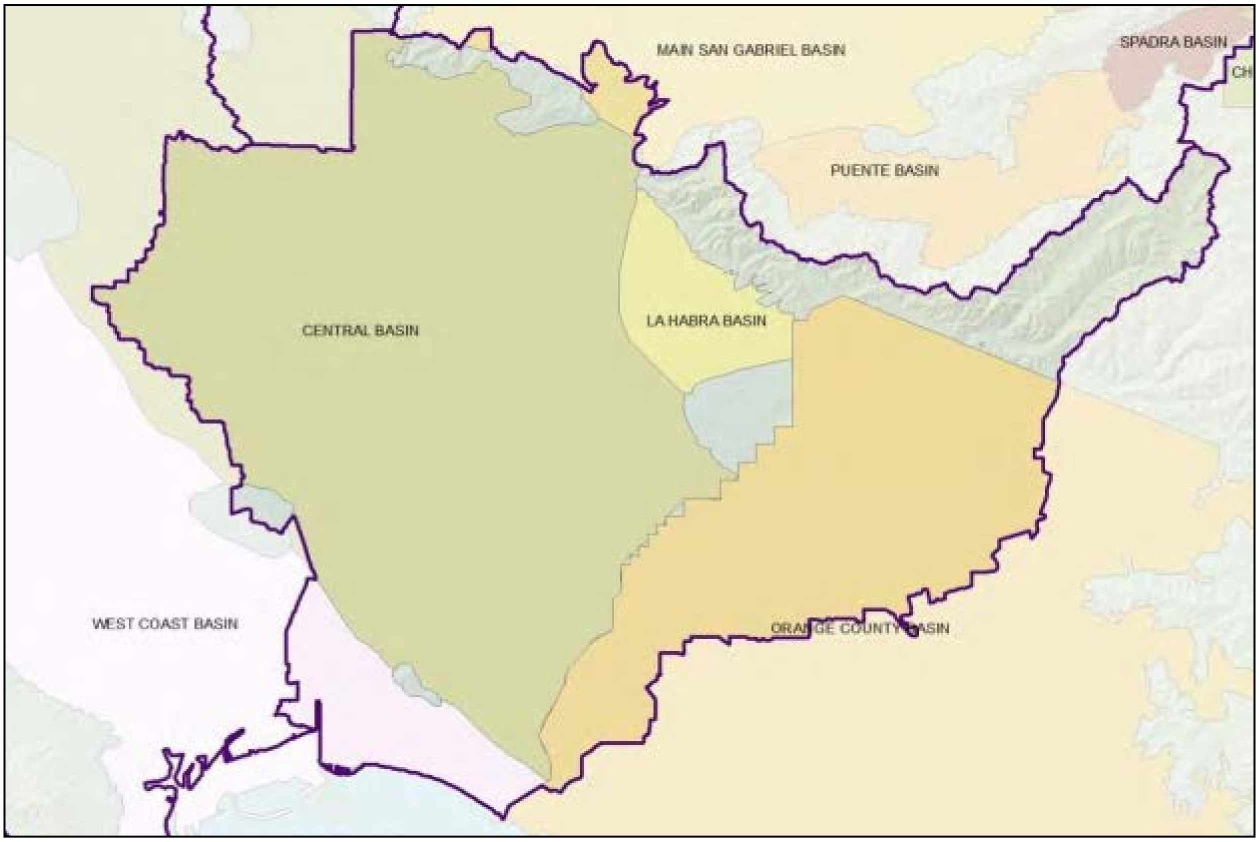
The Orange County Basin underlies the eastern portion of the southeastern portion of the Subregion, and is separated from the Central Basin boundary along Coyote Creek and the Los Angeles/Orange County line. This basin is adjudicated, and is managed by the Orange County Water District. Recharge to the Orange County Basin is primarily from the Santa Ana River through permeable sands and gravels within the forebay areas. Recharge also occurs through precipitation, irrigation, and other native incidental recharge. Artificial recharge activities include injection through wells at the Talbert and Alamitos seawater barriers, and spreading of imported and recycled water at spreading grounds. Artificial recharge facilities overlying the Orange County Basin allow for the recharge of Santa Ana River water, imported water, and recycled water. These facilities are located in the cities of Anaheim and Orange, as well as along the Santa Ana River. and include the following:

- Santa Ana River in the forebay areas
- Conrock and Warner Percolation Basins
- Burris Pit Percolation Basin
- Talbert seawater barrier
- Alamitos seawater barrier

La Habra Basin is located in northern Orange County, north of the Orange County Basin. Little groundwater production occurs in this basin due to low transmissivity and poor water quality caused by high TDS, sulfates, nitrates and color. The La Habra Basin is currently unmanaged.

In addition to the above discussed basins, some water agencies utilize groundwater pumped from the San Gabriel Basin to the northeast of the Subregion, including: the City of Whittier, California Domestic Water Company, San Gabriel Valley Water Company and Suburban Water Systems.

**Figure 6: Groundwater Basins of the Lower San Gabriel and Los Angeles River Subregion**




## Imported Water

Imported water represents a large portion of supply within the Subregion. Water is imported from northern California via the SWP and from the Colorado River, and is made available to water users through Central Basin MWD and the Cities of Compton, Long Beach and Los Angeles. The City of Los Angeles also imports water through the Los Angeles Aqueduct from the Owens River-Mono Basin. Additional information on imported water is available in Exhibit A.

## Recycled Water

Recycled water serves the Subregion both for non-potable reuse and for groundwater recharge. Recycled water demand is met by water reclamation plants both within the Subregion, and outside the Subregion, though only those water reclamation plants inside the Subregion’s boundaries will be explored here.

Within this Subregion, recycled water is produced by the Sanitation Districts of Los Angeles County at the Whittier Narrows Water Reclamation Plant (WRP), Los Coyotes WRP and Long Beach WRP (shown in Figure 7). In total, these WRPs have a capacity of 77.5 million gallons per day (MGD) and produced approximately 53,200 AFY of recycled water in 2010. Of this, approximately 11,000 AFY were used for non-potable reuse, and 6,000 AFY were used at the Montebello Forebay for groundwater replenishment. It should be noted that some of the recycled water from the Whittier Narrow WRP is reused in the Upper

San Gabriel and Rio Hondo Subregion. The remainder of the treated effluent is discharged to rivers and flows to the ocean.

Though just outside the Subregion, the San Jose Creek WRP's recycled water supplies are used extensively in the Subregion for groundwater recharge in the Montebello Forebay and for the non-potable reuse customers served by a number of wholesale and retail water purveyors. The San Jose WRP's capacity is 100 MGD, with supplies of approximately 42,000 AFY used for recharge and 6,000 AFY for non-potable reuse in 2010, though some non-potable reuse occurred in other subregions.

In addition to the above recycled water plants, recycled water may be supplied from plants outside of the Subregion, such as from West Basin MWD and the Municipal Water District of Orange County, but will not be discussed here. Recycled water plants across the Region are shown in Figure 7.

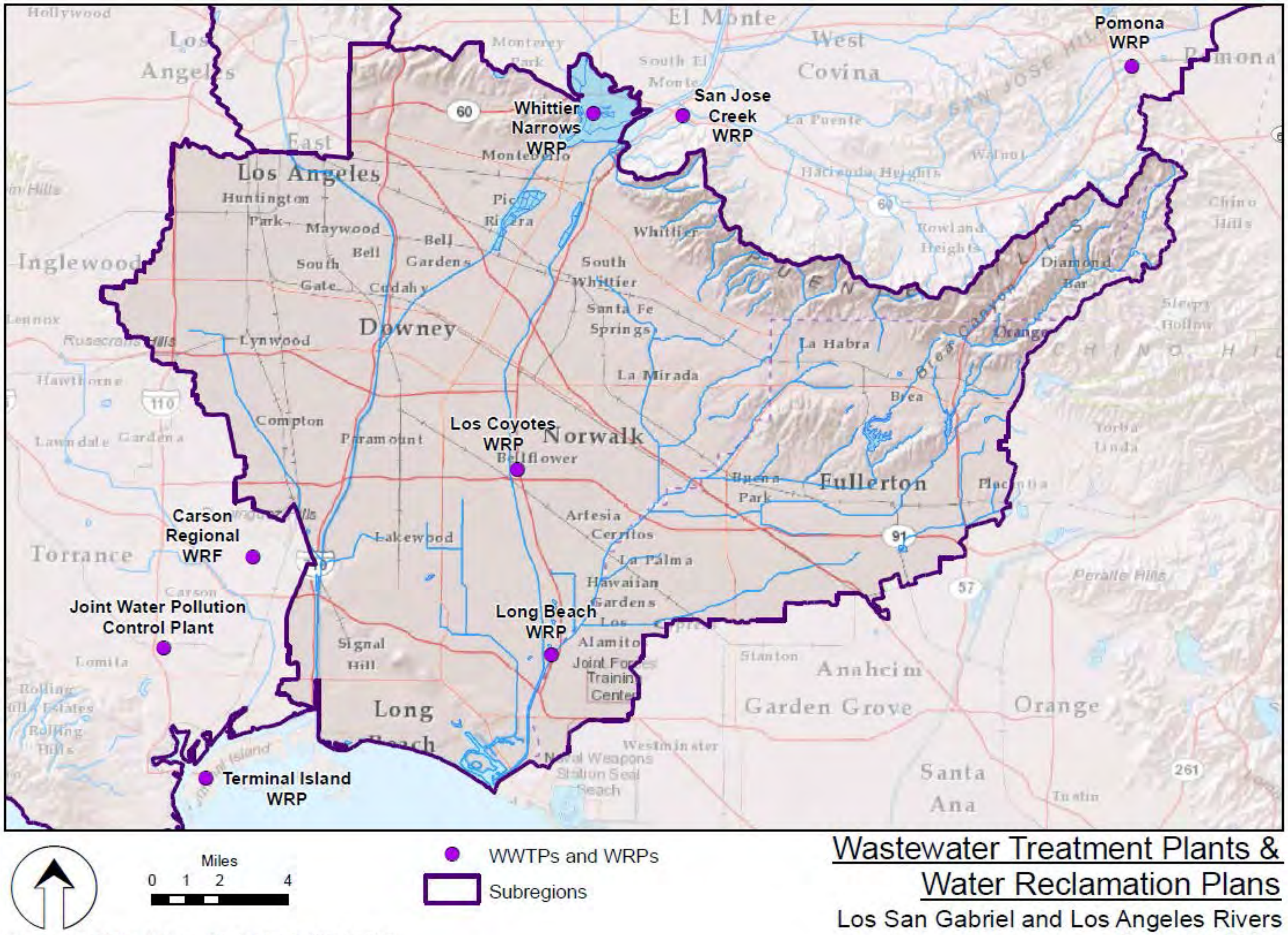
### Desalination

Desalinated ocean water is not currently used as a supply source in this Subregion, but has been explored by various agencies, including a partnership of the Long Beach Water Department, the Los Angeles Department of Water and Power, and the U.S. Bureau of Reclamation. This partnership undertook research to assess the feasibility of ocean water desalination as a source of potable water through the use of a prototype desalination plant. Should the partnership move forward with a full-time production facility, a project would likely move forward in the next 10-15 years.

### Rainwater-Stormwater Use

Stormwater use, also known as rainwater harvesting, is a method that can be used by municipalities both to add a source of supply to its water portfolio, and to reduce runoff that can contribute to flooding and water quality issues. The City of Los Angeles is planning on developing a Stormwater Capture Master Plan to increase the capture and use of stormwater, which would impact the portions of the Subregion intersecting the City of Los Angeles. The information contained in this master plan could be applied to the remaining areas in the Subregion to develop numerical targets.

**Figure 7: Water Reclamation Facilities in the GLAC Region**




Sources: Cal-Atlas, Metropolitan Water District, LACSD,
West Basin MWD, Water Replenishment District
Date Modified: 2013-Oct-07

## 2.3 Water Supply/Demand

As water agency boundaries are not aligned with the Subregional boundaries, an estimate of the actual Subregion's water supply and demand was not readily available for this Plan. Water supply and demand for the region was estimated based on review of 2010 Urban Water Management Plans (UWMPs).

Estimated demand projections for the Subregion are listed in Table 3. Demand was calculated using the 2010 UWMPs for City of Los Angeles, Long Beach Water Department, City of Fullerton, and Central Basin MWD as the service areas of these agencies provides sufficient coverage of the Subregion. All agencies have incorporated water conservation measures into water planning and practice. This practice involves the implementation of best management practices (BMPs) as prescribed by the California Urban Water Conservation Council in order to meet the requirements of SBx7-7 (Steinberg, 2009), also known as the 20x2020 Plan. Member agencies of MWD assist the Subregion by implementing incentive programs that provide rebates to water conservation and recycled water use projects and programs.

**Table 3: Subregion Demand Projections (acre-feet per year)**

| Water District | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| City of Los Angeles[2] | 22,000 | 25,000 | 26,000 | 27,000 | 28,000 | 28,000 |
| Long Beach | 54,000 | 55,000 | 55,000 | 55,000 | 55,000 | 55,000 |
| Fullerton | 28,000 | 32,000 | 33,000 | 33,000 | 33,000 | 33,000 |
| Central Basin MWD | 244,000 | 267,000 | 273,000 | 281,000 | 283,000 | 285,000 |
| **Total** | **348,000** | **379,000** | **387,000** | **396,000** | **399,000** | **401,000** |

## 2.4 Water Quality

The GLAC Region has suffered water quality degradation of varying degrees due to sources associated with urbanization, including the use of chemicals, fertilizers, industrial solvents, automobiles and household projects. Both surface water and groundwater quality have been impacted by this degradation which can be classified as either point or nonpoint sources. Regulations are in place to control both types of sources.

The Federal Water Pollution Control Act Amendments of 1972, amended in 1977, are commonly known as the Clean Water Act. The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the United Sates and gave the USEPA the authority to implement pollution control programs. In California, per the Porter Cologne Water Quality Control Act of 1969, responsibility for protecting water quality rests with the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs).

The SWRCB sets statewide policies and develops regulations for the implementation of water quality control programs mandated by state and federal statutes and regulations. The RWQCBs develop and implement Basin Plans designed to preserve and enhance water quality. The determination of whether water quality is impaired is based on the designated beneficial uses of individual water bodies, which are established in the Basin Plan. As mandated by Section 303(d) of the Federal Clean Water Act, the SWRCB maintains and updates a list of "impaired" water bodies that exceed state and federal water quality standards. To address these impairments, the RWQCBs identify the maximum amount of pollutants that may be discharged on a daily basis without impairing the designated beneficial uses, and

[2] Approximately 18% of the Lower San Gabriel and Los Angeles River region is located within the City of Los Angeles, therefore only 18% of the City of Los Angeles 2010 UWMP water demand values were accounted for.

are known as Total Maximum Daily Loads (TMDLs). In addition to development of the TMDLs the RWQCBs develop and implement the NPDES permits for discharges from wastewater treatment and water reclamation plants of treated wastewater effluent to surface water bodies.

The Subregion has 303(d) listings related to both human activities and natural sources. Human activity can produce poor water quality due to trash, nutrients from wastewater treatment effluent, metals, and toxic pollutants. These pollutants can be carried in stormwater runoff and through point source discharges, impacting streams, canyon ecosystems, and eventually beaches and offshore waters. Natural sources of contaminants primarily include minerals and metals from underlying local geology.

Even though agencies and cities in the Subregion have significantly reduced pollutants that are discharged to water bodies from individual point sources since the Clean Water Act was established, many of the major water bodies are still considered impaired due to trash, bacteria, nutrients, metals, and toxic pollutants. Water quality issues affecting the Subregion's local surface waters and groundwater basins are discussed below.

### Surface Water Quality

The watersheds in the Subregion serve many beneficial uses including: municipal and domestic supplies, groundwater recharges, recreation, wildlife habitat, warm freshwater habitat, aquatic habitat, industrial process supply, preservation of rare and endangered species, shellfish harvesting, fish migration, and fish spawning. Typically, surface water quality is better in the headwaters and upper portions of watershed, and is degraded by urban and stormwater runoff closer to the Pacific Ocean. As a result, the major watersheds in the Subregion, (Lower Los Angeles River and Lower San Gabriel River), and receiving waters are 303(d) listed for several constituents, as shown in Table 4 and Table 5. (SWRCB, 2010)

The locations of permitted dischargers are shown in Figure 8. Please note that Figure 8 does not show MS4 and Caltrans discharges as these are non-point discharge permits.

Investigations are needed to determine natural background levels for some listings which may not be due to anthropogenic causes. However, the reports written in support of the Subregion's TMDLs conduct a source assessment for each impairment, and determine the major sources of each, as listed below:

- **Los Angeles River Bacteria TMDL:** Dry and wet weather stormwater system discharges, wildlife, direct human discharge, septic systems, re-growth or re-suspension of sediments
- **Los Angeles River Metals TMDL:** Dry weather: Publically owned treatment works (POTWs) including Tillman WRP, LA-Glendale WRP and Burbank WRP, tributary flows, groundwater discharge and flows from other permitted NPDES discharges; wet weather: storm flow through permitted storm sewer systems; atmospheric deposition, natural geologic conditions
- **Los Angeles River Nutrient TMDL:** Discharges from POTWs, including Tillman WRP, LA-Glendale WRP and Burbank WRP, urban runoff, stormwater, groundwater discharge
- **Trash TMDL for the Los Angeles River Watershed:** Stormwater discharges, direct deposition by people or wind
- **Legg Lake Trash TMDL:** Litter from adjacent areas, roadways and direct dumping and deposition, storm drains
- **San Gabriel River Metals and Selenium TMDL:** Dry weather: Storm drains, WRPs, power plants; Wet weather: stormwater runoff through permitted storm sewer systems, Caltrans permit, general construction storm permits, and industrial storm permits; draining of open space areas, atmospheric deposition
- **Colorado Lagoon Pesticides, PAHs, PCBs, Metals, etc. TMDL:** Urban runoff and stormwater discharges from municipal storm sewer systems and Caltrans, sediment loading caused by runoff from urban, recreational park areas, atmospheric deposition

- **Los Cerritos Channel Metals TMDL:** Permitted stormwater discharges, atmospheric deposition
- **Long Beach City Beaches and Los Angeles River Estuary TMDLs for Indicator Bacteria:** Storm sewer discharge permittees, Caltrans facilities, vessels covered under the VGP, industrial and construct stormwater permittees, general NPDES permits, various nonpoint sources such as dogs on beaches, recreational vehicle parks, marina slip activities, waterfowl, human beach use
- **El Dorado Parks Lakes Multiple TMDLs:** Runoff, irrigation, groundwater and potable water inputs used for supplemental water additions, atmospheric deposition
- **North, Center, and Legg Lake Multiple TMDLs:** Permitted stormwater discharges, irrigation, groundwater used for supplemental water additions to maintain lake level, groundwater discharge from a Superfund site, atmospheric deposition

**Table 4: 303(d) Listed Waters with Adopted TMDLs**

| 303(d) Listed Waters and Impairments[1] | TMDL |
|---|---|
| **Colorado Lagoon** | |
| Chlordane | Colorado Lagoon Pesticides, PAHs, PCBs, Metals etc. TMDL |
| Dieldrin | |
| PCBs | |
| DDT | |
| Metals: Lead, Zinc | |
| PAHs | |
| Sediment Toxicity | |
| Benthic Community Effects | |
| **Compton Creek** | |
| Bacteria | Los Angeles River Bacteria TMDL |
| Metals: Copper, Lead | Los Angeles River Metals TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| Nutrients: pH | Los Angeles River Nutrient TMDL |
| **Coyote Creek** | |
| Metals: Copper, Lead, Selenium, Zinc | San Gabriel River Metals and Selenium TMDL |
| **Los Angeles River** | |
| Nutrients: Ammonia, Nutrients (Algae), pH | Los Angeles River Nutrient TMDL |
| Bacteria | Los Angeles River Bacteria TMDL |
| Metals: Copper, Lead, Zinc, Cadmium | Los Angeles River Metals TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| **Los Angeles River Estuary** | |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| Bacteria | Long Beach City Beaches and Los Angeles River Estuary TMDLs for Indicator Bacteria |
| **Rio Hondo** | |
| Nutrients: Ammonia, Nutrients (Algae), pH | Los Angeles River Nutrient TMDL |
| Bacteria | Los Angeles River Bacteria TMDL |
| Metals: Copper, Lead, Zinc, Cadmium | Los Angeles River Metals TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| **San Gabriel River** | |
| Metals: Copper, Lead, Zinc, Selenium | San Gabriel River Metals and Selenium TMDL |
| **San Gabriel River Estuary** | |
| Metals: Copper, Nickel | San Gabriel River Metals and Selenium TMDL |
| **Legg Lake** | |
| Trash | Legg Lake Trash TMDL |

| 303(d) Listed Waters and Impairments[1] | TMDL |
|---|---|
| Nutrients: ammonia, odor, pH | North, Center and Legg Lake TMDLs |
| Metals: copper, lead | |
| **Los Cerritos Channel** | |
| Metals: copper, lead, zinc | Los Cerritos Channel Metals TMDL |
| **El Dorado Park Lakes** | |
| Nutrients: algae, ammonia, eutrophic, pH | El Dorado Park Lakes TMDLs |
| Metals: Mercury | |
| Lead | No TMDL determined necessary by EPA |
| Copper | Cleanup and Abatement Order established for the City of Long Beach |

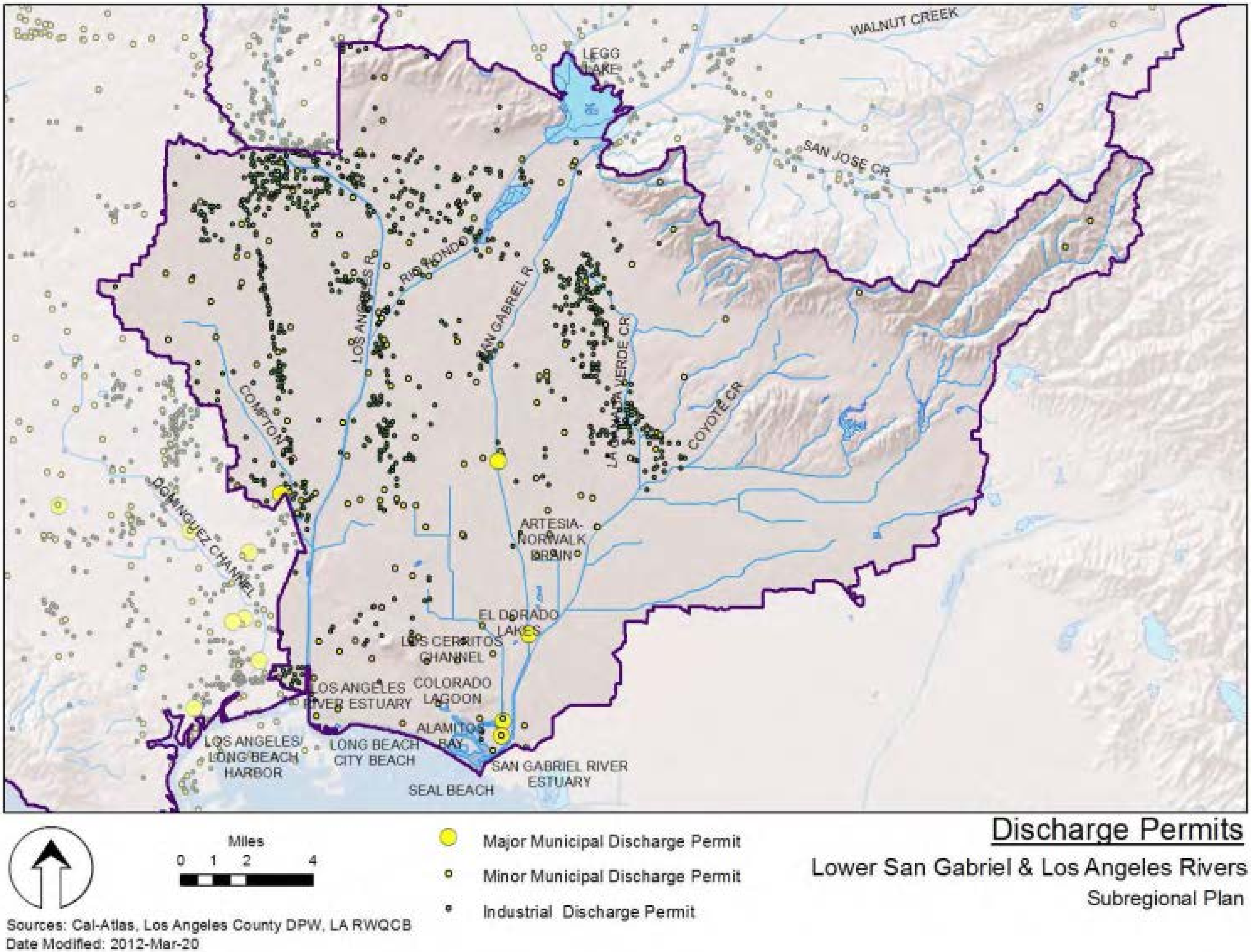
1. According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report

**Table 5: 303(d) Listed Waters without Adopted TMDLs**

| 303(d) Listed Waters and Impairments[1] | | |
|---|---|---|
| **Alamitos Bay** | | |
| Bacteria | | |
| **Compton Creek** | | |
| Benthic Community Effects | | |
| **Coyote Creek** | | |
| Diazinon | Toxicity | Nutrients: Ammonia, pH |
| Bacteria | | |
| **Los Angeles River** | | |
| Cyanide | DDT | Oil |
| Diazinon | Dieldrin | Dibenz[a,h]anthracene |
| **Los Angeles River Estuary** | | |
| Chlordane | PCBs | DDT |
| Sediment Toxicity | | |
| **Los Cerritos Channel** | | |
| Ammonia | DEHP | Chlordane |
| Bacteria | Trash | pH |
| **Rio Hondo** | | |
| Cyanide | Oil | Diazinon |
| **San Gabriel River** | | |
| Bacteria | Cyanide | pH |
| **San Gabriel River Estuary** | | |
| Dioxin | Oxygen, Dissolved | |
| **San Pedro Bay** | | |
| Chlordane | DDT | PCBs |
| Sediment Toxicity | ChemA | Bacteria |
| Nitrogen/Nitrate | Toxaphene | Toxicity |

1. According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report

**Figure 8: Permitted Dischargers as of 2011**



### Groundwater Quality

Groundwater quality varies throughout the Subregion, based on naturally occurring conditions, historical land use patterns, and groundwater extraction patterns. Poor groundwater quality can be attributed to several factors including over-drafting of groundwater basins (sometimes resulting in seawater intrusion), industrial discharges, agricultural chemical usage, legacy contaminants in urban runoff, and naturally occurring constituents. The cost of treating these contaminants is often significant, and for some improperly disposed chemicals, effective treatment has not yet been identified.

Central Basin is generally of good quality but has some localized areas of poor quality, primarily along the basin margins and in those aquifers affected by seawater intrusion. As stated previously, WRD monitors and manages both levels and water quality in Central Basin. The primary constituents of concern in this basin include: TDS, VOCs, perchlorate, nitrate, iron, manganese, and chromium. WRD has determined through its monitoring and sampling program that special interest constituents, including arsenic, hexavalent chromium, MTBE, total organic carbon, color and perchlorate, do not pose a substantive threat to the basin. (MWD, 2007)

In order to mitigate localized groundwater quality problems, WRD established a Safe Drinking Water Program to provide pumpers with wellhead treatment equipment to remove VOCs from the groundwater which has restored over 30,000 AFY of groundwater to beneficial use. Seawater intrusion is controlled in the basin through the Alamitos Gap Barrier Project run by the Los Angeles County Department of Public Works. (WRD, 2012)

West Coast Basin has high levels of TDS in the Torrance/Hawthorne area, which are outside the Subregion, that can be attributed to both sea-water intrusion and naturally occurring soil and geologic conditions in the region. Increases in groundwater TDS concentrations are primarily attributed to seawater intrusion, but are also a function of the recharge of storm and urban runoff, imported water, and incidental recharge. Seawater intrusion is attributed to the extraction of groundwater above natural replenishment levels. To reduce this, Los Angeles County operates and maintains two seawater intrusion barrier systems along the coast that utilize recycled water and imported water to reduce the seawater intrusion in coastal aquifers. Additionally, West Basin MWD and WRD operate desalting facilities to reduce these high TDS levels. (MWD, 2011)Water quality in the Orange County Basin is managed by the Santa Ana Water Project Authority (SAWPA). In addition to quality issues (including high TDS) due to seawater intrusion, this basin's constituents of concern include: nitrate, VOCs, perchlorate, color, and NDMA. There are several groundwater treatment projects within the basin, though they don't fall within this Subregion. (MWD, 2011)

### Near-Shore Ocean Water Quality

There are several indicators of coastal water quality. One of the most publicized is the annual report by Heal the Bay. The annual report evaluates California beaches from Memorial Day to Labor Day giving them a grade of A to F based on tests for bacterial pollution, which indicate how likely the water is to make swimmers sick. Statewide, 92% of California beaches earned A or B grades over the summer, the same as last year, according to the 2011 report. Additionally, constituents such as PCBs, metals, DDT and other pesticides, and PAHs have been found in coastal waters.

## 2.5 Environmental Resources

Due to the Subregion being highly urbanized, with its rivers engineered to protect homes and businesses from flooding, large areas of aquatic habitat have been lost. Despite their altered state, the Subregion's channels still serve as habitat for wildlife.

### 2.5.1 Habitats

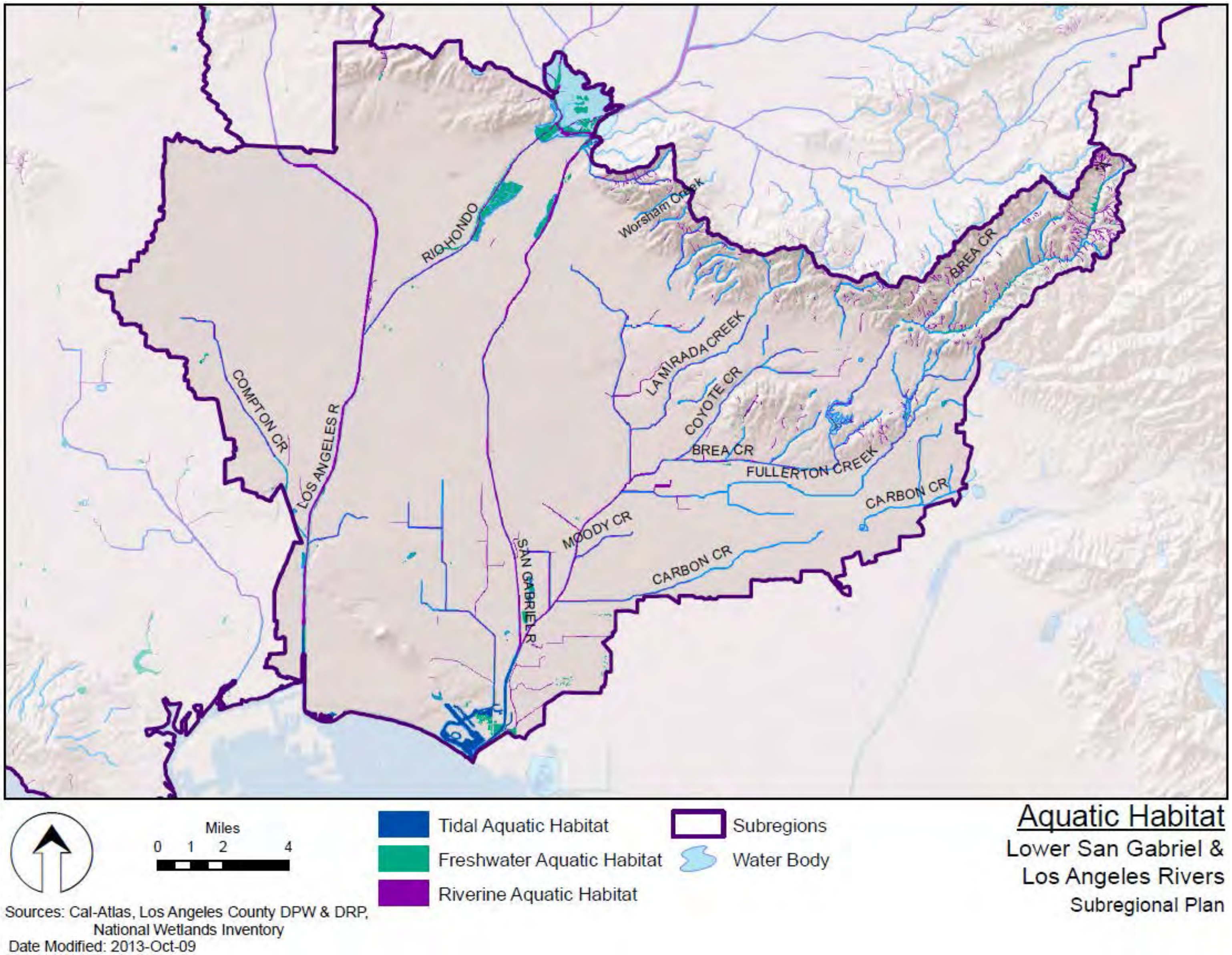
The lower watersheds of the Los Angeles and San Gabriel Rivers has been found by biological condition assessments to be more degraded, have fewer feeding strategies, and a dominance of organisms more tolerant of pollution than the upper watersheds.

Most of the Subregion's aquatic habitats have been destroyed or converted to other habitat, and much of the remaining habitat has been degraded by poor water quality or other human activities. Despite this, some areas of aquatic habitat still exist, as shown in Figure 9. Three types of aquatic habitats can be found in the Subregion including:

- **Tidal aquatic habitat:** Wetland habitats that are inundated by tides, either seasonally or year-round. Marine harbors, a man-made habitat, are also considered tidal aquatic habitat for the purposes of this Subregional Plan.
- **Freshwater aquatic habitat:** Aquatic habitats such as depressional marshes, lakes and ponds. For the purposes of this Subregional Plan, freshwater aquatic habitat include man-made habitats such as flood control basins and ponds which may include areas of freshwater aquatic habitats. It is important to note that although some spreading grounds and some stormwater Best Management Practices such as detention basins, swales and depressional areas, also provide ecosystem benefits, they belong under a separate category and should not be subject to the same protection criteria.
- **Riverine aquatic habitats:** Streambed and aquatic habitats associated with rivers and streams, including upper and lower riverine habitats. Man-made habitats considered riverine aquatic habitats include concrete-lined channels and soft-bottomed channels. Note that "riparian" is sometimes used to mean riverine aquatic habitats.

In addition to aquatic habitat, upland habitat is a valuable resource to ecosystems in the Subregion as it serves as a linkage between aquatic habitats. Within the Subregion, these habitats include the Los Angeles Coastal Plain and the Puente Hills. A majority of the coastal plain has been urbanized, which inhibits linkage between aquatic habitats. The Puente Hills, located in the north eastern portion of the Subregion, are by contrast mostly open space mostly free of development, but impacted by invasive species and water quality issues. The Puente Hills provide habitat linkages to the Cleveland National Forest. (RWQCB, 2011)

**Figure 9: Existing Aquatic Habitat**



### 2.5.2 Significant Ecological Areas

Los Angeles County developed the concept of significant ecological areas in the 1970s in conjunction with adopting the original general plan for the County.

The Significant Ecological Area (SEA) Program is a component of the Los Angeles County Conservation/Open Space Element in their General Plan. This program is a resource identification tool that indicates the existence of important biological resources. SEAs are not preserves, but are areas where the County deems it important to facilitate a balance between limited development and resource conservation. Limited development activities are reviewed closely in these areas where site design is a key element in conserving fragile resources such as streams, oak woodlands, and threatened or endangered species and their habitat.

Proposed development is governed by SEA regulations. The regulations, currently under review, do not preclude development, but allow limited, controlled development that does not jeopardize the unique biotic diversity within the County. The SEA conditional use permit requires development activities be reviewed by the Significant Ecological Area Technical Advisory Committee (SEATAC). Additional information about regulatory requirements is available on the Los Angeles County website. (Los Angeles County Planning, 2012, http://planning.lacounty.gov/sea/faqs).

Within the Subregion, SEAs include:

- Whittier Narrows Dam County Recreation Area
- Sycamore-Turnbull Canyons
- Powder Canyon-Puente Hills
- Tonner Canyon-Chino Hills
- Alamitos Bay

These SEAs can be seen in Figure 10.

### 2.5.3 Ecological Processes

The open space areas in the northern and-eastern portions of the Subregion known as the Puente-Chino Hills Wildlife Corridor is an unbroken zone of natural habitat extending nearly 31 miles from the Cleveland National Forest in Orange County to the West end of the Puente Hills above Whittier Narrows (LSA, 2007). This is a biologically rich area that provides critical habitat to endangered species and upland habitat, and connectivity between various habitat types.

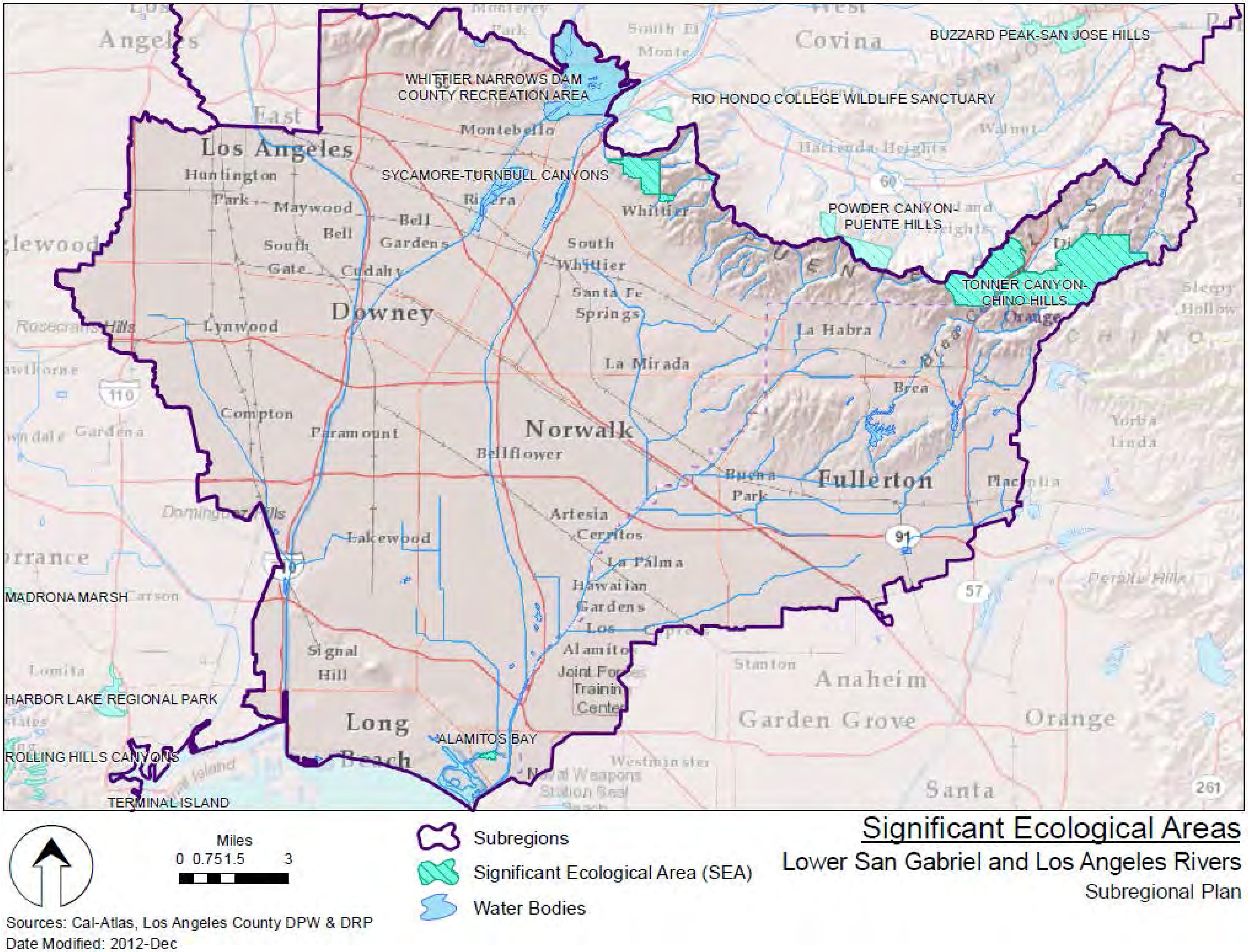
The aquatic and upland habitats found in the Subregion provide a number of ecosystem services including biodiversity support, flood damage reduction, carbon sequestration, pollutant reduction in runoff, consumptive use support (such as hunting and fishing), and non-consumptive use support (such as bird watching) (Brauman et al., 2007).

In addition to ecosystem services which may improve water supply and water quality, major ecological processes may impact water resources, and are listed below.

#### Fire

Fire is an integral and necessary part of the natural environment and plays a role in shaping the landscape. Catastrophic wildfire events can denude hillsides which create opportunities for invasive plants and increase the potential for subsequent rains to result in debris flows that erode the landscape and can clog stream channels, damage structures, and injure inhabitants in the canyons and lower foothill areas.

**Figure 10: Significant Ecological Areas of the Lower San Gabriel and Los Angeles Subregion**



### Invasive Species

Invasive species in the Region have also substantially affected specific habitats and areas. Along with the rest of California, most of the Subregion's native grasslands were long ago displaced by introduced species. The receptive climate has resulted in the widespread importation of plants from around the globe for landscaping. Some plant introductions have resulted in adverse impacts. In many undeveloped areas, non-native plants such as arundo (*Arundo donax*), tree of heaven (*Alianthus altissima*) tree tobacco (*Nicotiana glauca*), castor bean (Ricinus communis), salt cedar (*Tamarix ramosissima*) and cape ivy (*Senecio mikanioides*) are out-competing native. The removal of these particular species, which requires focused and repeated efforts, can provide substantial dividends in water savings and restored species diversity.

### Slope Stability

The area in the northern portion of the Subregion is prone to slope stability problems such as landslides, mudslides, slumping and rockfalls. Shallow slope failure such as mudslides and slumping occur where graded cut and fill slopes have been inadequately constructed. Rockfalls are generally associated with seismic ground-shaking or rains washing out the ground containing large rocks and boulders.

### 2.5.4 Critical Habitat Areas

Critical habitat areas have been established by the endangered species act (ESA) to prevent the destruction or adverse modification of designated critical habitat of endangered and threatened plants and animals. The United States Fish and Wildlife Service (USFWS) through the Endangered Species Act (ESA) defines critical habitat as "a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery."

A critical habitat designation typically has no impact on property or developments that do not involve a Federal agency, such as a private landowner developing a property that involves no Federal funding or permit. However, when such funding or permit is needed, the impacts to critical habitat are considered during the consultation with the USFWS.

Within the Subregion, there is 9,350 acres of designated critical habitat defined for the Coast California gnatcatcher as shown in Figure 11.

## 2.6 Open Space and Recreation

Open space and recreation area is limited in the Subregion due to its being highly developed. Parks, recreation and other open space in the Subregion can be seen in Figure 12. Acreage of recreation and open space lands within the Subregion is shown in Table 6. In total, of the Subregion's 231,000 acres, approximately 13,000 acres (or 6%) are open space or recreation land areas. A majority of the areas are developed urban park and recreation areas.

## 2.7 Land Use

Land use within the Lower San Gabriel and Los Angeles River Subregion reflects the historic pattern of urbanization as most of the interior valley is occupied with residential, industrial, commercial, and institutional uses while most of the foothills and mountains are principally open space/recreation/vacant area. The overall land use breakdown is shown in Table 7.

**Figure 11: Critical Habitat Areas**

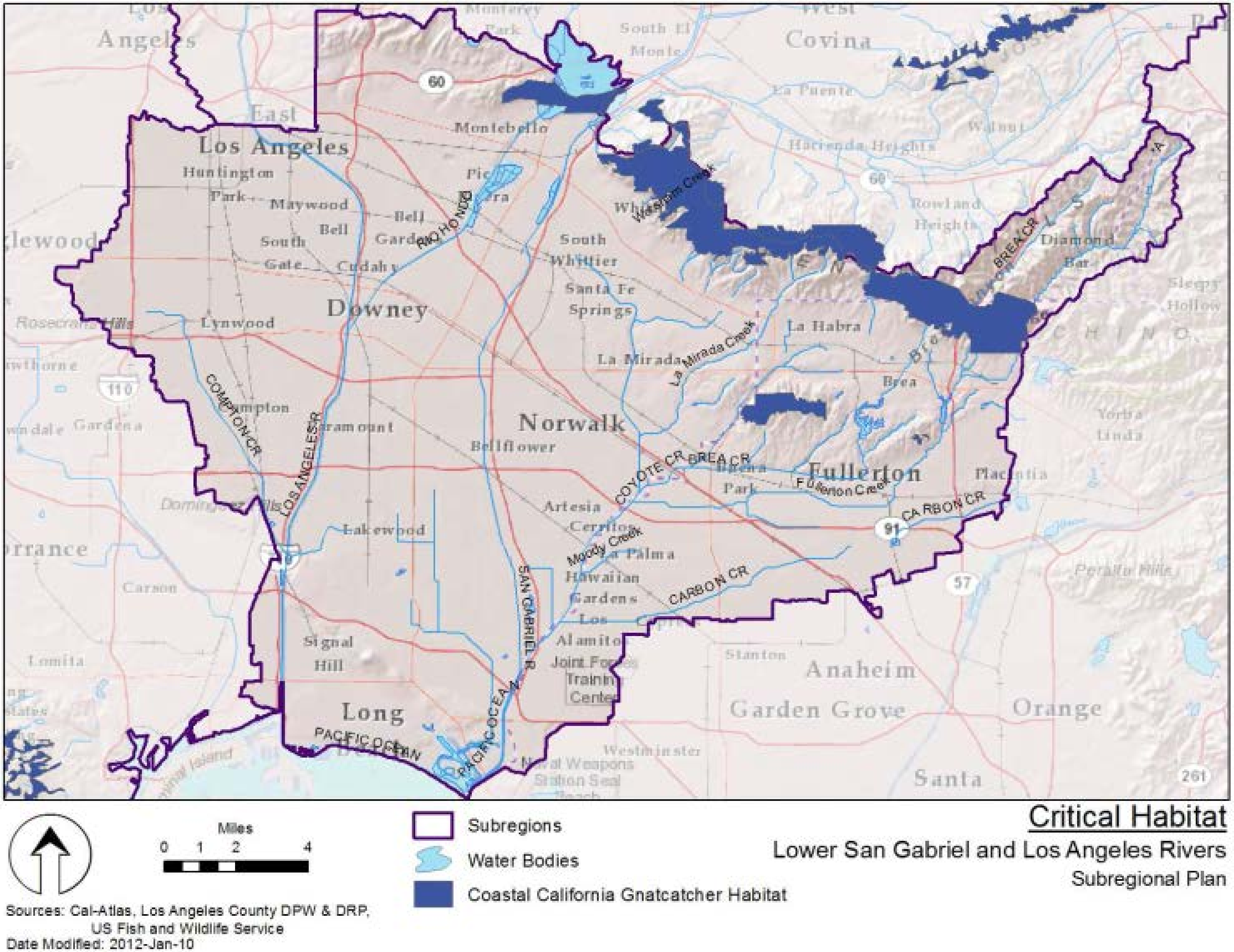


**Table 6: Existing Recreation and Open Space Land Area**

| Land Type | Acres |
|---|---|
| Developed Urban Park and Recreation Area | 7,000 acres |
| Open Space Lands | 5,090 acres |
| Greenways | 550 acres |
| Other/Miscellaneous | 50 acres |
| **Total Area in Subregion** | **12,690 acres** |

Land use types may include the following:

- Residential: duplexes and triplexes, single family residential, apartments and condominiums, trailer parks, mobile home courts and subdivisions
- Commercial: parking facilities, colleges and universities, commercial recreation, correctional facilities, elementary/middle/high schools, fire stations, government offices, office use, hotels and motels, health care facilities, military air fields, military bases, military vacant area, strip development, police and sheriff stations, pre-schools and day care centers, shopping malls, religious facilities, retail centers, skyscrapers, special care facilities, and trade schools
- Industrial: chemical processing, metal processing, manufacturing and assembly, mineral extractions, motion picture, open storage, packing houses and grain elevators, petroleum refining and processing, research and development, wholesaling and warehousing
- Transportation and Communication: airports, bus terminals and yards, communication facilities, electrical power facilities, freeways and major roads, harbor facilities, improved flood waterways and structures, maintenance yards, mixed transportation and utility, natural gas and petroleum facilities, navigation aids, park and ride lots, railroads, solid and liquid waste disposal facilities, truck terminals, water storage and transfer facilities
- Open Space / Recreation / Vacant: beach parks, cemeteries, golf courses, developed and undeveloped parks, parks and recreation, specimen gardens and arboreta, wildlife preserves and sanctuaries, abandoned orchards and vineyards, vacant undifferentiated, and vacant land with limited improvement

**Table 7: Land Use in the Lower San Gabriel and Los Angeles River Subregion**

| Land Use Type | Acres | Percentage |
|---|---|---|
| Residential | 134,533 | 47% |
| Open Space / Recreation / Vacant | 42,778 | 15% |
| Commercial | 36,999 | 13% |
| Industrial | 35,602 | 12% |
| Transportation, Utilities | 19,935 | 7% |
| Agriculture | 3,208 | 1% |
| Mixed Urban | 221 | <1% |
| Water | 11,148 | 4% |
| No Data | 606 | <1% |
| **Total** | **285,030** | **100%** |

**Figure 12: Parks, Recreation and Other Open Space**

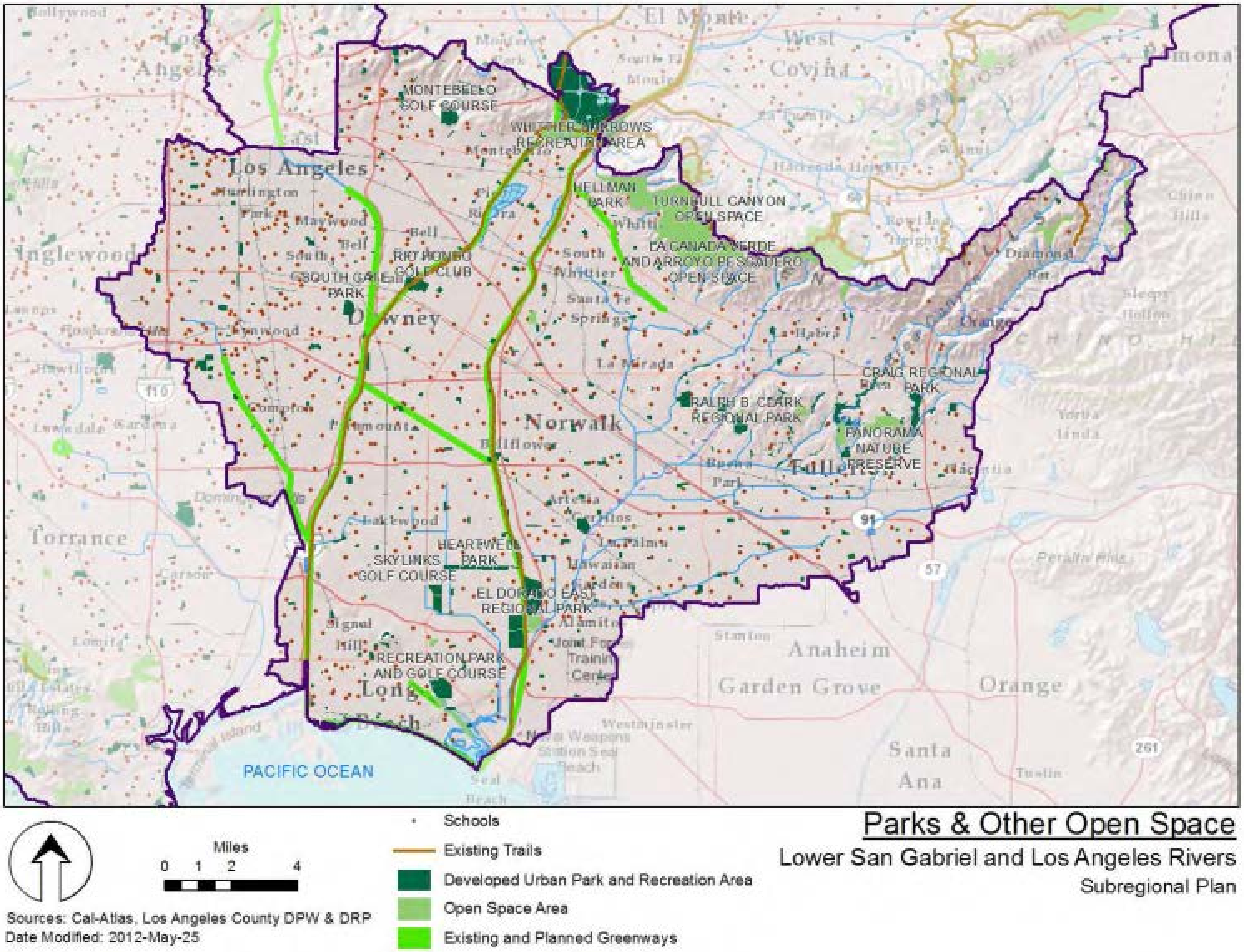
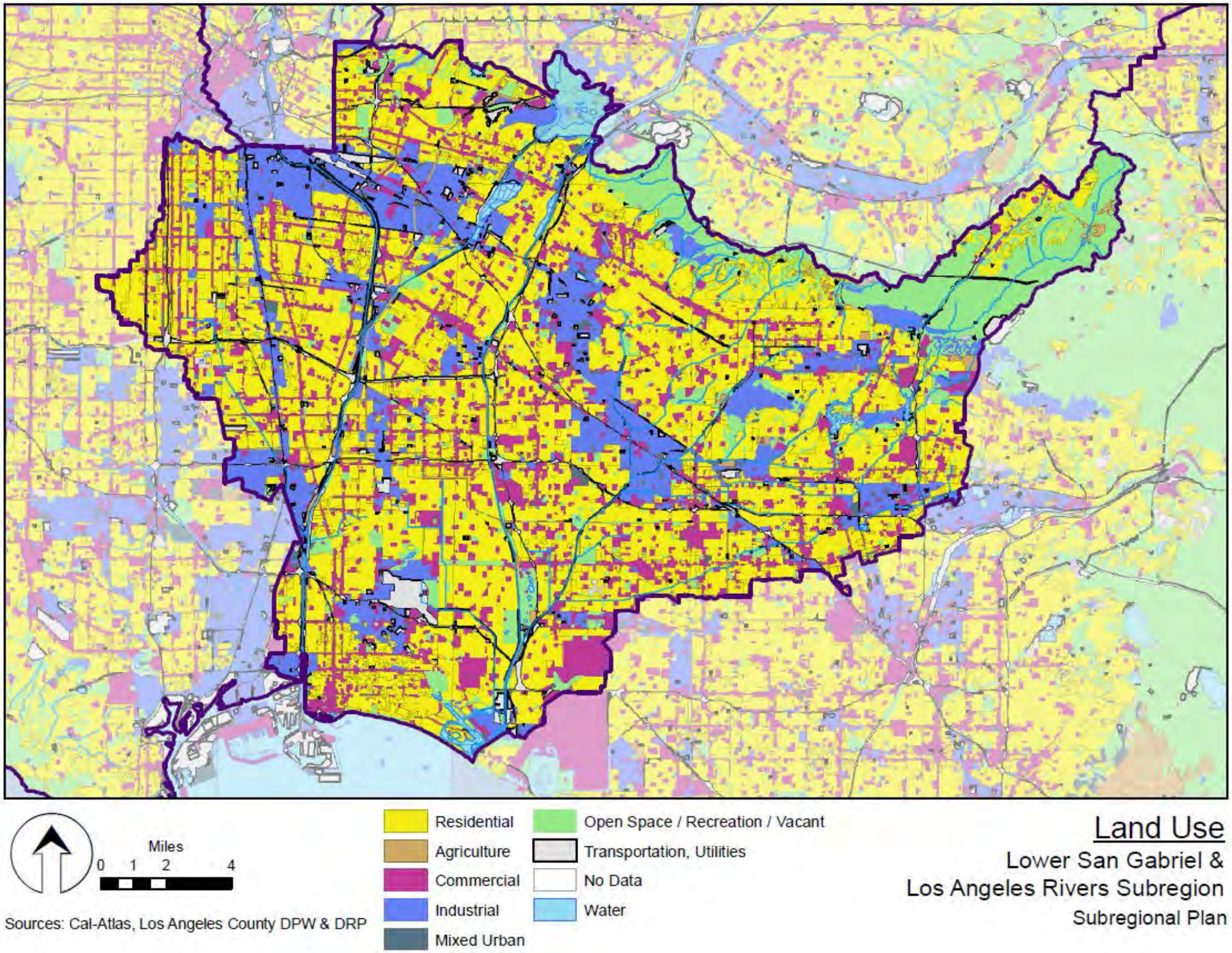


**Figure 13: Land Use**



# 3 Subregional Objectives and Targets

This section identifies the objectives for the Subregion and establishes quantified planning targets to the 2035 planning horizon that can be used to gauge success in meeting the objectives.

## 3.1 Objective and Target Development

The Greater Los Angeles County Regional IRWM Plan has developed regional goals, objectives, and targets. To assist the region in meeting these, objectives and targets have been developed for the Subregion. These objectives and targets are intended to help guide improvements to water supply, water quality, habitat, open space, and flood management to meet the Region's objectives and targets through subregional planning.

Five objectives have been articulated, based on recent water resource planning documents. Workgroups composed of Stakeholders from within the Region were involved in establishing the Plan's objectives and targets. To establish quantifiable benchmarks for implementation of the plan, planning targets were defined based on much discussion within the regional workgroup. Objectives for five water resource areas were identified for the Subregion, which are discussed below (and summarized in Table 8).

## 3.2 Water Supply Objective and Targets

Optimizing local water supply resources is vital for the Subregion to reduce its reliance on imported water and improve reliability of local water supplies should imported water supplies be reduced or interrupted due to environmental and/or political reasons. The Subregion plans on achieving this objective by conserving water through water use efficiency measures, creating an additional ability to pump groundwater, increasing the indirect potable reuse and non-potable reuse of recycled water, increasing ocean desalination, and increasing the infiltration, capture, and use of stormwater. In total, water supply targets will yield an additional 66,000 AFY of local supply for direct use, and 45,000 AFY of local supply for groundwater recharge.

To develop supply targets, water supply planning documents for agencies whose service areas cover a majority of the Subregion were examined for potential supply projects, and planned increases in supply between the years 2010 and 2035. The water supply targets for each Subregion were discussed in the *Water Supply Targets TM*.

## 3.3 Water Quality Objective and Targets

Improving the quality of urban and stormwater runoff will reduce or eliminate impairment of rivers, beaches, and other water bodies within and downstream of the Subregion. Improving the quality of urban and stormwater runoff would also make these local water supplies available for groundwater recharge. Additionally, the Subregion will continue to improve groundwater and protect drinking water quality to ensure a reliable water supply.

The Subregion plans on achieving these objectives by increasing the capacity to capture and treat runoff and prevent certain dry weather flows (see table above). The water quality target was determined by setting a goal of capturing ¾ inch of storms over the Subregion. The Subregion's target is to develop 14,400 AF of new stormwater capture capacity (or equivalent). An emphasis will be given to the higher priority catchments which will be determined by project-specific characteristics provided by the project proponent, including land use in the proposed project area, runoff and downstream impairments. It will be possible for the stormwater-related supply targets to overlap the water quality target.

The assumptions and calculations used to determine this target and catchment prioritization can be found in the *Water Quality Objectives and Targets TM*.

### 3.4 Habitat Objective and Targets

Protecting, restoring, and enhancing the Subregion's native habitats is vital to preserving areas that will contribute to the natural recharge of precipitation and improve downstream water quality. Additionally, the protection, restoration, and enhancement of upland habitat, aquatic habitat/marsh habitat, riparian habitat and buffer areas will help restore natural ecosystem processes and preserve long-term species diversity. Subregional targets for habitat were not developed, but Regional habitat target development is discussed in the *Open Space, Habitat and Recreation TM*.

### 3.5 Open Space and Recreation Objective and Targets

Open space and recreation areas provide space for native vegetation to create habitat and passive recreational opportunities for the community. In addition, open space and recreation areas may preserve or expand the area available for natural groundwater recharge (though only in the forebay areas), improve surface water quality to the extent that these open spaces filter, retain, or detain stormwater runoff, and provide opportunities to reuse treated runoff for irrigation. Subregional targets for open space and recreation were not developed, but Regional open space and recreation target development is discussed in the *Open Space, Habitat and Recreation TM*.

### 3.6 Flood Management Objective and Targets

Improved integrated flood management systems can help reduce the risk of flooding, and protect lives and property. The Subregion plans on meeting this objective by reducing 4,090 acres of local unmet drainage needs. The local unmet drainage target was determined by looking at Special Flood Hazard Areas (SFHAs), also known as flood plains, as defined by FEMA, compared to land uses and the presence of structures. Detailed assumptions and calculations used to develop the Subregion's flood target can be found in the *Flood Management Objectives and Targets TM*.

**Table 8: Subregion Objectives and Planning Targets**

| Objectives | | Regional Planning Targets |
|---|---|---|
| **Improve Water Supply** | | |
| Optimize local water resources to reduce the Subregion's reliance on imported water. | Water Use Efficiency | Conserve 19,000 AFY of water by 2035 through water use efficiency and conservation measures. |
| | Ground Water | Create ability to pump an additional 17,000 AFY using a combination of treatment, recharge, and storage access. |
| | Recycled Water | Increase indirect potable reuse of recycled water by 24,000 AFY.<br>Increase non-potable reuse of recycled water by 18,000 AFY. |
| | Ocean Desalination | Increase ocean desalination by 5,000 AFY. |
| | Stormwater | Increase capture and use of stormwater runoff by 7,000 AFY that is currently lost to the ocean.<br>Increase stormwater infiltration by 21,000 AFY. |
| **Improve Water Quality** | | |
| Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater, and wastewater. | Runoff (Wet Weather Flows) | Develop[3] 14,400 AF of new stormwater capture capacity (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[4]. |
| **Enhance Habitat** | | |
| Protect, restore, and enhance natural processes and habitats. | Habitat targets were not developed to the subregional level – only to the regional level. | |
| **Enhance Open Space and Recreation** | | |
| Increase watershed friendly recreational space for all communities. | Open space and recreation targets were not developed to the subregional level – only to the regional level. | |
| **Improve Flood Management** | | |
| Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. | Sediment Management and Integrated Flood Planning | Reduce flood risk in 4,090 acres of flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. |

[3] Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75", 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed).

[4] High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.

# 4 Partnership and Multi-benefit Opportunities

Many agencies and other entities have successfully been working together for decades on many collaborative projects. For instance in this Subregion, the entire system of flood management, conservation of local water supply, and recreation is a longstanding set of activities and facilities that represents collaboration and integration among the Los Angeles County Flood Control District, the Army Corps of Engineers, the Water Replenishment District of Southern California, the Sanitation Districts, Los Angeles County Department of Parks & Recreation and others. Projects that seek to enhance or extend these existing activities should be encouraged, because they will often be the most cost-effective.

Implementation of projects is the vehicle to meeting the objectives and planning targets discussed in Section 3. Integration and collaboration can help these projects achieve synergies and, at times, increase their cost-effectiveness in meeting multiple objectives. In addition to the collaboration described above, the GLAC IRWM Region will continue to build upon a wealth of potential multi-benefit project opportunities for partnership projects including:

- **Local Supply Development:** Alternative supply development such as distributed (smaller, non-centralized) stormwater capture projects are often too costly for a water supply agency to construct on their own for water supply purposes only. The near-term unit cost can be well in excess of the cost of imported water. However, partnerships often help to share the costs, thus providing opportunities for more complex, multi-benefit projects (such as water quality improvement) that otherwise might not be accomplished.
- **Improving Stormwater Quality:** In preparing this update of the IRWM Plan, a methodology to identify priority drainage areas based on their ability to improve water quality for coastal and terrestrial waters was developed. Integrated projects that can provide water quality improvements can be cited relative to that prioritization to achieve the highest benefits.
- **Integrated Flood Management:** Earlier studies, such as the Sun Valley Watershed Management Plan (2004), demonstrated the potential for similar cost-effective synergies between flood control, stormwater quality management, water supply, parks creation and habitat opportunities. Flood control benefits usually achieved through significant traditional construction projects can sometimes be accomplished with alternative multi-benefit projects.
- **Open Space for Habitat and Recreation:** When habitat is targeted for restoration, there are often opportunities for cost-effective implementation of flood control, stormwater management and passive recreation (such as walking and biking trails) as well.

These benefit synergies and cost effectiveness outcomes can best be attained when the unique physical, demographic and agency service area attributes of the region are considered. In addition to existing collaborative processes, the GLAC IRWMP has developed the geodatabase tool to assist in identifying areas and partnerships conducive to both inter-subregional and intra-subregional integrated project development. This section discusses this tool as well as some preliminary analyses on the Lower San Gabriel and Los Angeles Rivers Subregion’s potential partnerships and integrated project opportunities.

## 4.1 GLAC IRWMP Integration Process and Tools

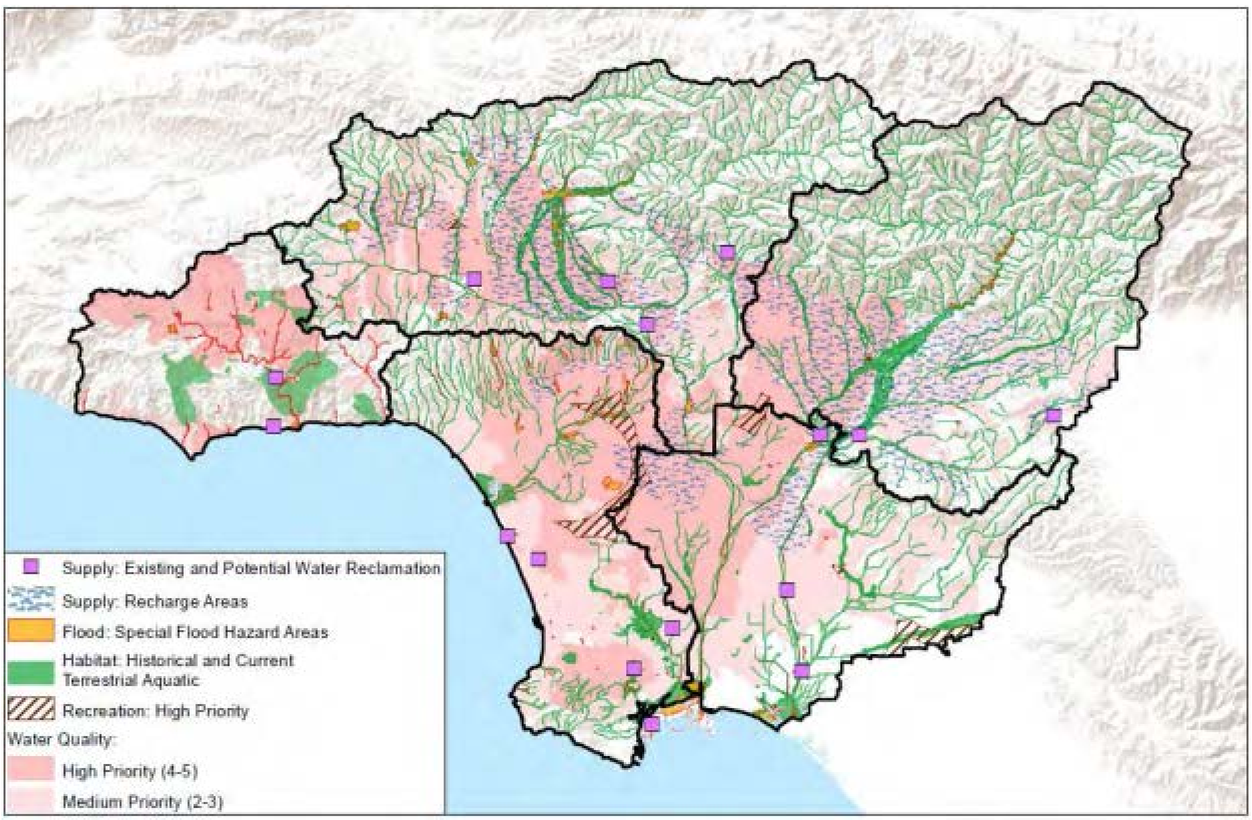
As part of the objectives and targets update process, the GLAC Region compiled and developed several geo-referenced data layers to assist in spatially identifying priorities and potential opportunities to achieve water supply, water quality, habitat, recreation and flood management benefits. These data layers were

initially used individually to determine the objectives and planning targets for each water management area. However, these datasets can also be overlaid to visually highlight areas with the greatest potential to provide multiple benefits. The resulting Potential Benefits Geodatabase (Geodatabase) can also align these areas relative to other layers containing agency service areas and jurisdictions – allowing for project proponents and partners to be identified.

## Potential Benefits Geodatabase

The GLAC IRWMP Potential Benefits Geodatabase is a dynamic tool that should be updated as new data is made available in order to maintain its relevance in the IRWM planning context. However, in order to provide an analysis of potential integration and partnership opportunities for the 2013 GLAC IRWM Plan, current data layers were overlaid and analyzed. The key layers used are shown in Figure 14 and described in Table 11. It should be noted that these datasets may not be complete or in need of further refinement and therefore will be updated on an as-needed basis – which is part of the dynamic process previously described. Therefore, the Geo-database should only be used as an initial step in identifying multi-benefit potential and by no means used to invalidate the potential for achieving benefits in other areas.

**Figure 14: GLAC Region Potential Benefits Geodatabase Layers**




## Using the Geodatabase

The Geodatabase is a dynamic visual tool. The data layers and maps shown in this Section are only some of a multitude of ways to package and view the datasets to help with the integration process. It is important to note that not all data that could be useful in identifying integration and partnership potential for the region is easily viewed spatially in this format. Therefore the Geodatabase should only be used as one of several potential integration tools or methods.

The Geodatabase can also be used to identify the potential for further integration between existing projects included in an IRWMP. Currently the GLAC Region has web-based project database (OPTI) thdat geo-references all projects included in the IRWM. As part of the 2013 Plan Update, this dataset of projects will eventually be updated and prioritized. This resulting project dataset could be included as a layer in the Geodatabase or conversely, the existing Geodatabase layers could be uploaded to OPTI for public viewing and made available to OPTI users. In the future, additional layers, such as groundwater quality and general plan areas, can be added to the Geodatabase to enhance the ability of project proponents to identify integration opportunities. Either way, by overlaying the current projects on top of the potential benefit layers, additional benefits could be added to existing project or linked to other projects and proponents through those benefits.

**Table 9: Potential Benefit Geodatabase Layers**

| Data Layer | Description |
|---|---|
| Supply: Recharge Areas[1] | Shows areas where soils suitable for recharging are above supply aquifer recharge zones. Thereby indicating that water infiltrating in these areas has the potential to increase groundwater supplies. |
| Supply: Existing and Potential Water Reclamation[2] | Shows locations of existing wastewater and water reclamation plants. |
| Flood: Special Flood Hazard Areas[3] | Shows some of the areas that would benefit from increased drainage to alleviate flooding potential. |
| Habitat: Historical and Current Aquatic[4] | Shows the combined current and historical habitat areas that would indicate the potential for aquatic habitat protection, enhancement, or restoration benefits to be derived. (Note: North Santa Monica Bay Subregion did not have similar data so it shows Significant Ecological Areas instead[5].) |
| Recreation: High Priority[6] | Shows areas that have the greatest need for open space recreation given the distance from current open space recreation sites. |
| Water Quality: Medium and High Priority[7] | Shows watershed areas with medium and high priority and therefore relative potential to improve surface water quality. |

[1] Created using Los Angeles County's groundwater basins shapefile overlaid with soils and known forebays shapefiles

[2] Created by RMC Water and Environment for the Los Angeles Department of Water and Power's Recycled Water Master Planning program to show sources of wastewater that could be made available for recycled water use.

[3] Created by Federal Emergency Management Agency to define areas at high risk for flooding (subject to inundation by the 1% annual chance flood event) and where national floodplain management regulations must be enforced.

[4] From *Regional restoration goals for wetland resources in the Greater Los Angeles Drainage Area: A landscape-level comparison of recent historic and current conditions using GIS* (C. Rairdan, 1998) and additional current aquatic habitat is based on the extent of current habitat derived from the National Wetlands Inventory.

[5] Significant Ecological Areas are those areas defined by Los Angeles County as having ecologically important land and water systems that support valuable habitat for plants and animals.

[6] Created for the *GLAC IRWM Open Space for Habitat and Recreation Plan (2012)*, and shows where there is less than one acre of park or recreation area per one thousand residents.

[7] Created for the *GLAC IRWM Water Quality Targets TM (2012)*, which ranked catchments based on TMDLs, 303(d) listings and catchments that drain into Areas of Special Biological Significance (ASBS).

### 4.2 Lower Los Angeles and San Gabriel Integration and Partnership Opportunities

Planning for the GLAC Region is primarily done on a subregional level, given that each subregion has a unique set of physical characteristics and stakeholders that create opportunities for project identification and collaboration. Therefore, the Geodatabase layers are more useful when examined and discussed on a subregional scale. Figure 15 focuses on the Lower San Gabriel and Los Angeles River Subregion and highlights just a few unique areas within the subregion that have potential for generating multiple benefit projects. These areas described here are meant to provide examples of potential multiple benefits areas and are not meant to be a comprehensive inventory of opportunities. As subregions move forward to identify potential projects, it will be necessary to examine localized site characteristics (such as land uses) to confirm that it will be possible to meet the potential benefits discussed below.

- There is a relatively high need for recreational open space in three different areas.
- There are critical recharge areas for the Central Basin in the upper Subregion (where the hydrolgeology is the most favorable for recharge) while the majority of pumping is done in the southern portion of the basin.
- The western portion of the Subregion has high priority drainage areas for water quality improvements that also overlap some of the recharge areas.
- There are coastal areas that could provide both flood control and habitat benefits.
- There are several sources of recycled water supply that could be further utilized as local supply, though it should be noted that this could be limited by contractual agreements for existing and future recycled water supplies.

The following sections highlight a few areas in the Subregion where integration and partnership opportunities could be found based upon the Geodatabase layers and multiple benefit analysis performed.

#### A: South Central Los Angeles Area Recreation, Recharge, Stormwater Quality Benefits

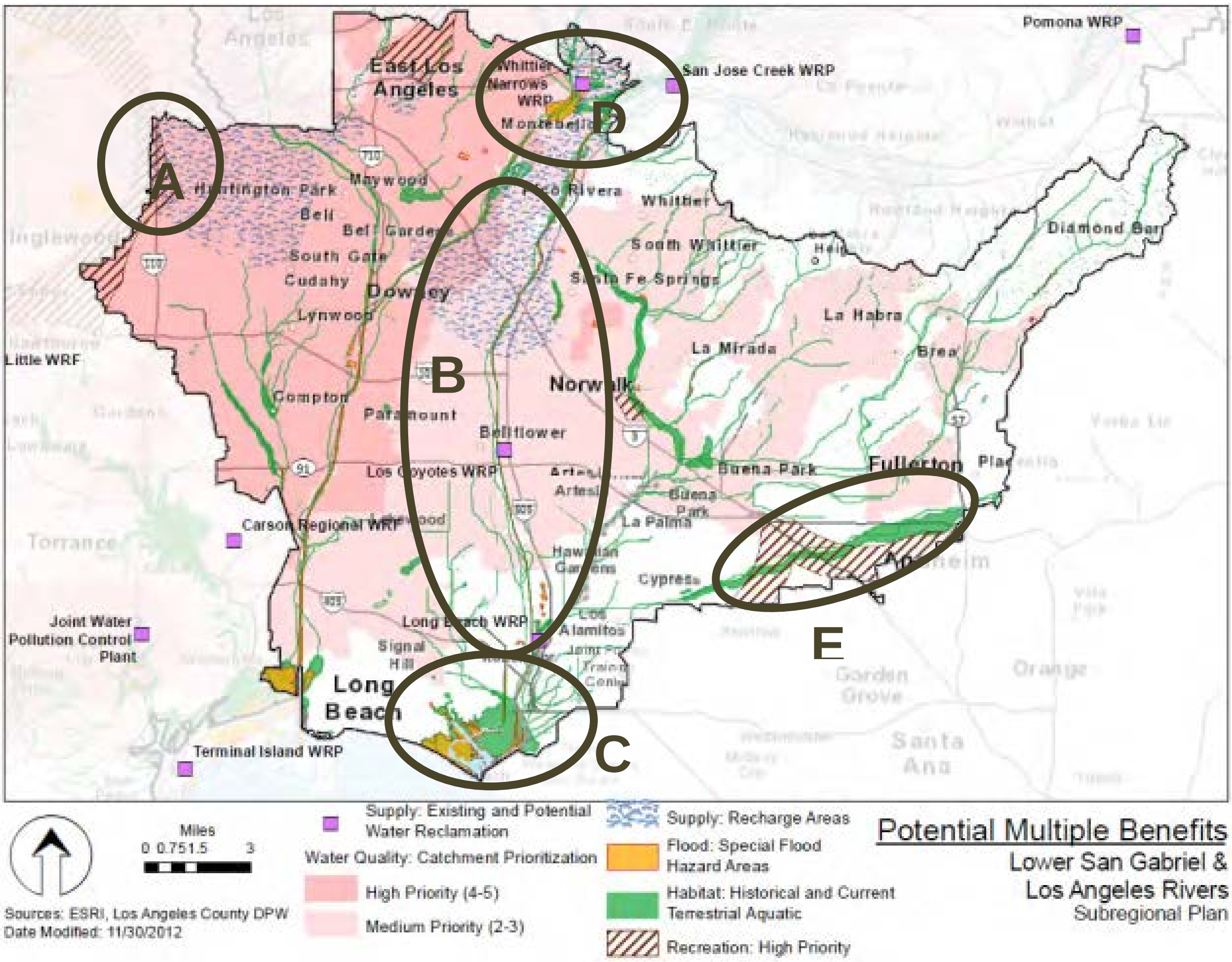
There are areas with the potential for groundwater recharge in the northwestern area of the subwatershed (South Central Los Angeles) overlying the Central Basin. Additionally, there are park-poor areas which also overlay high priority stormwater management catch basins. These recharge areas predominately lie within high priority areas for water quality improvements. Given that this area is heavily urbanized, it would be well suited for decentralized stormwater capture and use projects as well as infiltration BMP's that could achieve water quality and groundwater water supply benefits. Because it is park-poor, finding locations that can be converted from industrial use to parkland with infiltration for stormwater (where industrial areas border residential areas) shows promise. Care would need to be taken in the heavily industrialized areas that soils are not contaminated before infiltration is encouraged here.

Partnerships between WRD, Central Basin MWD and the City of Los Angeles, and cities such as Vernon and Huntington Park as well as unincorporated Los Angeles County could result in integrated projects.

#### B. Central Basin Recharge and Pumping

The majority of pumping demand needs are in the southern more heavily urbanized portion of the Subregion, however replenishment is conducted at the northern forebay recharge facilities. Although there are both underutilized recycled water and stormwater supplies available, the ability to infiltrate more supply is limited by the rapidity at which supplies can be pumped to ensure that mounding does not become an issue. Pumping in closer proximity to the recharge could prevent mounding. Partnership projects that would seek to create a recharge and pumping balance could be explored between the southern Central Basin pumpers and the WRD.

**Figure 15: Lower Los Angeles & San Gabriel Subregion Potential Multiple-Benefits**




## C. Lower San Gabriel River Watershed and Seal Beach Habitat Improvements and Flood

The mouth of the San Gabriel River provides opportunities for integrated project development that could result in achieving habitat and flood control benefits. Integrated flood management projects would become even more beneficial as a way to adapt to sea level rise as a result of climate change. Partnership opportunities exist between LACFCD, the City of Long Beach and the City of Seal Beach.

## D. Intra-Regional Montebello Forebay Recharge and Open Space

The San Gabriel River Valley narrows in the Montebello area which also provides the dividing line between the Upper San Gabriel and Rio Hondo Subregion and the Lower Los Angeles and San Gabriel Subregion. This area is also the main recharge forebay for the Central Basin where several spreading ground facilities are located. Although somewhat urbanized relative to other densities in the Region, this area also provides a great deal of open space given those facilities. Preserving and further enhancing the spreading capacity is critical to meeting supply goals, as well as water quality goals. Increased stormwater infiltration will lessen the amount of contaminants able to be transported further downstream. If there are projects that could also incorporate both habitat and recreation elements without compromising these primary functions, there is the potential for achieving further integrated and beneficial results.

Recycled water supplies in this area could be further maximized for increased recharge and supply benefits. Partnerships with WRD, LACSD, LACFCD, Central Basin MWD, Central Basin pumpers and overlying cities could also benefit from above ground open space.

### E. Anaheim and Fullerton Recreational and Habitat Open Space

There is a significant band of priority area for recreational open space in this swath of Orange County overlapping aquatic habitat areas. Water supply or quality projects in this area could be developed to include both recreation ad habitat components to achieve those benefits. Partnership opportunities exist for the Mountains and Rivers Conservancy or similar conservancies in Orange County along with the Cities of Anaheim and Fullerton.

## References

Central Basin Judgment, 1991. *Central and West Basin Water Replenishment District, etc., vs Charles E. Adams, et al. case no. 786,656 Second Amended Judgment, May 6, 1991.* http://www.water.ca.gov/watermaster/centralbasin_judgment/index.cfm

Fullerton, City of, 2011. 2010 Urban Water Management Plan

Long Beach, City of, 2011. 2010 Urban Water Management Plan

Los Angeles, City of, 2011. *2010 Urban Water Management Plan.*

Los Angeles County Department of Public Works (LACDPW), 2011. Annual Hydrologic Report 2009-2010.

Metropolitan Water District of Southern California (MWD), 2010. *Integrated Regional Plan.*

MWD, 2007. *Groundwater Assessment Study.* Report Number 1308. http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/GWAS.html

Palos Verdes Peninsula Land Conservancy, 2011. *Restoration and Land Stewardship.* http://www.pvplc.org/_lands/stewardship.asp

Regional Water Quality Control Board - Los Angeles Region (RWQCB), 2008. *State of the Watershed - Report on Surface Water and Sediment Quality, The Dominguez Channel and Los Angeles/Long Beach Watershed Management Area*. 2nd Edition. November.

RWQCB, 2011. Shapefiles of Permitted Storm Sewer System (MS4) Discharges, Industrial General Discharges, and Caltrans Discharges.

RWQCB, 2000. *State of the Watershed - Report on Surface Water Quality, The San Gabriel River Watershed.* June.

State Water Resources Control Board (SWRCB), 2010. *2010 Integrated Report (Clean Water Act Section 303(3) List / 305(b) Report) - Statewide.* http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

Southern California Association of Governments (SCAG), 2012. *Adopted 2012 RTP Growth Forecast.* http://www.scag.ca.gov/forecast/index.htm

U.S. Census Bureau, 2012. *2010 Census Data*. Census tract.

West Basin Municipal Water District, 2011. *2010 Urban Water Management Plan.*

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# Exhibit A. Regional Imported Water Information

### *State Water Project*

The SWP is a system of reservoirs, pumps and aqueducts that carries water from Lake Oroville and other facilities north of Sacramento to the Sacramento-San Joaquin Delta and then transports that water to central and southern California. Environmental concerns in the Sacramento-San Joaquin Delta have limited the volume of water that can be pumped from the SWP. The potential impact of further declines in ecological indicators in the Bay-Delta system on SWP water deliveries is unclear. Uncertainty about the long-term stability of the levee system surrounding the Delta system raises concerns about the ability to transfer water via the Bay-Delta to the SWP.

The MWD contract with the Department of Water Resources (DWR), operator of the SWP, is for 1,911,500 acre-feet/year. However, MWD projects a minimum dry year supply from the SWP of 370,000 acre-feet/year, and average annual deliveries of 1.4 million acre-feet/ year. These amounts do not include water which may become available from transfer and storage programs, or Delta improvements.

MWD began receiving water from the SWP in 1972. The infrastructure built for the project has become an important water management tool for moving not only annual deliveries from the SWP but also transfer water from other entities. MWD, among others, has agreements in place to store water at a number of groundwater basins along the aqueduct, primarily in Kern County. When needed, the project facilities can be used to stored move water to southern California.

### *Colorado River Aqueduct*

California water agencies are entitled to 4.4 million acre-feet/year of Colorado River water. Of this amount, the first three priorities totaling 3.85 million acre-feet/year are assigned in aggregate to the agricultural agencies along the river. MWD’s fourth priority entitlement is 550,000 acre-feet per year. Until a few years ago MWD routinely had access to 1.2 million acre-feet/year because Arizona and Nevada had not been using their full entitlement and the Colorado River flow was often adequate enough to yield surplus water to MWD. According to its 2010 Regional UWMP, MWD intends to obtain a full 1.2 million acre-feet/year when possible through water management programs with agricultural and other holders. MWD delivers the available water via the 242-mile Colorado River Aqueduct, completed in 1941, which has a capacity of 1.2 million acre-feet per year.

The Quantification Settlement Agreement (QSA), executed in 2003, affirms the state’s right to 4.4 million acre-feet per year, though water allotments to California from the Colorado River could be reduced during future droughts along the Colorado River watershed as other states increase their diversions in accord with their authorized entitlements. California’s Colorado River Water Use Plan and the QSA provide the numeric baseline to measure conservation and transfer water programs (such as the lining of existing earthen canals) thus enabling the shifting of some water from agricultural use to urban use. Since the signing of the QSA, water conservation measures have been implemented including the agriculture-to-urban transfer of conserved water from Imperial Valley to San Diego, agricultural land fallowing with Palo Verde, and the lining of the All-American Canal.


# J. North Santa Monica Bay Subregional Plan

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# North Santa Monica Bay Subregional Plan

# Final

**Prepared by:**

In Association with:

**October 2013**

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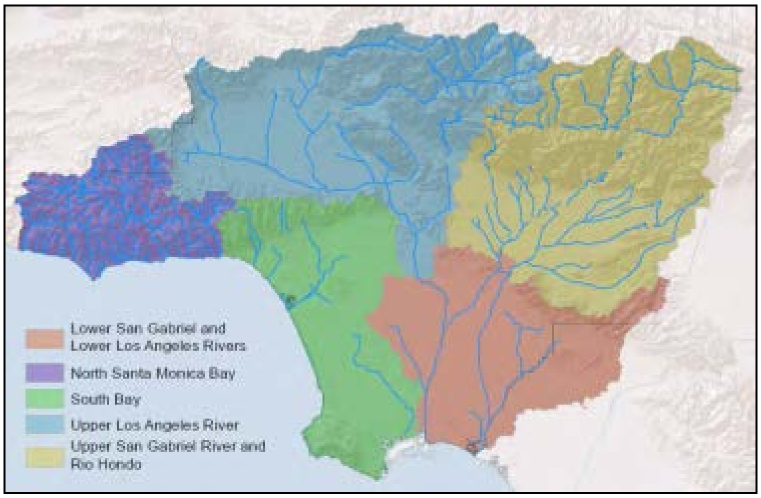
# 1 Background and Purpose of Subregional Plan

The North Santa Monica Bay Subregional plan is one of five Subregional plans that make up the Greater Los Angeles County Integrated Regional Water Management Plan (GLAC IRWM Plan). This Subregional plan describes the North Santa Monica Bay's physical setting, sources of water supply, water quality, environmental resources, planning objectives and targets, and partnership and multi-benefit opportunities. The purpose of the North Santa Monica Bay Subregional plan is to outline its expected contribution to meeting the GLAC regional planning goals, objectives, and targets.

# 2 North Santa Monica Bay Subregion Description

## 2.1 Physical Setting

**Figure 1: GLAC Subregional and Watershed Boundaries**




The North Santa Monica Bay is one of five Subregions within the Greater Los Angeles County Integrated Regional Water Management Region (GLAC IRWM Region). It is located at the western extent of Los Angeles County and comprises 203 square miles (Figure 1). This Subregion's boundaries reflect the combined watershed boundaries of Malibu Creek, Topanga Creek, and western Los Angeles County coastal watersheds from the mouth of Topanga Creek west to the county line to include the Arroyo Sequit Watershed. These watersheds include portions of Ventura County, including the City of Oak Park, a portion of Thousand Oaks, and parts of unincorporated Ventura County.

In contrast to other subregions within the region, 89% of the North Santa Monica Bay Subregion is comprised of undeveloped open space. The remaining 11% of land use is primarily residential and concentrated along the coastline and interior valleys.

The natural conditions include an array of significant vegetative and habitat resources, key watersheds that drain through wooded canyons into the Santa Monica Bay, spectacular views, rugged mountains, sheltered coves, and steep unstable slopes. There is a high potential for brush fires and many large faults pose a high seismic risk. For example, during the 1994 Northridge earthquake, there were large surface ruptures near Las Virgenes Road south of Agoura Road. There are large areas with high groundwater and geologic instability along the coast that affect stormwater management decisions.

Most of the area is within the boundaries of the Santa Monica Mountains Recreation Area, a unit of the National Park System. In addition to federal park land, there are a variety of open space land owners, including:

- State Department of Parks and Recreation
- Los Angeles County Parks
- Los Angeles County Department of Beaches and Harbors
- Other Los Angeles County Land (non-parkland)
- Mountain Resources Conservation Authority

- Santa Monica Mountains Conservancy
- University of California Reserve
- Mountains Restoration Trust
- Conejo Open Space Conservation Agency Open Space
- City of Calabasas Parks
- City of Los Angeles Parks
- Other City of Los Angeles Land (non-parkland)
- City of Malibu Parks and private parcels with large open space areas preserved through permits
- City of Thousand Oaks Parks
- Las Virgenes Municipal Water District
- State Lands Commission
- Miscellaneous Public Land
- Other Private Land

The Subregion is also home to over a dozen endangered and threatened species, including the southernmost Steelhead Trout population in the state and Tidewater Goby. The State Lands Commission owns the entire shoreline and preserves public access to the coast in partnership with various agencies that maintain over 10 miles of public beaches and 18 public vertical accessways along the coast.

### *Public Parklands and Recreation*

The public parkland and recreation use within the NSMB subregion is a defining feature of this area. Much of the NSMB subregion coincides with the Santa Monica Mountains National Recreation Area (SMMNRA). Within the 153,250-acre legislative boundary of SMMNRA, 55% of the land ownership is public parkland and other publicly protected open space, including the beaches and a 500-mile public recreational trail network. SMMNRA recreational visitation is approximately 33 million visitors annually. The public parkland and protected open space provide water quality protection through maintaining native habitat cover and associated resource services, such as rainfall infiltration and absorption of non-point source pollution from local roadways and other impermeable surfacing. The parkland agencies' natural resource education programs, as part of the mission of the national recreation area, educate the public about the importance of protecting and conserving water resources. The public trail network provides for the physical and emotional rejuvenation of many visitors who live in the highly urbanized areas of greater Los Angeles. Over 11 miles of the coastline are special marine protected areas including Areas of Special Biological Significance (ASBS) and 4.5 miles within the ASBS as two Point Dume Marine Protected Areas.

### *Political Boundaries*

The Subregion consists of seven cities, unincorporated areas of Los Angeles and Ventura Counties and other communities as depicted in Figure 2 . Based on census tract information from the 2010 census, the 2010 population of the Subregion is estimated to be 107,000. According to population growth projections from the Southern California Association of Governments (SCAG) for Los Angeles County, population is expected to increase at an average rate of 0.5% per year out to 2035. Applying this growth projection to the estimated 2010 populations in the Subregion indicates that by 2035 the population is expected to grow to 122,000. (SCAG, 2012; U.S. Census Bureau, 2012)

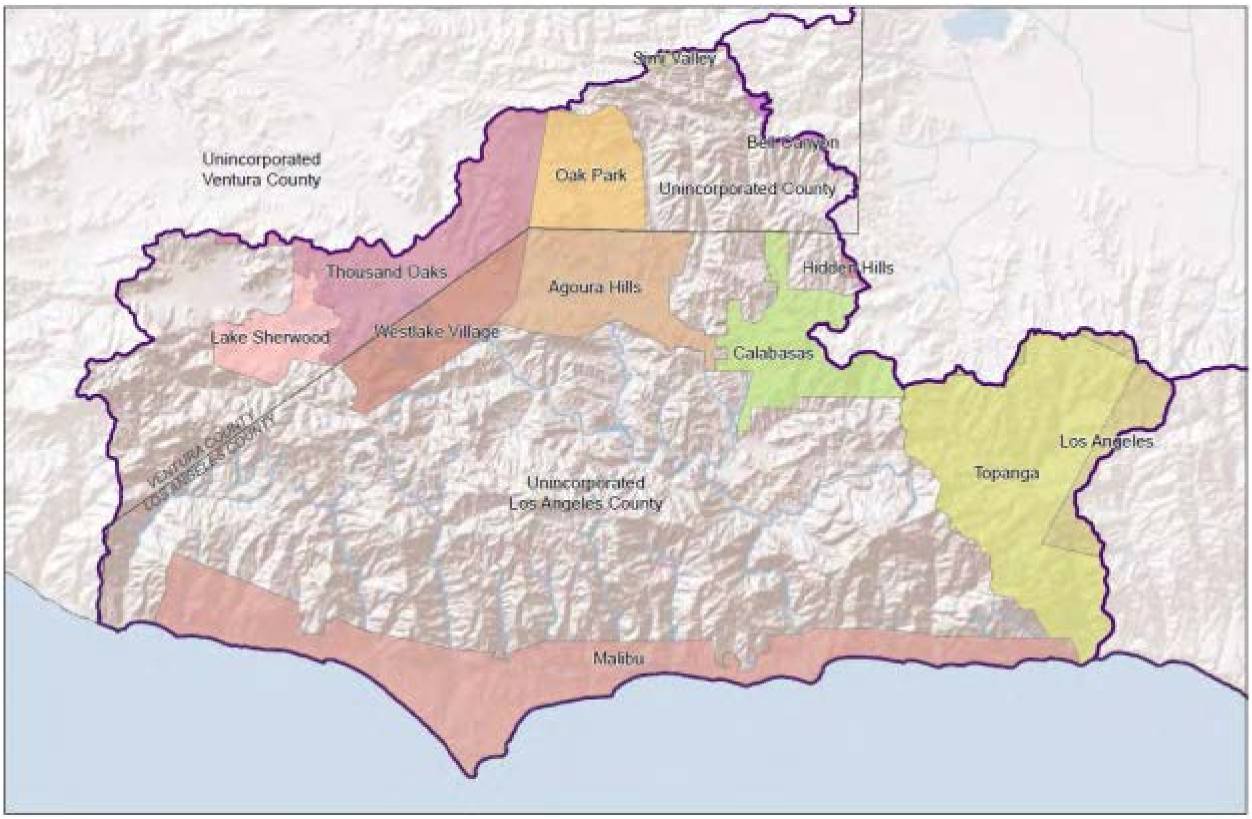
### *Climate, Temperature, and Rainfall*

The North Santa Monica Bay Subregion is within a Mediterranean climate zone. Summers are typically dry and warm while winters are wet and cool. Precipitation falls in a few major storm events between

November and March. However, the Subregion also experiences infrequent periods of extremely hot weather, winter storms, and dry hot Santa Ana winds.

Because of its location on Santa Monica Bay, morning fog is a common occurrence in May, June and early July (caused by ocean temperature variations and currents). As a general rule, the coastal temperature is from 5 to 10 degrees Fahrenheit (3 to 6 degrees Celsius) cooler than it is inland. The warmest temperatures tend to occur in September. The rainy season is from late October through late March. Winter storms usually approach from the northwest and pass quickly through the GLAC Region. There is very little rain during the rest of the year. Yearly rainfall totals are unpredictable as rainy years are occasionally followed by droughts.

**Figure 2: Cities and Communities in the Subregion**




*Geography and Geology*

The geography of the Subregion can generally be divided into three distinct types: a narrow coastal plain, the Santa Monica Mountains and Simi Hills, and the Conejo Valley, which separates the two ranges. The Santa Monica Mountains and Simi Hills are part of the east-west Transverse Ranges between the Pacific Ocean and the inland valleys. The Santa Monica Mountains extend for approximately 40 miles.

The Santa Monica Mountains are extensively faulted. The two most prominent faults in the Santa Monica Mountains consist of the Sycamore Canyon and Boney Mountain Faults at the western end of the range and the Malibu Coast Fault that runs east to west along the coastal boundary of the park. (NPS, 2012)

The most common geologic formation of the Subregion is the Conejo Volcanics, which dominates the rugged ridgeline of the western Santa Monica Mountains. Malibu Creek cuts through the Santa Monica Mountains to drain the Simi Hills. The headwaters of Malibu and Topanga Creeks, the two largest watersheds in the Subregion, are dominated by the Miocene marine Modelo Formation, a depositionally distinct unit of Monterey Shale, California's primary petroleum source rock. The Monterey and Modelo Formation (12% of surface area) are recognized as a source of elevated concentrations of hazardous trace elements in runoff. Tertiary marine and non-marine sedimentary formations constitute almost 50% of surface area in the Subregion, volcanic accounting for 32%, and Quaternary sediments accounting for 15%. (USGS, 2002)

## 2.2 Watersheds and Water Systems

*Watersheds*

The North Santa Monica Bay Subregion is defined by the watershed boundaries of Malibu Creek, Topanga Creek and western Los Angeles County coastal watersheds from the mouth of Topanga Creek west to the western boundary of Arroyo Sequit at the county line (Figure 3). The major watersheds are Malibu Creek (including Las Virgenes, Triunfo Creek and Medea Creeks), Topanga Canyon Creek, Trancas Creek, Zuma Creek, Ramirez Creek, Escondido Creek, Solstice Creek and Las Flores Creek. These watersheds feed both the Pacific Ocean (Santa Monica Bay) and numerous riparian corridors.

*Flood Management and Infrastructure*

Flood management is important to protect human lives and property, particularly in the North Santa Monica Bay where, historically, flooding has been an issue exacerbated by wildfires and changes to the natural landscape. The Los Angeles County Flood Control District manages most of the Subregion's flood infrastructure such as storm drains, culverts, and debris basins. Flood control facilities in the Subregion are shown in Figure 4. The City of Malibu is responsible for the construction and maintenance of storm drain systems, which consist of pipelines, catch basins, open channels, and retention pond in addition to the facilities owned and managed by Los Angeles County and the California Department of Transportation. Floods in the sub-region are also managed by natural streams as depicted in Figure 3.

*Water Suppliers*

The wholesale water suppliers in the North Santa Monica Bay Subregion include the Metropolitan Water District of Southern California (MWDSC), West Basin Municipal Water District (West Basin) and Calleguas Municipal Water District (Calleguas), both of which are direct MWDSC member agencies (Figure 5). Retail water agencies include Las Virgenes Municipal Water District (Las Virgenes) and Los Angeles County Waterworks District #29 (Waterworks) (Figure 6). These suppliers use a combination of imported water and recycled water to serve potable and non-potable demand in their service areas. Each of these major suppliers has written a comprehensive 2010 Urban Water Management Plan (UWMP) to estimate future water supply demands and availability, and which were utilized in estimation of the Subregion's supplies and demand discussed below.

## 2.3 Water Supply

The North Santa Monica Bay Subregion depends primarily on imported water to meet its potable water demands. Local water supplies are primarily non-potable supplies, including recycled water and small, non-potable groundwater basins. Imported water is provided by the wholesale agencies West Basin and Calleguas and the retail agency Las Virgenes, all of which purchase the water from MWDSC that delivers water imported primarily via the State Water Project (SWP) from northern California, and also from the Colorado River Aqueduct.

Factors that impact reliability include operational constraints such as court ordered pumping restrictions on imported water from the San Joaquin-Sacramento River Delta (Delta) for endangered species protection. Water quality concerns such as high salinity levels can require that water from the Colorado River be blended with higher quality SWP water. Invasive species, such as the quagga mussel, can force extensive maintenance of systems reducing operational flexibility. The entire Subregion receives between 93% and 100% State Water Project Water, and between 0% and 7% Colorado River Water. Individual agencies, districts and cities taking delivery of imported water receive an average blend of 0% to 50% Colorado River water, and 50% to 100% State Water Project water, depending on the wholesale agency and current supply conditions.

Another major factor in the coastal areas of the sub-region is the aging delivery and storage facilities of Waterworks serving the City of Malibu and unincorporated area of Topanga Canyon watershed; an area of about 47 square miles (30,000 acres). Waterworks currently serves 20,000 people through 7,500 metered connections and delivers water through many facilities that were installed from 1928 to 1970. Waterworks recently completed a Water System Master Plan (WSMP) to evaluate of the water system under existing and future water demand conditions through year 2035, and to prepare a Capital Improvement Program (CIP), including prioritization, phasing and cost estimates.

Significant deficiencies were identified by Waterworks in its service area: 1) the current available storage capacity is 20.8 MG, while the total storage volume required is approximately 25 MG, yielding a storage deficit of 4.2 MG. In the future system (2035), the total storage volume required is approximately 32 MG, 2) 11 new booster pump stations are recommended to meet existing system deficiencies and 11 additional booster pump stations are recommended to meet future system demands, and 3) existing pipeline deficiencies were analyzed using a computer hydraulic model to locate existing “bottlenecks” and fire flow deficits throughout the system. The recommended total pipeline upgrades needed for the existing water demands and fire flows include 30.5 miles of water pipes. Total project cost estimate of $266,500,000 would be implemented in phases and would require many different funding sources.

**Figure 3: Watersheds and Streams of the NSMB Subregion**

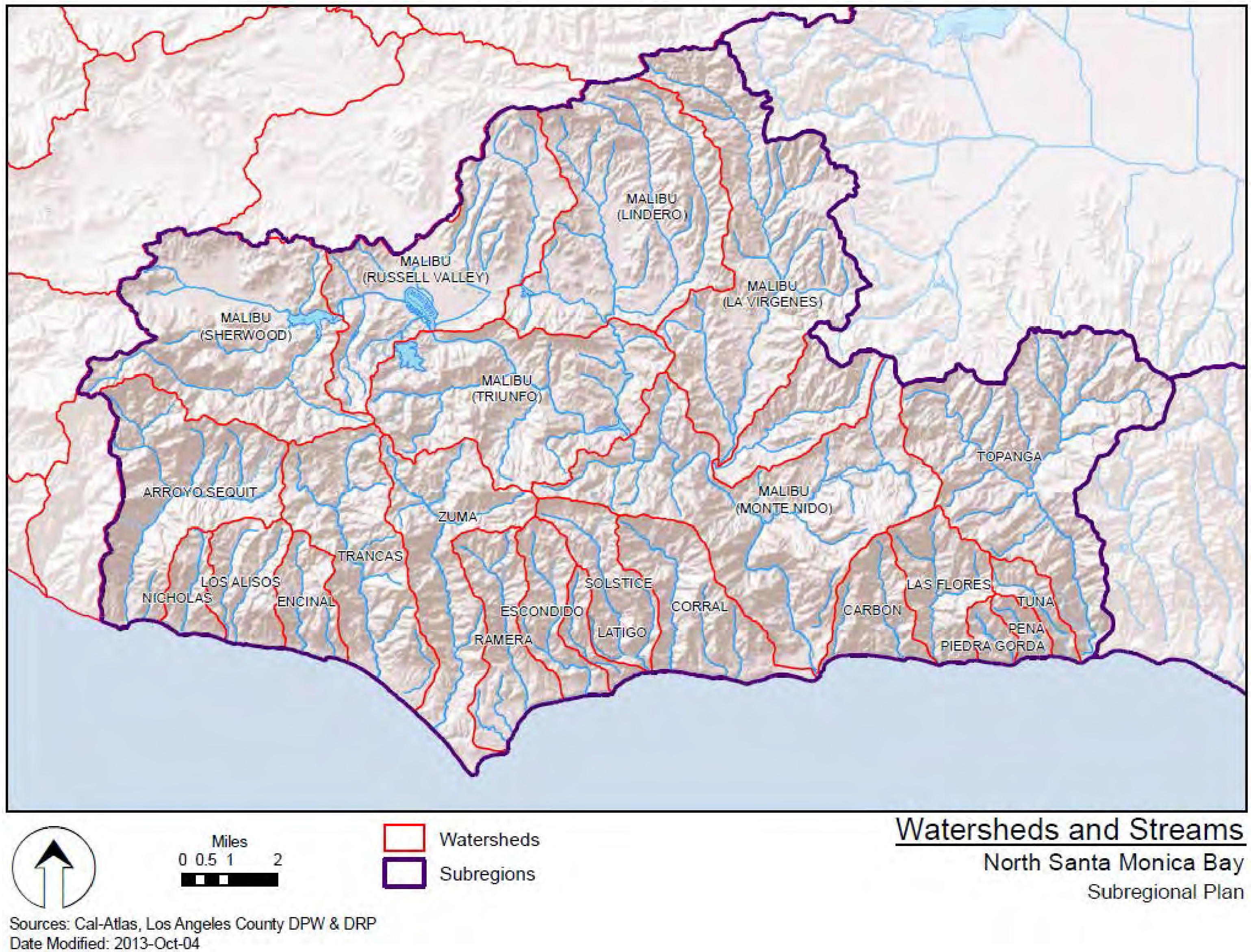


**Figure 4: Flood Control Facilities**

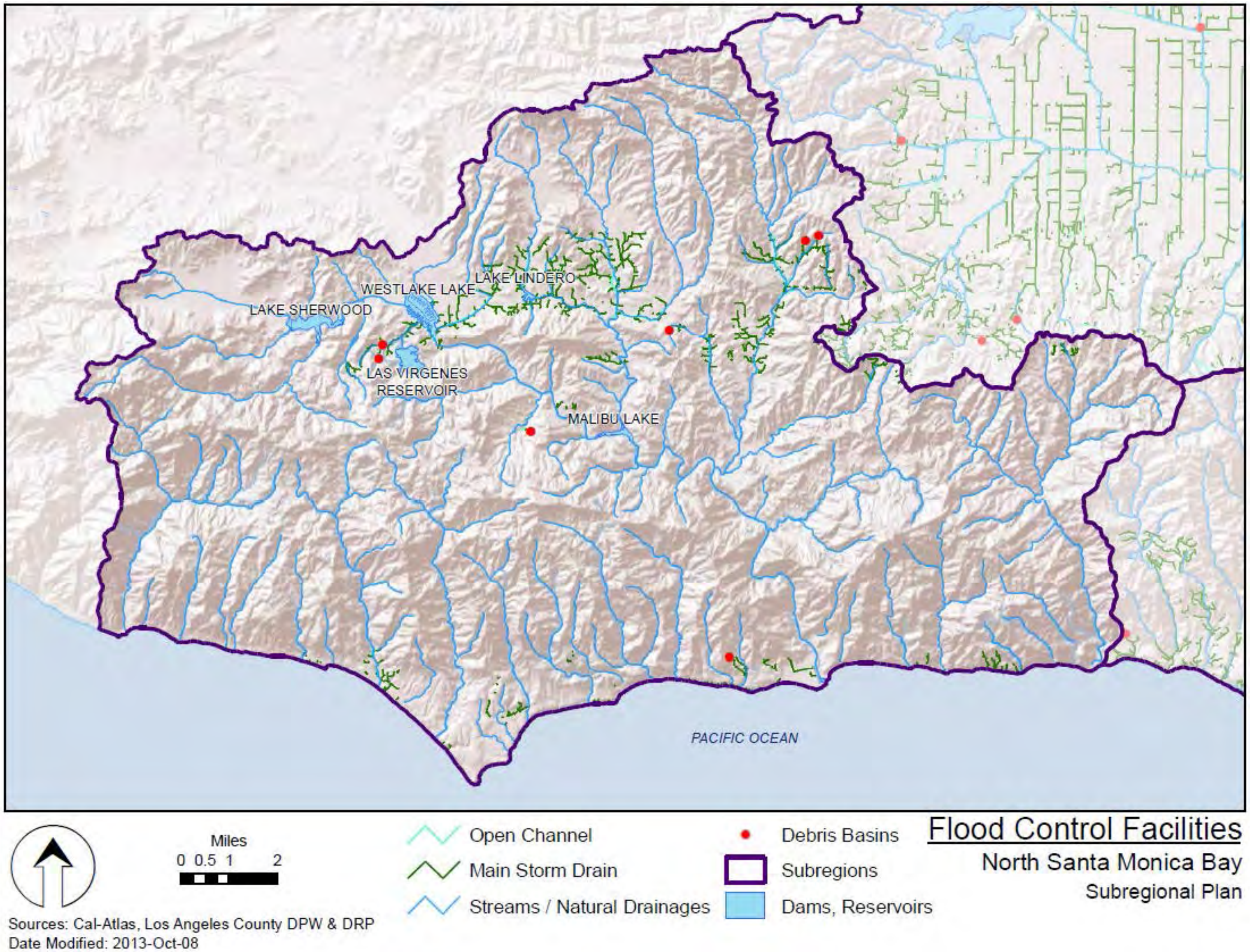


**Figure 5: Wholesale Water Suppliers**

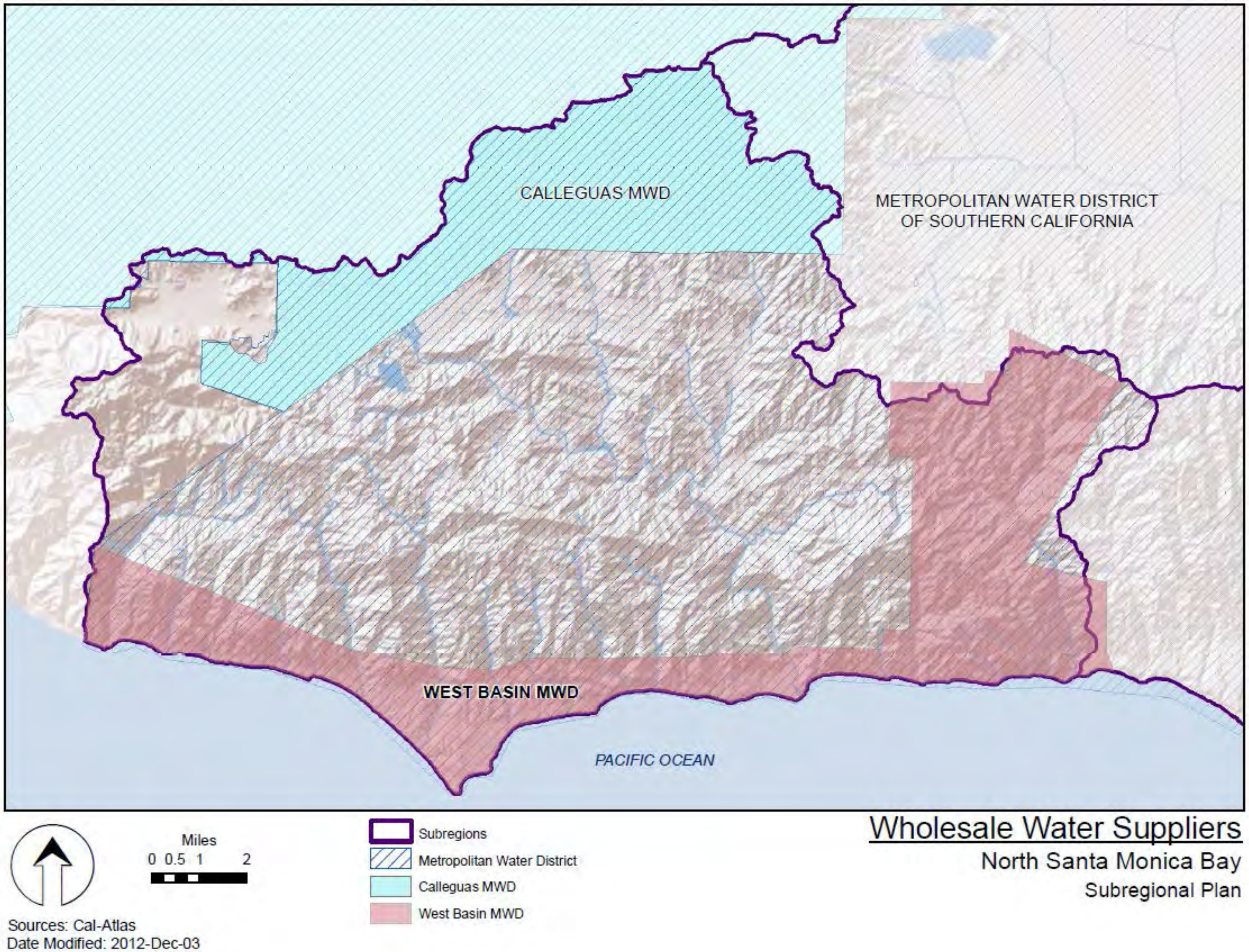
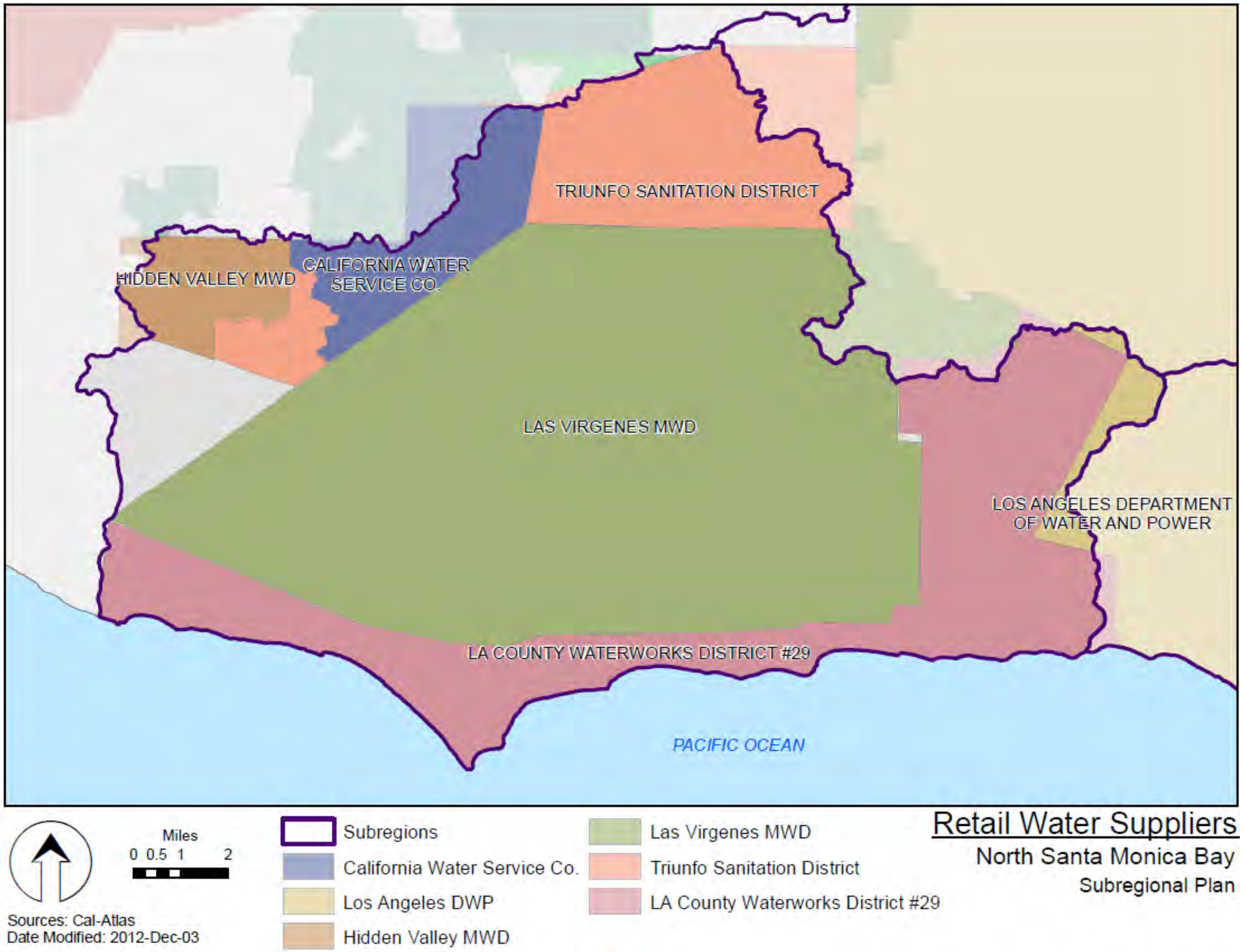


**Figure 6: Retail Water Suppliers**



## 2.4 Sources of Water Supply

Sources of supply vary throughout the Subregion, as shown in Table 1. This table was developed based on 2010 Urban Water Management Plans (UWMPs) from the following agencies:

- Las Virgenes (portion within the Subregion – 87% area)
- Los Angeles County Waterworks District #29
- Calleguas
- West Basin
- California Water Services Company, Westlake
- Lake Sherwood
- Triunfo Sanitation District / Oak Park Water Service

**Table 1: Actual Retail Supplies (acre-feet per year)**

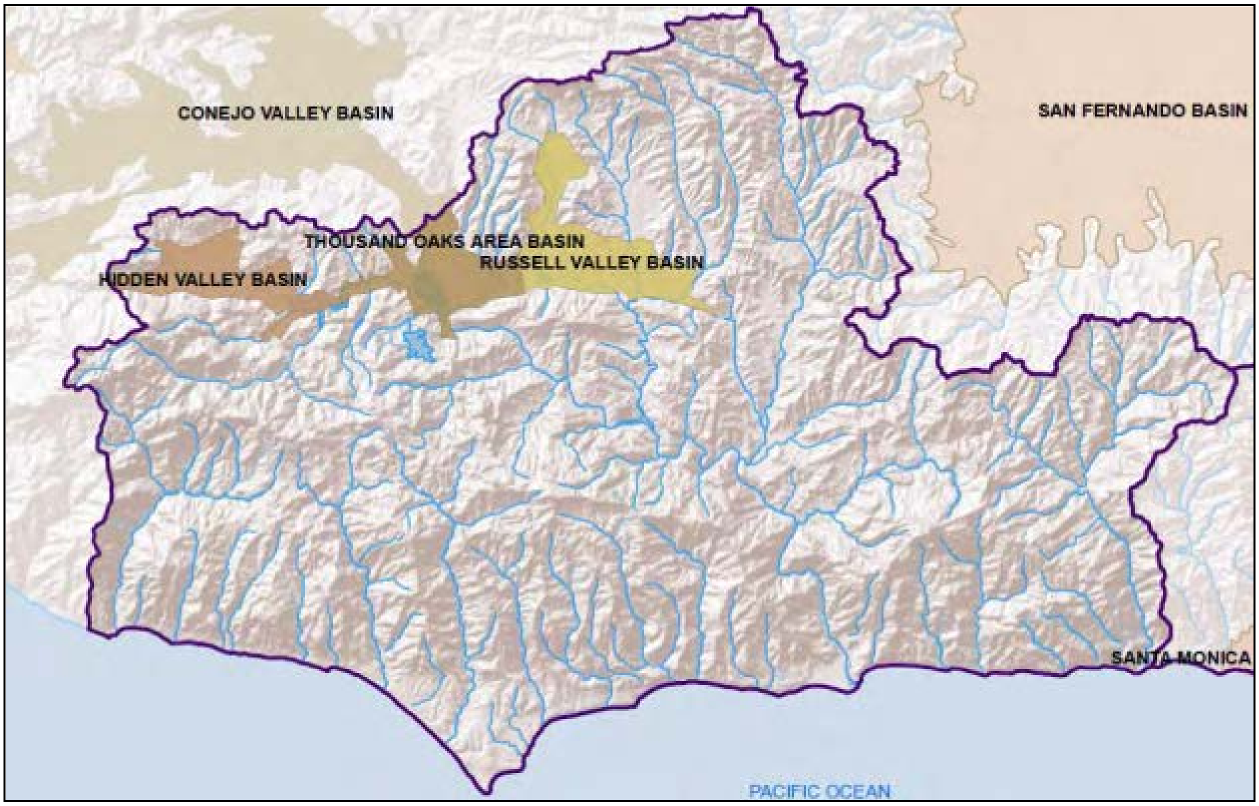
| Supply | 2010 |
|---|---|
| **Groundwater** | <1,000 |
| **Imported** | 35,000 |
| **Recycled (Non-Potable Reuse)** | 5,000 |
| **Surface Water Diversions** | 0 |
| **Desalinated Ocean Water** | 0 |
| **Water Use Efficiency** | <1,000 |
| **Stormwater Capture and Use** | <1,000 |
| **Total** | **40,000** |

Data sources: 2010 Urban Water Management Plans of agencies listed above
Supplies are rounded to the nearest thousand acre-feet per year.

### Groundwater

Groundwater represented less than one percent of the Subregion's supplies in 2010. The Hidden Valley, Russell Valley and Thousand Oaks Area Basins are the only groundwater basins underlying the Subregion (Figure 7). Each is relatively small and produces poor quality water that is not potable. Las Virgenes MWD pumps water from the Russell Valley Basin to augment supplies for its recycled water system. The maximum yield of this basin is 400 AFY, and the basin is not adjudicated. These groundwater basins are not utilized by water agencies within the Subregion. (MWDSC, 2007)

**Figure 7: Groundwater Basins of the NSMB Subregion**




Sources: Cal Atlas, Los Angeles County DPW

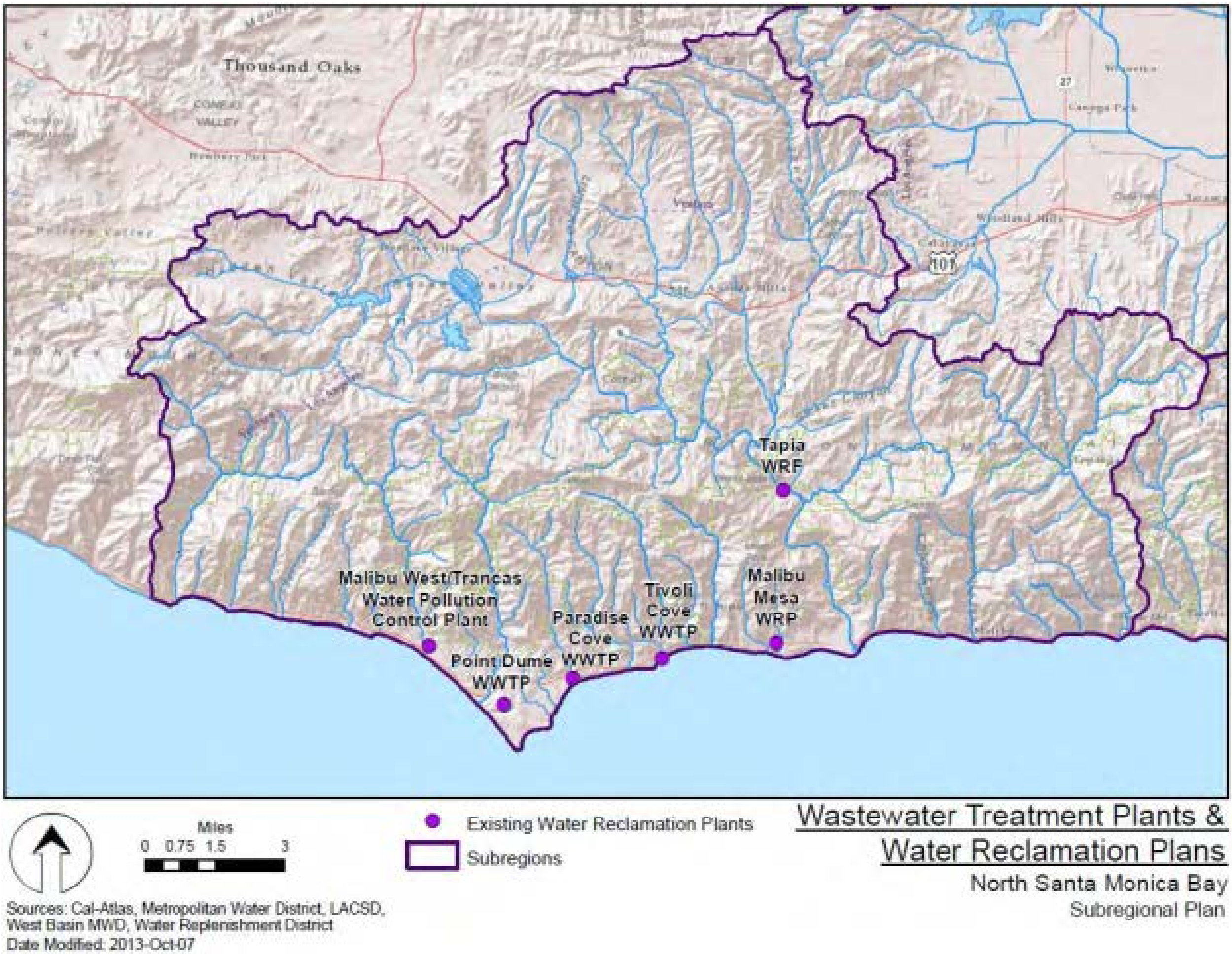
## Imported Water

This Subregion is highly dependent on imported water, with 2010 use at 35,000 AFY. The primary regional imported water wholesaler in the Subregion is MWDSC, which delivers to West Basin, Calleguas, and Las Virgenes. Additional information on imported water supplies is available in Exhibit A.

## Recycled Water

Current average annual recycled water production in the Subregion is approximately 6,000 AFY which represents approximately 15 percent of the Subregion's total supplies in 2010, and is primarily used for landscape irrigation. Tertiary treated recycled water is provided by the Malibu Mesa Water Reclamation Plant (WRP) which has a capacity of 0.2 MGD, and the Tapia Water Reclamation Facility (WRF) which has a capacity of 16 million gallons per day (MGD). Tapia WRF is operated under a joint powers authority between Las Virgenes MWD and Triunfo Sanitation District. Las Virgenes MWD owns two-third of the facility and Triunfo Sanitation District owns one-third. Malibu Mesa WRP is owned and operated by Los Angeles County Department of Public Works. Unused recycled water is currently disposed through land spraying, discharged to Malibu creek , or discharged to a tributary of the upper Los Angeles River. Between April 15th and November 15th of the year, a discharge prohibition is in place for the Tapia WRF, with exceptions for treatment plant upset or operational emergencies, qualified storm events, and stream flow augmentation to support endangered species when Malibu Creek flow drops below 2.5 cubic feet per second (cfs) for a designated number of days. Figure 8 shows the recycled water facilities within the GLAC Region.

**Figure 8: Water Reclamation Facilities in the GLAC Region**




## Desalinated Ocean Water

Though the Subregion does not have any desalination projects within its boundaries, the West Basin's Ocean-Water Desalination Demonstration Facility and Water Education Center located in Redondo Beach (located in the South Bay Subregion) may benefit the North Santa Monica Bay Subregion in the future. This facility is used to evaluate and demonstrate ocean protection, energy recovery and cost reduction technologies with the goals of ensuring a full scale ocean-water desalination facility will be done in a cost and energy efficient manner while protecting the ocean.

## Stormwater Use

The City of Malibu's 15-acre Legacy Park Project is an innovative water quality improvement project that transformed 15 acres in the heart of the city into a central park capable of capturing up to 2.6 million gallons of runoff per storm for treatment and disinfection. This integrated multi-benefit project improves water quality to Malibu Creek, Malibu Lagoon, and nearby beaches by capturing, detaining, screening, filtering, and treating stormwater runoff from the local watershed to remove pathogens, nutrients, and other pollutants, and also integrates and beneficially uses captured and treated stormwater to offset potable water usage. The project also creates a public and ecosystem amenity providing valuable habitat, education and passive recreation opportunities.

Additionally, Los Angeles County has implemented a low impact development (LID) ordinance that requires new developments and redevelopment constructed after 2009 to include LID best management practices (BMPs) that may be implementable on particular sites. This program may ultimately result in additional capture and use of stormwater to replace irrigation water, in particular.

## 2.5 Water Supply/Demand

As water agency boundaries are not aligned with the Subregional boundaries, the water supply and demand estimates made here are based on the percentage of each water agency's service area included in the Subregion. Water demand was estimated based on review of 2010 UWMPs for:

- Las Virgenes (portion within the Subregion – 87% area)
- Los Angeles County Waterworks District #29
- Calleguas
- West Basin
- California Water Services Company, Westlake
- Lake Sherwood
- Triunfo Sanitation District / Oak Park Water Service

Demand projections for the Subregion can be seen in Table 2. Demand was calculated using the 2010 UWMPs for Las Virgenes and Los Angeles County Waterworks (Waterworks) District #29. Given that Waterworks includes Marina Del Rey which is not within this Subregion, the portion of demand included in the Subregion was calculated by taking the proportion of the projected population for the areas within the Subregion (ranging from 67% in 2010 to 61% in 2035) and applying it to the total demand estimated in LACWW's UWMP.

Water demand is projected to increase little between 2010 and 2035, likely due to the inclusion of conservation in demand projections in agencies' 2010 UWMPs.

**Table 2: Subregion Demand Projections for Direct Use (acre-feet per year)**

| 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|
| 41,000 | 42,000 | 40,000 | 41,000 | 44,000 | 43,000 |

Data sources: 2010 Urban Water Management Plans of agencies listed above.
Totals have been rounded to the nearest thousand.

## 2.6 Water Quality

The GLAC Region has suffered water quality degradation of varying degrees due to sources associated with urbanization, including use of chemicals, fertilizers, industrial solvents, automobiles, and household products. Both surface water and groundwater quality have been impacted by this degradation which can be classified as either point or nonpoint sources. Regulations are in place to control both types of sources, and are often updated to control constantly changing water quality issues.

The Federal Water Pollution Control Act Amendments of 1972, amended in 1977, are commonly known as the Clean Water Act. The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the United States and gave the USEPA the authority to implement pollution control programs. In California, per the Porter Cologne Water Quality Control Act of 1969, responsibility for protecting water quality rests with the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs).

The SWRCB sets statewide policies and develops regulations for the implementation of water quality control programs mandated by state and federal statutes and regulations. The RWQCBs develop and implement Basin Plans designed to preserve and enhance water quality. The determination of whether water quality is impaired is based on the designated beneficial uses of individual water bodies, which are established in the Basin Plan. As mandated by Section 303(d) of the Federal Clean Water Act, the SWRCB maintains and updates a list of "impaired" water bodies that exceed state and federal water quality standards. To address these impairments, the RWQCBs identify the maximum amount of pollutants that may be discharged on a daily basis without impairing the designated beneficial uses, and are known as Total Maximum Daily Loads (TMDLs). In addition to development of the TMDLs the RWQCBs develop and implement the NPDES permits for discharges from municipal separate storm sewer systems (MS4) and water reclamation plants to surface water bodies.

The Subregion has 303(d) listings related to both human activities and natural sources. Natural geologic formations in the area are believed to be the source of high levels of various constituents (including elevated specific conductivity, selenium, chloride, metals, phosphorus, and sulfate) found in water bodies draining the Monterey and Modelo Formations. Human activity can produce poor water quality due to trash, nutrients from wastewater treatment effluent, metals, and toxic pollutants. Pathogens are contributed both by developed and natural areas. These pollutants may be carried in stormwater runoff and contributed by point source discharges, impacting streams, canyon ecosystems, beaches and offshore waters, threatening public health as well as the long-term health of the Santa Monica Bay. The large natural open space areas and lagoons with abundant wildlife also contribute natural bacteria and nutrients to receiving waters. Microbial source tracking research in this subregion is underway in multiple watersheds which will help identify sources that are controllable.

Even though agencies and cities in the Subregion have significantly reduced pollutants that are discharged to water bodies from individual point sources, many of the major water bodies are still considered impaired due to trash, bacteria, nutrients, metals, and toxic pollutants. Water quality issues affecting the Subregion's local surface waters and groundwater basins are discussed below.

## Surface Water Quality

The watersheds in the North Santa Monica Bay Subregion serve many beneficial uses including: recreation (trails, swimming, picnicking, fishing, outdoor education programs, etc.), and habitat (aquatic and terrestrial wildlife). Typically, surface water quality is better in the headwaters and upper portions of the watershed, and is degraded by urban and stormwater runoff closer to the Pacific Ocean. Malibu Creek watershed water quality is non-typical at least in terms of mineral content in that the highest mineral water concentrations are found in undeveloped, Monterey Formation-dominated northern headwaters, which dilute in the downstream direction, even as water flows through developed areas. As a result of anthropogenic and natural inputs, the major watershed in the Subregion (Malibu Creek and its subwatersheds) and the 15 other smaller coastal watersheds and receiving waters (Santa Monica Bay), and various near-shore areas and beaches are 303(d) listed for several constituents as shown in Table 3 and Table 4. (SWRCB, 2012) The locations of permitted discharges are shown in Figure 9. Please note that Figure 9 does not show municipal and park agency MS4 and Caltrans discharges as these are non-point discharge permits.

Investigations are needed to determine natural background levels for some listings which may not be due to anthropogenic causes. However, the reports written in support of the Subregion's TMDLs include a source assessment for each impairment, and determine the major sources of each, as listed below:

- **Malibu Creek Nutrient TMDL – major sources:** Tapia Water Reclamation Facility, septic systems, runoff from residential and commercial areas, runoff from undeveloped areas, agriculture and livestock, golf courses, groundwater, and atmospheric deposition
- **Malibu Creek Trash TMDL – major sources:** Litter discarded to channels, creeks and lakes

- **Malibu Creek Bacteria TMDL – major sources:** Runoff from residential, commercial and open space areas, dry weather storm drain loads, failing septic systems, and wildlife (in particular, birds)
- **Santa Monica Bay Beaches Wet Weather Bacteria TMDL – major sources:** Runoff from residential, commercial, industrial, and agricultural and undeveloped areas
- **Santa Monica Bay Beaches Dry Weather Bacteria TMDL – major sources:** Sanitary sewer and sewage plant overflows and spills, and dry weather urban runoff
- **Santa Monica Bay Nearshore Debris TMDL – major sources:** Litter discarded to channels, creeks, lakes, beaches, highways and the ocean
- **Santa Monica Bay DDTs and PCBs TMDL – major sources:** Sediments, Hyperion, Joint Water Pollution Control Plant, dewatering from the cleanup of contaminated sites, dewatering related to construction projects, and runoff

Over the next ten years, several additional TMDLs are scheduled to be developed, in addition to the TMDLs developed as of early 2012. This will require the implementation of projects and programs by permitted dischargers and all other responsible agencies. TMDL compliance deadlines may be considered during project selection.

**Table 3: North Santa Monica Bay Subregion 303(d) listed waters with Approved TMDLs**

| 303(d) Listed Waters and Impairments[1] | TMDL (Compliance Date) |
|---|---|
| Lake Lindero | |
| Nutrients: Algae, Eutrophic, Odor | • Malibu Creek Nutrient TMDL |
| Trash | • Malibu Creek Trash TMDL (2017) |
| Lake Sherwood | |
| Nutrients: Algae, Ammonia, Eutrophic, Organic Enrichment/Low Dissolved Oxygen | • Malibu Creek Nutrient TMDL |
| Las Virgenes Creek | |
| Coliform Bacteria | • Malibu Creek Bacteria TMDL (2021) |
| Nutrients: Algae, Organic Enrichment/Low Dissolved Oxygen, Scum/Foam – unnatural | • Malibu Creek Nutrient TMDL |
| Trash | • Malibu Creek Trash TMDL (2017) |
| Lindero Creek | |
| Coliform Bacteria | • Malibu Creek Bacteria TMDL (2021) |
| Nutrients: Algae, Scum/Foam – unnatural | • Malibu Creek Nutrient TMDL |
| Trash | • Malibu Creek Trash TMDL (2017) |
| Malibou Lake | |
| Nutrients: Algae, Eutrophic, Organic Enrichment/Low Dissolved Oxygen | • Malibu Creek Nutrient TMDL (compliance schedule under development) |
| Trash | • Malibu Creek Trash TMDL (2017) |
| Malibu Creek | |

| 303(d) Listed Waters and Impairments[1] | TMDL (Compliance Date) |
|---|---|
| Coliform Bacteria | • Malibu Creek Bacteria TMDL (2021) |
| Nutrients: Algae, Scum/Foam – unnatural | • Malibu Creek Nutrient TMDL (compliance schedule under development) |
| Trash | • Malibu Creek Trash TMDL (2017) |
| Malibu Lagoon | |
| Bacteria: Coliform Bacteria | • Malibu Creek Bacteria TMDL (2021) |
| Nutrients: Eutrophic, pH | • Malibu Creek Nutrient TMDL (compliance schedule under development) |
| Swimming Restrictions | • Malibu Creek Bacteria TMDL (2021) |
| Viruses (enteric) | • Malibu Creek Bacteria TMDL (2021) |
| Trash | • Malibu Creek Trash TMDL (2017) |
| Medea Creek (Lower and Upper) | |
| Nutrients: Algae | • Malibu Creek Nutrient TMDL (compliance schedule under development) |
| Coliform Bacteria | • Malibu Creek Bacteria TMDL (2021) |
| Trash | • Malibu Creek Trash TMDL (2017) |
| Palo Comado Creek | |
| Coliform Bacteria | • Malibu Creek Bacteria TMDL (2021) |
| Santa Monica Bay | |
| Debris | • Santa Monica Bay Nearshore Debris TMDL (2020) |
| Bacteria | • Santa Monica Bay Beaches Wet Weather Bacteria TMDL (2021)<br>Santa Monica Bay Beaches Dry Weather Bacteria TMDL (2009) |
| DDTs, PCBs, Sediment Toxicity, Fish Consumption | • Santa Monica Bay DDTs (water: 2014, sediment: 2023) and PCBs (water: 2014, sediment: 2034) TMDL |
| Stokes Creek | |
| Coliform Bacteria | • Malibu Creek Bacteria TMDL (2021) |
| Triunfo Creek | |
| Bacteria | • Malibu Creek Bacteria TMDL (2021) |
| Westlake Lake | |
| Nutrients: Algae, Ammonia, Eutrophic, Organic Enrichment/Low Dissolved Oxygen | • Malibu Creek Nutrient TMDL (compliance schedule under development) |
| Beaches: Escondido, Nicholas Canyon, Point Dume, Robert H. Meyer Memorial, Trancas (Broad), Zuma, Sea Level, Dan Blocker Memorial (Corral), Escondido, Leo Carrillo, Paradise Cove, Puerco, Amarillo, Malibu, Las Flores, Carbon, La Costa, Las Tunas, Topanga, Big Rock | |

| 303(d) Listed Waters and Impairments[1] | TMDL (Compliance Date) |
|---|---|
| Bacteria | • Santa Monica Bay Beaches Wet Weather Bacteria TMDL (2021)<br>Santa Monica Bay Beaches Dry Weather Bacteria TMDL (2009) |
| PCBs, Pesticides | • Santa Monica Bay DDTs (water: 2014, sediment: 2023) and PCBs (water: 2014, sediment: 2034) TMDL |

According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report

**Table 4: North Santa Monica Bay Subregion 303(d) listed waters without Approved TMDLs**

| 303(d) Listed Waters and Impairments[1] |
|---|
| **Lake Lindero** |
| Chloride<br>Selenium<br>Specific Conductivity |
| **Lake Sherwood** |
| Mercury (tissue) |
| **Las Virgenes Creek** |
| Benthic-Macroinvertebrate Bioassessments<br>Invasive Species<br>Sedimentation/Siltation<br>Selenium |
| **Lindero Creek** |
| Benthic-Macroinvertebrate Bioassessments<br>Selenium<br>Invasive Species |
| **Malibu Beach** |
| Toxics: DDT |
| **Malibu Creek** |
| Benthic-Macroinvertebrate Bioassessments<br>Invasive Species<br>Selenium<br>Fish Barriers (Fish Passage)<br>Sedimentation/Siltation<br>Sulfates |
| **Malibu Lagoon** |
| Benthic Community Effects |
| **Medea Creek** |

| 303(d) Listed Waters and Impairments[1] |
|---|
| Benthic-Macroinvertebrate Bioassessments<br>Sedimentation/Siltation<br>Invasive Species<br>Selenium |
| **Topanga Creek** |
| Lead |
| **Triunfo Creek** |
| Lead<br>Mercury<br>Sedimentation/Siltation<br>Benthic-Macroinvertebrate Bioassessments |
| **Westlake Lake** |
| Lead (recommended for delisting) |

According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report

## Groundwater Quality

Groundwater quality, like surface water quality, can be affected by both natural sources and human activities. Typically, groundwater quality is defined in terms of drinking water quality standards such as state or federal maximum contaminant levels (MCLs). The Russell Valley, Thousand Oaks Area and Hidden Valley groundwater basins are the only groundwater basins underlying the Subregion. The Russell Valley groundwater basin, which underlies a very small portion of the Subregion, is used by the Las Virgenes MWD for non-potable uses. Quality concerns in this basin include high levels of total dissolved solids (TDS) and sulfate which both exceed drinking water MCLs. As there are no plans to utilize the basin for municipal supply, future water quality conditions are not a significant concern. The Thousand Oaks Area Basin and Hidden Valley Basin groundwater quality is generally poor with high levels of TDS.

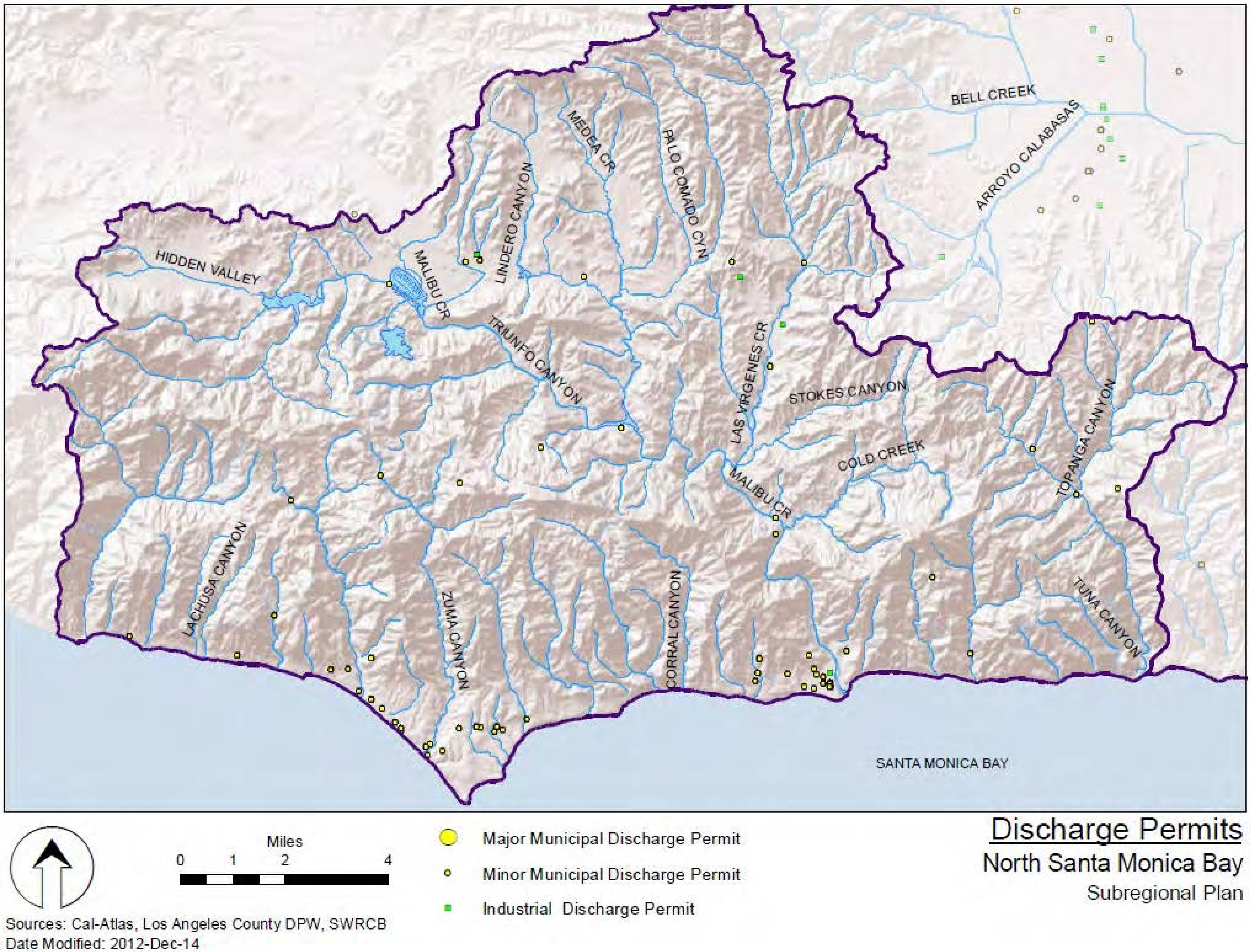
## Near-Shore Ocean Water Quality

There are several indicators of coastal water quality. One of the most publicized is the annual report by Heal the Bay, in addition to the 303(d) listings and TMDLs discussed previously. The annual report evaluates California beaches year-round giving them a grade of A to F based on results of tests for bacterial concentration, which are used as indicators of how likely the water is to make swimmers sick. Statewide, 92% of California beaches earned A or B grades over the summer according to the 2011 report.

Unfortunately, some Southern California beaches did not receive a passing grade including Topanga State Beach which was one of the most polluted beaches scoring the grade of "F". A Source Identification Pilot Program (SIPP) is currently being conducted at this beach by researchers from Stanford University, UCSB, UCLA, U.S. EPA and the Southern California Coastal Water Research Project. Their research will include a source tracking protocol to better identify microbial pollution sources.

Paradise Cove Beach, adjacent to Ramirez Canyon Creek, has historically exhibited high levels of fecal indicator bacteria. Property owners in the area and the City of Malibu have installed a runoff treatment facility, called the Paradise Cove Stormwater Treatment Facility, near the mouth of Ramirez Creek that was completed in July 2010. A post-project monitoring program has been implemented and shows the facility efficiently removes bacteria but samples collected at the immediate discharge point exceed bacteria limits most likely due to the observed birds and kelp wrack downstream of the discharge.

**Figure 9: Permitted Discharges as of 2011**



## 2.7 Environmental Resources

The environmental resources of the North Santa Monica Bay Subregion are unique compared to those of other Subregions with respect to land use, aquatic resources, open space, and recreation. Over 85 percent of the Subregion is still undeveloped open space. The environmental resources include riparian habitat, streams, beaches, ocean waters, rocky intertidal habitats, sand dunes, beach bluffs, mountains, and parklands. The remaining land uses in the area are primarily residential and are concentrated along the coastline and interior valleys. There is very little to no heavy industry.

### 2.7.1 Aquatic Habitats

The North Santa Monica Bay subregion has an abundance of freshwater and tidal wetalands. Subregional wetlands include Malibu Lagoon and Topanga Lagoon (Figure 10) and many other small, coastal wetland systems that are more brackish, including Zuma, Trancas and Las Flores lagoons. Tidal wetlands are characterized by differences in salinity and the tidal cycle. When functioning fully, the wetlands help mitigate flooding, and provide feeding and breeding habitat for fish and waterfowl. Figure 10 shows tidal and freshwater wetland resources within the subregion. Note that the National Wetlands Inventory data shown distinguish freshwater and riparian wetlands, but that “essentially the "linear" streams that show up as freshwater aquatic are just streams that are vegetated” (Elaine Blok, Acting Regional Wetlands Coordinator, U. S. Fish and Wildlife Service). Note that some dry washes/gullies are depicted as riverine wetlands on the National Wetlands Inventory.

#### Malibu Lagoon

Malibu Lagoon is a large, 30-acre brackish marine wetland at the mouth of Malibu Creek and discharges to Santa Monica Bay. The Lagoon suffered from poor water quality, lack of shallow water habitat, disruption of upstream flow, introduction of non-native plants and animals, and debris and bacteria from urban runoff. To restore the wetland State Parks began the Malibu Lagoon Restoration and Enhancement Project which was completed in 2013. Phase 1 involved the removal and relocating of an existing parking lot for a net gain of two acres of habitat and a new parking lot with stormwater capture and treatment features.

Phase 2 primarily focused on the water management areas of the western Lagoon. Phase 2 lowered will lower the elevation of the lagoon and created a single meandering channel with a series of secondary tributary channels. A series of interpretive and access features were constructed to educate visitors and students about how tidal lagoons function and the plants and animals that occupy lagoons. The new design elements are expected to greatly improve circulation, dissolved oxygen levels, species diversity and richness, and educational and visitor serving opportunities such as bird watching and surfing. (RWQCB, 2011 with updated language)

#### Topanga Lagoon

Historically, Topanga Lagoon covered more than 30 acres. In 1934, Pacific Coast Highway (PCH) was realigned inland, placing over 800,000 cubic feet of fill material directly into the lagoon, reducing its surface area by 94% to its present day size of less than 2 acres.

Water quality in the lagoon is impaired due to elevated bacteria (total coliform, fecal coliform, E.coli) levels. Although yet to be identified, there are several potential sources for high bacteria counts in Topanga Lagoon. These include both natural sources (such as birds and other wildlife) and anthropogenic sources (such as homeless encampments and commercial septic systems in the lower watershed). The spatial patterns of bacteria detected in Topanga Creek above the lagoon suggest that bacteria from potential upper watershed sources are cleansed downstream as water in the creek cascades through lower Topanga State Park. The lagoon is further threatened by the presence of invasive exotic vegetation including Arundo donax, Castor bean, German ivy, Morning glory, and Pampas grass which have all become well established, crowding out native Cattails and Willows. Planning is underway to develop a strategy for treating water quality problems and restoring the lagoon. (RCDSMM, 2011)

### 2.7.2 Riparian Habitat

Riparian habitat is typically a corridor of variable width that occurs along perennial, intermittent, and ephemeral streams and rivers, as well as around the lakes. These are depicted as Freshwater and Riparian Wetlands, according to the National Wetlands Inventory (NWI), in Figure 10. The NWI classification system applied in western states classifies vegetated streams as freshwater wetlands rather than riparian wetlands, so the two classifications on the map are essentially the same. The Santa Monica Mountains are home to a rich and diverse riparian habitat that includes several significant plant communities, as well as a variety of wildlife species including the endangered southern Steelhead Trout, Tidewater Goby and Arroyo Toad and the threatened red-legged frog. Aquatic habitat serves several purposes, including water quality protection, and providing essential habitats for a diversity of species such as birds, fish, amphibians, reptiles, and invertebrates. The Los Angeles County General Plan and other planning efforts seek to preserve riparian woodlands, Sycamore-alder riparian woodlands, southern and valley oak woodlands and California walnut woodlands in addition to animal habitat linkages and wildlife corridors.

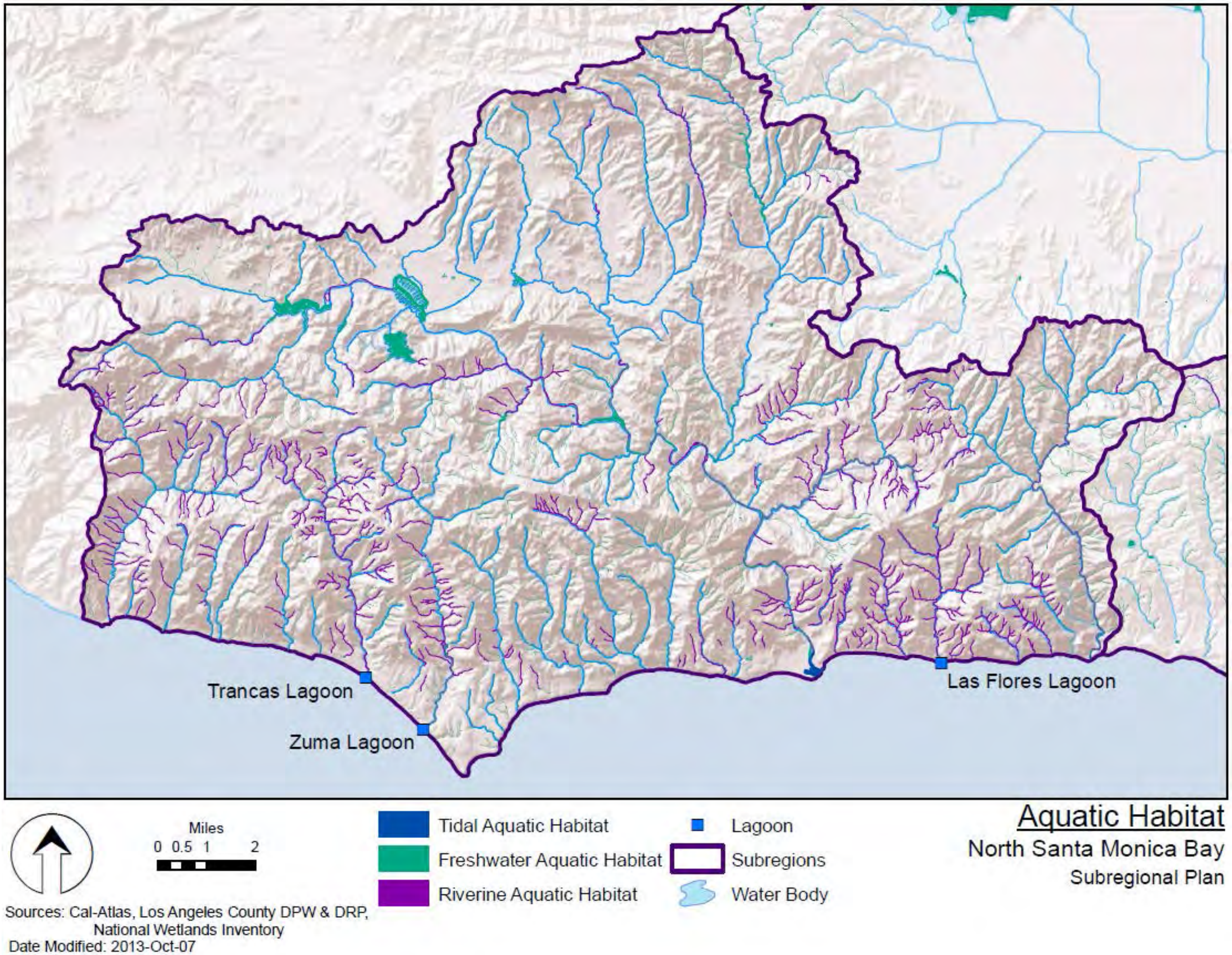
Buffer zones have been established adjacent to some areas of important preserved biological resources, including natural streams and drainages. These zones can protect biological resources from grading and construction activities, artificial lighting, and increased erosion and runoff. Some plans restrict new landscaping adjacent to preserved biological resources and cannot include invasive, non-indigenous species that would negatively impact the preserved resource. Park agencies are not regulated by municipal jurisdictions and do not apply consistent or sufficient protection of buffer zones. The following is a discussion of habitats in some of the major water bodies within the Subregion. There are also many other natural waterways including tributaries of the creeks described below and streams in smaller coastal watersheds.

#### Malibu Creek

Malibu Creek drains the southern slopes of the Simi Hills and slopes of the Santa Monica Mountains to flow through the Conejo Valley, and enters the Santa Monica Bay in Malibu. The Malibu Creek watershed drains 109 square miles and reaches as high as 3,000 feet in Ventura County. Approximately 80% of the land in the Malibu Creek watershed is undeveloped. Major tributaries include Triunfo, Medea and Las Virgenes Creeks. Malibu Creek's main stem begins at the confluence of Triunfo Creek (below Westlake Village) and Medea Creek, which was dammed to create Malibou Lake, and flows 13.4 miles through Malibu Canyon to Malibu Lagoon. Further downstream, the creek drops 100 feet over Rindge Dam as it descends to Malibu Lagoon.

Whether Malibu Creek is perennial or intermittent is an important regulatory distinction. California benthic macroinvertebrate bioassessment measures apply to perennial streams, but not to intermittent streams or streams that dry up to leave isolated pools in the dry season. Many reaches of Malibu Creek and tributaries do not flow year round.

**Figure 10: Aquatic Habitat of the NSMB Subregion**



### Topanga Creek

Topanga Creek is located in the Topanga Creek Watershed which is Santa Monica Bay's third largest watershed covering approximately 18 square miles, 75% of which is undeveloped. Although it is one of the least altered and most biologically diverse drainages in Santa Monica Bay, its resources suffer from impacts of human activities. Of special concern are the degraded lagoon and several stretches of stream bank in the lower watershed.

In the upper Topanga Creek, the issue of greatest concern is habitat degradation due to road maintenance practices along Topanga Canyon Road. Over the years, Caltrans has replaced extensive sections of stream bank with grouted riprap, concrete, and boulders as emergency flood repairs following storm damage to Topanga Canyon Road. Due to the emergency nature of these repairs, most are poorly engineered and require extensive maintenance. Many of these repairs have filled and constrained the stream channel, inducing landslides, increasing sedimentation, and impeding fish migration, including that of the endangered Steelhead trout. The upper Topanga Creek is also listed on the State 303d list of impaired water bodies. In support of restoration of the creek and lagoon, the SMBRP and other agencies have conducted a comprehensive Topanga Creek Watershed and Lagoon Restoration Feasibility Study to identify ways to restore the watershed's resources.

### Malibou Lake

Malibou Lake is a small, artificial lake about 41.5 acres in size in the Santa Monica Mountains located between the beaches of Malibu and the Conejo Valley of Ventura and Los Angeles Counties. It was created in 1922-23 with the completion of a bridge dam at the confluence of the Medea and Triunfo creeks. The lake did not actually fill until 1926. This private lake in Malibu Creek State Park is adjacent to Paramount Ranch (part of the Santa Monica Mountains National Recreation Area). The rustic, private community surrounding the lake consists of approximately 300 acres and 137 residences. (LakeMalibou.com, 2012)

## 2.7.3 Santa Monica Mountains

The Santa Monica Mountains, within the geomorphic province of the Transverse Ranges, extend approximately 40 miles east-west from the Hollywood Hills in Los Angeles to Point Mugu in Ventura County. The highest point in the mountains is Sandstone Peak at 3,100 feet.

Most of the area is within the Santa Monica Mountains National Recreation Area (SMMNRA; 153,250 acres) shown in Figure 11. Preservation of lands within the mountains are managed by California State Parks, National Park Service, Santa Monica Mountains Conservancy and Mountains Recreation & Conservation Authority, Mountains Restoration Trust, Los Angeles County, and municipal agencies. There are over twenty individual state and municipal parks in the Santa Monica Mountains. Those in the Subregion include three State Parks: Malibu Creek State Park, Topanga State Park, Leo Carrillo State Park; National Park Service lands in Cheeseboro, Palo Comado, Zuma/Trancas and Solstice Canyons, and Paramount and Peter Strauss Ranches; Santa Monica Mountains/Mountains Recreation & Conservation Authority parks: Upper Las Virgenes Canyon Open Space Preserve, Ed Edelman/Summit Valley Park, Tuna Canyon Park, and Corral Canyon Park; Mountains Restoration Trust-owned Cold Creek Preserve; and City of Malibu’s Charmlee Wilderness Park, Las Flores Creek Park, Trancas Canyon Park and Malibu Bluffs Park. (NPS, 2012)

The California Coastal Commission has found the Santa Monica Mountains ecosystem to be the largest, most pristine, physically complex, and biologically diverse example of a Mediterranean ecosystem in coastal Southern California. As a result of the large, interconnected blocks of habitat, the ecosystem supports an extremely diverse community of flora and fauna.

The Santa Monica Mountains have the greatest ecological diversity of all major mountain ranges within the Transverse Ranges province. According to the National Park Service, the Santa Monica Mountains contain 40 separate watersheds and over 170 major streams with 49 coastal outlets (National Park Service, 2000). Draft general management plan and environmental impact statement, Santa Monica Mountains National Recreation Area, California). The many different types of habitats support at least 17 native vegetation types. The main generic plant communities are coastal sage scrub, chaparral, riparian woodland, coast live oak woodland, and grasslands. Over 400 species of birds, 35 species of reptiles and amphibians, and more than 40 species of mammals have been identified in this diverse ecosystem. More than 80 sensitive species of plants and animals are listed or proposed for listing within this ecosystem. The 150,000 acres in the SMMNRA is estimated to be 90 percent free from development (National Park Service, 2000).

### 2.7.4 City of Malibu

The 20 square mile City extends 22 miles along the coast but extends only one mile inland on average. It forms a long and significant connecting link between the coast and the large, undisturbed habitat areas of the Santa Monica Mountains. The city itself contains substantial areas of undeveloped native habitat. Most development has occurred in the general vicinity of the Malibu Civic Center, Point Dume and Trancas and in those areas closest to the ocean, including several canyons (e.g. Las Flores and Ramirez). The most widespread vegetation type within the city is coastal sage scrub. Moving inland, the biodiversity increases to include chaparral as the primary vegetation type.

There are more than 15 watersheds in Malibu with over 30 drainage areas discharging into the ocean. The riparian corridors along many of these streams connect the habitats within the city to the large inland watersheds some of which are of particular significance to endangered steelhead trout. (Dixon, 2003)

### 2.7.5 Significant Ecological Areas and Environmentally Sensitive Habitat Areas

Significant Ecological Areas (SEAs) are ecologically important areas that are designated by the County of Los Angeles in unincorporated areas as having valuable plant or animal communities. Any development proposals located within a SEA and outside incorporated city boundaries are reviewed by the Significant Ecological Area Technical Advisory Committee (SEATAC) which recommends changes to a project and mitigation measures to protect the habitat. There are eight SEAs in the Subregion including a portion of Zuma Canyon, Upper La Sierra Canyon, Las Virgenes, Palo Comado Canyon, Cold Creek Canyon, Hepatic Gulch, a portion of Malibu Canyon and Lagoon, unincorporated areas of the Malibu Coastline, Malibu Creek State Park Buffer Area, and portions of Tuna Canyon (Figure 12). (LACDRP, 2011)

Similar to the SEAs are Environmentally Sensitive Habitat Areas (ESHAs) in the City of Malibu are designated by the Coastal Commission via local coastal programs. ESHAs include Ramirez Canyon Park, Escondido Canyon Park, Solstice Canyon Park and Corral Canyon Park with associated streams that reach to the Pacific Ocean. ESHAs are also mapped on private parcels to indicate special studies may be needed to protect biological resources in the permit conditions. The Malibu Land Use Plan (LUP) (1986) is the source of ESHA locations at this time. The description of specific ESHA areas should acknowledge that, within the City of Malibu, nearly all remaining open space is designated ESHA under the Malibu Local Coastal Program (LCP). The Santa Monica Mountains LCP and LUP have been approved by Los Angeles County, and the County is now in negotiations with Coastal Commission about designating ESHA in this LCP.

**Figure 11: Santa Monica Mountains National Recreation Area**


Sources: Cal Atlas, Los Angeles County DPW, National Parks Service

### 2.7.6 Marine Habitat

The marine environment of Santa Monica Bay includes a variety of habitats which provide food and shelter for thousands of species of marine life. Multiple non-profits and various programs are underway to protect and sustain marine ecosystems and biodiversity. The Los Angeles Regional Board's *State of the Watershed* report describes marine habitats as consisting of benthic, pelagic, beach and intertidal habitats. Most of the Subregion's *benthic marine habitat* is soft bottom, with few attached plants, but abundant and diverse invertebrate populations, including crabs and shrimp, snails, worms and echinoderms. Hard bottom areas support kelp beds in the subtidal regions west of Malibu. Kelp beds provide habitat, cover and protection for more than 800 species of fishes and invertebrates, some of which are uniquely adapted for life in the beds. *Pelagic habitat* is home to fish such as Pacific sardine, northern anchovy, Pacific mackerel, and Pacific bonito; as well as marine mammals such as seals and sea lions. Many species of whales and dolphins are also observed in Bay waters during the winter/spring migration. The thin uppermost layer of the water column (microlayer) is also home to the eggs and larvae of many invertebrates. Phytoplankton are the dominant plant life in the pelagic environment. Sandy beaches support species of crabs, clams and surf fish and serve as spawning grounds for grunion. *Intertidal zones* provide critical habitat and breeding grounds for a variety of marine algae, fish and invertebrates.

### 2.7.7 Areas of Special Biological Significance

In the mid-1970s, to protect sensitive coastal habitats, the SWRCB designated 34 areas on the coast of California as Areas of Special Biological Significance (ASBS), including the area between Mugu Lagoon in Ventura County and Latigo Point in Los Angeles County (Figure 12). There have been prohibitions to stormwater runoff in the last few years in support of these areas. (SWRCB, 2005)

**Figure 12: Significant Ecological Areas and Environmental Sensitive Habitat Areas of the NSMB Subregion**

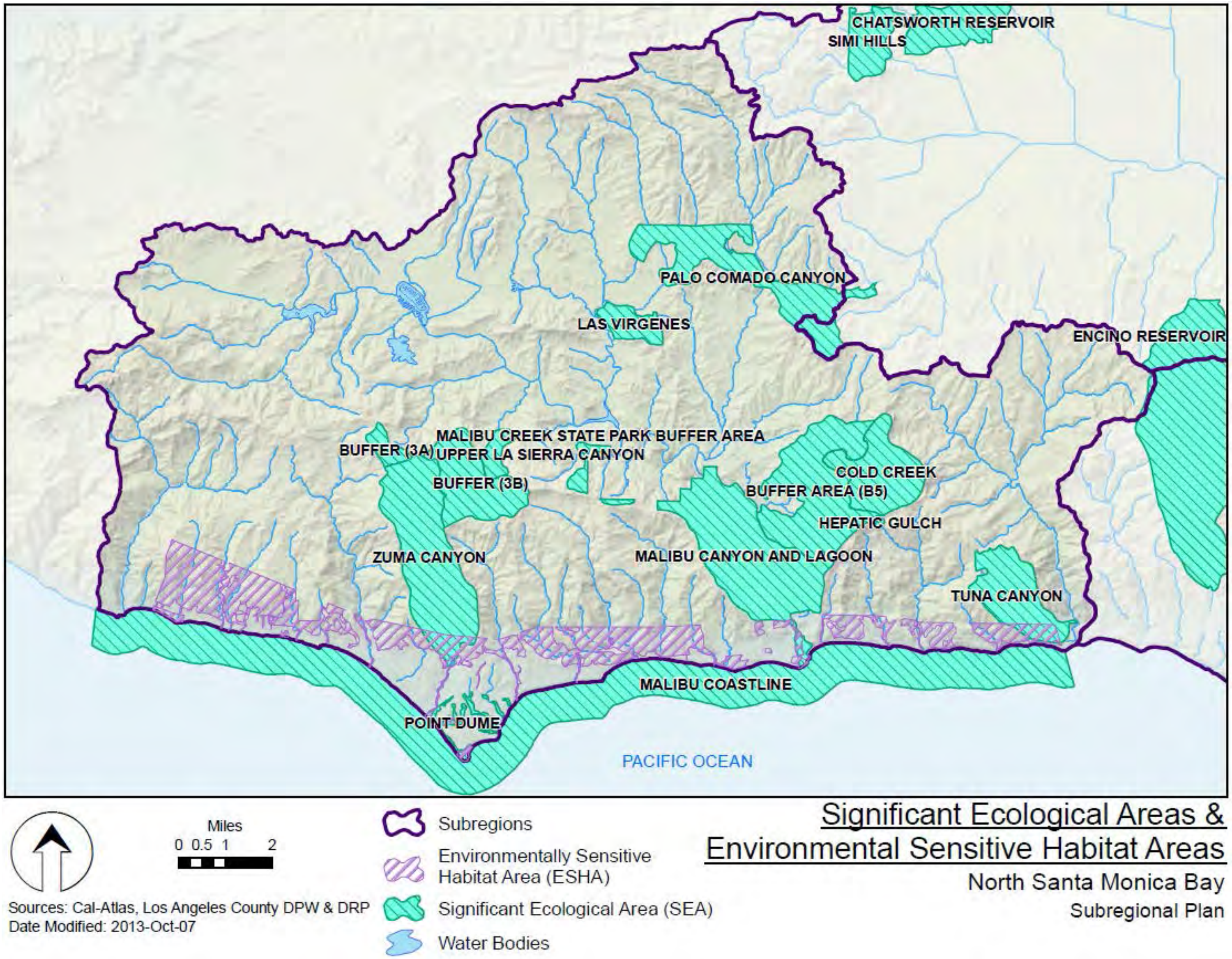
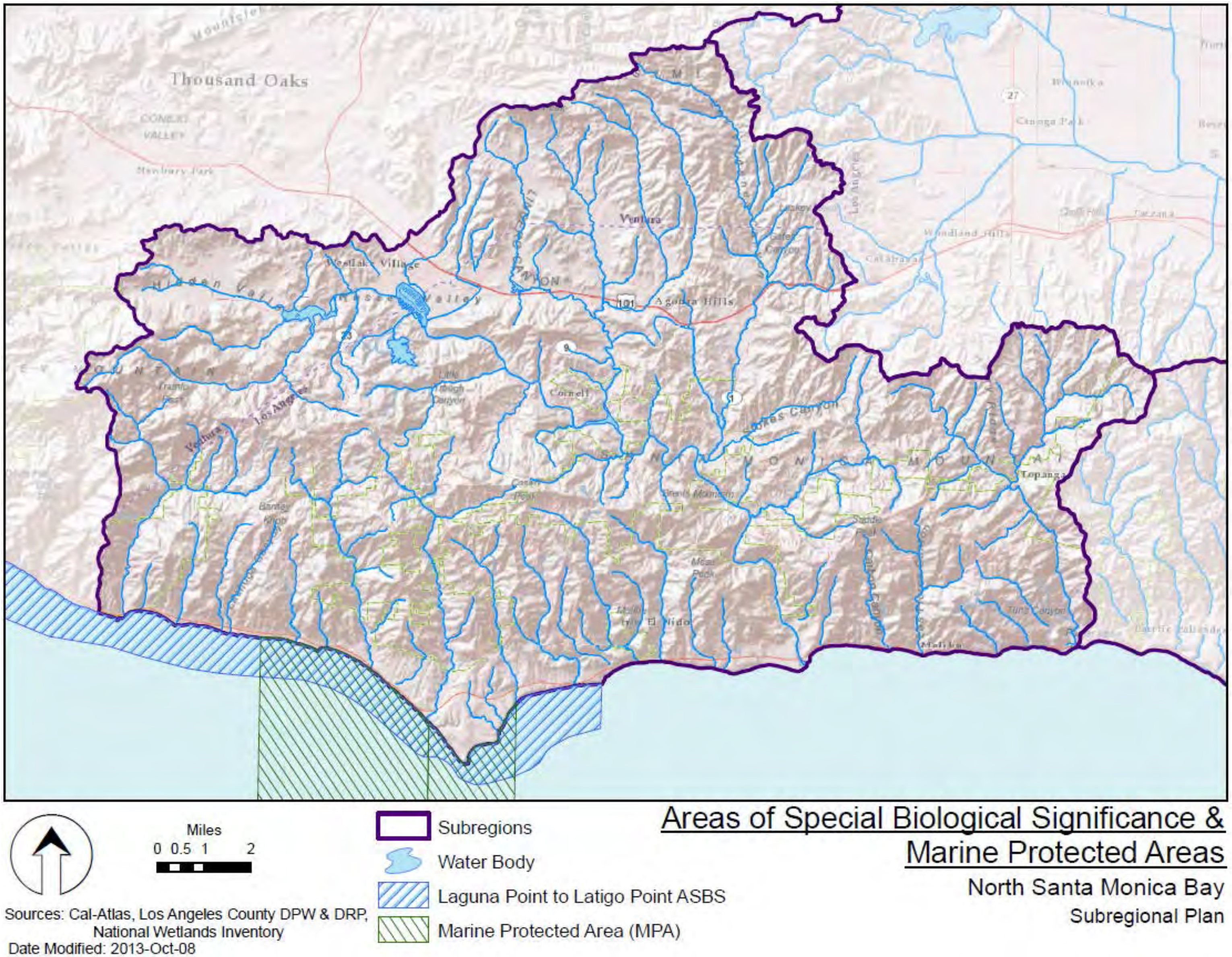


**Figure 13: Areas of Special Biological Significance**



### 2.7.8 Marine Protected Areas

The California Fish and Game Commission adopted regulations in December of 2010 to create MPAs in Southern California. The South Coast network was formally expanded as of January 1, 2012. The network includes Point Dume State Marine Conservation Area and the Point Dume State Marine Reserve located off Zuma Beach. This action is the culmination of two years of intense negotiation, on the heels of nearly ten years of political wrangling to get the MLPA planning process underway.

The MPAs are named, discrete geographic marine or estuarine areas designated to protect or conserve marine life and habitat. The South Coast network includes 37 new or modified (MPAs) and two special closures that allow limited recreation and commercial take. The MLPA, signed into law in 1999, directed the state to redesign California's system of MPAs to increase the effectiveness of protecting and sustaining the state's marine ecosystems. The State will monitor and adaptively manage the MPA network. A monitoring program will gather data on kelp forests, rocky intertidal habitats, sandy beaches, subtidal sandy habitats, pelagic systems, and the human activities that take place in these areas.

The Point Dume State Marine Conservation Area (SMCA) was established in 2010 stretches along the coast from Point Dume to El Matador. The SMCA designation prohibits recreational and commercial take. The recent South Coast network expansion specifically allows the following exceptions: the recreational take of pelagic finfish including Pacific bonito, and white seabass by spear fishing, the commercial take of coastal pelagic species by round haul net and swordfish by harpoon, and take pursuant to beach nourishment and other sediment management activities.

The Point Dume State Marine Reserve (SMR) is located south of the Point Dume SMCA and was established in 2010, and stretches Point Dume to Paradise Cove. In this SMR, the recreational or commercial take of all living marine resources is prohibited. There are 11 preexisting SMRs around the northern Channel Islands located due west of the Subregion.

#### Santa Monica Bay Restoration Commission's Marine Program

The Santa Monica Bay Restoration Commission (SMBRC) Marine Program works to conserve and rehabilitate natural resources in the marine environment and improve the beneficial uses of the Bay. To do this, the Marine Program assesses the status of marine habitats in the Bay, restores degraded habitats, monitors the recovery of restored habitats, and participates in the development of policies that protect marine resources. The MLPA process was a major focus of the program for two years.

Two initiatives of the Marine Program are the recently initiated work with local commercial fishermen to transition their fisheries from high-volume, low-value fisheries to higher-value, lower-volume fisheries, and the partnership with the Santa Monica Baykeeper to establish the Kelp Restoration and Monitoring Project. It is a community-based effort to restore kelp in areas that have been denuded by intensive sea urchin grazing. Restoration work off Escondido Beach in Malibu was initiated in 2000 and completed in 2004.

#### Other Programs

Santa Monica Baykeeper to establish the Kelp Restoration and Monitoring Project. It is a community-based effort to restore kelp in areas that have been denuded by intensive sea urchin grazing. Restoration work off Escondido Beach in Malibu was initiated in 2000 and completed in 2004.

### 2.7.9 Ecological Processes

The Santa Monica Mountains comprise a large and complex Mediterranean ecosystem of coastal sage scrub, chaparral, oak woodlands, and associated riparian areas. Connecting habitats within this ecosystem has been a top conservation priority. Integrity and connectivity is evidenced, albeit limited, by the presence of the mountain lion, cougar, bobcat, gray fox, badger, mule deer, and Steelhead trout.

## Fire

The Santa Monica Mountains are a fire-fed ecosystem in which fires naturally occur. In scattered developed areas characterized by heavy brush and trees and steep inaccessible slopes, the combination of dry brush and tinder with Santa Ana winds make the Santa Monica Mountains vulnerable to wildland fire disasters. Fires in the last two decades have included the Old Topanga (16,562 acres burned in 1993), Calabasas (12,502 acres burned in 1996), and other Malibu fires in 1996, 2003, and 2007. Development in the Santa Monica Mountains complicates fire prevention and protection due to winding roadways that restrict access. Ridge-top development is particularly vulnerable as the heat of fires pulls the fire uphill to homes while often sparing homes in the valley bottoms.

Fire frequency has increased due to human ignition with increasing populations and expanded human activity. In some areas, fire frequency has exceeded beyond the ability of native vegetation to successfully recover, threatening the long-term persistence of native shrub lands. Catastrophic wildfire events can denude hillsides which create opportunities for invasive plants and increase the potential for subsequent rains to result in debris flows that erode the landscape and can clog stream channels, damage structures, and injure inhabitants in the canyons and lower foothill areas. (NPS, 2007)

## Invasive Species

Invasive species in the Region have also substantially affected specific habitats and areas. Along with the rest of California, most of the Subregion's native grasslands were long ago displaced by introduced species. The receptive climate has resulted in the widespread importation of plants from around the globe for landscaping. Some plant introductions have resulted in adverse impacts. In many undeveloped areas, non-native plants such as arundo (*Arundo donax*), tree of heaven (*Alianthus altissima*) tree tobacco (*Nicotiana glauca*), castor bean (*Ricinus communis*), salt cedar (*Tamarix ramosissima*) and cape ivy (*Senecio mikanioides*) are out-competing native species.

In addition, there are a number of invasive and non-native aquatic species in the Subregion. The New Zealand mud snail (*Potamopyrcus antipodarum*) is one example of a species which has infested the watersheds of the area. Another example is the crayfish (*Procambarus clarkia*) which has invaded creeks and streams.

## Slope Stability

The Subregion is prone to slope stability problems such as landslides, mudslides, slumping and rockfalls. Shallow slope failure such as mudslides and slumping occur where graded cut and fill slopes have been inadequately constructed. Rockfalls are generally associated with seismic ground-shaking or rains washing out the ground containing large rocks and boulders and due to the erosive soils in the geologic conditions of this area.

## Flooding

Unlike other Subregions, the North Santa Monica Bay Subregion has no area-wide flood control system of concrete channels that carries off storm runoff and debris. Natural drainage patterns lead to high water levels during storm events. Exposure to flood hazards are minimized by slope modifications, setbacks, on-site water retention and percolation, and runoff controls. Potential flood hazards are generally limited to canyon and valley bottoms. There are existing storm drains and flood control facilities throughout the Subregion that generally have sufficient capacity to adequately protect the area.

### 2.7.10 Critical Habitat Areas

Critical habitat areas have been established by the endangered species act (ESA) to prevent the destruction or adverse modification of designated critical habitat of endangered and threatened plants and animals. The United States Fish and Wildlife Service (USFWS) through the Endangered Species Act (ESA) defines critical habitat as “a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection.

Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.” A critical habitat designation typically has no impact on property or developments that do not involve a Federal agency, such as a private landowner developing a property that involves no Federal funding or permit. However, when such funding or permit is needed, the impacts to critical habitat are considered during the consultation with the USFWS.

Within the Subregion, there are 7,630 acres of designated critical habitat defined for the Brauton’s milk-vetch, California red-legged frog, and Lyon’s pentachaeta, as shown in Figure 14.

## 2.8 Open Space and Recreation

A wide range of open space areas and recreation opportunities exist in the Subregion. Open space and recreation lands may include developed urban park and recreation areas, riparian/upland/wetland areas, beaches/estuaries, national forest lands, greenways, and a number of miscellaneous lands. A majority of these lands fall under the open space category as there are national, state and municipal parks. A map of open space and recreation areas is shown in Figure 14. However, only approximately 55 percent of land within the Santa Monica Mountains National Recreation Area is currently protected through ownership by federal, state and local park agencies. Nearly 500 miles of public recreational trails are used heavily by visitors from the GLAC region. Additionally, there are numerous education programs for school children during the week. Every weekend there are several agency-sponsored and non-profit group outdoor education and recreation programs. In addition, coastal areas provide the benefit of beaches and habitat, as discussed previously. The area does meet recreation standards for passive recreation for residents but much of the coastal and some developed inland area has limited access to active recreation and does not meet national and state standards for proximity. [Figure 15 and Figure 16 do not include active recreation deficiencies in this area.]

## 2.9 Land Use

The North Santa Monica Bay Subregion is characterized by a balance between natural and man-made environments. A majority of the land use is other open space (public parklands, nature preserves, undeveloped/vacant or partially developed private parcels, wildlife habitats, water bodies, and mountain lands). The significant amount of private open space adds natural, cultural, scenic, and recreational values. These values are generally protected in municipal permitting processes that limit developments, footprint and impacts.

Each year more than 33 million visitors enjoy the beaches and mountains within the Santa Monica Mountains National Recreation Area (SMMNRA). Visitors hike, bike or ride on hundreds of miles of mountain trails, or drive the scenic roads. (Malibu Creek State Park in the SMMNRA. http://www.nps.gov/samo/parkmgmt/gmp-general-management-plan-documents.htm)

Land use types may include the following:

- **Residential:** duplexes and triplexes, single family residential, apartments and condominiums, trailer parks, mobile home courts and subdivisions
- **Commercial:** parking facilities, colleges and universities, commercial recreation, correctional facilities, elementary/middle/high schools, fire stations, government offices, office use, hotels and motels, health care facilities, military air fields, military bases, military vacant area, strip development, police and sheriff stations, pre-schools and day care centers, shopping malls, religious facilities, retail centers, skyscrapers, special care facilities, and trade schools
- **Industrial:** chemical processing, metal processing, manufacturing and assembly, mineral extractions, motion picture, open storage, packing houses and grain elevators, petroleum refining and processing, research and development, wholesaling and warehousing
- **Transportation and Communication:** airports, bus terminals and yards, communication facilities, electrical power facilities, freeways and major roads, harbor facilities, improved flood waterways and structures, maintenance yards, mixed transportation and utility, natural gas and petroleum facilities, navigation aids, park and ride lots, railroads, solid and liquid waste disposal facilities, truck terminals, water storage and transfer facilities
- **Open Space and Recreation:** beach parks, cemeteries, golf courses, developed and undeveloped parks, parks and recreation, specimen gardens and arboreta, wildlife preserves and sanctuaries, undeveloped/vacant private land

A breakdown of land use in the North Santa Monica Bay Subregion is depicted in Table 5, and shown in Figure 15.

**Table 5: Land Use in the North Santa Monica Bay Subregion**

| Land Use Type | Acres | Percentage |
|---|---|---|
| Residential | 14,363 | 7% |
| Commercial | 1,941 | 1% |
| Industrial | 237 | <1% |
| Transportation, Utilities | 1,146 | 1% |
| Open Space / Recreation / Vacant | 196,142 | 90% |
| Agriculture | 2,017 | 1% |
| Mixed Urban | 438 | <1% |
| Water | 476 | <1% |
| No Data | 951 | <1% |
| **Total** | **217,711** | **100%** |

**Figure 14: Critical Habitat**

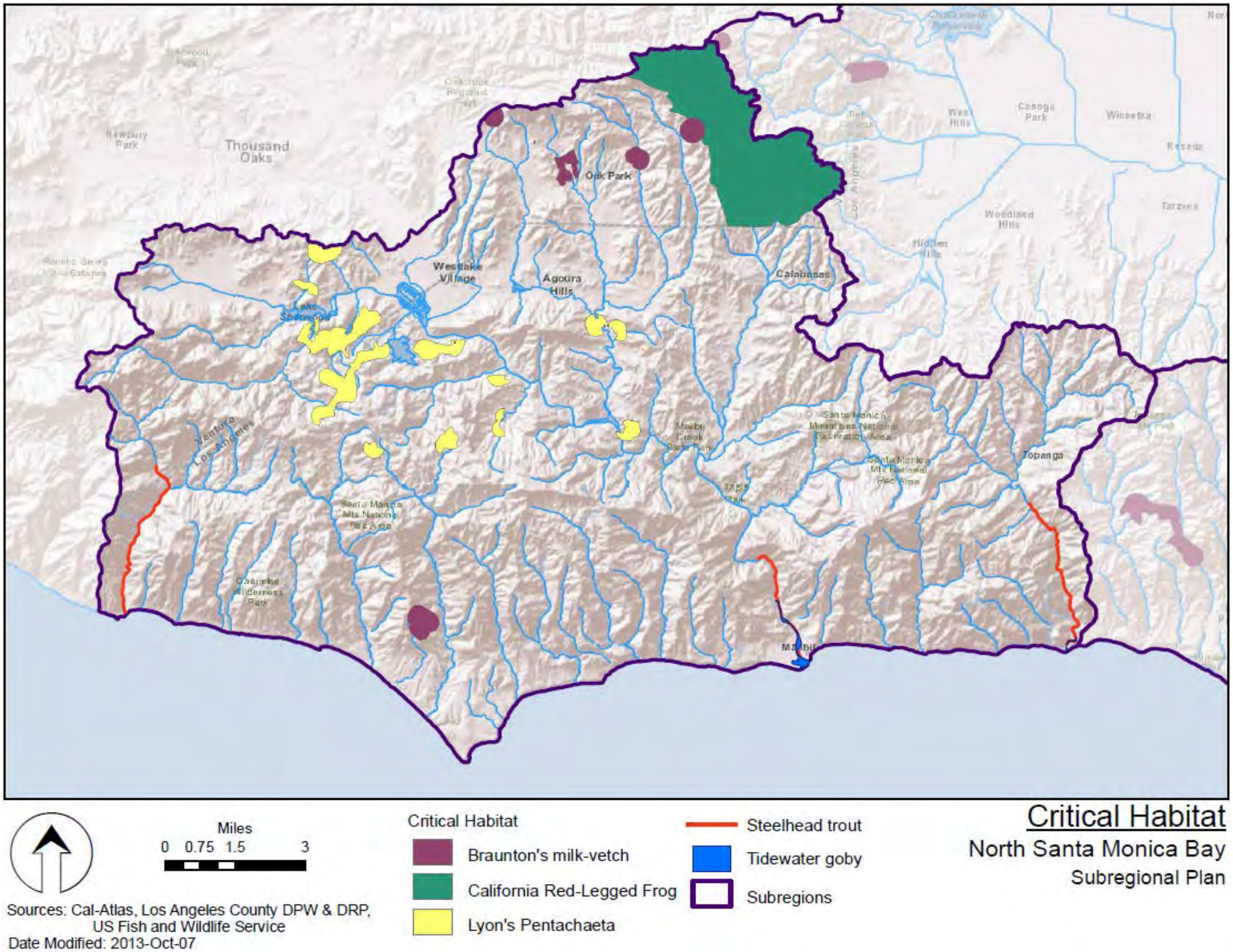


**Figure 15: Parks and Protected Open Space Areas**

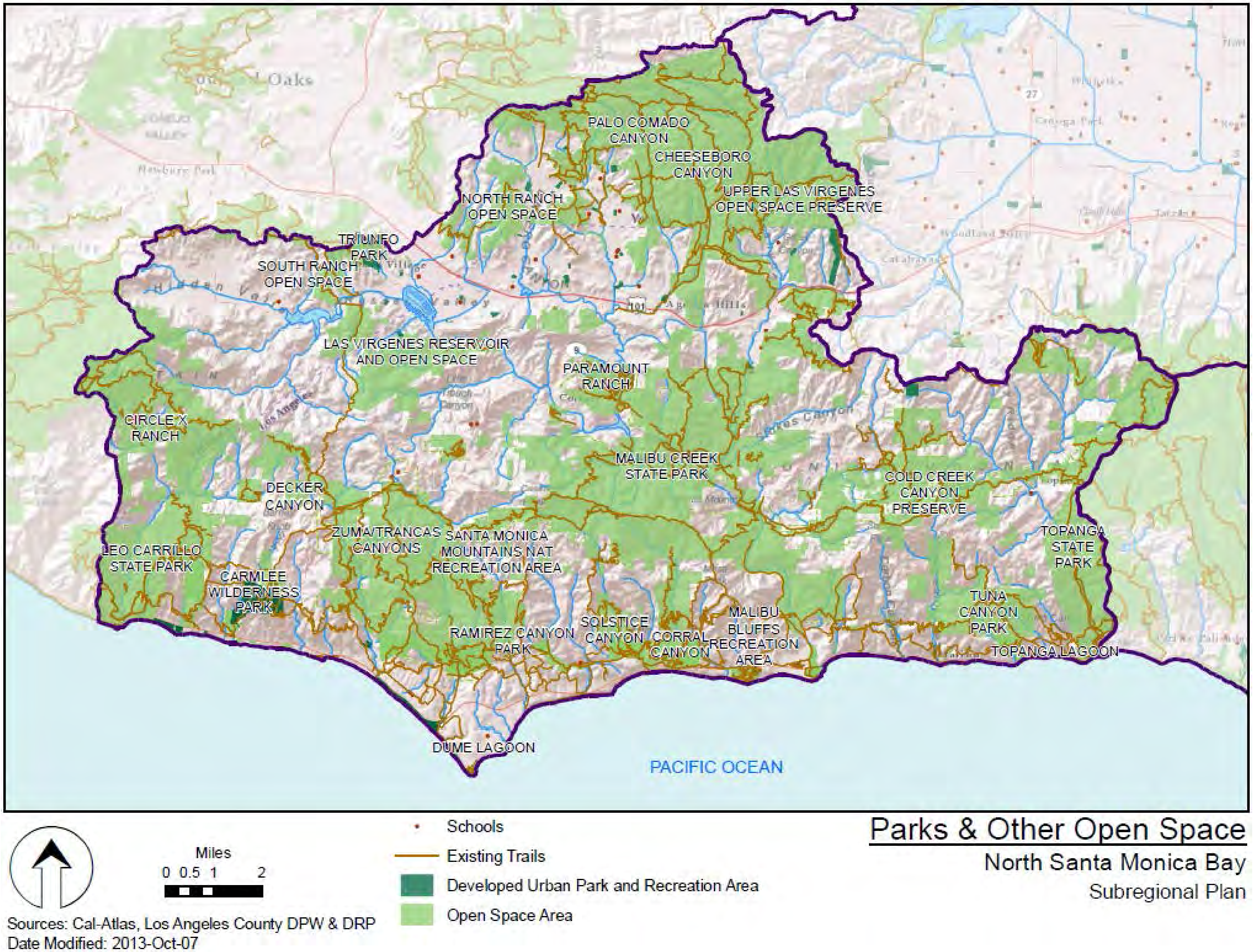


**Figure 16: City of Malibu Parks and Protected Open Space Areas**

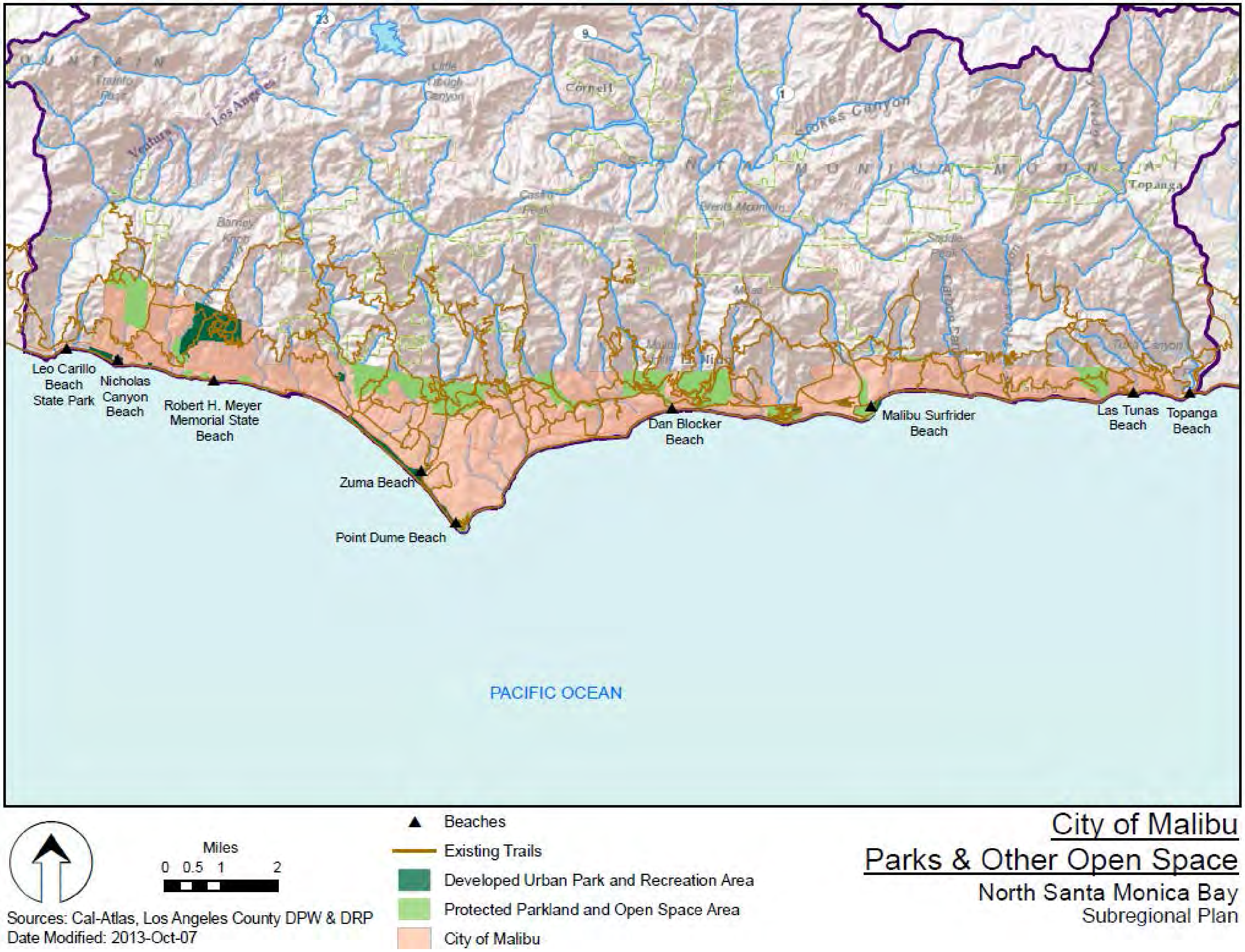
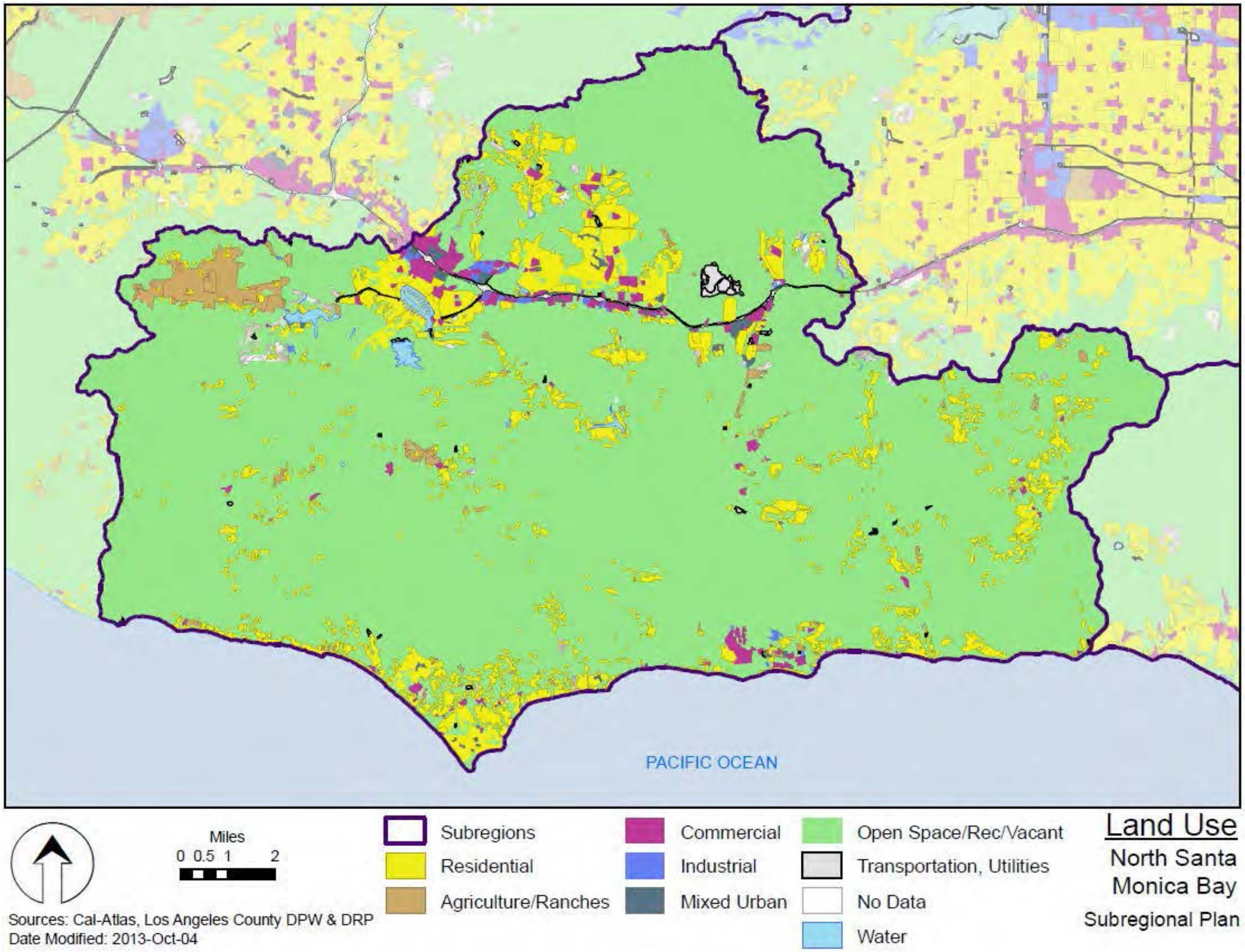


**Figure 17: Land Use**



# 3 Subregional Objectives and Targets

This section identifies the objectives for the Subregion and establishes quantified planning targets to the 2035 planning horizon that can be used to gauge success in meeting the objectives.

## 3.1 Objective and Target Development

The Greater Los Angeles County Regional IRWM Plan has developed regional goals, objectives, and targets. To assist the region in meeting these, objectives and targets have been developed for the Subregion. These objectives and targets are intended to help guide improvements to water supply, water quality, habitat, open space, and flood management to meet the Region's objectives and targets through Subregional planning.

Five objectives have been articulated, based on recent water resource planning documents. Workgroups composed of Stakeholders from within the Region were involved in establishing the Plan's objectives and targets. To establish quantifiable benchmarks for implementation of the plan, planning targets were defined based on much discussion within the regional workgroup. Objectives for five water resource areas were identified for the Subregion, which are discussed below and summarized in Table 6.

## 3.2 Water Supply Objective and Targets

Optimizing local water supply resources is vital for the Subregion to reduce its reliance on imported water and improve reliability of local water supplies should imported water supplies be reduced or interrupted due to environmental and/or political reasons. The Subregion plans on achieving this objective by conserving water through water use efficiency measures, increasing the non-potable reuse of recycled water, and increasing the capture and use of stormwater. In total, water supply targets will yield an additional 10,000 AFY of local supply for direct use.

To develop supply targets, water supply planning documents for agencies whose service areas cover a majority of the Subregion were examined for potential supply projects, and planned increases in supply between the years 2010 and 2035. The water supply targets for each Subregion were discussed in the *Water Supply Targets TM*.

## 3.3 Water Quality Objective and Targets

Improving the quality of urban and stormwater runoff will reduce or eliminate impairment of creeks, beaches, and other water bodies within and downstream of the Subregion. Additionally, the Subregion will continue to protect drinking water quality to ensure a reliable water supply.

Prevention of dry weather urban runoff can benefit water supplies by limiting water waste and can improve water quality by reducing the flow of pollutants to surface water.

The Subregion plans on achieving these objectives by increasing the capacity to capture and treat runoff and prevent certain dry weather flows. The water quality target was determined by setting a goal of capturing ¾ inch, 24-hour of storms over the Subregion. The Subregion's target is to develop 900 AF per ¾ inch, storm of new stormwater capture capacity (or equivalent) for water quality treatment. An emphasis will be given to the higher priority areas which will be determined by project-specific characteristics provided by the project proponent, including land use in the proposed project area, runoff and downstream impairments as well as protection priorities of the receiving waters. The assumptions and calculations used to determine this target for other subregions and catchment prioritization for this subregion can be found in the *Water Quality Objectives and Targets TM*. Applied to this subregion, the primary method of calculating ¾ inch storm capture on all subwatersheds with <98% developed or >1% impervious resulted in 4,200 AF of capture per ¾ inch storm. This method includes capture in open space area in many sparsely populated subwatersheds, resulting in an overestimation. A simpler method of multiplying developed area by ¾ inch was used. The total amount of rain that would fall on this 11% in a ¾ inch storm is 900_AF per ¾ inch storm. Recent research by Hibbs et al. (2012) demonstrated that even in the most developed watershed of Malibu Creek, up to 10% of summer time creek flow is attributed to urban runoff.

### 3.4 Habitat Objective and Targets

Protecting, restoring, and enhancing the Subregion’s native habitats is vital to preserving areas that will contribute to the natural recharge of precipitation and improve downstream water quality. Additionally, the protection, restoration, and enhancement of upland habitat, wetland/marsh habitat, riparian habitat and buffer areas will help restore natural ecosystem processes and preserve long-term species diversity. Subregional targets for habitat were not developed, but Regional habitat target development is discussed in the *Open Space, Habitat and Recreation TM*.

### 3.5 Open Space and Recreation Objective and Targets

Open space and recreation areas provide space for native vegetation to create habitat and passive recreational opportunities for the community. In addition, open space and recreation areas may preserve or expand the area available for natural groundwater recharge (though only in the forebay areas), improve surface water quality to the extent that these open spaces filter, retain, or detain stormwater runoff, and provide opportunities to reuse treated runoff for irrigation. Subregional targets for open space and recreation were not developed, but Regional open space and recreation target development is discussed in the *Open Space, Habitat and Recreation TM*.

### 3.6 Flood Management Objective and Targets

Improved integrated flood management systems can help reduce the risk of flooding, and protect lives and property. The Subregion plans on meeting this objective by reducing 2,760 acres of local unmet drainage needs, and removing 0.23 million cubic yards of sediment from debris basins and reservoirs. The local unmet drainage target was determined by looking at Special Flood Hazard Areas (SFHAs), also known as flood plains, as defined by FEMA, compared to land uses and the presence of structures. The sediment removal target was established using historical records to estimate sediment inflow, and estimate the sediment trapped within a 20-year period. Detailed assumptions and calculations used to develop the Subregion’s flood target can be found in the *Flood Management Objectives and Targets TM*.

**Table 6: Subregion Objectives and Planning Targets**

| Objectives | | Regional Planning Targets |
|---|---|---|
| **Improve Water Supply** | | |
| Optimize local water resources to reduce the Subregion's reliance on imported water. | Water Use Efficiency | Conserve 6,000 AFY of water by 2035 through water use efficiency and conservation measures. |
| | Groundwater | No target to increase groundwater pumping. |
| | Recycled Water | No target to increase indirect potable reuse of recycled water.<br><br>Increase non-potable reuse of recycled water by 4,000 AFY |
| | Ocean Desalination | No target to increase ocean desalination. |
| | Stormwater | Increase capture and use of stormwater runoff by <1,000 AFY that is currently lost to the ocean.<br><br>No target to increase stormwater infiltration. |
| **Improve Water Quality** | | |
| Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater, and wastewater. | Runoff (Wet Weather Flows) | Develop[1] 900 AF of new stormwater capture capacity (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[2]. |
| **Enhance Habitat** | | |
| Protect, restore, and enhance natural processes and habitats. | Habitat targets were not developed to the subregional level – only to the regional level. | |
| **Enhance Open Space and Recreation** | | |
| Increase watershed friendly recreational space for all communities. | Open space and recreation targets were not developed to the subregional level – only to the regional level. | |
| **Improve Flood Management** | | |
| Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. | Sediment Management and Integrated Flood Planning | Reduce flood risk in 2,760 acres of flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches.<br><br>Remove 0.23 million cubic yards of sediment from debris basins and reservoirs. |

[1] Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75", 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed). The calculation of North Santa Monica Bay priority ranking was based on modeling done using results from the primary regional method applied proportionally to the total from the alternate method for this subregion.

[2] High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.

# 4 Partnership and Multi-benefit Opportunities

Many agencies and other entities have successfully been working together for decades on many collaborative projects. For instance in this Subregion, the protection of water quality is the result of a set of activities and facilities that represents collaboration and integration among Los Angeles County, cities, recreation area managers and others. Projects that seek to enhance or extend these existing activities should be encouraged, because often they will be the most cost-effective.

Implementation of projects is the vehicle to meeting the objectives and planning targets discussed in Section 3. Integration and collaboration can help these projects achieve synergies and, at times, increase their cost-effectiveness in meeting multiple objectives. In addition to the collaboration described above, the GLAC IRWM Region will continue to build upon a wealth of potential multi-benefit project opportunities for partnership projects including:

- **Local Supply Development:** Alternative supply development such as distributed (smaller, non-centralized) stormwater capture projects are often too costly for a water supply agency to construct on their own for water supply purposes only. The near-term unit cost can be well in excess of the cost of imported water. However, partnerships often help to share the costs, thus providing opportunities for more complex, multi-benefit projects (such as water quality improvement) that otherwise might not be accomplished.
- **Improving Stormwater Quality:** In preparing this update of the IRWM Plan, a methodology to identify priority drainage areas based on their ability to improve water quality for coastal and terrestrial waters was developed. Integrated projects that can provide water quality improvements can be cited relative to that prioritization to achieve the highest benefits.
- **Integrated Flood Management:** Earlier studies, such as the Sun Valley Watershed Management Plan (2004), demonstrated the potential for similar cost-effective synergies between flood control, stormwater quality management, water supply, parks creation and habitat opportunities. Flood control benefits usually achieved through significant traditional construction projects can sometimes be accomplished with alternative multi-benefit projects.
- **Open Space for Habitat and Recreation:** When habitat is targeted for restoration, there are often opportunities for cost-effective implementation of flood control, stormwater management and passive recreation (such as walking and biking trails) as well. Active recreation projects may also provide opportunities for stormwater management and reuse. Targets and strategies outlined in the OSHARTM will be evaluated and considered when developing multi-benefit projects.

These benefit synergies and cost effectiveness outcomes can best be attained when the unique physical, demographic and agency service area attributes of the region are considered. In addition to existing collaborative processes, the GLAC IRWMP has developed a geodatabase tool to assist in identifying areas and partnerships conducive to both inter-subregional and intra-subregional integrated project development. This section discusses this tool as well as some preliminary analyses on the North Santa Monica Bay Subregion's potential partnerships and integrated project opportunities.

## 4.1 GLAC IRWMP Integration Process and Tools

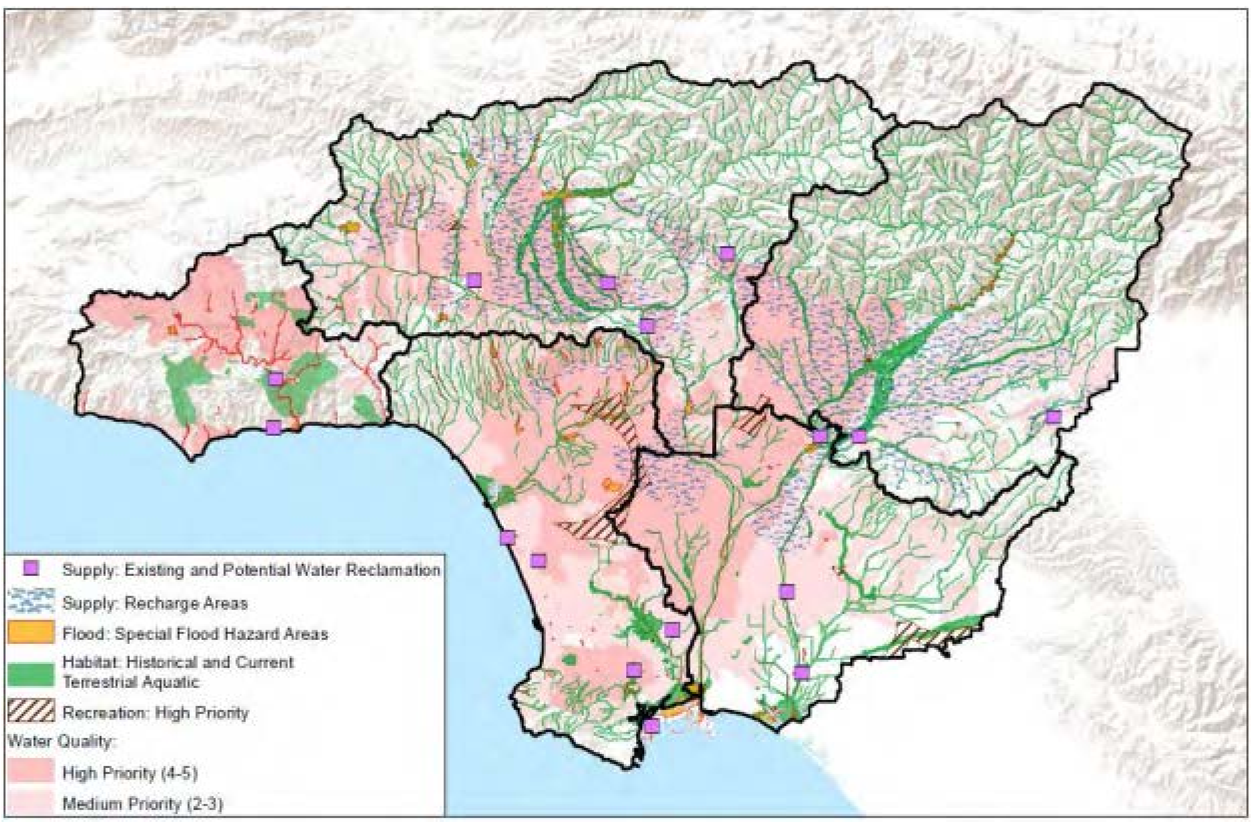
As part of the objectives and targets update process, the GLAC Region compiled and developed several geo-referenced data layers to assist in spatially identifying priorities and potential opportunities to achieve water supply, water quality, habitat, recreation and flood management benefits. These data layers were

initially used individually to determine the objectives and planning targets for each water management area. However, these datasets can also be overlaid to visually highlight areas with the greatest potential to provide multiple benefits. The resulting Potential Benefits Geodatabase (Geodatabase) can also align these areas relative to other layers containing agency service areas and jurisdictions – allowing for project proponents and partners to be identified.

## Potential Benefits Geodatabase

The GLAC IRWMP Potential Benefits Geodatabase is a dynamic tool that should be updated as new data is made available in order to maintain its relevance in the IRWM planning context. However, in order to provide an analysis of potential integration and partnership opportunities for the 2013 GLAC IRWM Plan, current data layers were overlaid and analyzed. The key layers used are shown in Figure 16 and described in Table 7. It should be noted that these datasets may not be complete or in need of further refinement and therefore will be updated on an as-needed basis – which is part of the dynamic process previously described. Therefore, the Geodatabase should only be used as an initial step in identifying multi-benefit potential and by no means used to invalidate the potential for achieving benefits in other areas.

**Figure 18: GLAC Region Potential Benefits Geodatabase Layers**




## Using the Geodatabase

The Geodatabase is a dynamic visual tool. The data layers and maps shown in this Section are only some of a multitude of ways to package and view the datasets to help with the integration process. It is important to note that not all data that could be useful in identifying integration and partnership potential for the region is easily viewed spatially in this format. Therefore, the Geodatabase should only be used as one of several potential integration tools or methods. More detailed reference maps are included in other figures within this Subregional Plan.

The Geodatabase can also be used to identify the potential for further integration between existing projects included in an IRWMP. Currently the GLAC Region has a web-based project database (OPTI) that geo-references all projects included in the IRWM. As part of the 2013 Plan Update, this dataset of projects will eventually be updated and prioritized. This resulting project dataset could be included as a layer in the Geodatabase or conversely, the existing Geodatabase layers could be uploaded to OPTI for public viewing and made available to OPTI users. In the future, additional layers, such as groundwater quality and general plan areas, can be added to the Geodatabase to enhance the ability of project proponents to identify integration opportunities. Either way, by overlaying the current projects on top of the potential benefit layers, additional benefits could be added to existing projects or linked to other projects and proponents through those benefits.

**Table 7: Potential Benefit Geodatabase Layers**

| Data Layer | Description |
|---|---|
| Supply: Recharge Areas[1] | Shows areas where soils suitable for recharging are above supply aquifer recharge zones, thereby indicating that water infiltrating in these areas has the potential to increase groundwater supplies. |
| Supply: Existing and Potential Water Reclamation[2] | Shows locations of existing wastewater and water reclamation plants. |
| Flood: Special Flood Hazard Areas[3] | Shows some of the areas that would benefit from increased drainage to alleviate flooding potential. |
| Habitat: Historical and Current Terrestrial Aquatic[4] | Shows the combined current and historical habitat areas that would indicate the potential for aquatic habitat protection, enhancement, or restoration benefits to be derived. (Note: North Santa Monica Bay Subregion did not have similar data so it shows Significant Ecological Areas instead[5].) |
| Recreation: High Priority[6] | Shows areas that have the greatest need for open space recreation given the distance from current open space recreation sites. |
| Water Quality: Medium and High Priority[7] | Shows watershed areas with medium and high priority and therefore relative potential to improve surface water quality. |

[1] Created using Los Angeles County's groundwater basins shapefile overlaid with soils and known forebays shapefiles

[2] Created by RMC Water and Environment for the Los Angeles Department of Water and Power's Recycled Water Master Planning program to show sources of wastewater that could be made available for recycled water use.

[3] Created by Federal Emergency Management Agency to define areas at high risk for flooding (subject to inundation by the 1% annual chance flood event) and where national floodplain management regulations must be enforced

[4] From *Regional restoration goals for wetland resources in the Greater Los Angeles Drainage Area: A landscape-level comparison of recent historic and current conditions using GIS* (C. Rairdan, 1998) and additional current terrestrial aquatic habitat is based on the extent of current habitat derived from the National Wetlands Inventory, with the exception of the GIS layer for NSMB watersheds which shows no streamlines.

[5] Significant Ecological Areas are those areas defined by Los Angeles County as having ecologically important land and water systems that support valuable habitat for plants and animals. The GIS layers do not reflect ESHAs in the City of Malibu which are also ecologically important.

[6] Created for the *GLAC IRWM Open Space for Habitat and Recreation Plan (2012)*, and shows where there is less than one acre of park or recreation area per one thousand residents.

[7] Created for the *GLAC IRWM Water Quality Targets TM (2012)*, which ranked catchments based on TMDLs, 303(d) listings and catchments that drain into Areas of Special Biological Significance (ASBS).

## 4.2 Integration Opportunities in North Santa Monica Bay

Based upon Figure 17, the North Santa Monica Bay Subregion is notable relative to other subregions in a few ways:

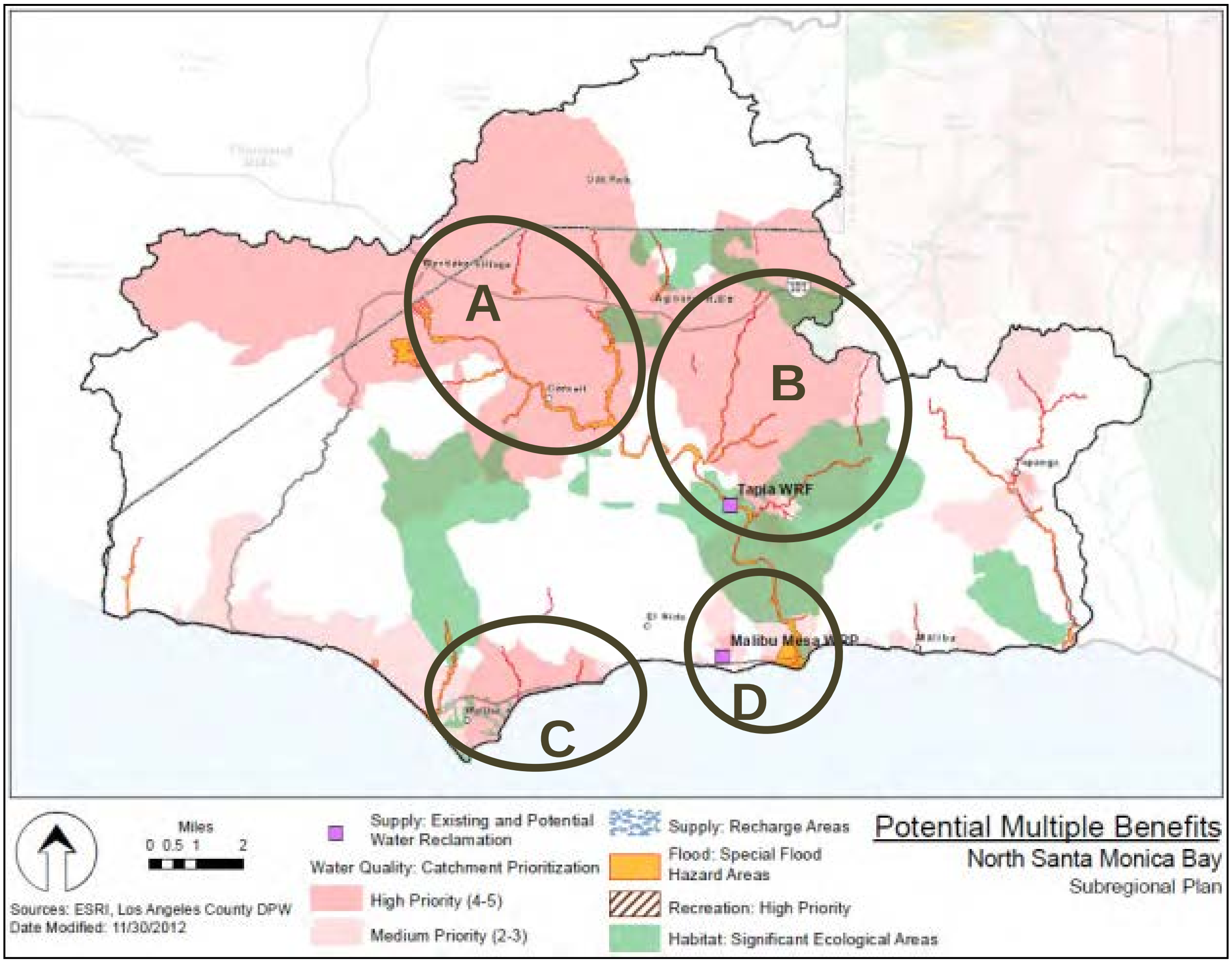
- There is less need for additional passive recreation and open space, however there is deficit of active recreation in this Subregion.
- There are urbanized upstream areas with stormwater quality and potential flood impacts on downstream developed areas, natural streams and sensitive nearshore habitat areas.
- There is less concrete channelization of streambeds than in other subregions and greater potential to more easily return channelized streambeds to natural streambeds and habitat areas.

What is not seen in the map, but is true of the North Santa Monica Bay Subregion, is that relative to other subregions, the North Santa Monica Bay is heavily dependent upon imported water supplies given limited groundwater recharge potential. Therefore, local supply development anywhere within the Subregion would be considered to provide great benefits.

There is the least need for new passive recreation and open space to serve local residents compared to the other four GLAC subregions, however there is a deficit in local, active recreation facilities. Also not reflected on the maps or in statement above, the SMMNRA and the NSMB play a critical role in providing public recreation for the areas of greater Los Angeles that do not have adequate parkland. For example, the park agencies' programs provide outdoor recreation opportunities for thousands of school children living in under-served communities each year. There are numerous programs that also educate children about where their water supply comes from and the importance of conserving water. Additionally, protection, enhancement, and restoration of this Subregion's existing open space are recognized as having great significance for the entire GLAC region.

The following sections highlight a few areas in the North Santa Monica Bay Region where integration and partnership opportunities could be found based upon the Geodatabase layers and multiple benefit analysis performed. The areas described here are meant to provide examples of potential multiple benefits areas and are not meant to be a comprehensive inventory of opportunities. As subregions move forward to identify potential projects, it will be necessary to examine localized site characteristics (such as land uses) to confirm that it will be possible to meet the potential benefits discussed below.

**Figure 19: GLAC Region Potential Benefits Geodatabase Layers**




## A: Westlake Village and Agoura Hills Integrated Flood Management and Water Quality

This area is a priority area for water quality issues as well as flood issues. Additionally, capturing stormwater for onsite use has the potential to reduce reliance on imported water supplies. There could also be opportunities to return channelized streams to more natural systems with habitat restoration as an added benefit. Projects could provide multiple benefits when coupled with water quality improvement components and flood management. Removal of non-native species in the upper watershed is also an opportunity for this area.

There is the potential for partnerships between LACFCD, Santa Monica Mountains Conservancy, State Parks, and the cities of Westlake Village and Agoura Hills.

## B. City of Calabasas Supply, Water Quality and Flood Management

The City of Calabasas is on the border between the Upper Los Angeles River Watershed and the North Santa Monica Bay Subregion, and therefore provides an opportunity for collaboration between these two subregions. This area is also a priority area for water quality improvements and integrated flood management that could further enhance habitat benefits for the Region by returning channelized streams to more natural systems. The proximity to a reclaimed water source could also incorporate a water supply benefit into projects developed in this area. Partnerships between the City of Calabasas, LACFCD, Las Virgenes MWD and local watershed groups could generate the multiple benefit projects.

## C. Point Dume and South East Coastal Watershed Protection of ASBS and MPAs

This coastal area is adjacent to an offshore significant habitat area and designated ASBS and MPAs, and has special need for water quality best management practices (BMPs) to protect the ASBS. This area also provides good opportunities for habitat restoration and partnerships between the City of Malibu, LACFCD, LACPW, LACB&H, Caltrans and State Parks. The area up coast of Point Dume Headlands is also a Marine Protected Area and the same partnership opportunities apply.

## D. Malibu Creek Habitat, Water Quality and Supply

This coastal area near and including Malibu Lagoon has great potential for habitat restoration, water quality protection and flood protection. Encouraging above ground collection of rain water in nearby residential and retail communities can also help reduce dependence on imported water while removing some potential for flooding and stormwater quality impacts. Partnerships between the City of Malibu, the Santa Monica Bay Restoration Commission, State Parks, Caltrans, LACB & H and LACFCD could result in integrated projects for the Subregion. The proposed centralized wastewater treatment facility in the Malibu Civic Center area will provide recycling opportunities to reduce dependence on imported water supplies.

## References

California Department of Fish and Wildlife, 2012. *Southern California Marine Protected Areas.* http://www.dfg.ca.gov/marine/mpa/scmpas_list.asp

California Water Services Company, Westlake, 2011. *2010 Urban Water Management Plan.*

Dixon, John, 2003. *Designation of ESHA in the Santa Monica Mountains.* Memorandum prepared for the California Coastal Commission.

Hibbs, B. J., W. Hu., and R. Ridgeway. 2012. Origin of source flows in a watershed at the wildlands-urban interface, Santa Monica Mountains, *Environmental and Engineering Geoscience*, 27(4).

Lake Sherwood, 2011. 2010 Urban Water Management Plan.

Las Virgenes MWD, 2011. 2010 Urban Water Management Plan.

Los Angeles County Department of Regional Planning (LACDRP), 2011. *Los Angeles County General Plan 2035.* Public Review Draft.

Maliboulake.com, 2012. *History of Malibou Lake.* http://www.lakemalibou.com/

Malibu, City of, 2000. *Parks and Recreation Master Plan*. http://www.ci.malibu.ca.us/Index.aspx?NID=342.

Malibu, City of, 2013. Local Coastal Program. http://www.ci.malibu.ca.us/Index.aspx?NID=372.

Los Angeles County Department of Public Works, Water District #29, 2011. *2010 Urban Water Management Plan.*

Metropolitan Water District of Southern California (MWDSC), 2010. *Integrated Regional Plan.*

MWDSC, 2007. Groundwater Assessment Study. Report Number 1308. http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/GWAS.html

NOAA, 2012. *Southern California Steelhead Recovery Plan Summary.* http://swr.nmfs.noaa.gov/recovery/SC_Steelhead/

National Park Service (NPS), 2007. *Santa Monica Mountains National Recreation Area Fire Management Plan.* http://home.nps.gov/samo/parkmgmt/upload/Final_FMP_07update.pdf.

NPS, 2012. Santa Monica Mountains National Recreation Area. http://www.nps.gov/samo/index.htm

Regional Water Quality Control Board - Los Angeles Region (RWQCB), 2011. *State of the Watershed - Report on Water Quality, The Santa Monica Bay Watershed Management Area*. 2nd Edition.

RWQCB, 2011b. Shapefiles of Permitted Storm Sewer System (MS4) Discharges, Industrial General Discharges, and Caltrans Discharges.

Resource Conservation District of the Santa Monica Mountains (RCDSMM), 2011. *Topanga Creek Watershed.* http://www.rcdsmm.org/topanga-creek-watershed-what-makes-it-so-special.

State Water Resources Control Board (SWRCB), 2010. *2010 Integrated Report (Clean Water Act Section 303(3) List / 305(b) Report) - Statewide.* http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

SWRCB, 2005. *California Areas of Special Biological Significance.* http://www.waterboards.ca.gov/water_issues/programs/ocean/asbs_map.shtml

Southern California Association of Governments (SCAG), 2012. *Adopted 2012 RTP Growth Forecast.* http://www.scag.ca.gov/forecast/index.htm

Triunfo Sanitation District / Oak Park Water Service, 2011. *2010 Urban Water Management Plan.*

U.S. Census Bureau, 2012. *2010 Census Data*. Census tract.

U.S. Geological Survey (USGS), 2002. *Hazardous Trace Elements in Petrolium Source Rocks, Monterey Formation.* http://energy.cr.usgs.gov/TraceElements/monterey.html.

# Exhibit A. Regional Imported Water Information

*State Water Project*

The SWP is a system of reservoirs, pumps and aqueducts that carries water from Lake Oroville and other facilities north of Sacramento to the Sacramento-San Joaquin Delta and then transports that water to central and southern California. Environmental concerns in the Sacramento-San Joaquin Delta have limited the volume of water that can be pumped from the SWP. The potential impact of further declines in ecological indicators in the Bay-Delta system on SWP water deliveries is unclear. Uncertainty about the long-term stability of the levee system surrounding the Delta system raises concerns about the ability to transfer water via the Bay-Delta to the SWP.

The MWD contract with the Department of Water Resources (DWR), operator of the SWP, is for 1,911,500 acre-feet/year. However, MWD projects a minimum dry year supply from the SWP of 370,000 acre-feet/year, and average annual deliveries of 1.4 million acre-feet/ year. These amounts do not include water which may become available from transfer and storage programs, or Delta improvements.

MWD began receiving water from the SWP in 1972. The infrastructure built for the project has become an important water management tool for moving not only annual deliveries from the SWP but also transfer water from other entities. MWD, among others, has agreements in place to store water at a number of groundwater basins along the aqueduct, primarily in Kern County. When needed, the project facilities can be used to move stored water to southern California.

*Colorado River Aqueduct*

California water agencies are entitled to 4.4 million acre-feet/year of Colorado River water. Of this amount, the first three priorities totaling 3.85 million acre-feet/year are assigned in aggregate to the agricultural agencies along the river. MWD's fourth priority entitlement is 550,000 acre-feet per year. Until a few years ago MWD routinely had access to 1.2 million acre-feet/year because Arizona and Nevada had not been using their full entitlement and the Colorado River flow was often adequate enough to yield surplus water to MWD. According to its 2010 Regional UWMP, MWD intends to obtain a full 1.2 million acre-feet/year with possible water management programs with agricultural and other holders. MWD delivers the available water via the 242-mile Colorado River Aqueduct, completed in 1941, which has a capacity of 1.2 million acre-feet per year.

The Quantification Settlement Agreement (QSA), executed in 2003, affirms the state's right to 4.4 million acre-feet per year, though water allotments to California from the Colorado River could be reduced during future droughts along the Colorado River watershed as other states increase their diversions in accord with their authorized entitlements. California's Colorado River Water Use Plan and the QSA provide numeric baseline to measure conservation and transfer water programs thus enabling the shifting to conserve water (such as the lining of existing earthen canals) and to shift some water from agricultural use to urban use. Since the signing of the QSA, water conservation measures have been implemented including the agriculture-to-urban transfer of conserved water from Imperial Valley to San Diego, agricultural land fallowing with Palo Verde, and the lining of the All-American Canal.


# K. South Bay Subregional Plan

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# South Bay
# Subregional Plan

# Final

**Prepared by:**

RMC
Water and Environment

In Association with:

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consultants

**October 2013**

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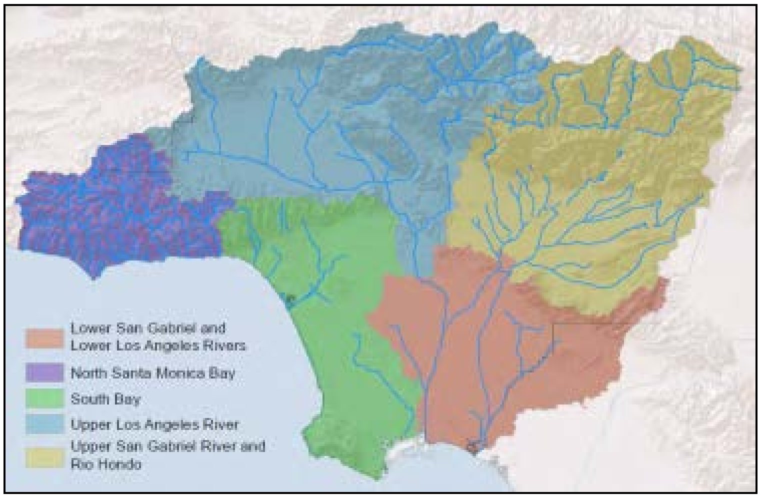
# 1 Background and Purpose of Subregional Plan

The South Bay Subregional Plan is one of five subregional plans that make up the Greater Los Angeles County Integrated Regional Water Management Plan (GLAC IRWM Plan). This Subregional Plan outlines the South Bay's physical setting, sources of water supply, water quality, environmental resources, planning objectives and targets, and partnership and multi-benefit opportunities. The purpose of the South Bay Subregional Plan is to outline its expected contribution to meeting the GLAC regional planning goals, objectives, and targets.

# 2 South Bay Subregion Description

## 2.1 Physical Setting

**Figure 1: GLAC Subregional Boundaries**




The South Bay Subregion of the Greater Los Angeles County Integrated Regional Water Management Region (GLAC IRWM Region) is located in the southwest area of Los Angeles County and is composed of the southeastern half of the Santa Monica Bay Watershed, along with the Dominguez Channel Watershed. The Subregion's watersheds consist of three defining characteristics—its coastline, its population and its industry. More than 30 miles of coastline in the South Bay attracts tens of millions of visitors every year, serve as an important recreation area for the area's residents, and in a few remaining pockets such as the Palos Verdes Peninsula, Madrona Marsh, Ballona Wetlands, portions of the Santa Monica Mountains and Baldwin Hills, support a diverse population of birds and other wildlife.

With over 2.6 million residents according to the 2010 census, the South Bay is one of the most dense and economically diverse urban areas of the region, creating both challenges to preserve and enhance local water resources and the natural environment, as well as unique opportunities for collaboration. Population projections from the Southern California Association of Governments (SCAG) estimate that the population within the South Bay could increase to over 3 million residents by 2035. The South Bay's industries--oil refining, power generation and transportation via the Port of Los Angeles, Los Angeles International Airport and major freeways—provide similar challenges and opportunities. (U.S. Census Bureau, 2012; SCAG, 2012)

*Political Boundaries*

The South Bay Subregion is located within the Los Angeles County and includes over 20 cities and unincorporated areas. Figure 2 depicts the county and city boundaries of the South Bay Subregion.

*Climate, Temperature, and Rainfall*

The South Bay is within the Mediterranean climate zone, which extends from Central California to San Diego, and is characterized by winter precipitation, mostly falling in a few major storm events between November and March, followed by dry summers. Long-term annual average rainfall is approximately 12 inches per year, but can vary greatly from year to year and between the coast and the Santa Monica Mountains.

**Figure 2: Cities in the South Bay Subregion**

*Geography and Geomorphology*

The geography of the South Bay can generally be divided into two distinct types: coastal plain and mountain range (the Santa Monica Mountains). Most of the coastal plain is less than 1,000 feet in elevation.

Geology varies from Precambrian metamorphic rocks (1.7 billion years old) to alluvial deposits washed down from mountain canyons. Alluvial deposits of sand, gravel, clay and silt in the coastal plain are thousands of feet thick in some areas, due in part to the erosive nature of the neighboring San Gabriel and Santa Monica Mountains. The South Bay is webbed with fault systems including the Newport-Inglewood fault that runs from Newport Beach to Beverly Hills via Long Beach and Signal Hill.

## 2.2 Watersheds and Water Systems

*Watersheds*

The South Bay Subregion contains two major watersheds, the southeastern portion of the Santa Monica Bay watershed (which includes the Ballona Creek watershed) and Dominguez Channel watershed, in addition to many smaller watersheds which drain directly to the Santa Monica Bay. The watersheds are shown on Figure 3.

The Southeastern Santa Monica Bay Watershed includes the Santa Monica Mountains to the north, the Palos Verdes Peninsula to the south and reaches almost to downtown Los Angeles to the east. The130 square mile Ballona Creek Watershed, about 9 miles in length, is the largest subwatershed of the Southeast Santa Monica Bay Watershed but many smaller coastal watersheds are part of the larger watershed as well. (RWQCB, 2011)

The Dominguez Channel Watershed is 15 miles long and drains a densely urbanized area of approximately 133 square miles to the inner Los Angeles Harbor. The watershed covers the area just south of the Santa Monica Bay, its northern boundary beginning at Inglewood, extending south to Long Beach Harbor. The watershed generally has a low gradient, and its boundaries are not visually apparent in many locations, defined by the directions that underground storm drains flow. Within the Dominguez Channel Watershed there are five main sub-watersheds including the Upper Channel Watershed, Lower Channel Watershed, Retention Basins Watershed, Machado Lake Watershed and Harbors Watershed. (RWQCB, 2008)

*Flood Management*

Due to the Subregion’s highly urbanized nature, flood management is important to protect human lives and property. The County and the many cities of the area have storm drains which flow within the watersheds. The Los Angeles County Flood Control District manages the regional flood infrastructure, in particular channelized streams (including Ballona Creek and Dominguez Channel), debris basins and flood control dams. Within the South Bay Subregion there are very few debris basins, all of which are located in the Santa Monica Mountains. (LACDPW, 2011)

**Figure 3: Watersheds and Surface Waters in the South Bay Subregion**

**Figure 4: Wholesale Water Suppliers**

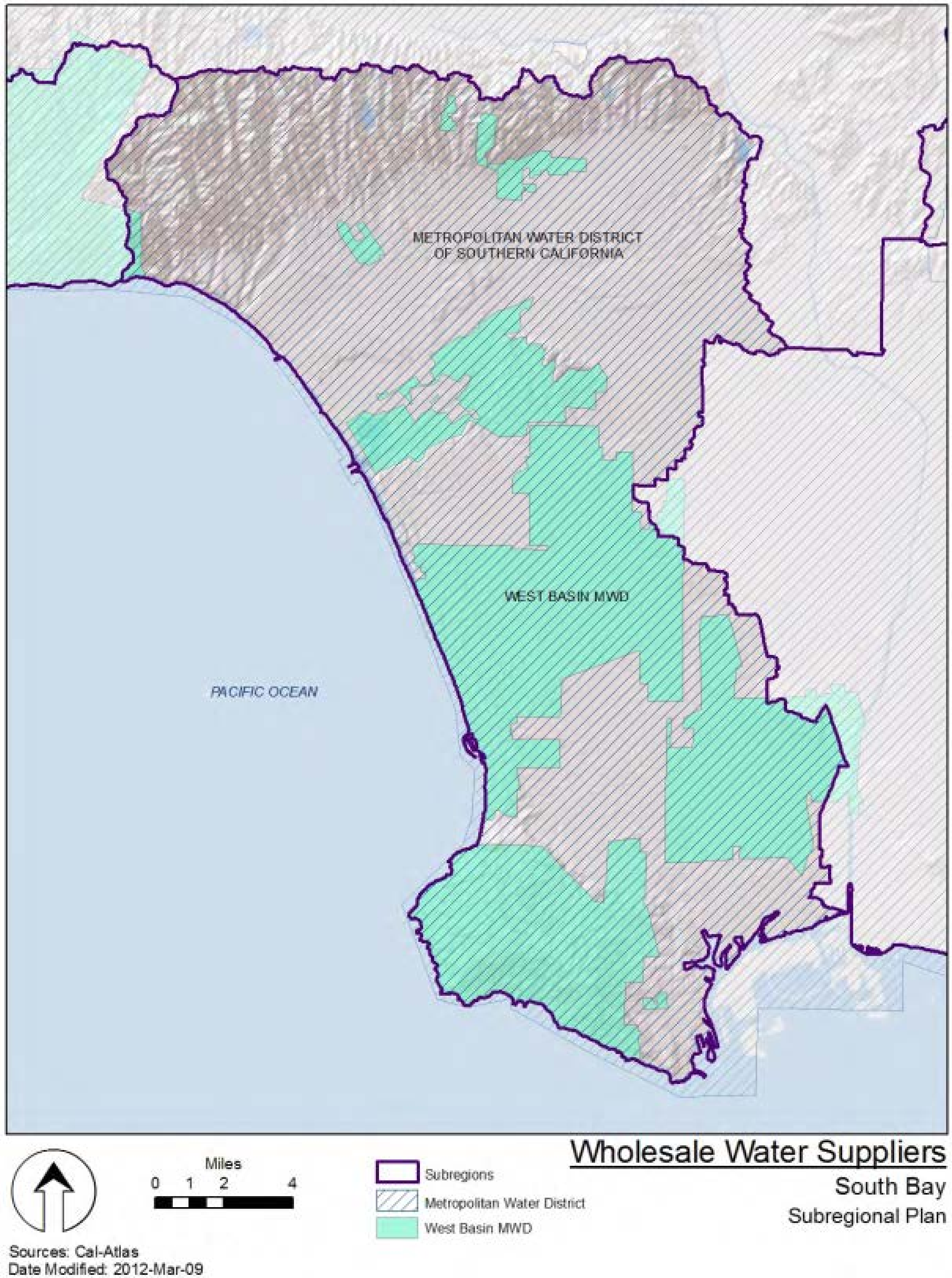
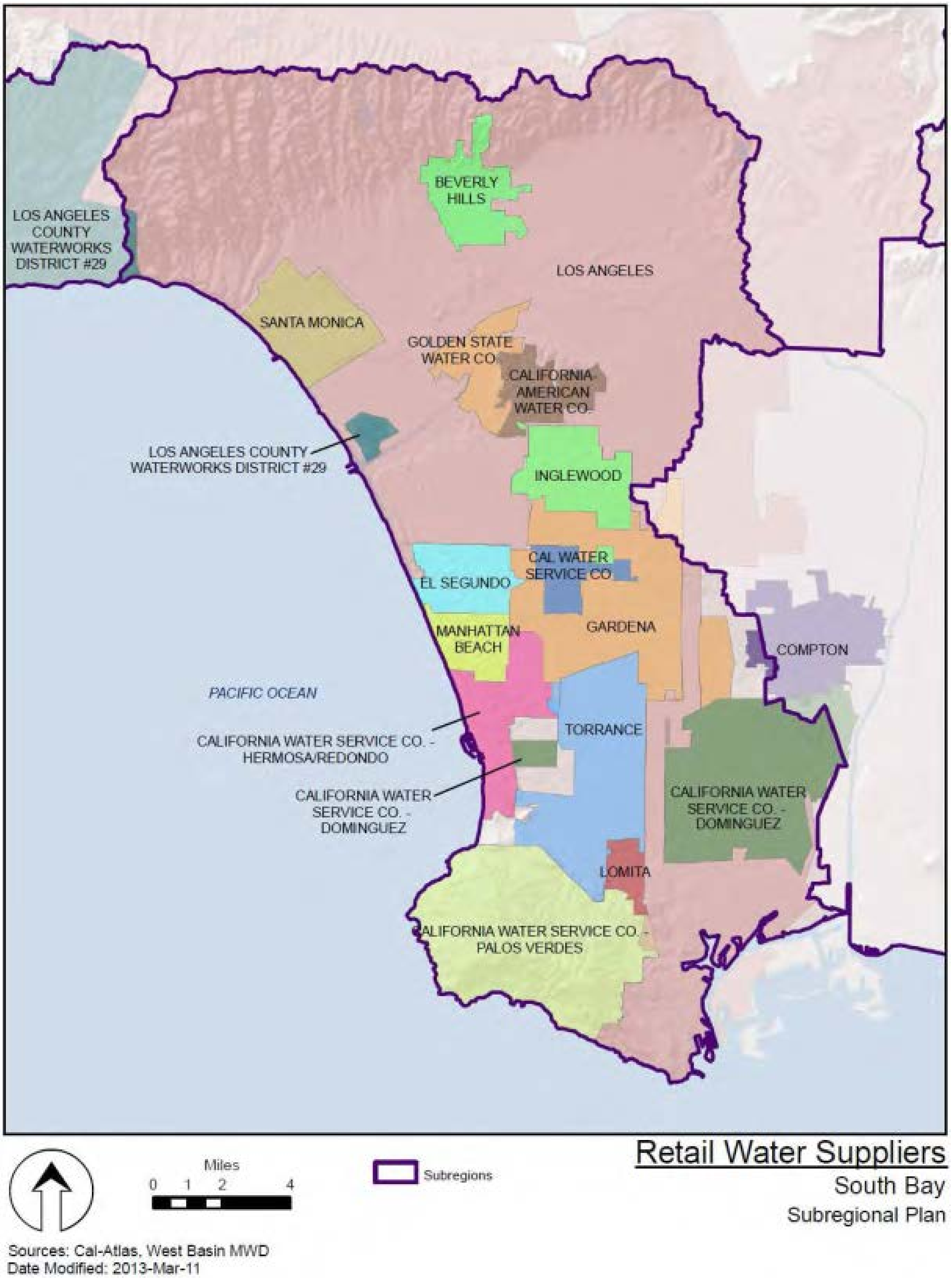


**Figure 5: Retail Water Suppliers**



*Water Suppliers and Infrastructure*

The water suppliers in the Subregion can be divided into wholesalers and retailers. Wholesalers (Figure 4) provide imported water and/or recycled water and to other agencies, while retailers (Figure 5) sell water to end users. The major wholesalers in the Subregion include West Basin Municipal Water District (WBMWD) and Metropolitan Water District of Southern California (MWDSC). The major retailers in the Subregion include Los Angeles Department of Water and Power (LADWP) and the cities of Santa Monica, Torrance, and Beverly Hills(shown in Figure 5). The retailers that are customer agencies of WBMWD include California American Water Company, California Water Service Company, Golden State Water Company, Los Angeles County Waterworks District #29, City of Lomita, City of Manhattan Beach, City of Inglewood, and City of El Segundo. These suppliers use a combination of imported water, groundwater, and recycled water to serve potable and non-potable demand in their service areas. Each of these major suppliers has written a comprehensive 2010 UWMP to estimate future water supply demands and availability, and which were utilized in the estimation of supplies discussed later in this plan.

Given that this Subregion is highly urbanized, there is extensive water infrastructure in place for the production of water and the delivery of water to both retailers and to end-users. A number of cities have groundwater wells in place for the pumping of the groundwater basins in the area. In addition, the MWDSC delivers water through imported water feeder pipelines to WBMWD, Torrance, Los Angeles, Santa Monica and Beverly Hills.

## 2.3 Sources of Water Supply

The South Bay has developed a diverse mix of local and imported water supply sources. Local water resources include groundwater, recycled water, water conservation, and water transfers. Water is imported through the California State Water Project (SWP), the Colorado River Aqueduct, and the Los Angeles Aqueduct. Major water supply sources are described below.

Sources of retail supply vary throughout the Subregion, as shown in Table 1. This table was developed based on 2010 Urban Water Management Plans (UWMPs) whose service areas cover a majority of the Subregion. These agencies include:

- WBMWD (portion within Subregion)
- City of Torrance
- City of Beverly Hills
- City of Santa Monica
- City of Los Angeles (portion within Subregion)

In addition to retail supply, replenishment supply is needed to both replenish the West Coast Groundwater Basin and to use with injection wells serving as seawater barriers. Table 2 shows 2010 supplies used to meet replenishment needs.

**Table 1: Current Retail Supplies (acre-feet per year)**

| Supply | 2010 |
|---|---|
| Groundwater | 53,000 |
| Imported Water | 405,000 |
| Recycled Water | 27,000 |
| Desalinated Ocean Water | 0 |
| Stormwater | 0 |
| Water Use Efficiency | 17,000 |
| **Total** | **502,000** |

**Table 2: Current Replenishment Supplies (acre-feet per year)**

| Supply | 2010 |
|---|---|
| Imported Water | 15,000 |
| Recycled Water | 8,000 |
| Stormwater | 0 |
| **Total** | **23,000** |

## Groundwater

Groundwater is the only source of local potable supply in the Subregion. The major groundwater basins underlying the South Bay Subregion are the West Coast Basin, Santa Monica Basin and Hollywood Basin (Figure 6).

The West Coast Basin is adjudicated; therefore producers within this basin follow management guidelines established by their adjudication. The Santa Monica Basin and Hollywood Basin are both unadjudicated and the primary producers in each basin are Santa Monica and Beverly Hills, respectively.

Groundwater basin recharge can occur via existing and restored natural channel bottoms or percolation of rainwater (natural recharge); however natural recharge is typically insufficient to maintain basin water levels and current pumping levels due to the extent of impervious surfaces and the presence of clay soils in parts of the Subregion. There are currently injection wells in place in the West Coast Basin which inject recycled water and imported water along the coast to form barriers to seawater intrusion in two locations (the Dominguez Gap and West Coast Basin Barriers). Some underflow to the West Coast Basin from the neighboring Central Basin is known to occur.

The recharged water augments and blends with groundwater, which is eventually extracted for potable use. Conjunctive use programs may also be implemented to recharge basins, where imported water is recharged via injection wells. Recharge also can occur "in-lieu" when an agency suspends production from its wells and uses other supplies. The reduction in pumping allows groundwater levels in the basin to recover. The amount of water that can be recharged in the basin may be limited by local runoff, recharge capacity, overlying groundwater demands, and water rights.

## Imported Water

Imported water is the largest source of supply in the Subregion. The primary imported water wholesaler to the Subregion is MWDSC. WBMWD, the City of Los Angeles, and Torrance purchase water from MWDSC. WBMWD, in turn, wholesales imported water to retailers in the South Bay Subregion.

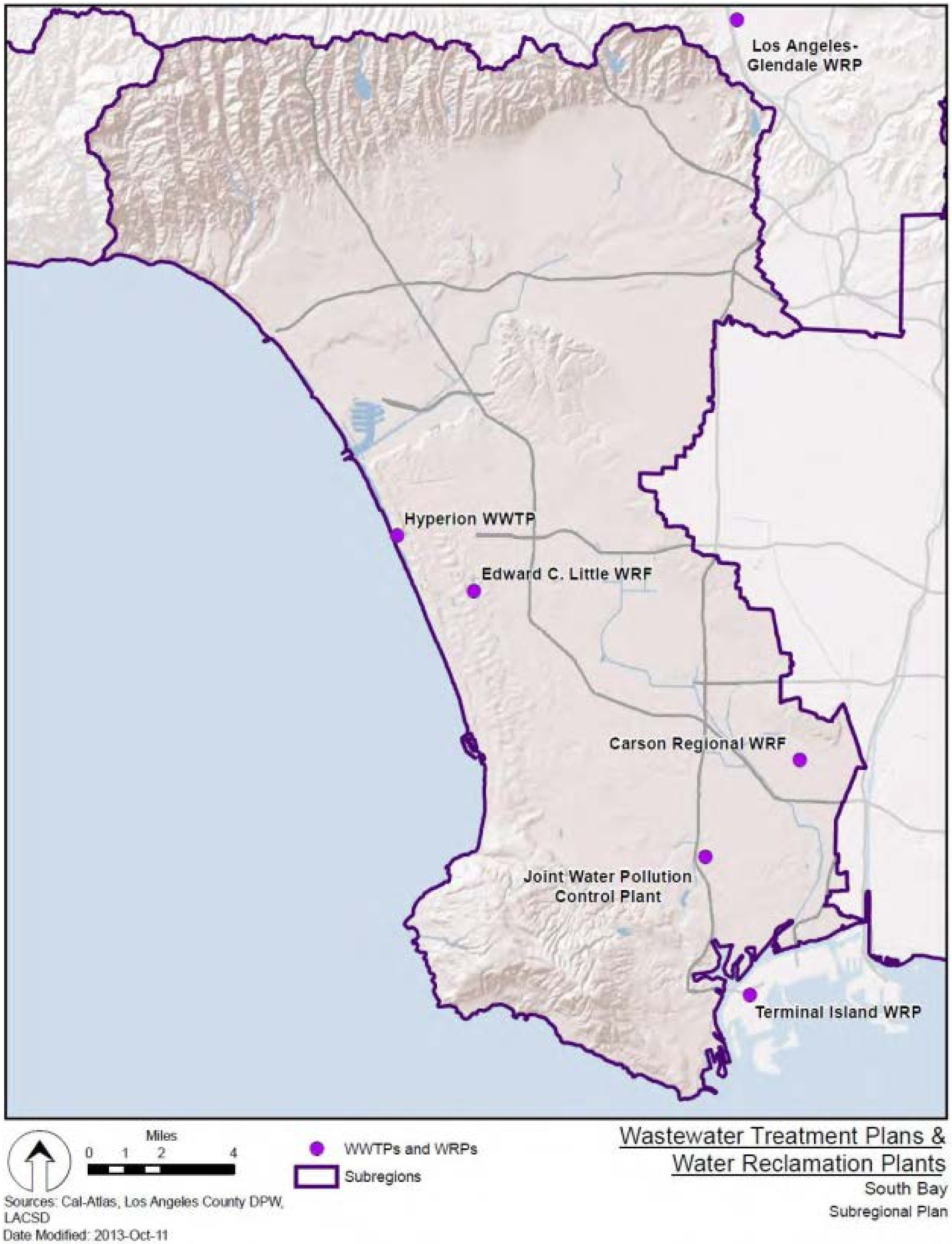
Imported water comes from the State Water Project, Colorado River Aqueduct, and the Los Angeles aqueducts.

**Figure 6: Groundwater Basins**


## Recycled Water

Recycled water is produced through treatment at a number of wastewater and reclamation plants including: the City of Los Angeles' Hyperion Treatment Plant, the County of Los Angeles Terminal Island Treatment Plant, the Edward C. Little WRF and the Joint Water Pollution Control Plant (JWPCP) (shown in Figure 7). In total, these WRPs have a capacity of approximately 790 million gallons per day

**Figure 7: Wastewater Treatment Plants and Water Reclamation Facilities**



(MGD), and treat nearly 40,000 AFY, using tertiary and advanced treatment, and reused for municipal uses (e.g., irrigation), industrial applications, and maintenance of seawater barriers in groundwater basins along the coast. The remainder is discharged to creeks and rivers, supporting riparian habitat in some locations, or directly to the ocean. The primary producers of recycled water in the Subregion are the Sanitation Districts of Los Angeles County, the City of Los Angeles, and WBMWD. Existing and future recycled water projects in the Subregion that were identified in the MWDSC's Integrated Water Resources Plan are shown in Table 3 and Table 4, respectively (MWD, 2010).

**Table 3: Existing Recycled Water Projects**

| Sponsoring Agency | Project Name | Ultimate Capacity (acre-feet) |
|---|---|---|
| LADWP | Edward C. Little Water Recycling Facility Phase I-IV | 1,000 |
| City of Santa Monica | Santa Monica Urban Runoff Recycling Facility (SMURRF) | 280 |
| Torrance | Edward C. Little Water Recycling Facility Phase I-IV | 7,800 |
| West Basin MWD | Edward C. Little Water Recycling Facility Phase I-IV | 54,800 |

**Table 4: Future Recycled Water Projects**

| Sponsoring Agency | Project Name | Ultimate Capacity (acre-feet) |
|---|---|---|
| LADWP | LAX Cooling Towers | 240 |
| West Basin MWD | Carson Regional Water Recycling Facility Phase II Expansion Project to serve LADWP | 9,300 |
| | Edward C. Little Water Recycling Facility Phase V | 5,026 |
| | Carson Regional Water Recycling Facility Phase II Expansion Project to serve BP | 2,100 |

## Desalinated Ocean Water

Desalinated ocean water can add to the Region's water supply reliability by diversifying its water supply sources. WBMWD operates the Ocean Water Desalination Demonstration Facility and Water Education Center to evaluate and demonstrate ocean protection, energy recovery and cost reduction technologies with the goals of ensuring a full scale ocean-water desalination facility will be done in a cost and energy efficient manner while protecting the ocean. WBMWD is planning on expanding this facility in the future to provide up to 21,000 AFY of desalinated ocean water.

## Stormwater Capture and Use

Stormwater capture and use is a method that can be used by municipalities both to add a source of supply to its water portfolio, and to reduce runoff that can contribute to flooding and water quality issues. Because this watershed has minimal opportunity to capture large quantities of water for infiltration to underlying water supply basins, stormwater capture and use will largely be used for irrigation purposes rather than directly for drinking water consumption. Stormwater use is currently taking place at a local level where the City of Los Angeles is planning on developing a Stormwater Capture Master Plan, and the

City of Santa Monica which actively promotes the use of rainwater for various non-potable applications through free workshops in addition to rain barrel and cistern rebates.

### 2.4 Water Supply and Demand

As water agency boundaries are not aligned with the subregional boundaries, water demand was estimated based on review of 2010 Urban Water Management Plans (UWMPs) for:

- West Basin MWD (portion within Subregion)
- City of Torrance
- City of Beverly Hills
- City of Santa Monica
- City of Los Angeles (portion within Subregion)

The demand projections in WBMWD's Regional UWMP were included as its service area covers the areas not covered by the individually listed cities. Given that the City of Los Angeles covers multiple subregions, the portion included in the South Bay Subregion was applied to the total demand estimated in the City of Los Angeles's UWMP to approximate the demand of the City of Los Angeles within the South Bay Subregion.

Demand projections for the South Bay Subregion can be seen in Table 5.

**Table 5: Current and Projected Subregion Water Demand**

| 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|
| 426,000 AF | 477,000 AF | 498,000 AF | 507,000 AF | 518,000 AF | 522,000 AF |

### 2.5 Water Quality

The GLAC Region has suffered water quality degradation of varying degrees due to sources associated with urbanization, including the use of chemicals, fertilizers, industrial solvents, automobiles and household products. Both surface water and groundwater quality have been impacted by this degradation which can be classified as either point or nonpoint sources. Regulations are in place to control both types of sources, and are often updated to control constantly changing water quality issues.

The Federal Water Pollution Control Act Amendments of 1972, amended in 1977, are commonly known as the Clean Water Act. The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the United States and gave the USEPA the authority to implement pollution control programs. In California, per the Porter Cologne Water Quality Control Act of 1969, responsibility for protecting water quality rests with the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs).

The Subregion has 303(d) listings related to both human activities and natural sources. Human activities can produce poor water quality due to trash, nutrients from wastewater treatment effluent, metals, and toxic pollutants. These pollutants can be carried in stormwater runoff and through point source discharges, impacting streams, canyon ecosystems, and eventually beaches and offshore waters. Natural sources of contaminants primarily include minerals and metals from underlying local geology.

Even though agencies and cities in the Subregion have significantly reduced pollutants that are discharged to water bodies from individual point sources since the Clean Water Act was established, many of the major water bodies are still considered impaired due to trash, bacteria, nutrients, metals, and toxic pollutants. Water quality issues affecting the Subregion's local surface waters and groundwater basins are discussed below.

## Surface Water Quality

The watersheds in the South Bay Subregion serve many beneficial uses including: navigation, fishing, habitat, and aquatic habitats. Typically, surface water quality is better in the headwaters and upper portions of a watershed, and is degraded by urban and stormwater runoff closer to the Pacific Ocean. As a result, the major watersheds in the Subregion, (Dominguez Channel and Santa Monica Bay watersheds), and receiving waters (Santa Monica Bay) are 303(d) listed for several constituents, as shown in Table 6 and Table 7. (SWRCB, 2010). The locations of permitted point dischargers are shown in Figure 8. Please note that Figure 8 does not show MS4 and Caltrans discharges as these are non-point discharge permits.

Investigations are needed to determine natural background levels for some listings which may not be due to anthropogenic causes. However, the reports written in support of the Subregion's TMDLs include a source assessment for each impairment, and determine the major sources of each, as listed below:

- **Ballona Creek Metals TMDL:** Dry weather: storm drains, groundwater discharge, NPDES discharges; Wet weather: wet weather storm water flows (including MS4 permits issued to the County of Los Angeles and Caltrans, general construction permits, and general industrial storm water permits)
- **Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL:** Dry and wet weather urban runoff discharges from the storm water conveyance system, and through connecting tide gates to the Ballona Estuary from the Del Rey Lagoon and Ballona Wetlands, natural sources from birds, waterfowl and other wildlife
- **Ballona Creek Estuary Toxic Pollutants:** Dry weather: storm drains, groundwater discharge, NPDES discharges; Wet weather: wet weather storm water flows (including MS4 permits, general construction permits, and general industrial storm water permits)
- **Ballona Creek Trash TMDL:** Litter discarded to channels, and litter discarded then carried to storm drains by wind or runoff
- **Ballona Creek Wetlands Sediment and Invasive Exotic Vegetation TMDL:** Wet weather storm water flows (including MS4, general construction permits, and general industrial storm water permits), Ballona Creek watershed sediment loading, Playa Vista Freshwater Marsh, fill deposited in the wetland from construction activities, Southern California Gas Company activities in the area, Fiji Ditch
- **Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL:** Stormwater and urban runoff discharges, atmospheric deposition and fluxes from contaminated sediments into overlying water, loadings from contributing watersheds
- **Machado Lake Trash TMDL:** Litter from adjacent land areas, roadways and direct dumping and deposition to Machado Lake
- **Machado Lake Nutrient TMDL:** Dry weather: storm drains, groundwater discharge, NPDES discharges; Wet weather: wet weather storm water flows (including MS4, general construction permits, and general industrial storm water permits), fluxes from contaminated sediments into overlying water
- **Machado Lake Toxics TMDL:** Dry weather: storm drains, groundwater discharge, NPDES discharges; Wet weather: wet weather storm water flows (including MS4, general construction permits, and general industrial storm water permits), fluxes from contaminated sediments into overlying water
- **Santa Monica Bay Beaches Wet Weather Bacteria TMDL – major sources:** Runoff from residential, commercial, industrial, agricultural and undeveloped areas
- **Santa Monica Bay Beaches Dry Weather Bacteria TMDL – major sources:** Sanitary sewer and sewage plant overflows and spills, dry weather urban runoff

- **Santa Monica Bay Nearshore Debris TMDL – major sources:** Litter discarded to channels, creeks, lakes, beaches and the ocean
- **Santa Monica Bay DDTs and PCBs TMDL – major sources:** Sediments, Hyperion, JWPCP, dewatering from the cleanup of contaminated sites, dewatering related to construction projects, runoff
- **Los Angeles Harbor Bacteria TMDL:** Dry and wet weather urban runoff discharges from the storm water conveyance system, marina activities including waste disposal from boats, boat deck and slip washing, swimmer “wash-off”, restaurant washouts, and natural sources from birds, waterfowl and other wildlife
- **Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL:** Dry and wet weather urban runoff discharges from the storm water conveyance system, waste disposal from boats, boat deck and slip washing, swimmer “wash-off”, restaurant washouts, and natural sources from birds, waterfowl and other wildlife
- **Marina del Rey Harbor Toxics TMDL:** Urban storm water, marine sediments, deposition of airborne particles

**Table 6: 303(d) listed waters with Approved TMDLs**

| 303(d) Listed Waters and Impairments[1] | TMDL (Compliance Deadline) |
|---|---|
| **Ballona Creek** | |
| Metals: Copper, Lead, Selenium, Zinc, Toxicity | Ballona Creek Metals TMDL (2016) |
| Pathogens: Coliform Bacteria, Viruses (enteric) | Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL (2021) |
| Trash | Ballona Creek Trash TMDL (2015) |
| **Ballona Creek Estuary** | |
| Metals: Cadmium, Copper, Lead, Silver, Zinc | Ballona Creek Estuary Toxic Pollutants (2020) |
| Toxics: PAHs PCBs, Chlordane, DDT, Sediment Toxicity | |
| Bacteria | Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL (2021) |
| **Ballona Creek Wetlands** | |
| Trash | Ballona Creek Trash TMDL (2015) |
| Exotic Vegetation | Ballona Creek Wetlands Sediment and Invasive Exotic Vegetation TMDL (compliance schedule under development) |
| Habitat Alterations | |
| Hydromodification, Reduced Tidal Flushing | |
| **Sepulveda Channel** | |
| Indicator Bacteria | Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL (2021) |
| Metals: Lead | Ballona Creek Metals TMDL (2016) |
| Trash | Ballona Creek Trash TMDL (2015) |
| **Dominguez Channel** | |
| Metals: Copper, Lead, Zinc, Toxicity | Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL (2031) |
| Pesticides: Diazinon | |
| **Dominguez Channel Estuary** | |
| Pesticides: DDT, Chlordane, Dieldrin | Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL (2031) |
| Other Organics: Benzopyrene, Beno[a]anthracene, Chrysene, PCBs, Phenanthrene, Pyrene | |
| Metals: Lead, Zinc | |
| Sediment Toxicity | |
| **Machado Lake** | |

| | |
|---|---|
| Pesticides: Chlordane, DDT, Dieldrin, PCBs, ChemA | Machado Lake Toxics TMDL (2019) |
| Nutrients: Algae, Ammonia, Eutrophic, Odor | Machado Lake Nutrient TMDL (2017) |
| Trash | Machado Lake Trash TMDL (2012) |
| **Torrance Carson Channel** | |
| Metals: Copper, Lead | Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL (2031) |
| Coliform Bacteria | |
| **Wilmington Drain** | |
| Metals: Copper, Lead | Machado Lake Toxics TMDL (2019) |
| **Los Angeles Harbor** | |
| Pathogens: Indicator Bacteria, Beach Closures | Los Angeles Harbor Bacteria TMDL (2009) |
| Toxics: DDT, Dieldrin, Toxaphene, Chlordane | Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL (2031) |
| Metals: Cadmium, Chromium, Copper, Lead, Mercury, Zinc | |
| Sediment Toxicity | |
| Other Organics: 2-Methylnapthalene, Benzopyrene, Benzoanthracene, Chrysene, Dibenzanthracene, PCBs, Phenanthrene, Pyrene | |
| **Marina Del Rey Harbor** | |
| Toxics | Marina del Rey Harbor Toxics TMDL (2026) |
| **Marina Del Rey Mothers' Beach and Back Basins** | |
| Bacteria | Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL (2021) |
| **San Pedro Bay** | |
| Pesticides: DDT, Chlordane | Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL (2031) |
| PCBs | |
| Sediment Toxicity | |
| DDT | |
| **Santa Monica Bay** | |
| Debris | Santa Monica Bay Nearshore Debris TMDL (draft) |
| Bacteria | Santa Monica Bay Beaches Wet Weather Bacteria TMDL (2021)<br>Santa Monica Bay Beaches Dry Weather Bacteria TMDL (2009) |
| DDTs, PCBs, Sediment Toxicity, Fish Consumption | Santa Monica Bay DDTs (water: 2014, sediment: 2023) and PCBs (water: 2014, sediment: 2034) TMDL |
| **Santa Monica Bay beaches** | |
| Bacteria | Santa Monica Bay Beaches Wet Weather Bacteria TMDL (2021)<br>Santa Monica Bay Beaches Dry Weather Bacteria TMDL (2009) |

1. According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report)

**Table 7: 303(d) Listed Waters without Approved TMDLs**

| 303(d) Listed Waters and Impairments[1] |
|---|
| **Ballona Creek** |
| Inorganics: Cyanide |
| Shellfish Harvesting Advisory |
| **Ballona Creek Wetlands** |
| Shellfish Harvesting Advisory |

| |
|---|
| **Santa Monica Canyon** |
| Bacteria |
| Metals: Copper, Lead, Selenium |
| Nutrients: Ammonia |
| **Dominguez Channel** |
| Nutrients: Ammonia |
| Indicator Bacteria |
| **Dominguez Channel Estuary** |
| Nutrients: Ammonia |
| Coliform Bacteria |
| Benthic Community Effects |
| **Torrance Carson Channel** |
| Coliform Bacteria |
| **Wilmington Drain** |
| Coliform Bacteria |
| **Los Angeles Harbor** |
| Benthic Community Effects |

2. According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report)

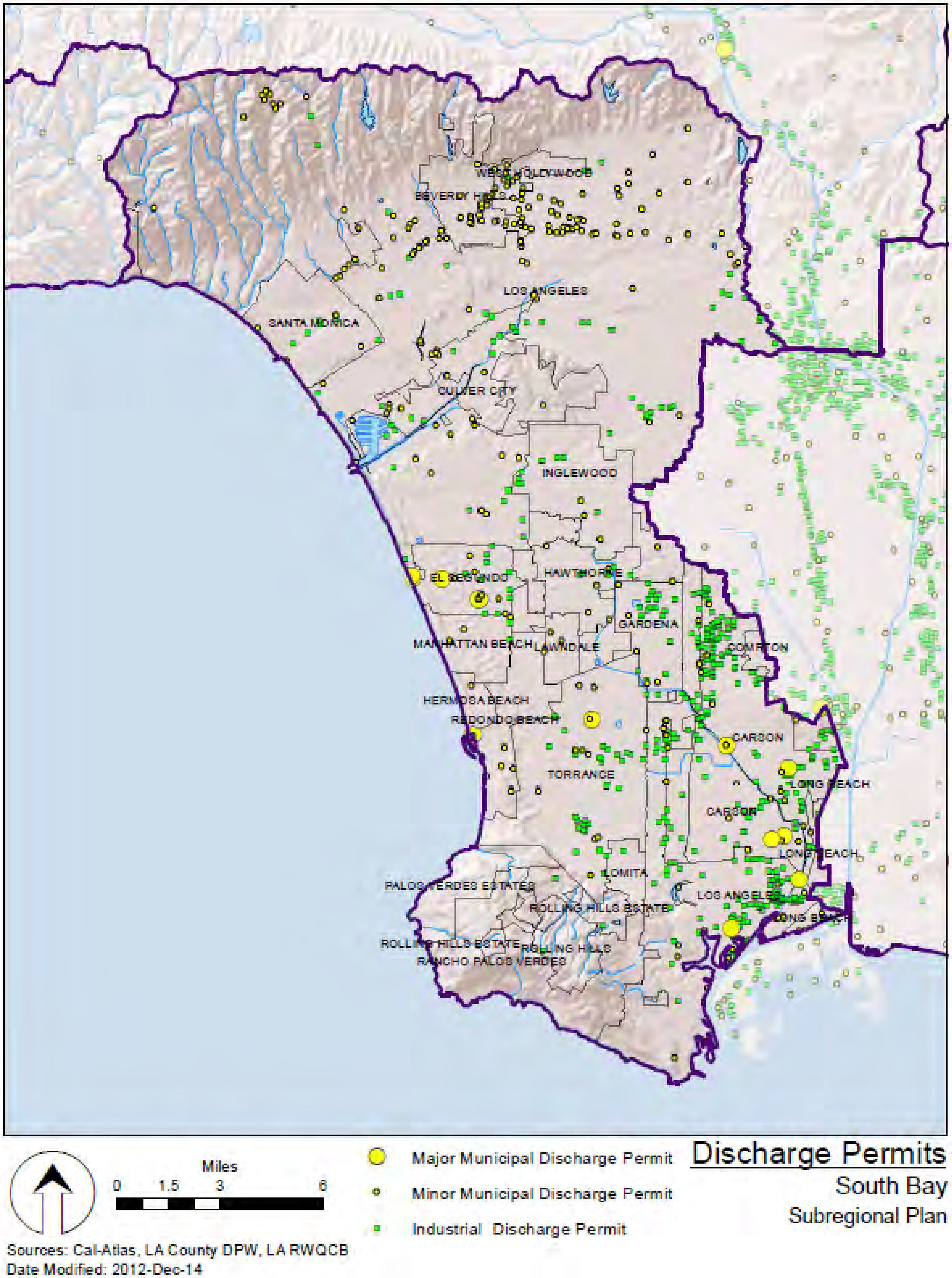
## Groundwater Quality

Groundwater quality varies throughout the Subregion, based on naturally occurring conditions, historical land use patterns, and groundwater extraction patterns. Poor groundwater quality can be attributed to several factors including over-drafting of groundwater basins (sometimes resulting in seawater intrusion), industrial discharges, agricultural chemical usage, legacy contaminants in urban runoff, and naturally occurring constituents. The cost of treating these contaminants is often significant, and for some improperly disposed chemicals, effective treatment has not yet been identified. The Water Replenishment District of Southern California (WRD), which is tasked with groundwater management for the Central Basin and West Coast Basin, has implemented programs to assess treatment options and treat the contaminated groundwater in the West Coast Basin.

High levels of TDS in the Torrance/Hawthorne area of the West Coast Basin, and in the Hollywood Basin can be attributed to both seawater intrusion, and naturally occurring soil and geologic conditions in the region often result in elevated levels of dissolved solids. Increases in groundwater TDS concentrations are a function of the recharge of storm and urban runoff, imported water, and incidental recharge. Seawater intrusion is attributed to the extraction of groundwater above natural replenishment levels. To reduce this, Los Angeles County operates and maintains two seawater intrusion barrier systems along the coast that utilize recycled water and imported water to reduce the seawater intrusion in coastal aquifers. Additionally, the City of Beverly Hills, WBMWD, and WRD operate desalting facilities to reduce these high TDS levels (as discussed previously in the Water Supply section). (West Basin MWD, 2011; MWD, 2007)

Organic constituents of concern (TCE, PCE, and perchlorate) have been detected in the Santa Monica Basin, and are attributed to the past disposal of industrial solvents. This has required the City of Santa Monica to install air strippers to treat water pumped from certain wells. Additionally, a methyl tertiary butyl ethylene (MTBE) plume caused by leaking underground fuel storage tanks required the shutdown of a majority of the City of Santa Monica's wells in 1996. These wells have since been reactivated with the construction of a treatment facility to remove MTBE and organic contaminants. (MWD, 2007)

**Figure 8: Permitted Discharges as of 2011**



## Coastal Ocean Water Quality

There are several indicators of coastal water quality. One of the most publicized is the annual report by Heal the Bay. The annual report evaluates California beaches, giving them a grade of A to F based on tests for bacterial pollution, which indicate how likely the water is to make swimmers sick. Statewide, 92% of California beaches earned A or B grades over the summer, the same as the previous year, according to the 2011 report. Heal the Bay's Report Cards rate California beaches over three time periods: summer dry, winter dry and wet weather. However, several South Bay beaches did not receive a passing grade. Cabrillo Beach in San Pedro earned an F for the eighth consecutive summer despite millions of dollars spent on municipal projects to improve water quality. Collaboration with SMBRC, EPA, LARWQCB, and other stakeholders is ongoing to implement and enforce water quality requirements including Santa Monica Bay Marine debris TMDL, and the City of Los Angeles Hyperion Wastewater Treatment Plant NPDES permit.

## 2.6 Environmental Resources

The environmental resources of the South Bay Subregion include aquatic habitats, riparian habitat, streams, wide beaches, rocky intertidal habitats, sandy dunes, beach bluffs, and parklands. Over time this network of natural resources has been striped with miles of concrete channels, culverts and underground pipes.

### 2.6.1 Aquatic Habitats

The South Bay Subregion was once an area replete with coastal aquatic habitat stretching from the Santa Monica Canyon watershed, south to the Dominguez Channel watershed. Of the remaining aquatic habitats, the most expansive area that remains is the Ballona Wetlands with lagoons near the mouth of Ballona Creek located in Playa del Rey in the City of Los Angeles. Another remaining historic aquatic habitat area in the Subregion includes the Madrona Marsh in Torrance. Existing aquatic habitats are shown in Figure 9.

Several organizations and governmental agencies have been active in the restoration of aquatic habitats in the South Bay Subregion. Those organizations include the Wetlands Recovery Project (WRP), the Santa Monica Bay Restoration Commission (SMBRC), the California State Coastal Conservancy, the Coastal Commission, the California Department of Fish and Wildlife Services (DFWS), Friends of Ballona Wetlands, and the cities of Manhattan Beach, Culver City, Inglewood, Los Angeles, and Santa Monica.

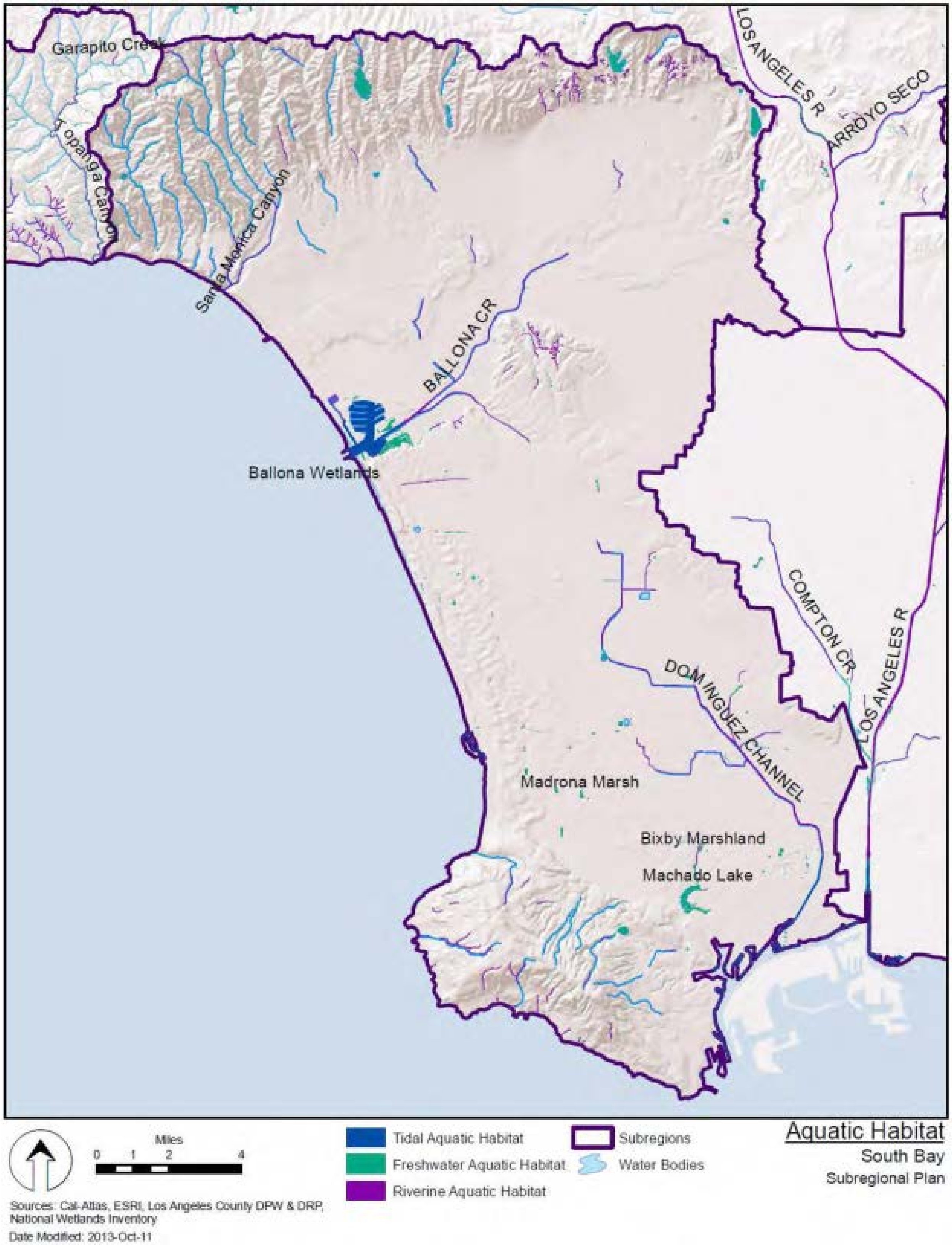
#### Ballona Wetlands

The Ballona Wetlands stretch from Playa del Rey to Venice and once occupied a 2,000-acre expanse of critical coastal habitat. Over time, the wetland has suffered from the loss of the historic connection with freshwater sources and the ocean thereby resulting in the loss of many ecological functions and many native species. In addition, it became the dumping site for dredging during the construction of Marina del Rey just to the north and the construction of the Ballona Creek Flood Control Channel.

In 2004, the State of California took title to a 600-acre parcel that encompasses a large portion of the historic Ballona Wetlands. The property was designated as a state ecological reserve - Ballona Wetlands Ecological Reserve (BWER) – and is the largest coastal wetland in the Santa Monica Bay. The property is owned by two state agencies, the DFWS and the State Lands Commission.

The Ballona Wetlands Project, spearheaded by the SMBRC under the auspices of the State Coastal Conservancy (SCC), endeavors to develop a plan of action to return the daily ebb and flow of tidal waters, maintain freshwater circulation and support a more natural and healthy ecosystem. Creating these suitable habitats and natural conditions will allow wetland vegetation to flourish and attract the insects, reptiles, amphibians, fishes, birds and mammals that call wetlands home. (Bay Restoration Foundation, 2011)

**Figure 9: Aquatic Habitat in the South Bay Subregion**



### Madrona Marsh

The Madrona Marsh Preserve, located in Torrance, is the last vernal marsh remaining in the South Bay Subregion and one of few aquatic habitats located within its urban landscape. Formed eons ago when the mountains of the Palos Verdes Peninsula rose to the south, Madrona Marsh is a shallow depression fed by wet season storms, as the name "vernal" indicates. After the rainy season, evaporation, percolation and transpiration reduce the water depth by about one-quarter of an inch (6 mm) per day. By the end of August, the aquatic habitat is dry and remains so until the following rainy season. Situated on land that was set aside for oil production in 1924, Madrona Marsh was never developed—unlike the surrounding city—and remains a valuable natural habitat for birds, reptiles, insects and even small mammals. (Friends of Madrona Marsh, 2012)

### Machado Lake

Machado Lake, located in Ken Malloy Harbor Regional Park along the Wilmington Drain, is a perennial freshwater lake and marsh that provides aquatic habitat to a number of species. Due to contamination by surrounding urban land uses, this area is undergoing ecosystem rehabilitation by the City of Los Angeles and Los Angeles County (SDLAC, 2010). Partial funding for this rehabilitation comes from the Proposition 50 Integrated Regional Water Management Grant Program.

## 2.6.2 Riparian Habitat

Riparian habitat is typically a linear corridor of variable width that occurs along perennial, intermittent, and ephemeral streams and rivers. In undisturbed areas, two distinguishing features of riparian ecosystems are the hydrologic interaction that occurs between the stream channel and adjacent areas through periodic exchange of surface water and groundwater, and the distinctive geomorphic features and vegetation communities that develop in response to this hydrologic interaction.

Due to the extensive urbanization on the coastal plain and inland valleys, current riparian habitat within the Subregion bears little resemblance to the pre-development conditions. Faber et al. (1989) estimated that 90- to 95-percent of the riparian habitat has been lost. Most native riparian habitat in the Subregion is located in the Santa Monica Mountains; in the restored riparian corridor below the Westchester Bluffs.

### Ballona Creek

Ballona Creek is an approximately nine mile long flood control channel surrounded by urban development and traversed by roads, freeways, and infrastructure. The creek has the potential of providing a habitat corridor from Baldwin Hills to the Ballona Wetlands, but currently does not contain significant riparian habitat.  However a 50 acre riparian corridor and freshwater marsh for stormwater management purposes were completed in the early 2000’s and contains many willows, cattails and tule habitat areas.

The Ballona Creek Greenway Plan is the result of collaboration between the Ballona Creek Watershed Task Force and the SMBRC. It is a plan that will explore issues related not only to short-term recreational improvements but also to longer-term restoration design possibilities. The Task Force is comprised of state and local agencies, environmental organizations, private businesses, and resident stakeholders. Concurrently, SMBRC - with the aid of partner agencies such as the State Coastal Conservancy, Baldwin Hills Conservancy (BHC), Mountains Recreation Conservation Authority (MRCA), and City and County of Los Angeles – have embarked on the Lower Ballona Ecosystem Restoration Feasibility Study (LBERF) with the U.S. Army Corps of Engineers.

### Stone Creek

UCLA and the University Lab School (ULS) campuses are conducting restoration efforts at Stone Creek which runs through the UCLA campus. Since 2007, the SMBRC has been working with support of the State Coastal Conservancy and the RWQCB to restore the stream with monthly volunteer weeding and planting events.

### Dominguez Channel

The Dominguez Channel extends from the Los Angeles International Airport to the Los Angeles Harbor and drains large if not all portions of the cities of Inglewood, Hawthorne, El Segundo, Gardena, Lawndale, Redondo Beach, Torrance, Carson and Los Angeles. Dominguez Channel is in the Dominguez Watershed which is comprised of approximately 110 square miles of land in the southern portion of Los Angeles County. The remaining land areas within the watershed drain to several debris basins and lakes or directly to the Los Angeles and Long Beach Harbors. Because of the largely industrial land base in this watershed, very little native riparian vegetation remains. (RWQCB, 2008)

### Madrona Marsh

The Madrona Marsh Preserve, located in Torrance, is the last vernal marsh remaining in the South Bay Subregion. Ongoing efforts are restoring native plants including wildflowers and butterfly species. The area has long been popular with bird watchers and the Audubon Society has used Madrona Marsh for their annual bird census since 1967. El Camino College uses it as an outdoor biology and botany lab. Torrance operates the Madrona Marsh Nature Center in cooperation with the Friends of the Madrona Marsh. (Friends of Madrona Marsh, 2012)

### Bixby Marshland

The Bixby Marshland is a remnant of a formerly extensive, natural-freshwater aquatic habitat known as Bixby Slough. Over the years, most of Bixby Slough was destroyed due to development. The Bixby Marshland, a 17-acre marsh, located to the northwest of the Sanitation Districts of Los Angeles County Joint Water Pollution Control Plant (JWPCP) near the intersection of Figueroa Street and Sepulveda Boulevard in the City of Carson, has recently been restored by the Sanitation Districts of Los Angeles County (SDLAC, 2012). Partial funding for this restoration comes from the Proposition 50 IRWM Grant Program.

### Beach Bluff Restoration

Beach bluff restoration is underway at several locations within the Subregion. The Los Angeles Conservation Corps is working with at-risk youth to restore three acres of bluff habitat adjacent to a Youth Center at Dockweiler Beach. The site is a priority restoration site due to its proximity to other native plant habitat supporting the federally endangered El Segundo blue butterfly within the dunes just west of Los Angeles International Airport. The Palos Verdes Peninsula Land Conservancy (PVPLC) has implemented a number of nature preserves that will preserve beach bluff areas, including the Vicente Bluffs, Abalone Cove, Alta Vicente, and the future Ocean Trails preserves. (Palos Verdes Peninsula Land Conservancy, 2012)

## 2.6.3 Upland Habitat

Upland habitat that exists further inland serves as a linkage between aquatic habitats. Within the Subregion, these habitats include the Los Angeles Coastal Plain and the Santa Monica Mountains to the north. A majority of the coastal plain has been urbanized, which inhibits linkage between aquatic habitats. The small portion of the Santa Monica Mountains in the northern portion of the Subregion are by contrast mostly open space and  free of development, but impacted by invasive species and water quality issues. (RWQCB, 2011) PVPLC has developed preserves in upland areas, including the following: Agua Amarga, Three Sisters, Upper Filiorum, Portuguese Bend, and San Ramon. In addition, Rolling Hills Estates has established the Linden H. Chandler Preserve and the George F. Canyon Nature Preserve, and San Pedro has established the Fuel Depot managed area and the White Point Nature Preserve.

### 2.6.4 Significant Ecological Areas and Environmentally Sensitive Habitat Areas

Significant Ecological Areas (SEAs) are ecologically important areas that are designated by the County of Los Angeles as having valuable plant or animal communities. Similar to the SEAs are Environmentally Sensitive Habitat Areas (ESHAs), which are designated by the Coastal Commission via local coastal programs. SEAs are offered certain protections within the unincorporated portions of Los Angeles County.

Development proposals located within a SEA and outside incorporated City boundaries are reviewed by the Significant Ecological Area Technical Advisory Committee (SEATAC) which recommends changes to the project and mitigation measures to protect the habitat. The County of Los Angeles is in the process of updating the SEA designations and policies. (LACDRP, 2011) SEAs in the Subregion are shown in Figure 10 and include:

- Agua Amarga Canyon located on the Palos Verdes Peninsula with headwaters in the City of Rolling Hills Estates and passing through Rancho Palos Verdes and Palos Verdes Estates (not Redondo Beach)
- Ballona Creek in Venice
- El Segundo Dunes in Venice
- Harbor Regional Park which contains Machado Lake is located in the City of Los Angeles in San Pedro
- Madrona Marsh in Torrance
- Palos Verdes Peninsula Coastline
- Redondo Beach and San Pedro
- Portuguese Bend Preserve located in Rancho Palos Verdes
- Rolling Hills Canyons in Rolling Hills, Rolling Hills Estates, and Rancho Palos Verdes

### 2.6.5 Critical Habitat Areas

Critical habitat areas have been established by the endangered species act (ESA) to prevent the destruction or adverse modification of designated critical habitat of endangered and threatened plants and animals. The United States Fish and Wildlife Service (USFWS) through the Endangered Species Act (ESA) defines critical habitat as “a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection.”

Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.” A critical habitat designation typically has no impact on property or developments that do not involve a Federal agency, such as a private landowner developing a property that involves no Federal funding or permit. However, when such funding or permit is needed, the impacts to critical habitat are considered during the consultation with the USFWS.

Within the Subregion, there are 5,640 acres of designated critical habitat defined for the Coast California gnatcatcher, Brauton’s milk-vetch, and Palos Verdes blue butterfly, as shown in Figure 11.

**Figure 10: Significant Ecological Areas in the South Bay Subregion**

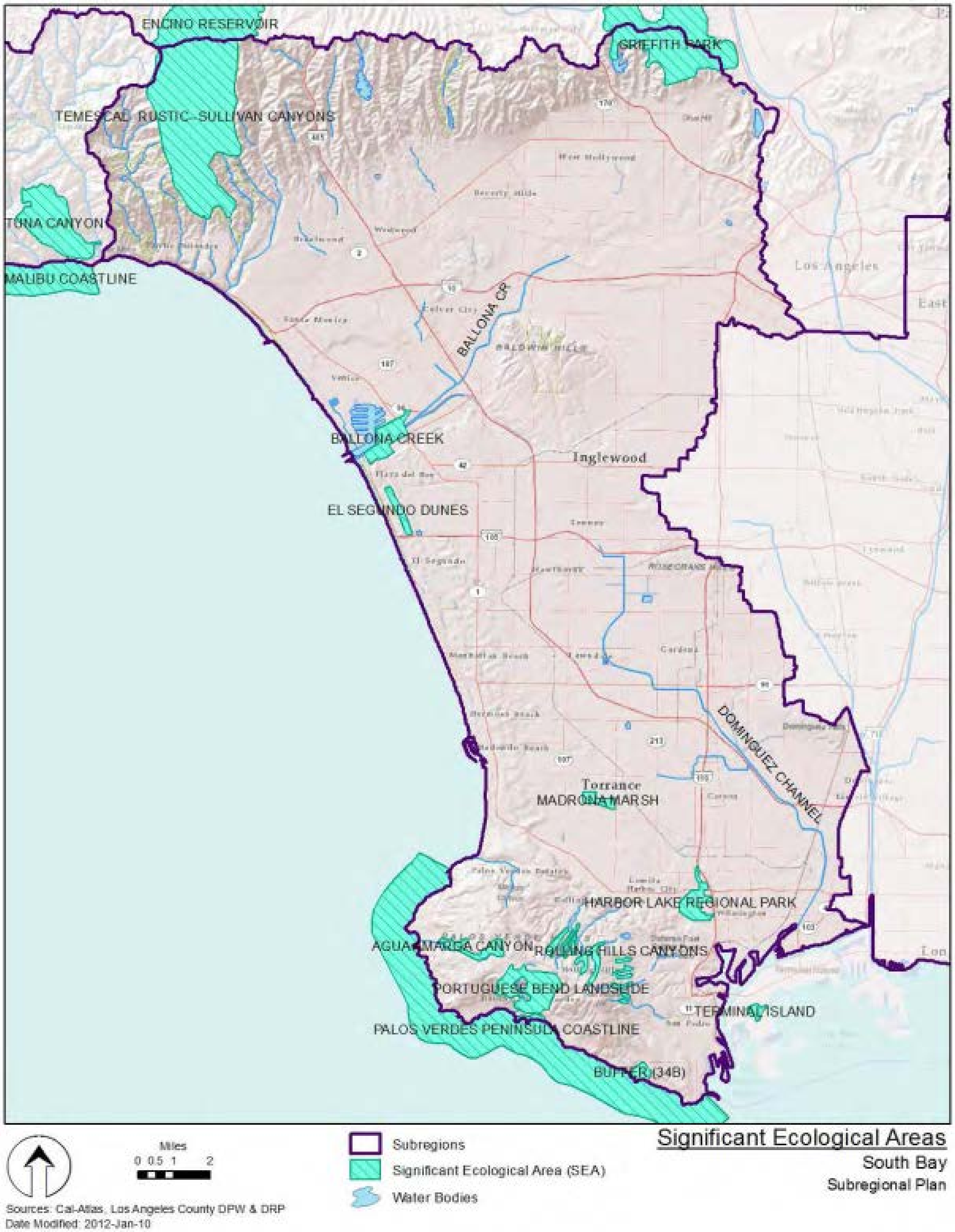
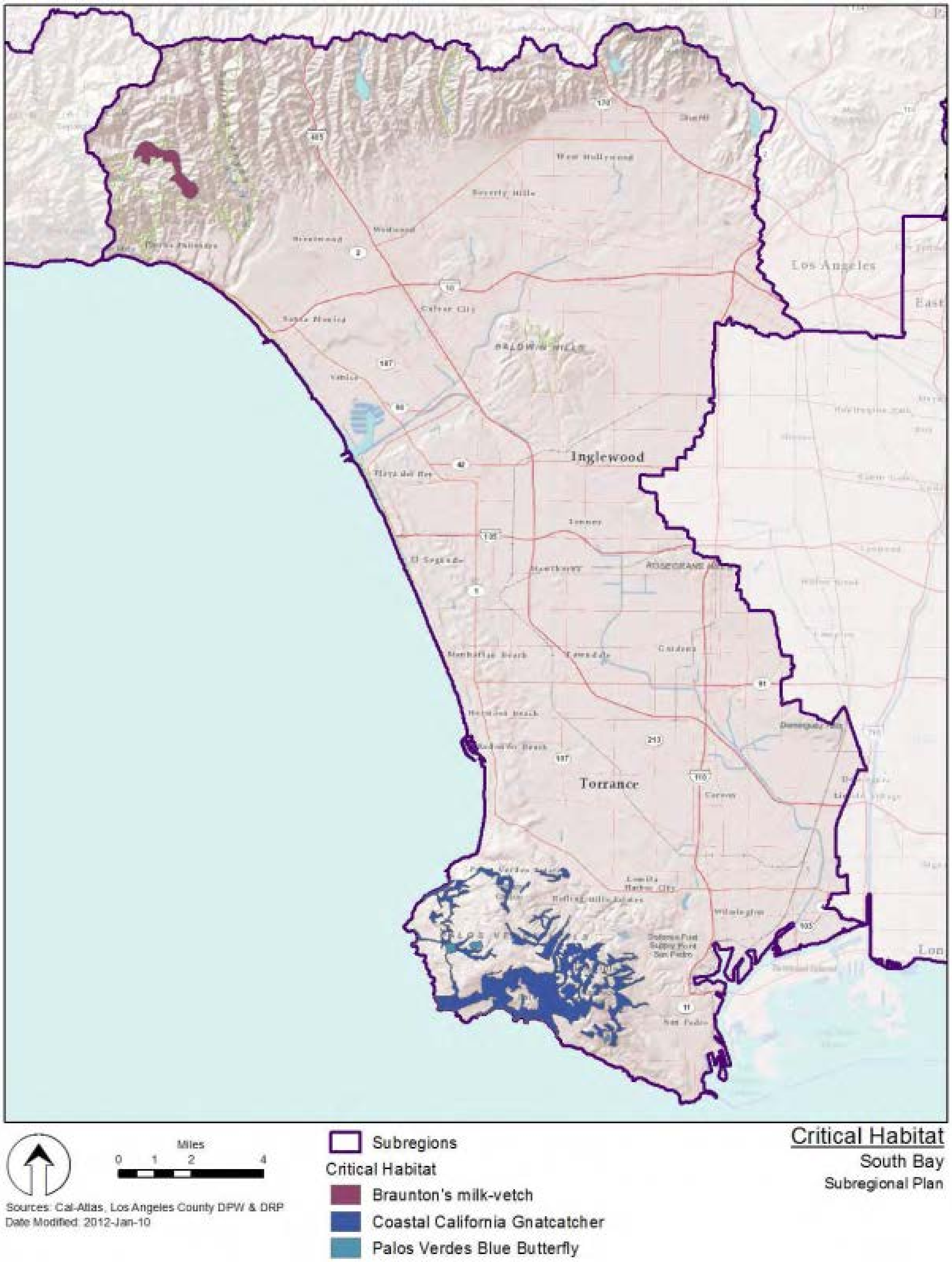


**Figure 11: Critical Habitat Areas**



### 2.6.6 Area of Special Biological Significance

In the mid-1970s, to protect sensitive coastal habitats, the SWRCB designated 34 areas on the coast of California as Areas of Special Biological Significance (ASBS), including the area between Mugu Lagoon in Ventura County and Latigo Point in Los Angeles County.

### 2.6.7 Marine Habitat

The marine environment of Santa Monica Bay includes a variety of habitats which provide food and shelter for thousands of species of marine life. The Marine Program of the SMBRC seeks to conserve and rehabilitate natural resources in the marine environment and improve the beneficial uses of the Bay. To do this, the Marine Program assesses the status of marine habitats in the Bay, restores degraded habitats, monitors the recovery of restored habitats, and participates in the development of policies that protect marine resources.

### 2.6.8 Ecological Processes

The Santa Monica Mountains in the northern portion of the Subregion comprise a large and complex Mediterranean ecosystem of coastal sage scrub, chaparral, oak woodlands, and associated riparian areas. Connecting habitats within this ecosystem has been a top conservation priority. Integrity and connectivity is evidenced, albeit limited, by the presence of the mountain lion, cougar, bobcat, gray fox, badger, mule deer and Steelhead trout.

#### Fire

Fire is an integral and necessary part of the natural environment and plays a role in shaping the landscape. Catastrophic wildfire events can denude hillsides which create opportunities for invasive plants and increase the potential for subsequent rains to result in debris flows that erode the landscape and can clog stream channels, damage structures, and injure inhabitants in the canyons and lower foothill areas.

#### Invasive Species

Invasive species in the Region have also substantially affected specific habitats and areas. Along with the rest of California, most of the Subregion’s native grasslands were long ago displaced by introduced species. The receptive climate has resulted in the widespread importation of plants from around the globe for landscaping. Some plant introductions have resulted in adverse impacts. In many undeveloped areas, non-native plants such as arundo (*Arundo donax*), tree of heaven (*Alianthus altissima*) tree tobacco (*Nicotiana glauca*), castor bean (*Ricinus communis*), salt cedar (*Tamarix ramosissima*) and cape ivy (*Senecio mikanioides*) are out-competing native flora. The removal of these particular species, which requires focused and repeated efforts, can provide substantial dividends in water savings and restored species diversity.

#### Slope Stability

The area in the northern portion of the Subregion is prone to slope stability problems such as landslides, mudslides, slumping and rockfalls. Shallow slope failure such as mudslides and slumping occur where graded cut and fill slopes have been inadequately constructed. Rockfalls are generally associated with seismic ground-shaking or rains washing out the ground containing large rocks and boulders. In particular, significant landslide activity has occurred in the Palos Verdes Peninsula area.

## 2.7 Open Space and Recreation

Open space and recreation area is limited in the Subregion due to it being highly developed. Parks, recreation and other open space in the Subregion can be seen in Figure 12. Acreage of recreation and open space lands within the Subregion is shown in Table 8. In total, of the Subregion’s 210,000 acres, approximately 24,000 acres (or 12%) are considered open space or recreation land areas. A majority of open space and recreation land areas are National Forest Land within the Santa Monica Mountains.

**Table 8: Existing Recreation and Open Space Land Area**

| Land Type | Acres |
|---|---|
| Developed Urban Park and Recreation Area | 3,900 acres |
| Open Space Lands (including aquatic habitats and National Forest) | 20,100 acres |
| Greenways | 70 acres |
| Other/Miscellaneous | 240 acres |
| **Total Area in Subregion** | **24,310 acres** |

## 2.8 Land Use

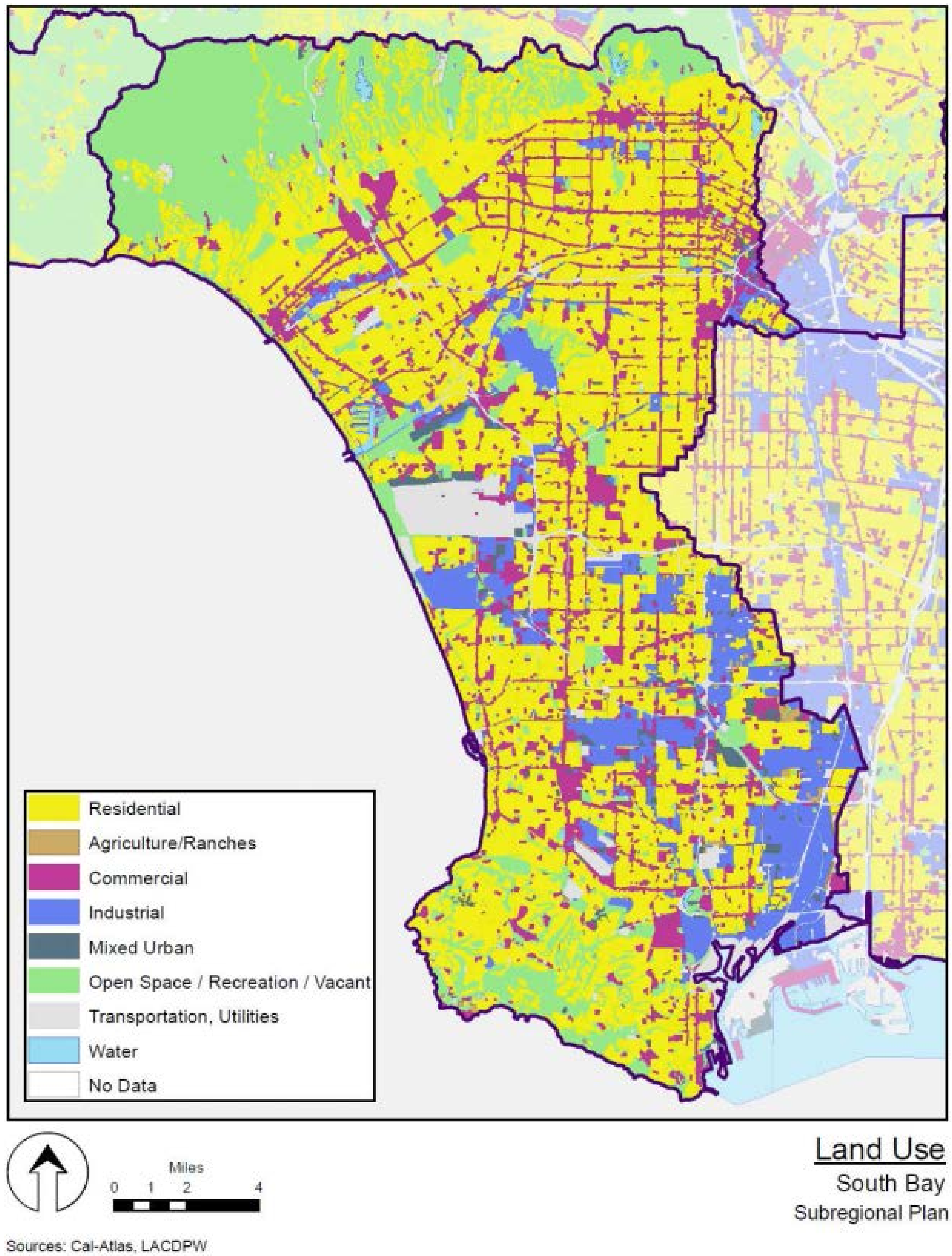
Land use within the South Bay Subregion reflects the historic pattern of urbanization as most of the coastal plain is occupied with residential, industrial, commercial, and institutional uses while most of the Santa Monica Mountains are principally open space. A breakdown of land use in the South Bay Subregion is depicted in Figure 13. This Subregion is considered to be nearly at build-out, meaning there is little to no additional open space available for development.

**Table 9: Land Use in the South Bay Subregion**

| Land Use Type | Acres | Percentage |
|---|---|---|
| Residential | 114,045 | 46% |
| Open Space / Recreation / Vacant | 56,850 | 24% |
| Commercial | 28,562 | 12% |
| Industrial | 21,702 | 9% |
| Transportation, Utilities | 15,073 | 6% |
| Agriculture | 1,090 | <1% |
| Mixed Urban | 3,271 | 1% |
| Water | 4,073 | 2% |
| No Data | 748 | <1% |
| **Total** | **245,416** | **100%** |

**Figure 12: Parks and Open Space in the South Bay Subregion**

**Figure 13: Land Use in the South Bay Subregion**



# 3 Subregional Objectives and Targets

This section identifies the objectives for the Subregion and establishes quantified planning targets to the 2035 planning horizon that can be used to gauge success in meeting the objectives.

## 3.1 Objective and Target Development

The Greater Los Angeles County Regional IRWM Plan has developed regional goals, objectives, and targets. To assist the region in meeting these, objectives and targets have been developed for the Subregion. These objectives and targets are intended to help guide improvements to water supply, water quality, habitat, open space, and flood management to meet the Region's objectives and targets through Subregional planning.

Five objectives have been articulated, based on recent water resource planning documents. Workgroups composed of Stakeholders from within the Region were involved in establishing the Plan's objectives and targets. To establish quantifiable benchmarks for implementation of the plan, planning targets were defined based on much discussion within the regional workgroup. Objectives for five water resource areas were identified for the Subregion, which are discussed below (and summarized in Table 10).

## 3.2 Water Supply

Optimizing local water supply resources is vital for the Subregion to reduce its reliance on imported water and improve reliability of local water supplies should imported water supplies be reduced or interrupted due to environmental and/or political reasons. The Subregion plans on achieving this objective by conserving water through water use efficiency measures, creating an additional ability to pump groundwater, increasing the non-potable reuse of recycled water, adding ocean desalination, and increasing the capture and use of stormwater. In total, water supply targets will yield an additional 136,000 AFY of local supply for direct use, and 13,000 AFY of local supply for groundwater recharge.

To develop supply targets, water supply planning documents for agencies whose service areas cover a majority of the Subregion were examined for potential supply projects, and planned increases in supply between the years 2010 and 2035. The water supply targets for each Subregion were discussed in the *Water Supply Targets TM*.

## 3.3 Water Quality

Improving the quality of urban and stormwater runoff will reduce or eliminate impairment of rivers, beaches, and other water bodies within and downstream of the Subregion. Improving the quality of urban and stormwater runoff would also make these local water supplies available for groundwater recharge. Additionally, the Subregion will continue to improve groundwater and protect drinking water quality to ensure a reliable water supply.

The Subregion plans on achieving these objectives by increasing the capacity to capture and treat runoff and prevent certain dry weather flows (see table above). The water quality target was determined by setting a goal of capturing ¾" of storms over the Subregion. The Subregion's target is to develop 12,700 AF of new stormwater capture capacity (or equivalent) per ¾ inch storm. An emphasis will be given to the higher priority areas which will be determined by project-specific characteristics provided by the project proponent, including land use in the proposed project area, runoff and downstream impairments. The assumptions and calculations used to determine this target and catchment prioritization can be found in the *Water Quality Objectives and Targets TM*.

### 3.4 Habitat Objective and Targets

Protecting, restoring, and enhancing the Subregion's native habitats is vital to preserving areas that will contribute to the natural recharge of precipitation and improve downstream water quality. Additionally, the protection, restoration, and enhancement of upland habitat, wetland/marsh habitat, riparian habitat and buffer areas will help restore natural ecosystem processes and preserve long-term species diversity. Subregional targets for habitat were not developed, but Regional habitat target development is discussed in the *Open Space, Habitat and Recreation TM*.

### 3.5 Open Space and Recreation Objective and Targets

Open space and recreation areas provide space for native vegetation to create habitat and passive recreational opportunities for the community. In addition, open space and recreation areas may preserve or expand the area available for natural groundwater recharge (though only in the forebay areas), improve surface water quality to the extent that these open spaces filter, retain, or detain stormwater runoff, and provide opportunities to reuse treated runoff for irrigation. Subregional targets for open space and recreation were not developed, but Regional open space and recreation target development is discussed in the *Open Space, Habitat and Recreation TM*.

### 3.6 Flood

Improved integrated flood management systems can help reduce the risk of flooding, and protect lives and property. The Subregion plans on meeting this objective by reducing 2,310 acres of local unmet drainage needs. The local unmet drainage target was determined by looking at Special Flood Hazard Areas (SFHAs), also known as flood plains, as defined by FEMA, compared to land uses and the presence of structures. Detailed assumptions and calculations used to develop the Subregion's flood target can be found in the *Flood Management Objectives and Targets TM*.

**Table 10: Subregional Objectives and Planning Targets**

| Objectives | | Subregional Planning Targets |
|---|---|---|
| **Improve Water Supply** | | |
| Optimize local water resources to reduce the Subregion's reliance on imported water. | Water Use Efficiency | Conserve 38,000 AFY of water by 2035 through water use efficiency and conservation measures. |
| | Ground Water | Create ability to pump an additional 35,000 AFY using a combination of treatment, recharge, and storage access. |
| | Recycled Water | Increase indirect potable reuse of recycled water by 13,000 AFY.<br>Increase non-potable reuse of recycled water by 36,000 |
| | Ocean Desalination | Add ocean desalination by 21,000 AFY. |
| | Stormwater | Increase capture and use of stormwater runoff by 6,000 AFY that is currently lost to the ocean. |
| **Improve Water Quality** | | |
| Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater, and wastewater. | Runoff (Wet Weather Flows) | Develop[1] 12,700 AF of new stormwater capture capacity (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[2]. |
| **Enhance Habitat** | | |
| Protect, restore, and enhance natural processes and habitats. | Habitat targets were not developed to the subregional level – only to the regional level. | |
| **Enhance Open Space and Recreation** | | |
| Increase watershed friendly recreational space for all communities. | Open space and recreation targets were not developed to the subregional level – only to the regional level. | |
| **Improve Flood Management** | | |
| Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. | Sediment Management and Integrated Flood Planning | Reduce flood risk in 2,310 acres of flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. |

[1] Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75", 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed).

[2] High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.

# 4 Partnership and Multi-benefit Opportunities

Many agencies and other entities have successfully been working together for decades on many collaborative projects. For instance in this Subregion, the entire system of flood management, conservation of local water supply, and recreation is a longstanding set of activities and facilities that represents collaboration and integration among the Los Angeles County Flood Control District, West Basin MWD, the Water Replenishment District, other water agencies, LA County Dept of Parks & Recreation and others. Projects that seek to enhance or extend these existing activities should be encouraged, because often they will be the most cost-effective.

Implementation of projects is the vehicle to meeting the objectives and planning targets discussed in Section 3. Integration and collaboration can help these projects achieve synergies and, at times, increase their cost-effectiveness in meeting multiple objectives. In addition to the collaboration described above, the GLAC IRWM Region will continue to build upon a wealth of potential multi-benefit project opportunities for partnership projects including:

- **Local Supply Development:** Alternative supply development such as distributed stormwater capture projects are often too costly for a water supply agency to construct on their own for water supply purposes only. The near-term unit cost can be well in excess of the cost of imported water. However, partnerships often help to share the costs, thus providing opportunities for more complex, multi-benefit projects (such as water quality improvement) that otherwise might not be accomplished.
- **Improving Stormwater Quality:** In preparing this update of the IRWM Plan, a methodology to identify priority drainage areas based on their ability to improve water quality for the coastal and terrestrial waters was developed. Integrated projects that can provide water quality benefits can be cited relative to that prioritization to achieve the highest benefits.
- **Integrated Flood Management:** Earlier studies, such as the Sun Valley Watershed Management Plan (2004), demonstrated the potential for similar cost-effective synergies between flood control, stormwater quality management, water supply, parks creation and habitat opportunities. Flood control benefits usually achieved through significant traditional construction projects can sometimes be accomplished with alternative multi-benefit projects.
- **Open Space for Habitat and Recreation:** When habitat is targeted for restoration, there are often opportunities for cost-effective implementation of flood control, stormwater management and passive recreation (such as walking and biking trails) as well.

These benefit synergies and cost effectiveness outcomes can best be attained when the unique physical, demographic and agency service area attributes of the region are considered. In addition to existing collaborative processes, the GLAC IRWMP has developed the geodatabase tool to assist in identifying areas and partnerships conducive to both inter-subregional and intra-subregional integrated project development. This section discusses these tools as well as some preliminary analyses on the South Bay Subregion's potential partnerships and integrated project opportunities.

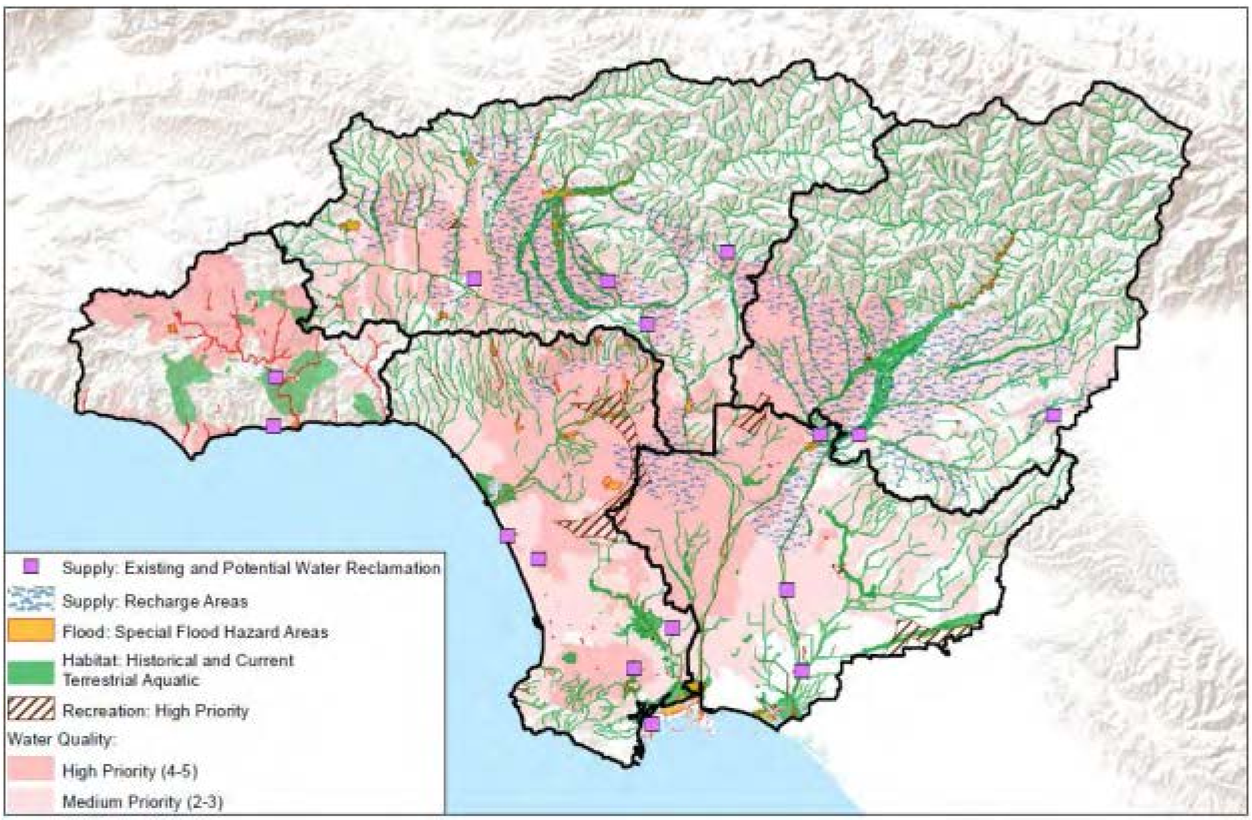
## 4.1 GLAC IRWMP Integration Process and Tools

As part of the objectives and targets update process, the GLAC Region compiled and developed several geo-referenced data layers to assist in spatially identifying priorities and potential opportunities to achieve water supply, water quality, habitat, recreation and flood management benefits. These data layers were initially used individually to determine the objectives and planning targets for each water management area. However, these datasets can also be overlaid to visually highlight areas with the greatest potential to provide multiple benefits. The resulting Potential Benefits Geodatabase (Geodatabase) can also align these areas relative to other layers containing agency service areas and jurisdictions – allowing for project proponents and partners to be identified.

## Potential Benefits Geodatabase

The GLAC IRWMP Potential Benefits Geodatabase is a dynamic tool that should be updated as new data is made available in order to maintain its relevance in the IRWM planning context. However, in order to provide an analysis of potential integration and partnership opportunities for the 2013 GLAC IRWM Plan, current data layers were overlaid and analyzed. The key layers used are shown in Figure 14 and described in Table 11. It should be noted that these datasets may not be complete or in need of further refinement and therefore will be updated on an as-needed basis – which is part of the dynamic process previously described. Therefore, the Geo-database should only be used as an initial step in identifying multi-benefit potential and by no means used to invalidate the potential for achieving benefits in other areas.

**Figure 14: GLAC Region Potential Benefits Geodatabase Layers**




## Using the Geodatabase

The Geodatabase is a dynamic visual tool. The data layers and maps shown in this Section are only some of a multitude of ways to package and view the datasets to help with the integration process. It is important to note that not all data that could be useful in identifying integration and partnership potential for the region is easily viewed spatially in this format. Therefore the Geodatabase should only be used as one of several potential integration tools or methods.

The Geodatabase can also be used to identify the potential for further integration between existing projects included in an IRWMP. Currently the GLAC Region has web-based project database (OPTI) that geo-references all projects included in the IRWM. As part of the 2013 Plan Update, this dataset of projects will eventually be updated and prioritized. This resulting project dataset could be included as a layer in the Geodatabase or conversely, the existing Geodatabase layers could be uploaded to OPTI for public viewing and made available to OPTI users. In the future, additional layers, such as groundwater quality and general plan areas, can be added to the Geodatabase to enhance the ability of project proponents to identify integration opportunities. Either way, by overlaying the current projects on top of the potential benefit layers, additional benefits could be added to existing projects or linked to other projects and proponents through those benefits.

**Table 11: Potential Benefit Geodatabase Layers**

| Data Layer | Description |
|---|---|
| Supply: Recharge Areas[1] | Shows areas where soils suitable for recharging are above supply aquifer recharge zones. Thereby indicating that water infiltrating in these areas has the potential to increase groundwater supplies. |
| Supply: Existing and Potential Water Reclamation[2] | Shows locations of existing wastewater and water reclamation plants. |
| Flood: Special Flood Hazard Areas[3] | Shows some of the areas that would benefit from increased drainage to alleviate flooding potential. |
| Habitat: Historical and Current Terrestrial Aquatic[4] | Shows the combined current and historical habitat areas that would indicate the potential for aquatic habitat protection, enhancement, or restoration benefits to be derived. (Note: North Santa Monica Bay Subregion did not have similar data so it shows Significant Ecological Areas instead[5].) |
| Recreation: High Priority[6] | Shows areas that have the greatest need for open space recreation given the distance from current open space recreation sites. |
| Water Quality: Medium and High Priority[7] | Shows watershed areas with medium and high priority and therefore relative potential to improve surface water quality. |

[1] Created using Los Angeles County's groundwater basins shapefile overlaid with soils and known forebays shapefiles.

[2] Created by RMC Water and Environment for the Los Angeles Department of Water and Power's Recycled Water Master Planning program to show sources of wastewater that could be made available for recycled water use.

[3] Created by Federal Emergency Management Agency to define areas at high risk for flooding (subject to inundation by the 1% annual chance flood event) and where national floodplain management regulations must be enforced.

[4] From *Regional restoration goals for wetland resources in the Greater Los Angeles Drainage Area: A landscape-level comparison of recent historic and current conditions using GIS* (C. Rairdan, 1998) and additional current aquatic habitat is based on the extent of current habitat derived from the National Wetlands Inventory.

[5] Significant Ecological Areas are those areas defined by Los Angeles County as having ecologically important land and water systems that support valuable habitat for plants and animals.

[6] Created for the *GLAC IRWM Open Space for Habitat and Recreation Plan (2012)*, and shows where there is less than one acre of park or recreation area per one thousand residents.

[7] Created for the *GLAC IRWM Water Quality Targets TM (2012)*, which ranked catchments based on TMDLs, 303(d) listings and catchments that drain into Areas of Special Biological Significance (ASBS).

## 4.2 South Bay Integration and Partnership Opportunities

Planning for the GLAC Region is primarily done on a subregional level, given that each subregion has a unique set of physical opportunities and stakeholders that create opportunities for project identification and collaboration. Therefore, the Geodatabase layers are more useful when examined and discussed on a subregional scale. Figure 14 focuses on the South Bay Subregion and highlights just a few unique areas within the subregion that have potential for generating multiple benefit projects. The areas described here are meant to provide examples of potential multiple benefits areas and are not meant to be a comprehensive inventory of opportunities. As subregions move forward to identify potential projects, it will be necessary to examine localized site characteristics (such as land uses) to confirm that it will be possible to meet the potential benefits discussed below.

The South Bay Subregion's integration potential is notable relative to other subregions in a few ways:

- There are minimal areas suitable for groundwater recharge.
- It has the largest area in need for open space recreation.
- It has great potential for coastal habitat preservation, enhancement and restoration.
- There are significant areas with a high priority water quality improvement potential.

What is not obvious from Figure 15 is that relative to other subregions, the South Bay is heavily dependent upon imported water supplies given limited groundwater recharge potential. Therefore local supply development anywhere within the Subregion would be considered to provide great benefits.

The following paragraphs describe the circled areas in Figure 15 where integration and partnership opportunities could be found based upon the Geodatabase layers and multiple benefit analysis performed. There are multiple areas beyond those few highlighted here for further exploration by the South Bay Subregion stakeholders and project proponents.

### A: Hollywood Basin Water Supply and Water Quality

Although limited, there are areas with the potential for groundwater recharge in the northern area of the subregion (Beverly Hills and Hollywood areas) that could recharge the Hollywood Groundwater Basin. These recharge areas also predominately lie within high priority areas for water quality improvements. Given that this area is heavily urbanized, it would be well suited for decentralized stormwater capture and use projects as well as infiltration BMP's that could achieve water quality and groundwater water supply benefits. Potential partnerships between LA County DPW, and the cities of Beverly Hills and West Hollywood and Los Angeles as well as several NGO's could result in multi-benefit projects.

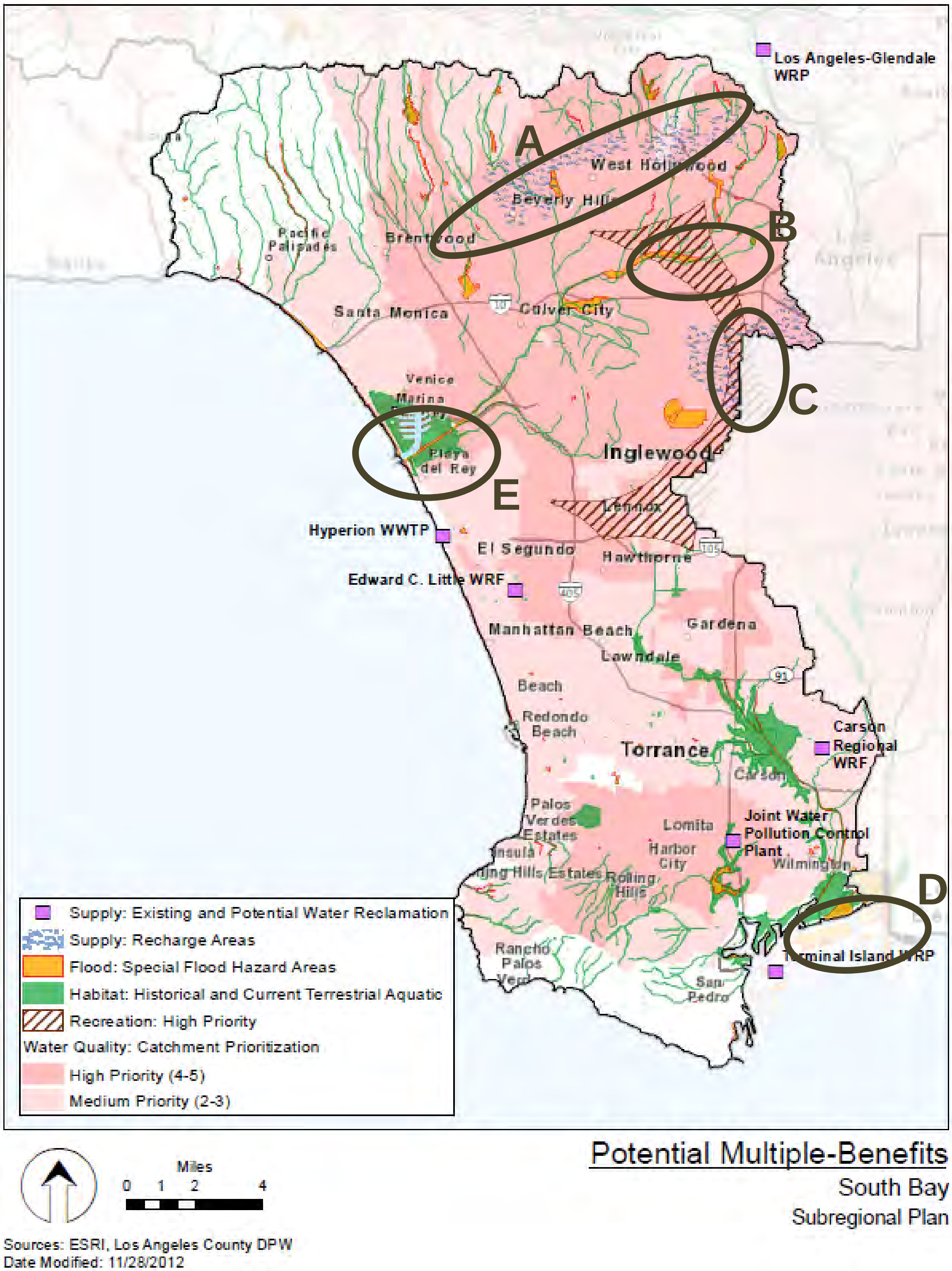
### B. Mid City Los Angeles Water Quality, Flood Management Habitat and Recreation

Historically, this area was the upstream area of Ballona Creek but has since then become heavily urbanized. These unique characteristics provide an area with opportunities for both flood management and water quality improvements. The area's current urban density may limit the ability to provide habitat benefits however recreation opportunities could still be feasible in the area on a neighborhood scale. Projects could provide multiple benefits when coupled with water quality improvement components and flood management.

### C. South Central Intra-subregional Groundwater Recharge, Recreation and Water Quality

The northern-most boundary between the South Bay and Lower Los Angeles and San Gabriel River subregions is South Central Los Angeles. This area has a high recharge potential and water quality improvement priority as well as a great need for open space recreation for the heavily urbanized neighborhoods. Therefore, this area has great potential for generating integrated projects that could provide benefits to both subregions. Projects could include stormwater landscaping BMPs on a site (yard) and neighborhood (park) scale to capture and infiltrate stormwater flows in open areas. Close proximity to regional water reclamation plants can also provide additional supplies to further enhance current use of recycled water for groundwater recharge. Project partners could be WBMWD, WRD and the City of Los Angeles.

**Figure 15: South Bay Subregion Potential Multiple-Benefits**



## D. Dominguez Channel Flood Management, Water Supply and Coast Habitat

Another area for a potential intra-subregional project with the Lower Los Angeles and San Gabriel Subregion is at the mouth of the Dominguez Channel. The area also houses the City of Los Angeles' Terminal Island Water Reclamation Plant that could supply recycled water supplies for potable offset for agencies in both subregions though their joint involvement in the Central Basin. Although heavily industrial, there is potential for habitat benefits if such a project were conceived that could also improve the flood management needed in the area. Partnerships between the cities of Los Angeles, Carson, Long Beach, WRD and WBMWD could result in integrated projects.

## E. Marina del Rey Water Quality and Coastal Habitat

The Ballona Creek empties into the Santa Monica Bay at Marina del Rey. This coastal area is home to the Ballona Wetlands that are in the process of being restored through past and future new projects that will further increase its habitat and water quality value and benefits. The presence of Ballona Channel (a stream and flood control channel) also provides opportunities for the management of flood waters and coastal inundation as a result of climate change. There are also opportunities for added freshwater wetland treatment upstream of the salt marsh areas that could incorporate passive activity trails.

Potential project partners are the State Fish and Wildlife Services, the Coastal Conservancy, and the Santa Monica Bay Restoration Commission, along with the LACFCD, non-profit groups (such as the Friends of Ballona Wetlands and Ballona Creek Renaissance) and cities of Los Angeles and Culver City.

The Oxford Flood Control Basin manages stormwater flows into Marina del Rey. While it is principally a flood control basin, it has potential for stormwater quality management and habitat restoration as well with potential partners including LACFCD and LA County Beaches and Harbors.

Venice Canals and Ballona Lagoon areas also provide opportunities for low impact development to minimize flooding and enhance water quality and open space habitat for the City of Los Angeles and local neighbors and environmental groups.

## References


Bay Restoration Foundation, 2011. *Ballona Wetlands.* http://www.santamonicabay.org/ballonarestoration.html

Beverly Hills, City of, 2011. *2010 Urban Water Management Plan.*

Friends of Madrona Marsh, 2012. *Explore the Marsh.* http://www.friendsofmadronamarsh.com/j/index.php?option=com_content&view=category&layout=blog&id=34&Itemid=53

Los Angeles, City of, 2011. *2010 Urban Water Management Plan.*

Los Angeles County Department of Regional Planning (LACDRP), 2011. *Los Angeles County General Plan 2035.* Public Review Draft.

Metropolitan Water District of Southern California (MWD), 2010. *Integrated Regional Plan.*

MWD, 2007. *Groundwater Assessment Study.* Report Number 1308. http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/GWAS.html

Palos Verdes Peninsula Land Conservancy, 2011. *Restoration and Land Stewardship.* http://www.pvplc.org/_lands/stewardship.asp

Regional Water Quality Control Board - Los Angeles Region (RWQCB), 2011. *State of the Watershed - Report on Water Quality, The Santa Monica Bay Watershed Management Area*. 2nd Edition.

RWQCB, 2011b. Shapefiles of Permitted Storm Sewer System (MS4) Discharges, Industrial General Discharges, and Caltrans Discharges.

RWQCB, 2008. *State of the Watershed - Report on Surface Water and Sediment Quality, The Dominguez Channel and Los Angeles/Long Beach Watershed Management Area*. November.

Sanitation Districts of Los Angeles County (SDLAC), 2012. *Bixby Marshland.* http://www.lacsd.org/wastewater/wwfacilities/jwpcp/bixbymarshland.asp

SDLAC, 2010. *Machado Lake Ecosystem Rehabilitation Project and Wilmington Drain Multi-Use Project.* http://www.lacitysan.org/wpd/Siteorg/LAPropO/sitefiles/Machado/machadointro.htm

Santa Monica, City of, 2011. *2010 Urban Water Management Plan.*

State Water Resources Control Board (SWRCB), 2010. *2010 Integrated Report (Clean Water Act Section 303(3) List / 305(b) Report) - Statewide.* http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

Southern California Association of Governments (SCAG), 2012. *Adopted 2012 RTP Growth Forecast.* http://www.scag.ca.gov/forecast/index.htm

Torrance, City of, 2011. *2010 Urban Water Management Plan.*

U.S. Census Bureau, 2012. *2010 Census Data*. Census tract.

Water Replenishment District (WRD), 2012. *Safe Drinking Water Program.* http://www.wrd.org/engineering/groundwater-los-angeles.php?url_proj=safe-drinking-water

West Basin Municipal Water District, 2011. *2010 Urban Water Management Plan.*

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# Exhibit A. Regional Imported Water Information

### *State Water Project*

The SWP is a system of reservoirs, pumps and aqueducts that carries water from Lake Oroville and other facilities north of Sacramento to the Sacramento-San Joaquin Delta and then transports that water to central and southern California. Environmental concerns in the Sacramento-San Joaquin Delta have limited the volume of water that can be pumped from the SWP. The potential impact of further declines in ecological indicators in the Bay-Delta system on SWP water deliveries is unclear. Uncertainty about the long-term stability of the levee system surrounding the Delta system raises concerns about the ability to transfer water via the Bay-Delta to the SWP.

The MWD contract with the Department of Water Resources (DWR), operator of the SWP, is for 1,911,500 acre-feet/year. However, MWD projects a minimum dry year supply from the SWP of 370,000 acre-feet/year, and average annual deliveries of 1.4 million acre-feet/ year. These amounts do not include water which may become available from transfer and storage programs, or Delta improvements.

MWD began receiving water from the SWP in 1972. The infrastructure built for the project has become an important water management tool for moving not only annual deliveries from the SWP but also transfer water from other entities. MWD, among others, has agreements in place to store water at a number of groundwater basins along the aqueduct, primarily in Kern County. When needed, the project facilities can be used to move stored water to southern California.

### *Colorado River Aqueduct*

California water agencies are entitled to 4.4 million acre-feet/year of Colorado River water. Of this amount, the first three priorities totaling 3.85 million acre-feet/year are assigned in aggregate to the agricultural agencies along the river. MWD's fourth priority entitlement is 550,000 acre-feet per year. Until a few years ago MWD routinely had access to 1.2 million acre-feet/year because Arizona and Nevada had not been using their full entitlement and the Colorado River flow was often adequate enough to yield surplus water to MWD. According to its 2010 Regional UWMP, MWD intends to obtain a full 1.2 million acre-feet/year with possible water management programs with agricultural and other holders. MWD delivers the available water via the 242-mile Colorado River Aqueduct, completed in 1941, which has a capacity of 1.2 million acre-feet per year.

The Quantification Settlement Agreement (QSA), executed in 2003, affirms the state's right to 4.4 million acre-feet per year, though water allotments to California from the Colorado River could be reduced during future droughts along the Colorado River watershed as other states increase their diversions in accord with their authorized entitlements. California's Colorado River Water Use Plan and the QSA provide numeric baseline to measure conservation and transfer water programs thus enabling the shifting to conserve water (such as the lining of existing earthen canals) and to shift some water from agricultural use to urban use. Since the signing of the QSA, water conservation measures have been implemented including the agriculture-to-urban transfer of conserved water from Imperial Valley to San Diego, agricultural land fallowing with Palo Verde, and the lining of the All-American Canal.

# APPENDIX L

## L. Upper Los Angeles River Subregional Plan

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# Upper Los Angeles River Subregional Plan

# Final

**Prepared by:**

RMC
Water and Environment

In Association with:

Geosyntec
consultants

**October 2013**

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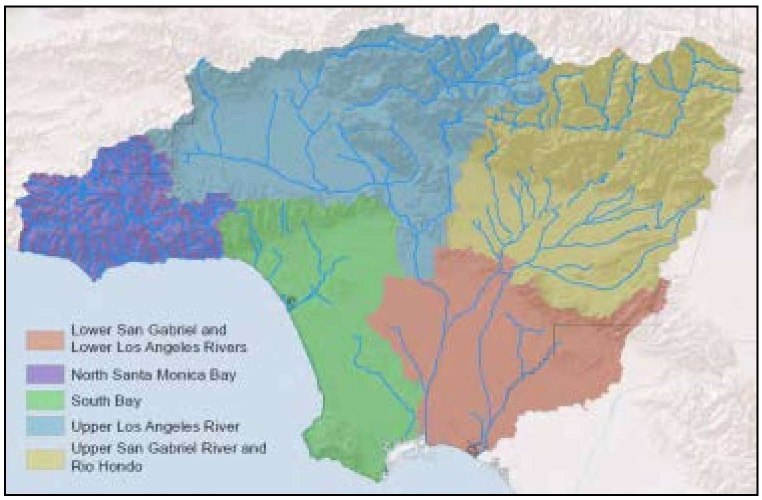
# 1 Background and Purpose of Subregional Plan

The Upper Los Angeles Subregional plan is one of five Subregional plans that make up the Greater Los Angeles County (GLAC) Integrated Regional Water Management (IRWM) Plan. This Subregional plan outlines Upper Los Angeles's physical setting, sources of water supply, water quality, environmental resources, planning objectives and targets, and partnership and multi-benefit opportunities. The purpose of the Subregional Plan is to outline its expected contribution to meeting the GLAC regional planning goals, objective, and targets.

# 2 Upper Los Angeles Description

## 2.1 Physical Setting

**Figure 1: GLAC Subregional and Watershed Boundaries**




The Upper Los Angeles River Subregion of the GLAC Region is located in the northwest portion of the Los Angeles County urbanized area. The Upper Los Angeles River Watershed begins in the surrounding mountains (San Gabriel Mountains, Santa Susana Mountains, Simi Hills and Santa Monica Mountains) and runs through the San Fernando Valley on its way south to the Pacific Ocean. Development is concentrated in the interior valleys and the surrounding foothills. Groundwater basins and runoff from the surrounding mountains provide local water supplies, although groundwater contamination from industrial sources and prior land uses poses a significant challenge in some locations. The large expanses of urban and suburban development on the valley floors are home to approximately 2.3 million residents, with projections estimating population increasing to 2.6 million residents by 2035 (SCAG, 2010). Most of the major river and stream channels on the valley floors have been subject to channelization due to flood issues in the past, which prevents percolation.

### *Political Boundaries*

The Subregion consists of 8 cities and unincorporated areas of Los Angeles County. **Figure 2** depicts the county and city boundaries of the Upper Los Angeles River Subregion.

### *Climate, Temperature, and Rainfall*

The Upper Los Angeles River Subregion is within a Mediterranean climate zone. Summers are typically dry and hot while winters are wet and cool. Precipitation typically falls in a few major storm events between November and March. Precipitation in the Upper Los Angeles River Subregion averages 19 inches per year, though the foothills and mountains receive considerably more rain than valleys, causing considerable runoff and flooding potential.

### *Geography and Geomorphology*

The geography of the Upper Los Angeles River Subregion can generally be divided into three distinct types: inland valleys, foothills that generally surround the valley, and the surrounding mountains. The San Gabriel Mountains, Santa Susana Mountains, Simi Hills and Santa Monica Mountains are part of the

Transverse Ranges, which extend 350 miles east to west from the Eagle Mountains in San Bernardino County to the Pacific Ocean. The elevation of the San Gabriel Mountains (in the northeastern portion of the Subregion) ranges from sea level to over 10,000 feet and separates the Los Angeles basin from the Mojave Desert. The Santa Susana Mountains are located in the northwestern portion of the Subregion, reaching a height of 3,747 feet, and separates the San Fernando and Santa Clarita Valleys. The Santa Monica Mountains lie to the south of the Subregion and separate the San Fernando Valley and the Los Angeles Basin. The Simi Hills form the western border of the Subregion. The foothills reach 3,000 to 4,000 feet before rising rapidly into the surrounding mountains. Below these elevations are the valley areas.

The San Gabriel, Santa Monica and Santa Susana Mountains, as well as Simi Hills are young mountains, geologically speaking, and continue to rise at a rate of one-quarter to three-quarters of an inch per year. Because of this instability, they are also eroding at a rapid rate. Alluvial deposits of sand, gravel, clay and silt in the coastal plain are thousands of feet thick in some areas, due in part to the erosive nature of the surrounding mountains. The Subregion is extensively faulted, with the San Andreas Fault bordering the north side and the Sierra Madre–Cucamonga fault zone on the south side of the San Gabriel Mountains and Santa Susana Mountains. The Santa Monica Mountains Thrust Fault runs through the Santa Monica Mountains.

Petroleum source rock found within the Subregion is a well-known source of potential water quality concerns. The Modelo Formation forms parts of the northern, western and southern slopes of the San Fernando Valley. The Modelo Formation is a depositionally distinct subset of the Monterey Formation, California's primary petroleum source rock. The Los Angeles River cuts through the Puente Formation, also a petroleum source rock, by Elysian Park. Both of these formations contribute high concentrations of solutes to runoff, includes metals, sulfates, chloride, phosphorus and selenium.[1]

[1] U.S. Geological Survey, 2002. Hazardous trace elements in petroleum source rock: The Monterey Formation. http://geomaps.wr.usgs.gov/env/monterey.html

**Figure 2: Cities and Communities in the ULAR Subregion**

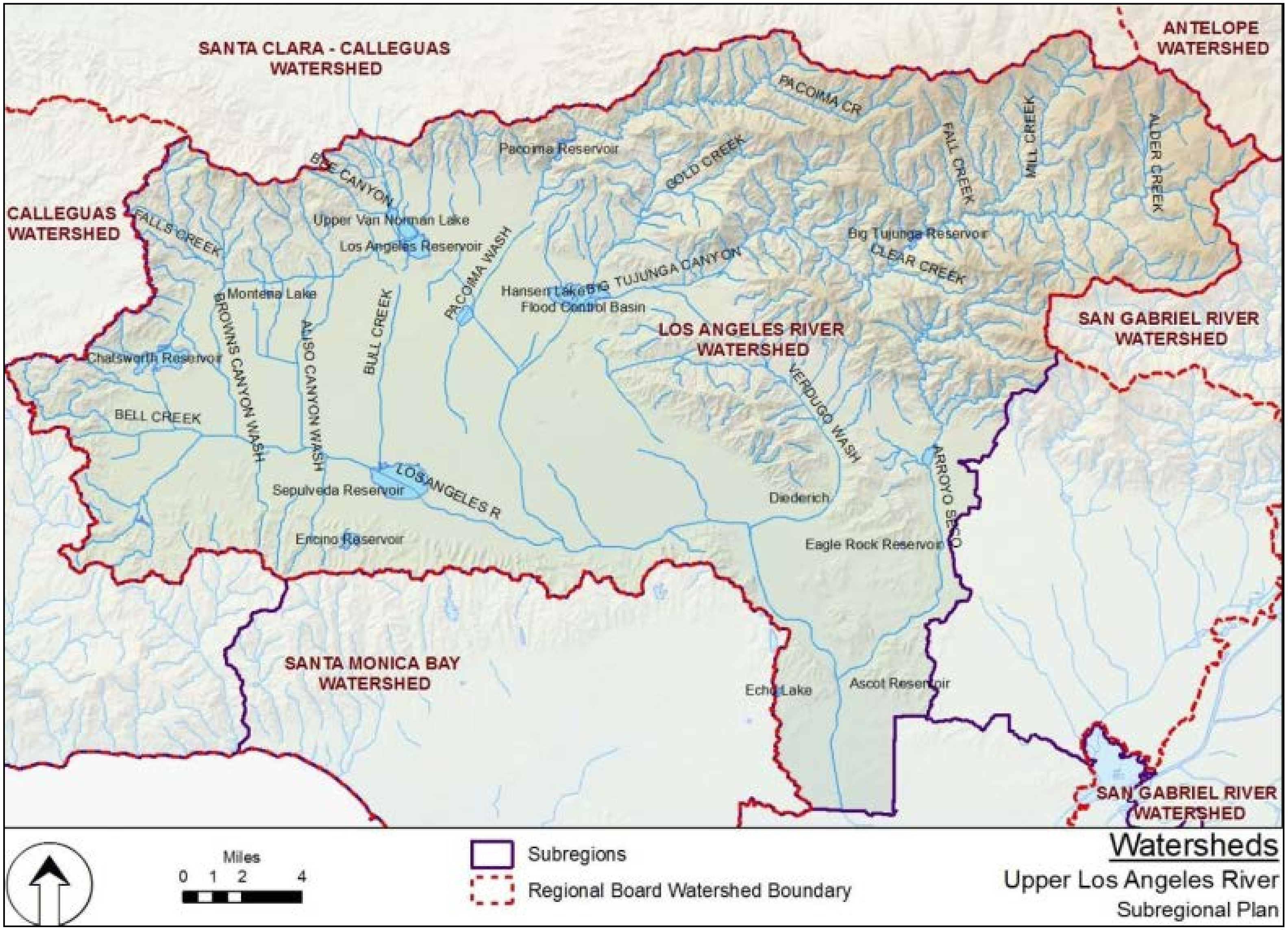

## 2.2 Watersheds and Water Systems

*Watersheds*

The Upper Los Angeles River Subregion consists of the Upper Los Angeles River watershed (Figure 3). The watershed begins in the surrounding mountains, and stretches across the San Fernando Valley, then down to the Pacific Ocean. The portion of the watershed which this Subregional plan is concerned with is the upper watershed, upstream of the coastal plain, at the Glendale Narrows. The Upper Los Angeles River watershed is made up of a number of tributaries in addition to the main Los Angeles River channel, including: Arroyo Calabasas, Bell Creek, Aliso Creek, Pacoima Wash, Tujunga Wash, Big Tujunga Creek, Verdugo Wash, and the Arroyo Seco. The main Los Angeles River begins at the confluence of Bell Creek and Calabasas Creek in Canoga Park in the City of Los Angeles, with its tributaries running south to meet it. There is very little natural flow within the Los Angeles River throughout most of the year. The tertiary treated recycled wastewater of the wastewater treatment plants in the Subregion provide the baseflow seen during most of the year. During storm events, a large amount of runoff can be conveyed through the flood control infrastructure discussed in the next section.

In addition, though Rio Hondo isn't a part of the Subregion, it is typically included as a part of the Upper Los Angeles River watershed. The Rio Hondo lies to the east of the Subregion and captures runoff from the San Gabriel Valley, running southwest through the Whittier narrows then through urban areas to its confluence with the Los Angeles River.

**Figure 3: Watersheds of the ULAR Subregion**



### *Flood Management and Infrastructure*

Flood management is important to protect human lives and property, particularly in the surrounding mountain regions where, historically, flooding and debris flows have been an issue due to wildfires and changes to the natural landscape. The Los Angeles County Flood Control District, with the Army Corps of Engineers, constructed, manages and maintains the Subregion's flood infrastructure, such as debris basins, storm drains, culverts, dams, reservoirs, spreading basins, and flood control channels (Figure 6).

The Subregion's dams and reservoirs often operate secondarily as water conservation facilities. The major flood control reservoirs within the Subregion include the Hansen, Lopez and Sepulveda Reservoirs. Many tributary stream channels to the Los Angeles River have concrete banks and bottoms due to frequent and historical flooding. This added imperviousness has reduced the amount of permeable acreage and recharge to the groundwater basin. A number of in-stream and off-stream groundwater replenishment facilities are in place to attempt to help offset the impact of the flood control features.

### *Water Suppliers and Infrastructure*

The water suppliers in the Subregion can be divided into wholesalers and retailers. Wholesalers (Figure 4) provide imported water and/or recycled water and to other agencies, while retailers (Figure 5) sell water to end users. These suppliers use a combination of imported water, recycled water, and groundwater to serve potable and non-potable demand in their service areas. Each of these major suppliers has written a 2010 Urban Water Management Plan (UWMP) to estimate future water supply demand and availability, and which were utilized in the estimation of supplies described later in this plan.

**Figure 4:  Wholesale Water Suppliers**

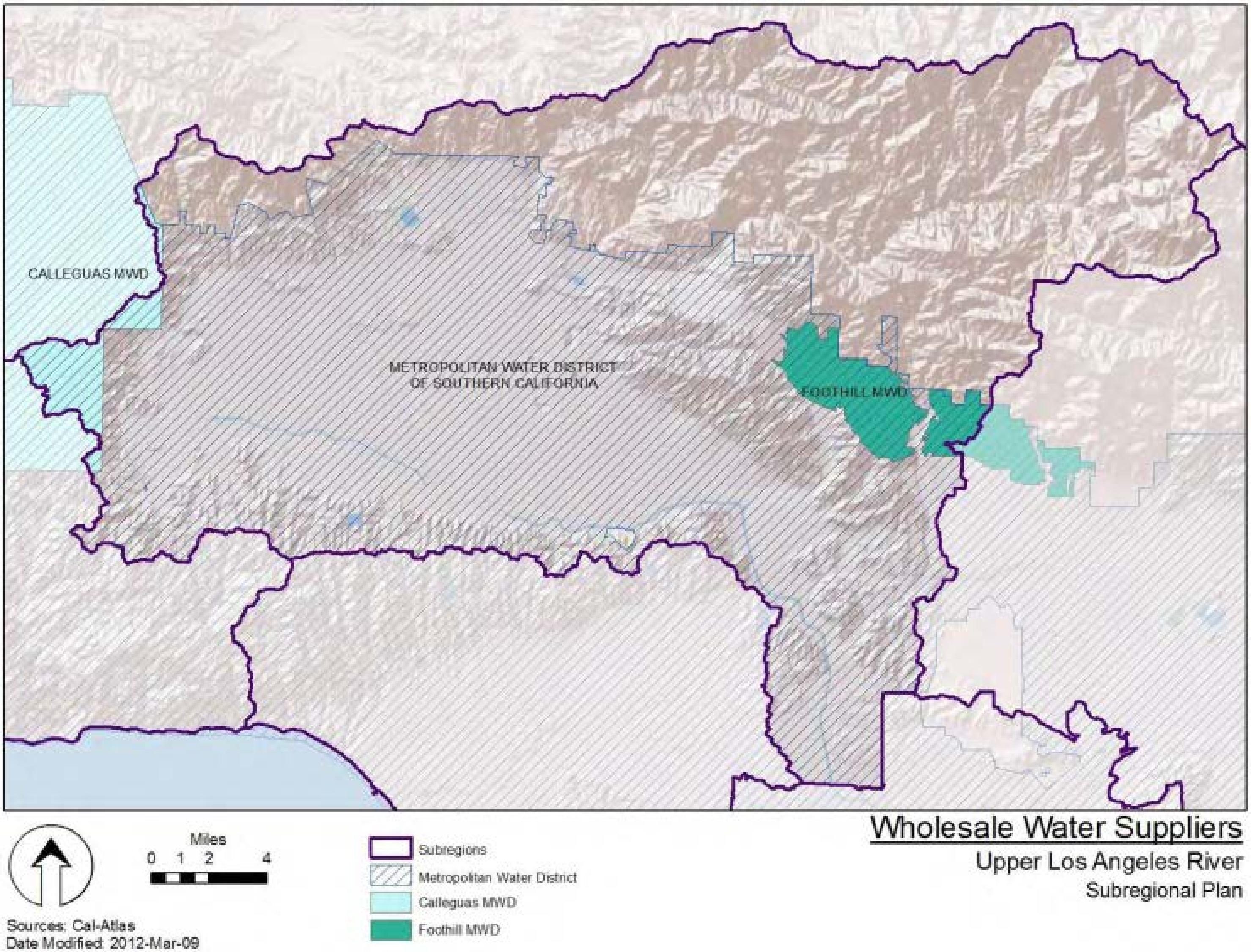
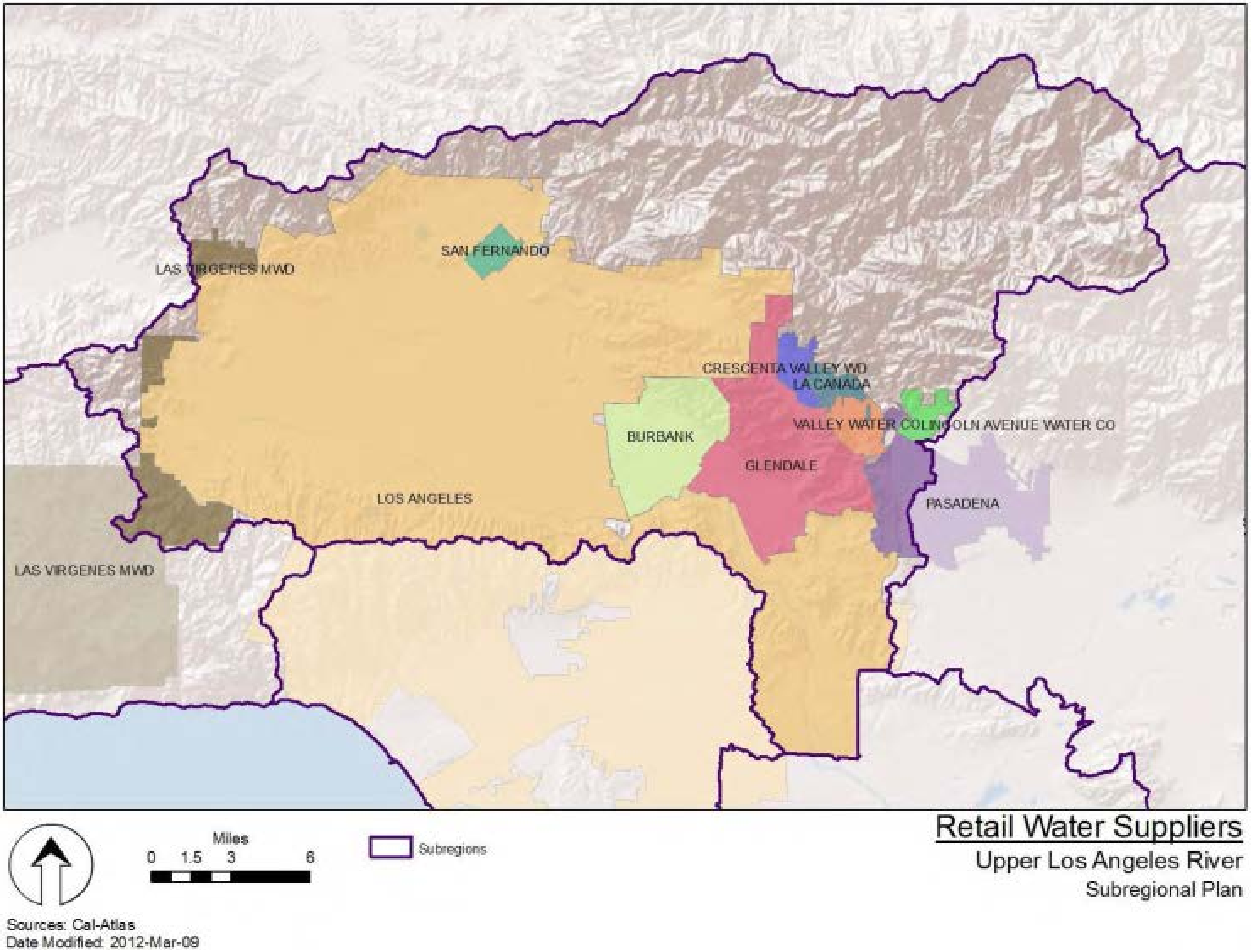


**Figure 5: Retail Water Suppliers**



## 2.3 Sources of Water Supply

The Upper Los Angeles River Subregion depends primarily on a combination of groundwater and imported water to meet its water demands. Local water supplies include surface water, recycled water, and groundwater. Imported water is provided by Metropolitan Water District of Southern California (MWDSC) through the California State Water Project (SWP) and the Colorado River Aqueduct, and the City of Los Angeles through the Los Angeles Aqueduct. MWDSC calculates that it can reliably deliver water under not only normal conditions but under multiple dry year conditions. Imported water provided through the Los Angeles Aqueduct has decreased over time due to the need for environmental mitigation in the Owens Valley area, but the City of Los Angeles predicts that deliveries will be sufficient to meet demand in conjunction with Los Angeles's other supplies. Recycled water is provided by the Sanitation Districts of Los Angeles County, the City of Los Angeles, and Las Virgenes MWD.

Sources of supply vary throughout the Subregion, as shown in Table 1. These supplyies are based on numbers reported in the 2010 Urban Water Mangement Plans (UWMPs) for Glendale, Burbank, Pasadena, Los Angeles, Las Virgenes MWD, Calleguas MWD and Foothill MWD. These water suppliers were chosen as their service areas cover a majority of the Subregion.

This table was developed based on 2010 Urban Water Management Plans (UWMPs) whose service areas cover a majority of the Subregion. These agencies include:

- City of Los Angeles (portion within Subregion)
- City of Glendale
- City of Burbank
- City of Pasadena
- Las Virgenes MWD (portion within Subregion)
- Foothill MWD (portion within Subregion)

In addition to retail supply, replenishment supply is needed to refill the Central Groundwater Basin and to use with injection wells serving as seawater barriers. Table 2 shows the actual supplies used to meet replenishment needs.

**Table 1: Actual Retail Supplies (acre-feet per year)**

| Supply | 2010 |
|---|---|
| **Ground Water** | 90,000 |
| **Imported Water** | 286,000 |
| **Recycled Water** | 13,000 |
| **Local Surface Water** | 1,000 |
| **Desalinated Ocean water** | - |
| **Water Use Efficiency** | 5,000 |
| **Stormwater Capture and Use** | - |
| **Total** | **395,000** |

**Table 2: Actual Replenishment Supplies (acre-feet per year)**[2]

| Supply | 2010 |
|---|---|
| Imported Water | 2,000 |
| Recycled Water | - |
| Stormwater | 33,000 |
| **Total** | **35,000** |

## Surface Water

The Subregion has developed a system of dams, flood control channels, and spreading basins for supplying local water and recharging groundwater. Though there are many areas of the Subregion's rivers that are concrete lined, several spreading grounds have been constructed adjacent to them to allow for recharge (Figure 7), including:

- Pacoima Spreading Grounds (adjacent to Pacoima Wash)
- Branford Spreading Basin (adjacent to Pacoima Wash)
- Tujunga Spreading Grounds (adjacent to Tujunga Wash)
- Hansen Spreading Grounds (adjacent to Tujunga Wash)

Water agencies that have water diversion rights within the Subregion include the City of Pasadena and the City of Los Angeles. The City of Pasadena has rights up to 25 cfs of Arroyo Seco runoff, though the yield of the Arroyo Seco is highly variable depending on weather and rain patterns, and uses its diversions for both direct use and groundwater recharge. The City of Los Angeles has full rights to flows in the Los Angeles River, and uses its diversion rights for groundwater recharge.

[2] Replenishment supplies based on 10-year average of replenishment in Coastal Plain area as reported in Los Angeles County Hydrologic reports. Included are groundwater basin recharge (100% contribution to groundwater supply) and sea water barrier injection (60% contribution to groundwater supply)

**Figure 6: Flood Control Facilities**

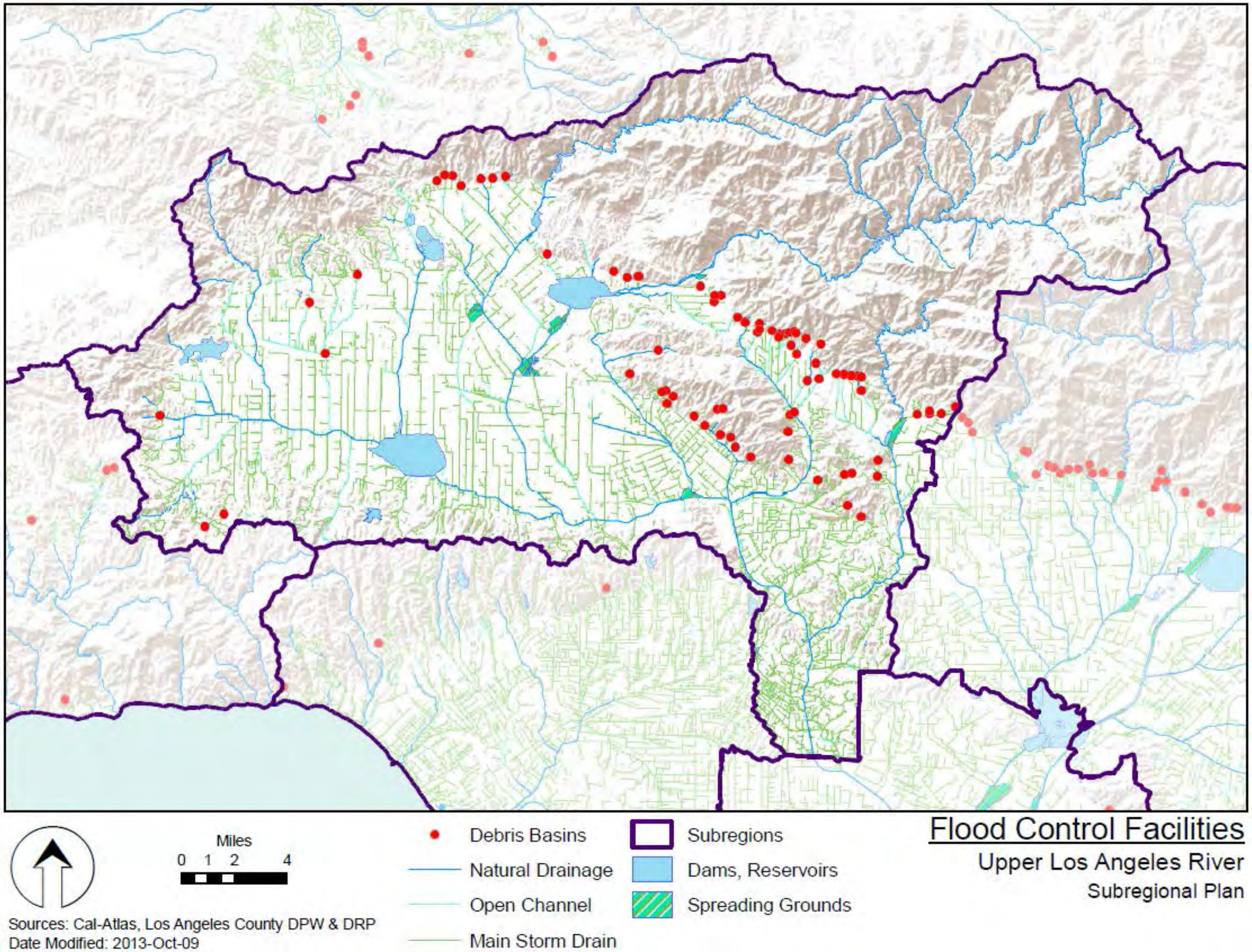
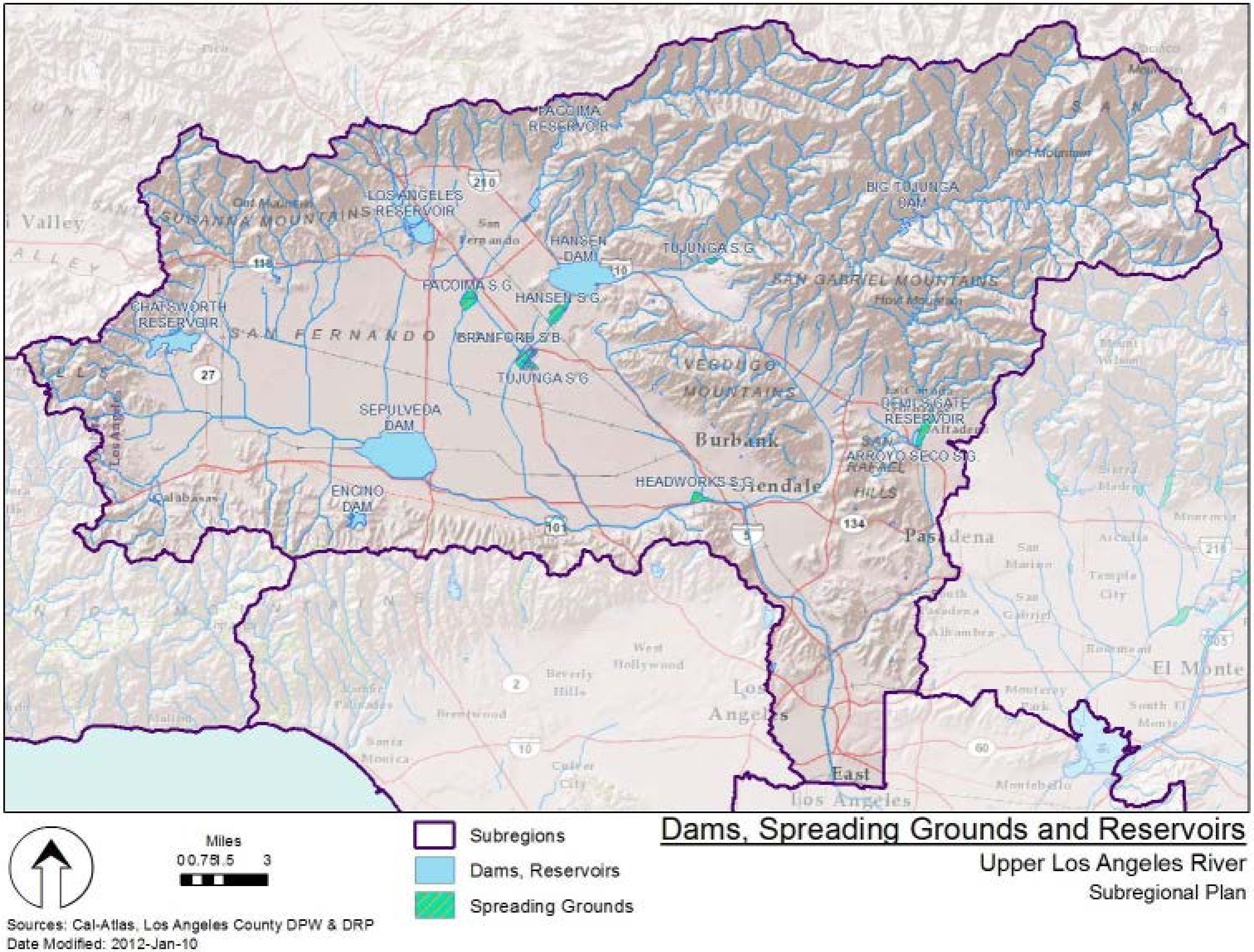


**Figure 7: Spreading Basins, Dams and Reservoirs**



## Groundwater

Groundwater represents a significant portion of local supplies in the Subregion. The majority of groundwater yield in the Subregion is naturally recharged through the percolation of direct rainfall, and stream flow from surface runoff, percolation of imported water, and return flow from applied water. Some areas capture surface runoff and release it into spreading basins for additional percolation into the groundwater basin. The Los Angeles County Flood Control District and the City of Los Angeles operate several groundwater recharge facilities along tributaries to the Los Angeles River which recharge the San Fernando Basin. The Pasadena Water and Power Water Services Division also operates recharge facilities which recharge the Raymond Basin as discussed previously under “Surface Water”.

Groundwater basins act as underground reservoirs. During wet years, a basin can store excess surface water (imported and local) when available in wet years and then withdraw that water in dry years or during emergency situations when other sources are not available. Some basins, such as the Raymond Basin and Central Basin, have ample storage capacity and are able to store water for other agencies through conjunctive use programs.

The groundwater basins (shown in Figure 8) underlying this Subregion include:

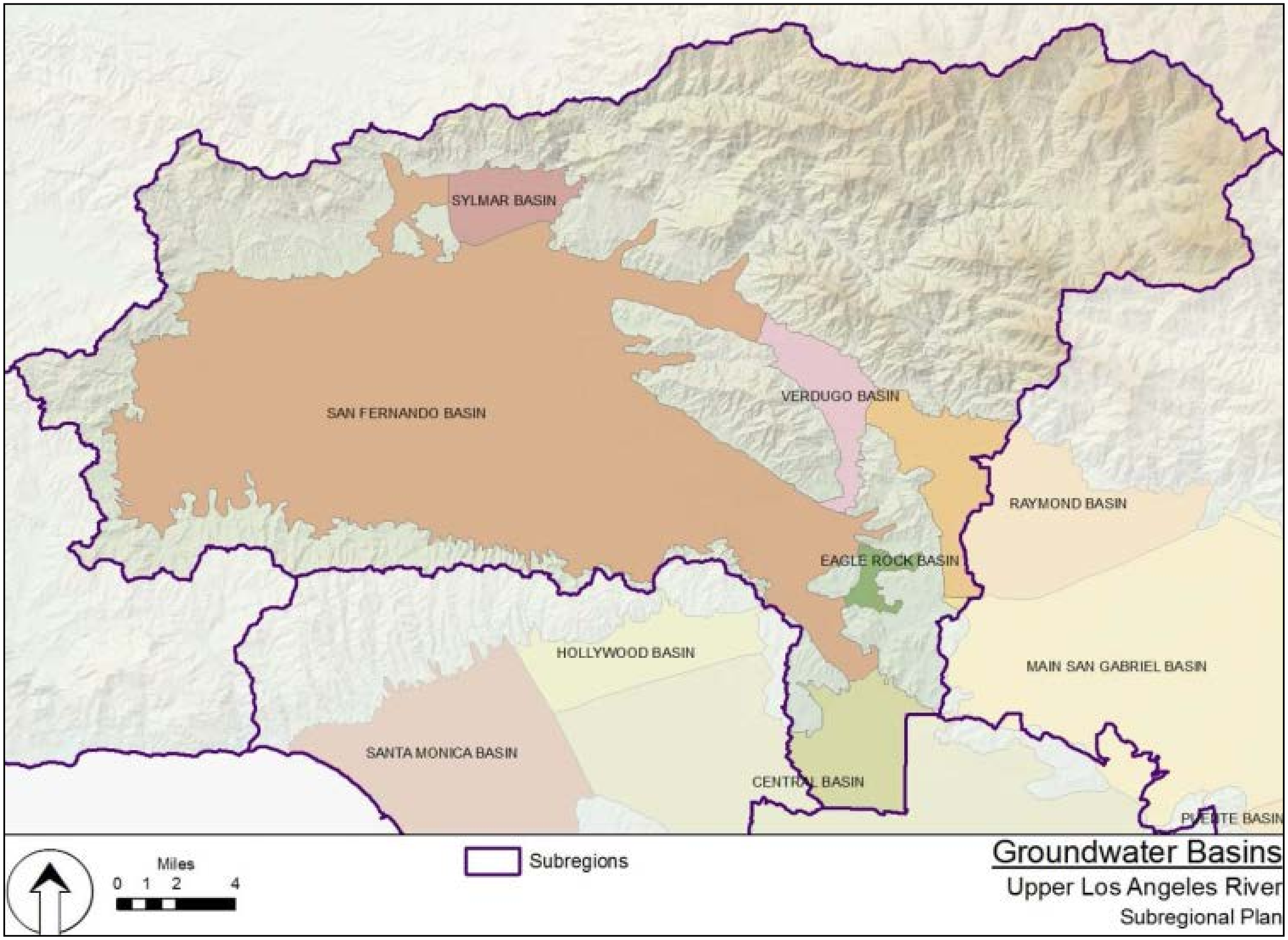
- San Fernando Basin
- Verdugo Basin
- Sylmar Basin
- Eagle Rock Basin
- Raymond Basin
- Central Basin

The San Fernando, Sylmar, Eagle Rock and Verdugo Basin are collectively referred to as the Upper Los Angeles River Area (ULARA) Basins. The ULARA Basins cover a majority of the San Fernando Valley Floor and are bound by the San Gabriel and Santa Susana Mountains to the north, and the Santa Monica Mountains to the south. These basins are managed by the ULARA Watermaster, which tracks groundwater pumpage from 43 parties.

The Raymond Basin is bounded on the north by the San Gabriel Mountains, on the south and east by the San Gabriel Valley and on the west by the San Rafael Hills; only the western portion of the basin underlays the Upper Los Angeles River Subregion. The Raymond Basin Management Board manages the basin, and tracks the groundwater pumpage of the 16 different water purveyors that pump water from the basin.

The Central Basin is adjudicated through the Central Basin Judgment, with the total amount of allowable extraction rights set at 217,367 AFY. The California Department of Water Resources serves as Watermaster for the Central Basin, while the Water Replenishment District of Southern California is responsible for ensuring an adequate supply of replenishment water to offset groundwater production through monitoring, and various groundwater reliability programs and projects.

**Figure 8: Groundwater Basins**



## Imported Water

This Subregion significantly depends on imported water as local supply alone is insufficient to meet demand. The imported water wholesaler to the Subregion is the MWDSC. The City of Los Angeles also obtains imported water from the Los Angeles Aqueduct as described in Section 2.3.

Factors that impact reliability of MWDSC deliveries include operational constraints such as court ordered pumping restrictions on imported water from the San Joaquin-Sacramento River Delta (Delta) due to endangered species protection. Water quality concerns such as high salinity levels can require that water from the Colorado River be blended with higher quality SWP water. Invasive species, such as the quagga mussel, can force extensive maintenance of systems reducing operational flexibility. Climate change may impact supply reliability by reducing levels of precipitation impacting the snowpack in the Sierra Nevada Mountains, increasing the intensity and frequency of extreme weather such as droughts, and flooding events that increase the risk of levee failure in the Delta.

The reliability of Los Angeles Aqueduct supplies also includes operational constraints due to environmental mitigation needs in the Owens Valley and Mono Basin. Additionally, water quality concerns such as disinfection byproducts may require future treatment of Los Angeles Aqueduct water. Climate change is also expected to reduce the amount of water that can be imported from the Sierra Nevada Mountains. (LADWP 2010 UWMP)

Further discussion on imported water is included in Exhibit A.

## Recycled Water

Recycled water supplied to the Subregion is treated at the Donald C. Tillman Water Reclamation Plant (DCTWRP), Burbank WRP, Los Angeles-Glendale WRP (LAGWRP) and La Cañada WRP, all shown in Figure 9. DCTWRP and LAGWRP are both owned and operated by the City of Los Angeles. The DCTWRP has been producing recycled water since 1985 and annually produces approximately 23,000 acre-feet of recycled water per year. The LAGWRP began operation in 1976, and produces approximately 5,000 acre-feet of recycled water per year. La Cañada WRP is owned and operated by the Sanitation Districts of Los Angeles County. The La Cañada WRP has been in operation since 1962 and provides approximately 100 acre-feet per year of recycled water for golf course lakes and irrigation. Lastly, the Burbank WRP, owned and operated by Burbank Water and Power, began operation in 1966 and was upgraded in 2000 to meet current regulations. Burbank WRP produces approximately 10,000 acre-feet per year of recycled water. Smaller quantities are provided by Tapia WRF to Las Virgenes MWD service areas in Calabasas.

In addition, there is potential for additional recycled water flows from these facilities, specifically the potential for increased production of recycled water in the Subregion if funding is available for capital improvements. These capital improvements could be at the treatment plants themselves to increase capacity, or by modifications of the upstream sewer collection system to divert more wastewater to the treatment plants, as well as extensions to recycled water distribution systems.

Recycled water projects are being pursued by the water suppliers in the Subregion. Many of those projects are supported by MWDSC's Local Projects rebates program. For some agencies, recycled water provides a significant portion of total water supplies. Recycled water is typically used for irrigation of large landscapes such as golf courses, freeway medians, parks, sports fields, and cemeteries. Existing recycled water projects in the Subregion are shown in Table 3. Additionally, the LADWP Recycled Water Master Plan proposes using recycled water for groundwater replenishment in the future. Those recycled water projects that are under construction, in advanced planning, or in the feasibility study stage include those shown in Table 4. (MWDSC, 2010)

**Figure 9: Water Reclamation Facilities in the GLAC Region**

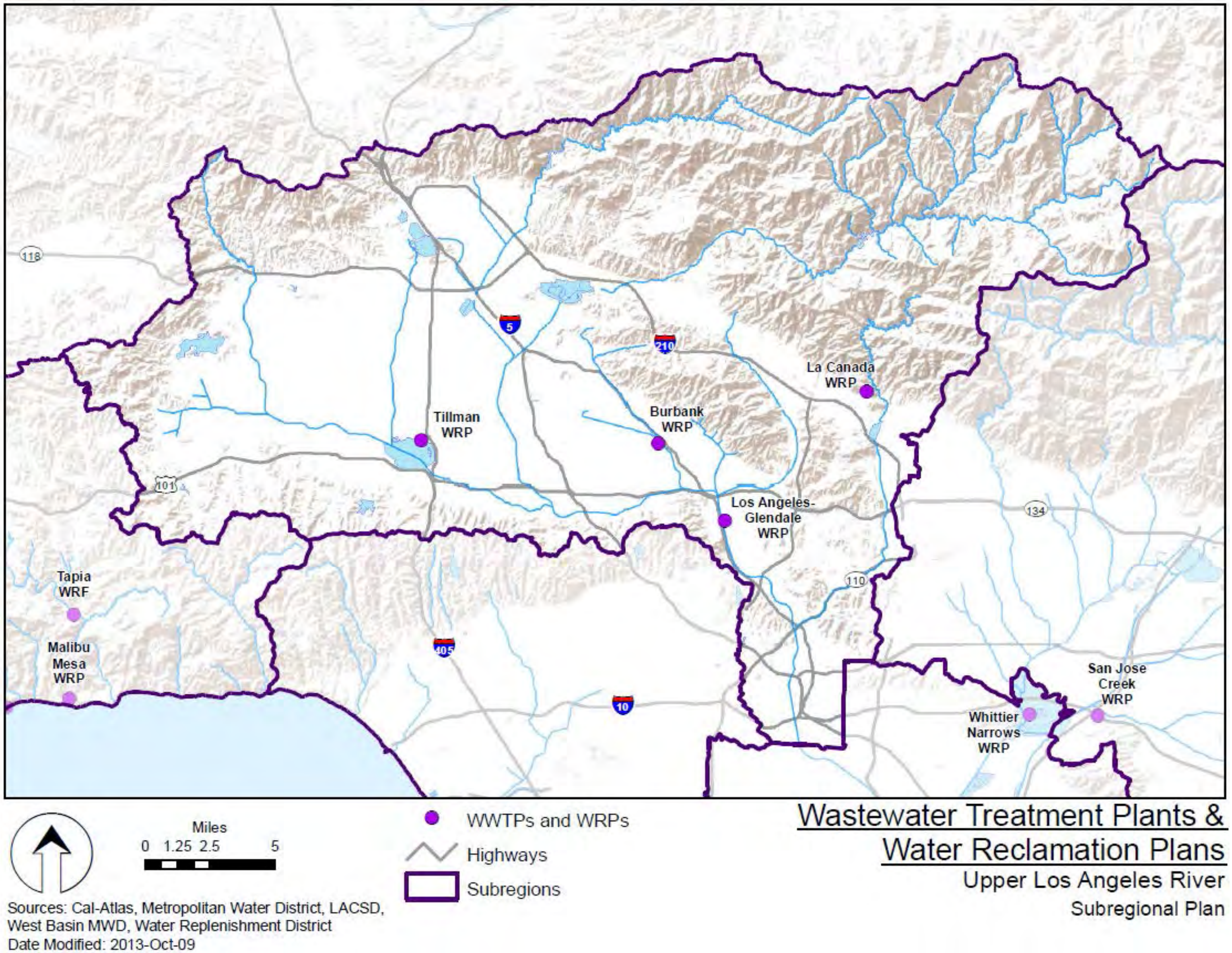


**Table 3: Existing Recycled Water Projects**

| Agency | Project Name | Ultimate capacity (acre-feet) |
|---|---|---|
| Burbank Water and Power | Burbank Reclaimed Water System Project Expansion | 850 |
| | BWP Power Plant | 1,500 |
| | Caltrans | 20 |
| Sanitation Districts of Los Angeles County | La Canada-Flintridge Country Club | 224 |
| Glendale | Glendale Forest Lawn WRP Expansion | 500 |
| | Glendale Grayson Power Plant Project | 460 |
| | Glendale Verdugo-Scholl Canyon Brand Park Reclaimed Water Project | 2,225 |
| LADWP | Environmental Use | 28,000 |
| | Griffith Park | 650 |
| | Hansen Area Water Recycling Project, Phase1 | 2,500 |
| | Los Angeles Greenbelt Project | 900 |
| | MCA/Universal | 810 |
| | Sepulveda Basin Water Reclamation Project | 1,500 |
| Las Virgenes MWD / Triunfo Sanitation District | Eastern Recycled Water System | 7,280 |
| | **Total Capacity** | **47,419** |

**Table 4: Future Recycled Water Projects**

| Agency | Project Name | Ultimate capacity (acre-feet) |
|---|---|---|
| Burbank Water and Power | Burbank Reclaimed Water System Project Expansion, Phase II | 974 |
| Foothill MWD | Foothill MWD Recycled Water Project | 318 |
| LADWP | Hansen Dam Golf Course Water Recycling Project | 500 |
| | LA-Glendale Storage & Distribution System Water Recycling Project | 2,600 |
| | Elysian Park Tank and Pumping Station Water Recycling Project | 500 |
| | LA Zoo Water Recycling Project | 500 |

| Agency | Project Name | Ultimate capacity (acre-feet) |
|---|---|---|
| | Tillman Groundwater Replenishment System | 30,000 |
| | San Fernando Valley/Central City Water Recycling and Reliability Project | 1,500 |
| | Satellite Plant and Distribution System | 4,500 |
| Pasadena Water and Power | Central Los Angeles County Regional Recycled Water Project: Phase 1 | 730 |
| | Central Los Angeles County Regional Recycled Water Project: Phase 2 | 3,110 |
| | Central Los Angeles County Regional Recycled Water Project: Phase 3 | 3,170 |
| Las Virgenes MWD / Triunfo Sanitation District | Woodland Hills Golf Course Recycled Water System Extension | **230** |
| | **Total Capacity** | **48,632** |

## Ocean Desalination

Due to the Subregion's lack of proximity to the ocean, ocean desalination projects would not occur within the Subregion. However, there may be opportunities to partner with an agency along the coast and transfer water through either a groundwater basin or through MWDSC in the future as desalination supplies become more cost competitive with imported water.

## Stormwater Capture and Use

Stormwater runoff from urban areas is an underutilized resource. Within the Subregion, a majority of stormwater runoff is directed to storm drains and channeled to the ocean. Stormwater reuse is a method that can be used by municipalities both to add a source of supply to its water portfolio, and to reduce runoff that can contribute to flooding and water quality issues. The County of Los Angeles, the City of Los Angeles, and the City of Burbank have low impact development (LID) ordinances in place that will increase the use of best management practices (BMPs) to reduce stormwater quality issues, flooding, and increase percolation to groundwater basins.

The City of Los Angeles is planning to develop a Stormwater Capture Master Plan in place that will investigate potential strategies for advancement of stormwater and watershed management in the City of Los Angeles, including centralized and distributed stormwater capture goals, and recommended projects to meet those goals. The City of Los Angeles has undertaken programs in the Sun Valley watershed to manage runoff and prevent flooding. The various stormwater management methods include installation of catch basins, storm drain inlets, and underground pipes to divert water to retention basins, open space for the storage and percolation of stormwater, and use of stormwater for landscaping.

The City of Burbank is completing a pilot percolation project that improves public right of ways along a street that will allow for the capture and percolation of stormwater.

It should also be mentioned that reservoirs in the Subregion have the capability to conserve some stormwater from the upper watershed, though primary purpose of these reservoirs is generally flood prevention. In addition, the permeable soils of the Subregion would allow for stormwater recharge of the groundwater basins.

## 2.4 Water Supply/Demand

As water agency boundaries are not aligned with the Subregional boundaries, an estimate of the actual Subregion's water supply and demand was not readily available for this Plan. Water supply and demand for the Subregion was estimated based on review of 2010 Urban Water Management Plans (UWMPs).

Demand projections for the Subregion can be seen in Table 5. Demand was calculated using the 2010 UWMPs for the following water purveyors:

- City of Los Angeles (portion within Subregion)
- City of Glendale
- City of Burbank
- City of Pasadena
- Las Virgenes MWD (portion within Subregion)
- Foothill MWD (portion within Subregion)

All agencies have incorporated water conservation measures into water planning and practice. This practice involves the implementation of best management practices (BMPs) as prescribed by the California Urban Water Conservation Council in order to meet the requirements SBx7-7 (Steinberg, 2009), also known as the 20x2020 Plan. Member agencies of MWDSC assist the Subregion by implementing incentive programs that provide rebates to water conservation and recycled water use projects and programs.

**Table 5: Subregion Retail Demand Projections (acre-feet per year)**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| **Demand** | 394,000 | 439,000 | 462,000 | 477,000 | 493,000 | 500,000 |
| **Supply** | 395,000 | 441,000 | 465,000 | 480,000 | 496,000 | 503,000 |

## 2.5 Water Quality

The GLAC Region has suffered water quality degradation of varying degrees due to sources associated with urbanization, including the use of chemicals, fertilizers, industrial solvents, automobiles and household products. Both surface water and groundwater quality have been impacted by this degradation which can be classified as either point or nonpoint sources. Regulations are in place to control both types of sources.

The Federal Water Pollution Control Act Amendments of 1972, amended in 1977, are commonly known as the Clean Water Act. The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the United Sates and gave the USEPA the authority to implement pollution control programs. In California, per the Porter Cologne Water Quality Control Act of 1969, responsibility for protecting water quality rests with the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs).

The SWRCB sets statewide policies and develops regulations for the implementation of water quality control programs mandated by state and federal statutes and regulations. The RWQCBs develop and implement Basin Plans designed to preserve and enhance water quality. The determination of whether water quality is impaired is based on the designated beneficial uses of individual water bodies, which are established in the Basin Plan. As mandated by Section 303(d) of the Federal Clean Water Act, the SWRCB maintains and updates a list of "impaired" water bodies that exceed state and federal water quality standards. To address these impairments, the RWQCBs identify the maximum amount of pollutants that may be present without impairing the designated beneficial uses, and are known as Total

Maximum Daily Loads (TMDLs). In addition to development of the TMDLs the RWQCBs develop and implement the NPDES permits for discharges from wastewater treatment and water reclamation plants of treated wastewater effluent to surface water bodies.

The Subregion has 303(d) listings related both human activities and natural sources. Human activity can cause poor water quality due to trash, nutrients from wastewater treatment effluent, metals, and toxic pollutants. These pollutants are carried in stormwater runoff and through point source discharges, impacting streams, canyon ecosystems, and eventually beaches and offshore waters. Natural sources of contaminants primarily include minerals and metals from underlying local geology.

Even though agencies and cities in the Subregion have significantly reduced pollutants that are discharged to water bodies from individual point sources since the Clean Water Act was established, many of the major water bodies are still considered impaired due to trash, bacteria, nutrients, metals, and toxic pollutants. Water quality issues affecting the Subregion's local surface waters and groundwater basins are discussed below.

## Surface Water Quality

The Upper Los Angeles River and its tributaries serve many beneficial uses including: municipal and domestic supply, groundwater recharge, recreation, warm freshwater habitat, aquatic habitat, wildlife habitat, protection of rare and endangered species, and wildlife habitat. Typically, surface water quality is better in the headwaters and upper portions of watershed, and is degraded by urban and stormwater runoff as the rivers move through urban areas. As a result, a number of waters in the Subregion are 303(d) listed for several constituents as shown in Table 6 and Table 7.

The locations of permitted dischargers are shown in Figure 10. Please note that Figure 10 does not show MS4 and Caltrans discharges as these are non-point discharge permits.

Investigations are needed to determine natural background levels for some listings which may not be due to anthropogenic causes. However, the reports written in support of the Subregion's TMDLs conduct a source assessment for each impairment, and determine the major sources of each, as listed below:

- **Los Angeles River Bacteria TMDL:** Dry and wet weather stormwater system discharges, wildlife, direct human discharge, septic systems, re-growth or re-suspension of sediments
- **Los Angeles River Metals TMDL:** Dry weather: Publically owned treatment works (POTWs) including Tillman WRP, LA-Glendale WRP and Burbank WRP, tributary flows, groundwater discharge and flows from other permitted NPDES discharges; wet weather: storm flow through permitted storm sewer systems; atmospheric deposition, natural geologic conditions
- **Los Angeles River Nutrient TMDL:** Discharges from POTWs, including Tillman WRP, LA-Glendale WRP and Burbank WRP, urban runoff, stormwater, groundwater discharge
- **Trash TMDL for the Los Angeles River Watershed:** Stormwater discharges, direct deposition by people or wind
- **Lincoln Park Lake TMDLs:** Runoff, supplemental water additions to maintain lake level, parkland irrigation, atmospheric deposition
- **Echo Park Lake TMDLs:** Permitted storm sewer discharges, parkland irrigation, supplemental water additions to maintain lake levels, atmospheric deposition
- **Lake Calabasas TMDLs:** Permitted storm sewer discharges, Caltrans stormwater discharge permit, parkland irrigation, supplemental water additions to maintain lake levels, atmospheric deposition

**Table 6: 303(d) Listed Waters with Approved TMDLs**

| 303(d) Listed Waters and Impairments[1] | TMDLs |
| --- | --- |

| 303(d) Listed Waters and Impairments[1] | TMDLs |
|---|---|
| **Aliso Canyon Wash** | |
| Metals: Copper, Selenium | Los Angeles River Metals TMDL |
| Fecal Coliform | Los Angeles River Bacteria TMDL |
| **Arroyo Seco** | |
| Coliform Bacteria | Los Angeles River Bacteria TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| **Bell Creek** | |
| Coliform Bacteria | Los Angeles River Bacteria TMDL |
| Metals: Copper | Los Angeles River Metals TMDL |
| **Burbank Western Channel** | |
| Metals: Copper, Lead, Selenium | Los Angeles River Metals TMDL |
| Indicator Bacteria | Los Angeles River Bacteria TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| **Dry Canyon Creek** | |
| Fecal Coliform | Los Angeles River Bacteria TMDL |
| Metals: Selenium | Los Angeles River Metals TMDL |
| **Los Angeles River** | |
| Nutrients: Ammonia, Nutrients (Algae), pH | Los Angeles River Nutrient TMDL |
| Bacteria | Los Angeles River Bacteria TMDL |
| Metals: Copper, Lead, Zinc, Cadmium | Los Angeles River Metals TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| **McCoy Canyon Creek** | |
| Fecal Coliform | Los Angeles River Bacteria TMDL |
| Nutrients: Nitrite, Nitrate | Los Angeles River Nutrient TMDL |
| Selenium | Los Angeles River Metals TMDL |
| **Tujunga Wash** | |
| Coliform Bacteria | Los Angeles River Bacteria TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| Nutrients: Ammonia | Los Angeles River Nutrient TMDL |
| Metals: Copper | Los Angeles River Metals TMDL |
| **Verdugo Wash** | |
| Coliform Bacteria | Los Angeles River Bacteria TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| Metals: Copper | Los Angeles River Metals TMDL |
| **Echo Park Lake** | |
| Nutrients: Algae, Eutrophic, Organic Enrichment/Low Dissolved Oxygen | Echo Park Lake TMDLs |
| Ammonia | |
| Odor | |
| DDT | |
| pH | |
| PCBs | |
| Trash | |
| Metals: Copper, Lead | No TMDL necessary as metals determined to be meeting numeric targets |
| **Lake Calabasas** | |
| Nutrients: Ammonia, Eutrophic, Organic Enrichment/Low Dissolved | Lake Calabasas TMDLs |
| pH | |
| Odor | |

| 303(d) Listed Waters and Impairments[1] | TMDLs |
|---|---|
| **Lincoln Park Lake** | |
| Nutrients: Ammonia, Eutrophic, Organic Enrichment/Low Dissolved Oxygen, Odor | Lincoln Park Lake TMDLs |
| Trash | |
| Lead | No TMDL necessary as lead determined to be meeting numeric targets |

1. According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report

**Table 7: 303(d) Listed Waters without Approved TMDLs**

| 303(d) Listed Waters and Impairments[1] |
|---|
| **Arroyo Seco** |
| Benthic-Macroinvertebrate Bioassessments |
| **Burbank Western Channel** |
| Cyanide |
| **Los Angeles River** |
| Oil |

1. According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report

## Groundwater Quality

Groundwater quality in the ULARA Basins is managed by the ULARA Watermaster which reports on water quality, treatment and remedial investigation activities in its annual report. The overall quality of the ULARA Basins is generally within the recommended limits of drinking water standards, except for those areas of concern listed in Table 8. Groundwater pumped from these areas (for those wells that haven't been shut down) are treated to meet state drinking water standards.

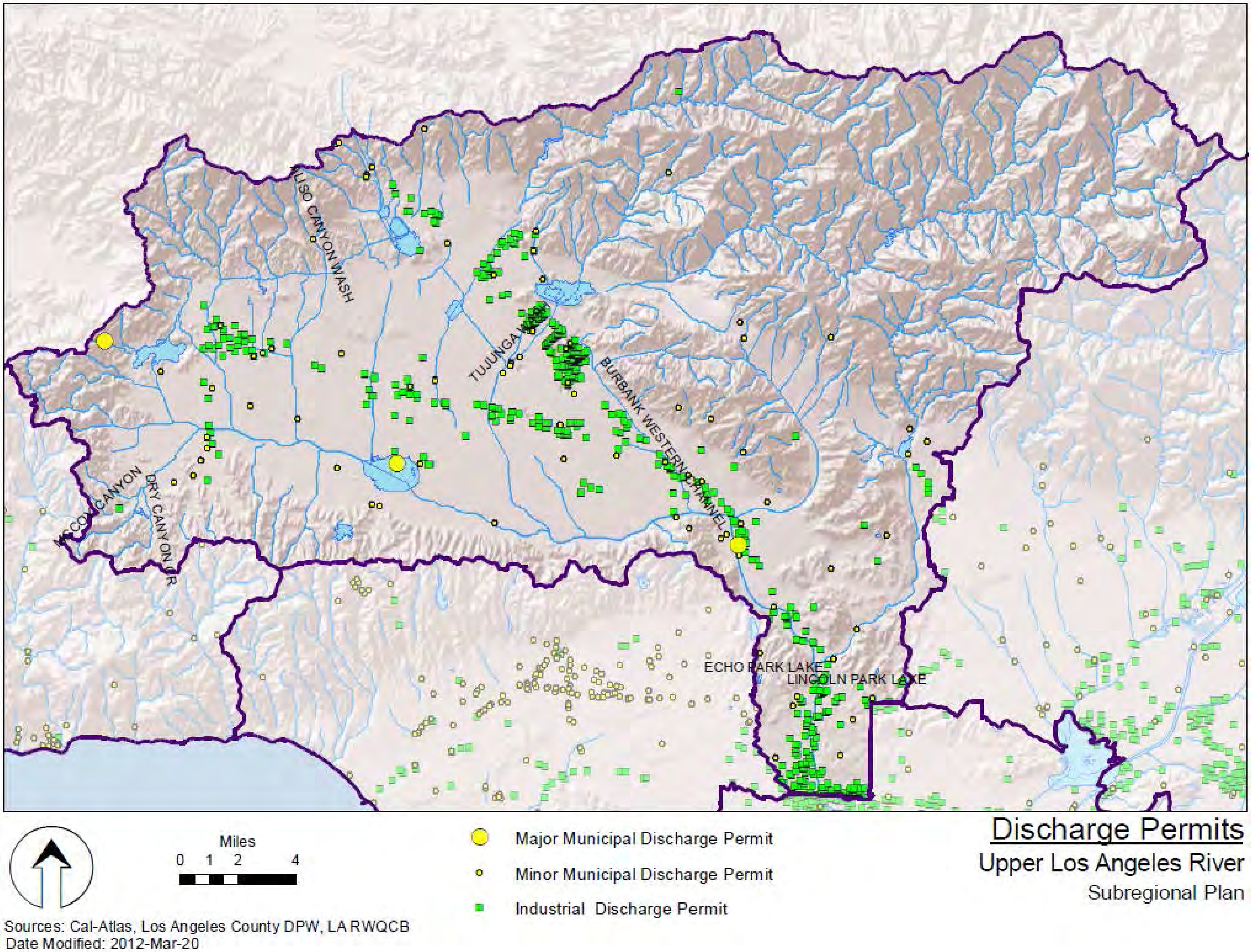
Within the San Fernando Valley, three Operable Units (OUs) have been created as part of long-term groundwater remediation activities in the San Fernando Basin. These OUs include: 1) North Hollywood OU due to VOC contamination, 2) Burbank OU due to VOCs and hexavalent chromium, and 3) Glendale North and South OUs due to VOCs. Various groundwater quality investigations are also taking place throughout the ULARA Basins to determine the cause and extent of the above listed contamination.

**Table 8: Groundwater Quality Concerns in the ULARA Basins**

| Basin Area | Water Quality Concern |
|---|---|
| San Fernando Basin – eastern portion | TCE, PCE, hexavalent chromium, nitrate |
| San Fernando Basin – western portion | Sulfate, TDS |
| Verdugo Basin | MTBE, nitrate |
| Sylmar Basin | nitrate |

Raymond Basin groundwater quality is managed by the Raymond Basin Management Board. This basin provides potable supply, with good to fair groundwater quality in most areas. Constituents of concern include TDS, nitrate, perchlorate, and VOCs. There is one Superfund site located at the Jet Propulsion Laboratory (JPL) due to liquid waste seepage which released perchlorate and VOCs into the groundwater. Water agencies which pump from the Raymond Basin have treatment facilities in place to treat groundwater for VOCs and Perchlorate.

**Figure 10: Permitted Dischargers as of 2011**



## 2.6 Environmental Resources

The Subregion contains areas that have been highly urbanized as well as areas in the San Gabriel Mountains that provide a variety of natural resources that serve as habitat for wildlife. Below is a discussion of the existing environmental resources found in the Subregion.

### 2.6.1 Habitat

A variety of habitats can be found in the Subregion. In terms of water resources, these habitats include both upland and aquatic habitat.

Upland habitat provides a buffer to aquatic habitat as well as linkages to species through the landscape. Wetland areas provide habitat to innumerable species of flora and fauna. Wetland areas within the Subregion can be seen in Figure 11, and include:

- **Freshwater aquatic habitats:** Aquatic habitats such as depressional marshes, lakes and ponds. For the purposes of this Subregional Plan, freshwater aquatic habitats include man-made habitats such as flood control basins and ponds which may include areas of freshwater aquatic habitats. It is important to note that although some spreading grounds and some stormwater Best Management Practices such as detention basins, swales and depressional areas, also provide ecosystem benefits, they belong under a separate category and should not be subject to the same protection criteria
- **Riverine aquatic habitats:** Streambed and aquatic habitats associated with rivers and streams, including upper and lower riverine habitats. Man-made habitats considered riverine aquatic habitats include concrete-lined channels and soft-bottomed channels. Note that “riparian” is sometimes used to mean riverine aquatic habitats.

Studies have found that the Subregion contains a number of distinct habitats that fall under the above described upland and aquatic habitat:

- **Soft bottom channel with annually flooded riparian growth:** Soft bottom areas which are lined with cobble, sediment and boulders allow growth of willows and other riparian vegetation. This habitat occurs in two areas: Glendale Narrows from the Burbank/Western Channel confluence (Victory Boulevard) to just above the Arroyo Seco confluence and in the Sepulveda Flood Control Basin from the dam to above Balboa Boulevard.
- **River bank:** Earthen river banks can be found around the edges of some flood control basins, especially behind Hansen Dam
- **Freshwater marsh/cienega:** This habitat, which was once common along the river, now occurs only in small areas of teh soft bottom channel
- **Open freshwater reservoirs:** Constructed reservoirs and lakes within the Los Angeles River watershed that offer feeding and resting habitat to migrating birds include Silver Lake, Encino, Los Angeles, Pacoima and Tujunga reservoirs and spreading grounds. These form part of the "habitat system" to which the river belongs.
- **Floodplain forest:** This habitat is characterized by willows and cottonwoods, with dense shrubby undergrowth. Once common along the river, remnants of this habitat now occur only in Whittier Narrows, Sepulveda and Hansen flood control basins.
- **Valley oak savanna:** Once occurred in the western area of the river drainage. Now only disturbed remnants remain near the Chatsworth Reservoir and in Sepulveda Basin.
- **Alluvial scrub:** Occurred on alluvial washes, or bajadas. Big Tujunga Wash contains the only remnant of this habitat.

- **Urban/suburban:** This highly modified habitat type, with mostly exotic tree and shrub species, is typical of the lowland portions of the Los Angeles River. The extensive urbanization of the flood plain and the channelization of the river and its tributaries have provided for the spread of this habitat type. While some native species survive, most native birds and animals do not adapt to this habitat.
- **Aerial:** Animals that eat insects, such as bats, swallows and swifts, are common throughout the Los Angeles River watershed where conditions of vegetation, wind and topography produce ideal conditions for large concentrations of insects, and therefore, the species that feed on them.

It has been determined that seasonal and permanent freshwater aquatic habitats, lowland riparian forests and thickets, and alluvial scrub have been the most heavily impacted by urbanization and flood control programs. *(The Biota of the Los Angeles River)*

### 2.6.2 Significant Ecological Areas

Los Angeles County developed the concept of significant ecological areas in the 1970s in conjunction with adopting the original general plan for the County.

The Significant Ecological Area (SEA) Program is a component of the Los Angeles County Conservation/Open Space Element in their General Plan. This program is a resource identification tool that indicates the existence of important biological resources. SEAs are not preserves, but are areas where the County deems it important to facilitate a balance between limited development and resource conservation. Limited development activities are reviewed closely in these areas where site design is a key element in conserving fragile resources such as streams, oak woodlands, and threatened or endangered species and their habitat.

Proposed development is governed by SEA regulations. The regulations, currently under review, do not to preclude development, but to allow limited, controlled development that does not jeopardize the unique biotic diversity within the County. The SEA conditional use permit requires development activities be reviewed by the Significant Ecological Area Technical Advisory Committee (SEATAC). Additional information about regulatory requirements is available on the Los Angeles County website. (Los Angeles County Planning, 2012, http://planning.lacounty.gov/sea/faqs).

Within the Subregion, SEAs include:

- Santa Susana Mountains
- Santa Susana Pass
- Chatsworth Reservoir
- Simi Hills
- Palo Comado Canyon
- Encino Reservoir
- Tujunga Valley / Hansen Dam
- Verdugo Mountains
- Griffith Park

These SEAs can be seen in Figure 12.

**Figure 11: Aquatic Habitat**

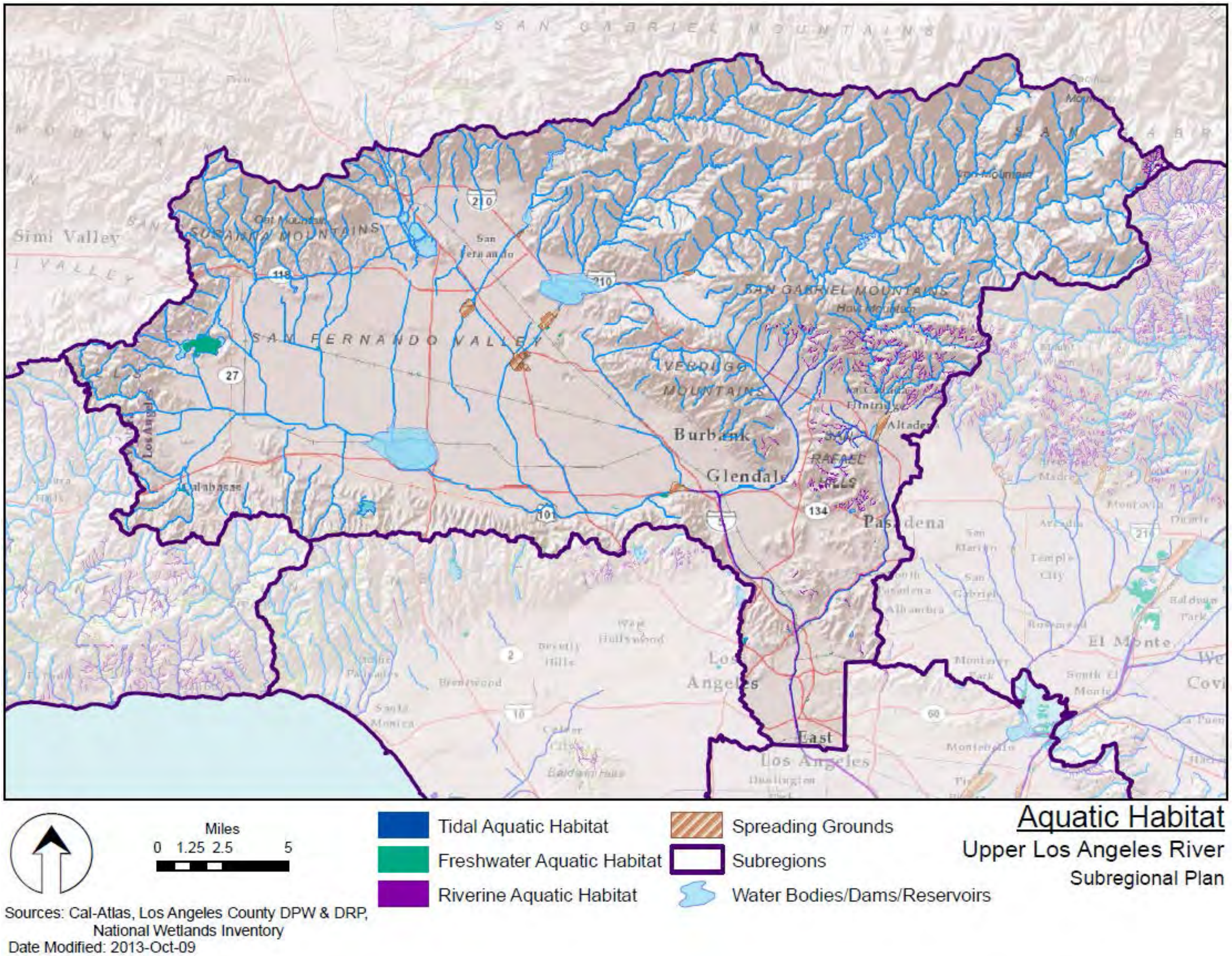
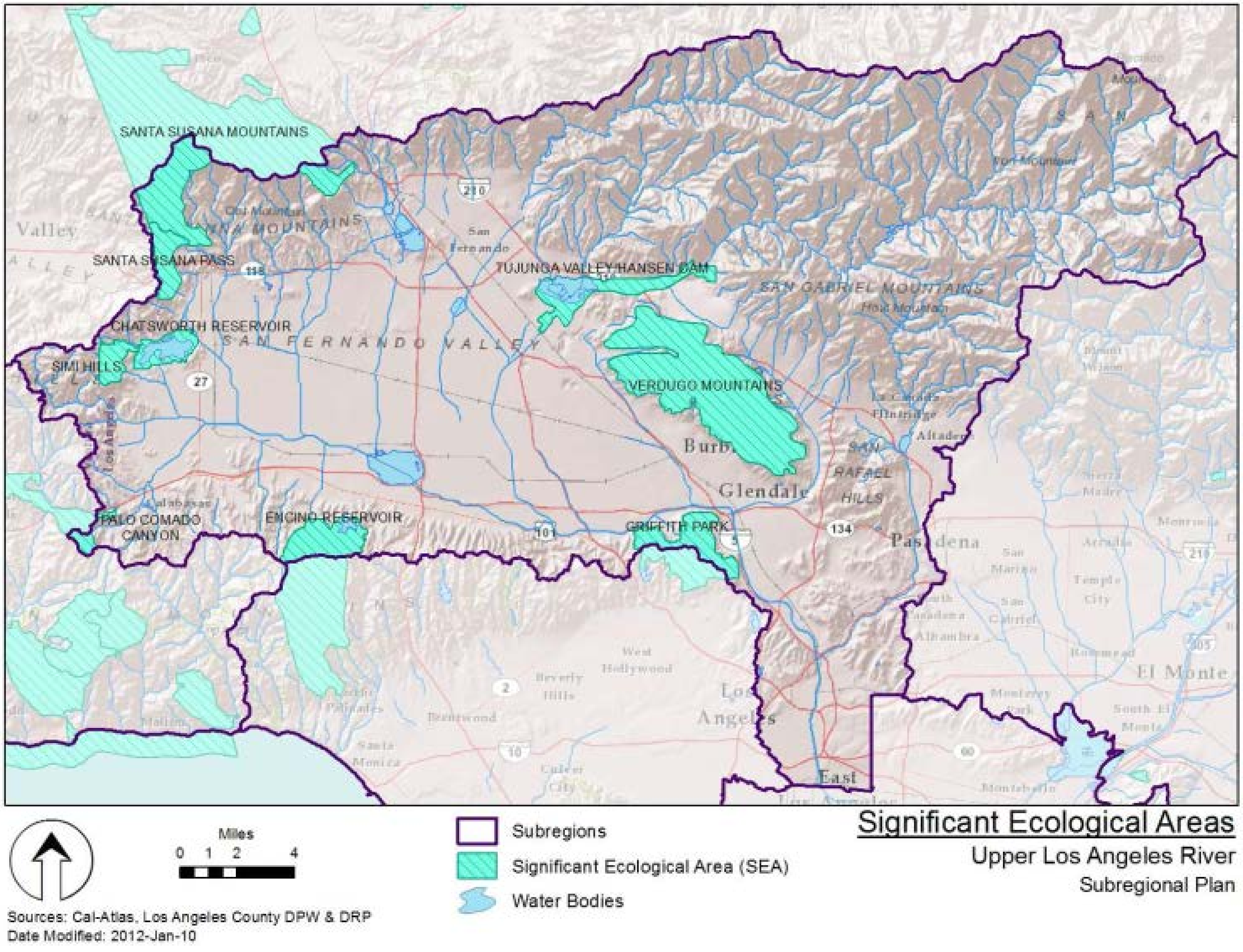


**Figure 12: Significant Ecological Areas**



### 2.6.3 Ecological Processes

The open space areas in the northern and-eastern portions of the Subregion known as the Puente-Chino Hills Wildlife Corridor is an unbroken zone of natural habitat extending nearly 31 miles from the Cleveland National Forest in Orange County to the West end of the Puente Hills above Whittier Narrows (LSA, 2007). This is a biologically rich area that provides critical habitat to endangered species and upland habitat, and connectivity between various habitat types.

The aquatic habitat and upland habitats found in the Subregion provide a number of ecosystem services including biodiversity support, flood damage reduction, carbon sequestration, pollutant reduction in runoff, consumptive use support (such as hunting and fishing), and non-consumptive use support (such as bird watching) (Brauman et al., 2007).

In addition to ecosystem services which may improve water supply and water quality, major ecological processes may impact water resources, and are listed below.

#### Fire

Fire is an integral and necessary part of the natural environment and plays a role in shaping the landscape. Catastrophic wildfire events can denude hillsides which create opportunities for invasive plants and increase the potential for subsequent rains to result in debris flows that erode the landscape and can clog stream channels, damage structures, and injure inhabitants in the canyons and lower foothill areas.

#### Invasive Species

Invasive species in the Region have also substantially affected specific habitats and areas. Along with the rest of California, most of the Subregion’s native grasslands were long ago displaced by introduced species. The receptive climate has resulted in the widespread importation of plants from around the globe for landscaping. Some plant introductions have resulted in adverse impacts. In many undeveloped areas, non-native plants such as arundo (*Arundo donax*), tree of heaven (*Alianthus altissima*) tree tobacco (*Nicotiana glauca*), castor bean (*Ricinus communis*), salt cedar (*Tamarix ramosissima*) and cape ivy (*Senecio mikanioides*) are out-competing native. The removal of this particular species, which requires focused and repeated efforts, can provide substantial dividends in water savings and restored species diversity.

#### Slope Stability

The area in the northern portion of the Subregion is prone to slope stability problems such as landslides, mudslides, slumping and rockfalls. Shallow slope failure such as mudslides and slumping occur where graded cut and fill slopes have been inadequately constructed. Rockfalls are generally associated with seismic ground-shaking or rains washing out the ground containing large rocks and boulders.

### 2.6.4 Critical Habitat Areas

Critical habitat areas have been established by the endangered species act (ESA) to prevent the destruction or adverse modification of designated critical habitat of endangered and threatened plants and animals. The United States Fish and Wildlife Service (USFWS) through the Endangered Species Act (ESA) defines critical habitat as “a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.” A critical habitat designation typically has no impact on property or developments that do not involve a Federal agency, such as a private landowner developing a property that involves no Federal funding or permit. However, when such funding or permit is needed, the impacts to critical habitat are considered during the consultation with the USFWS.

Within the Subregion, there is 11,400 acres of designated critical habitat defined for various endangered and threatened species as shown in Figure 13.

## 2.7 Open Space and Recreation

Open space and recreation area is limited in the Subregion due to its being highly developed. Parks, recreation and other open space in the Subregion can be seen in Table 9. Acreage of recreation and open space lands within the Subregion is shown in Table 9. In total, of the Subregion's 373,665 acres, approximately 154,590 acres (or 41%) are considered open space or recreation land areas. A majority of the areas are National Forest Land within the San Gabriel Mountains.

**Table 9: Existing Recreation and Open Space Land Area**

| Land Type | Acres |
|---|---|
| Developed Urban Park and Recreation Area | 4,600 acres |
| Open Space Lands (including aquatic habitats and National Forest) | 149,000 acres |
| Greenways | 430 acres |
| Other/Miscellaneous | 560 acres |
| **Total Area in Subregion** | **154,590 acres** |

**Figure 13: Critical Habitat**

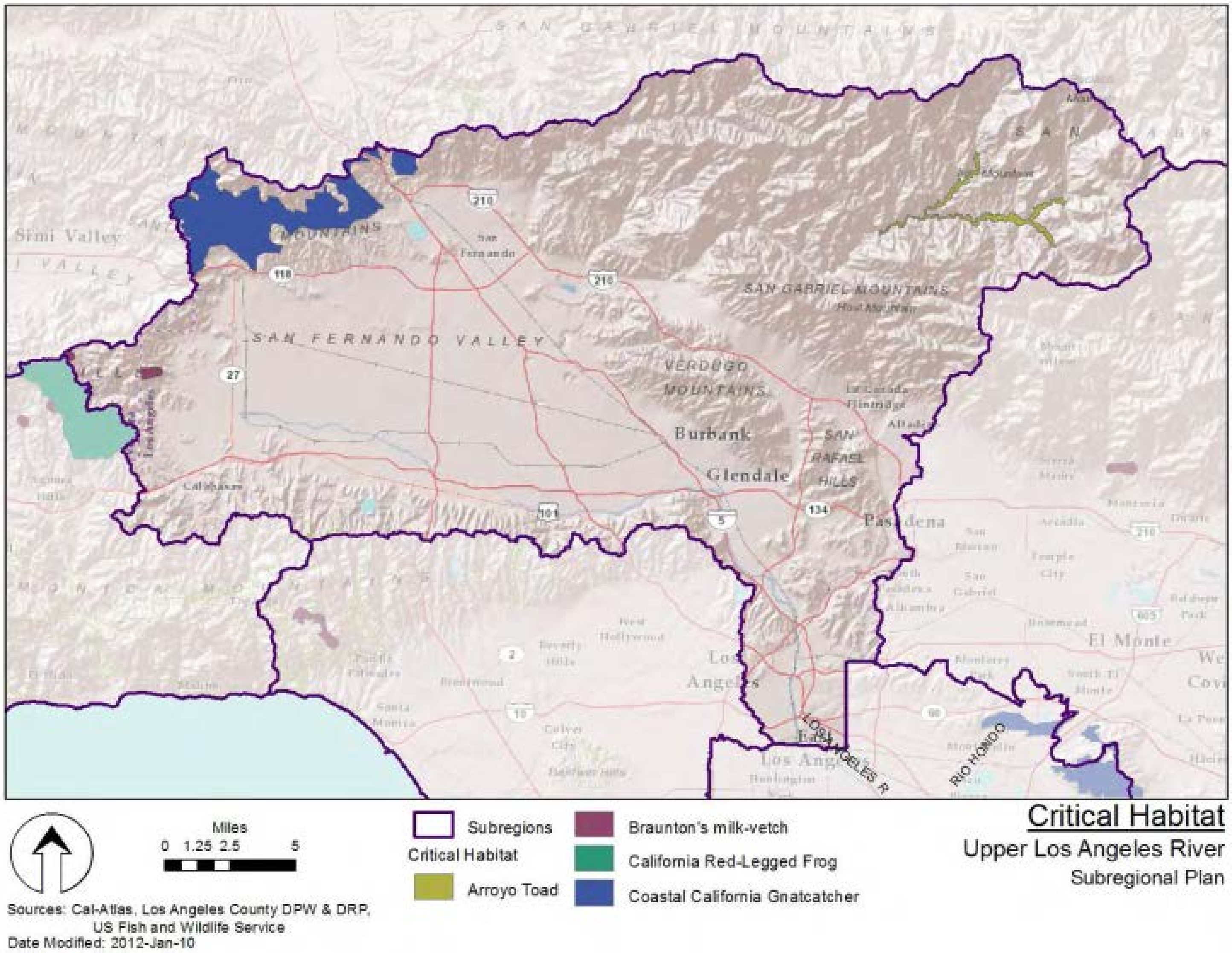
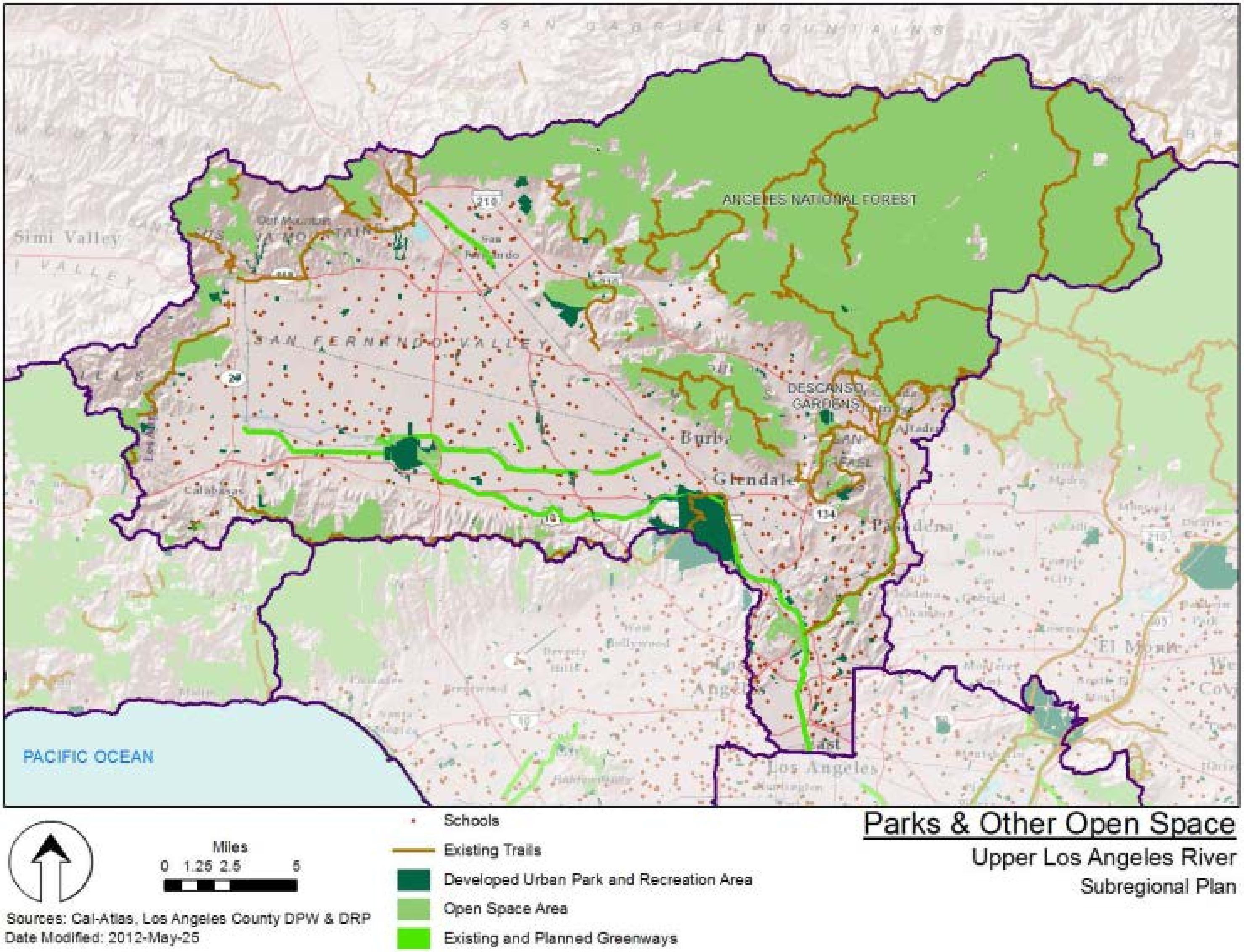


**Figure 14: Parks, Recreation and Other Open Space**



## 2.8 Land Use

Land use within the Upper Los Angeles Subregion reflects the historic pattern of urbanization as most of the Subregion is occupied with residential, commercial, industrial, and institutional uses while most of the foothills and mountains are principally open space.

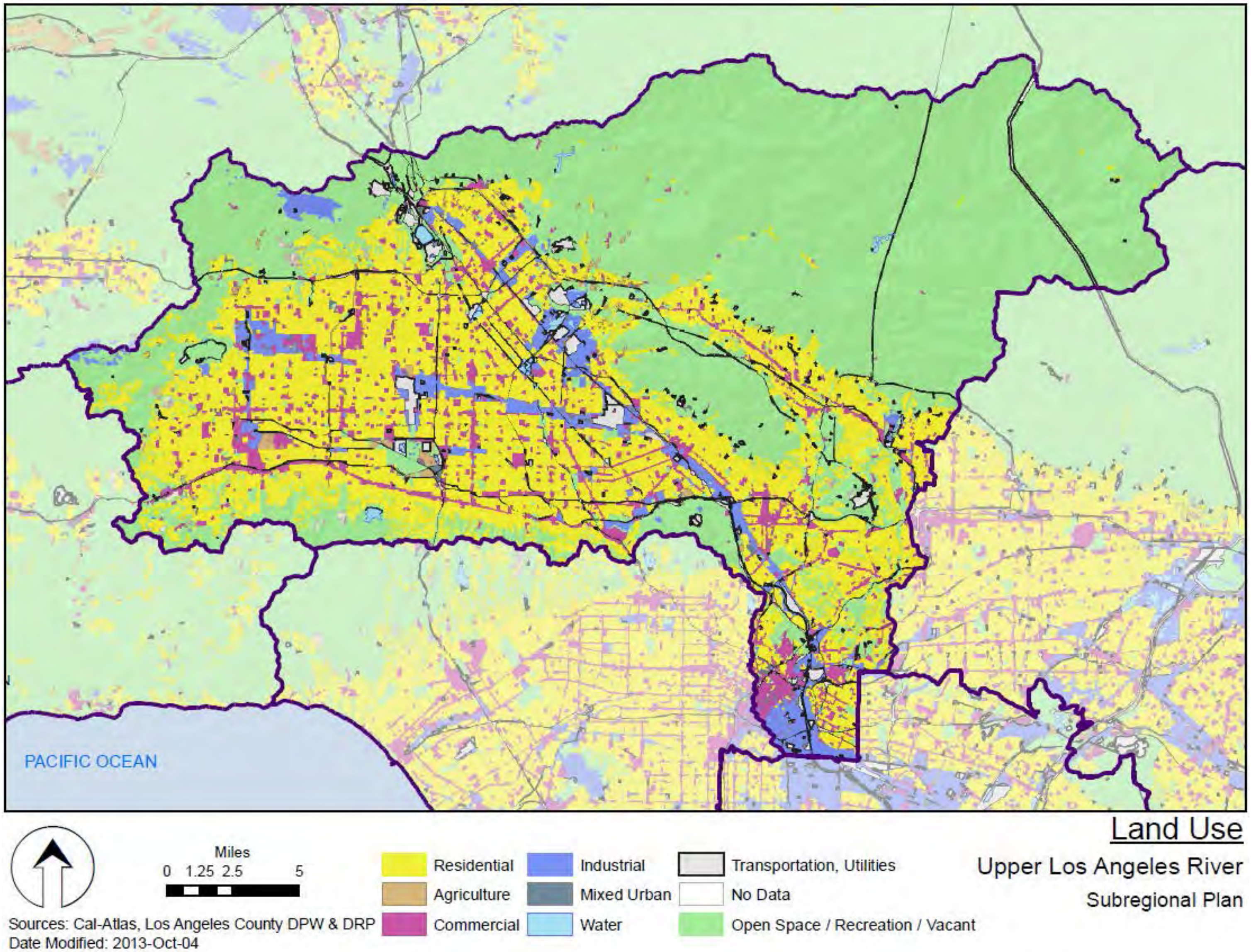
Land use types may include the following:

- **Residential:** duplexes and triplexes, single family residential, apartments and condominiums, trailer parks, mobile home courts and subdivisions
- **Commercial:** parking facilities, colleges and universities, commercial recreation, correctional facilities, elementary/middle/high schools, fire stations, government offices, office use, hotels and motels, health care facilities, military air fields, military bases, military vacant area, strip development, police and sheriff stations, pre-schools and day care centers, shopping malls, religious facilities, retail centers, skyscrapers, special care facilities, and trade schools
- **Industrial:** chemical processing, metal processing, manufacturing and assembly, mineral extractions, motion picture, open storage, packing houses and grain elevators, petroleum refining and processing, research and development, wholesaling and warehousing
- **Transportation and Communication:** airports, bus terminals and yards, communication facilities, electrical power facilities, freeways and major roads, harbor facilities, improved flood waterways and structures, maintenance yards, mixed transportation and utility, natural gas and petroleum facilities, navigation aids, park and ride lots, railroads, solid and liquid waste disposal facilities, truck terminals, water storage and transfer facilities
- **Open Space and Recreation / Vacant Land:** cemeteries, golf courses, developed and undeveloped parks, parks and recreation, specimen gardens and arboreta, wildlife preserves and sanctuaries, abandoned orchards and vineyards, vacant undifferentiated, and vacant land with limited improvements. Note that this land use type includes more land uses than are listed in Table 9: Existing Recreation and Open Space Land Area.

**Table 10: Land Use in the Upper Los Angeles Subregion**

| Land Use Type | Acres | Percentage |
|---|---|---|
| Open Space / Recreation / Vacant | 199,481 | 53% |
| Residential | 115,543 | 31% |
| Commercial | 21,048 | 6% |
| Industrial | 14,476 | 4% |
| Transportation, Utilities | 16,738 | 4% |
| Agriculture | 2,195 | 1% |
| Mixed Urban | 3,124 | 1% |
| Water | 1,024 | <1% |
| No Data | 36 | <1% |
| **Total** | **373,665** | **100%** |

**Figure 15: Land Use**



# 3 Subregional Objectives and Targets

This section identifies the objectives for the Subregion and establishes quantified planning targets to the 2035 planning horizon that can be used to gauge success in meeting the objectives.

## 3.1 Objective and Target Development

The Greater Los Angeles County Regional IRWM Plan has developed regional goals, objectives, and targets. To assist the region in meeting these, objectives and targets have been developed for the Subregion. These objectives and targets are intended to help guide improvements to water supply, water quality, habitat, open space, and flood management to meet the Region's objectives and targets through Subregional planning.

Five objectives have been articulated, based on recent water resource planning documents. Workgroups composed of Stakeholders from within the Region were involved in establishing the Plan's objectives and targets. To establish quantifiable benchmarks for implementation of the plan, planning targets were defined based on much discussion within the regional workgroup. Objectives for five water resource areas were identified for the Subregion, which are discussed below (and summarized in Table 9).

## 3.2 Water Supply

Optimizing local water supply resources is vital for the Subregion to reduce its reliance on imported water and improve reliability of local water supplies should imported water supplies be reduced or interrupted due to environmental and/or political reasons. The Subregion plans on achieving this objective by conserving water through water use efficiency measures, creating an additional ability to pump groundwater, increasing the indirect potable reuse and non-potable reuse of recycled water, and increasing the infiltration, capture, and use of stormwater. In total, water supply targets will yield an additional 97,000 AFY of local supply for direct use, and 67,000 AFY of local supply for groundwater recharge.

To develop supply targets, water supply planning documents for agencies whose service areas cover a majority of the Subregion were examined for potential supply projects, and planned increases in supply between the years 2010 and 2035. The water supply targets for each Subregion were discussed in the *Water Supply Targets TM*.

## 3.3 Water Quality

Improving the quality of urban and stormwater runoff will reduce or eliminate impairment of rivers, beaches, and other water bodies within and downstream of the Subregion. Improving the quality of urban and stormwater runoff would also make these local water supplies available for groundwater recharge. Additionally, the Subregion will continue to improve groundwater and protect drinking water quality to ensure a reliable water supply.

The Subregion plans on achieving these objectives by increasing the capacity to capture and treat runoff and prevent certain dry weather flows (see table above). The water quality target was determined by setting a goal of capturing ¾" of storms over the Subregion. The Subregion's target is to develop 14,800 AF of new stormwater capture capacity (or equivalent). An emphasis will be given to the higher priority areas which will be determined by project-specific characteristics provided by the project proponent, including land use in the proposed project area, runoff and downstream impairments. The assumptions and calculations used to determine this target and catchment prioritization can be found in the *Water Quality Objectives and Targets TM*.

## 3.4 Habitat Objective and Targets

Protecting, restoring, and enhancing the Subregion's native habitats is vital to preserving areas that will contribute to the natural recharge of precipitation and improve downstream water quality. Additionally, the protection, restoration, and enhancement of upland habitat, aquatic habitat/marsh habitat, riparian habitat and buffer areas will help restore natural ecosystem processes and preserve long-term species diversity. Subregional targets for habitat were not developed, but Regional habitat target development is discussed in the *Open Space, Habitat and Recreation TM*.

## 3.5 Open Space and Recreation Objective and Targets

Open space and recreation areas provide space for native vegetation to create habitat and passive recreational opportunities for the community. In addition, open space and recreation areas may preserve or expand the area available for natural groundwater recharge (though only in the forebay areas), improve surface water quality to the extent that these open spaces filter, retain, or detain stormwater runoff, and provide opportunities to reuse treated runoff for irrigation. Subregional targets for open space and recreation were not developed, but Regional open space and recreation target development is discussed in the *Open Space, Habitat and Recreation TM*.

## 3.6 Flood Management Objective and Targets

Improved integrated flood management systems can help reduce the risk of flooding, and protect lives and property. The Subregion plans on meeting this objective by reducing 1,970 acres of local unmet drainage needs, and removing 27.6 million cubic yards of sediment from debris basins and reservoirs. The local unmet drainage target was determined by looking at Special Flood Hazard Areas (SFHAs), also known as flood plains, as defined by FEMA, compared to land uses and the presence of structures. The sediment removal target was established using historical records to estimate sediment inflow, and estimate the sediment trapped within a 20-year period. Assumptions used to develop the Subregion's flood target can be found in the *Flood Management Objectives and Targets TM*.

**Table 11: Upper Los Angeles Subregion Objectives and Planning Targets**

| Objectives | | Regional Planning Targets |
|---|---|---|
| **Improve Water Supply** | | |
| Optimize local water resources to reduce the Subregion's reliance on imported water. | Water Use Efficiency | Conserve 37,000 AFY of water by 2035 through water use efficiency and conservation measures. |
| | Ground Water | Create additional ability to pump 40,000 AFY using a combination of treatment, recharge, and storage access. |
| | Recycled Water | Increase indirect potable reuse of recycled water by 30,000 AFY.<br>Increase non-potable reuse of recycled water by 13,000 AFY. |
| | Ocean Desalination | No target to increase ocean desalination. |
| | Stormwater | Increase capture and use of stormwater runoff by 7,000 AFY that is currently lost to the ocean.<br>Increase stormwater infiltration by 37,000 AFY. |
| **Improve Water Quality** | | |
| Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater, and wastewater. | Runoff (Wet Weather Flows) | Develop[3] 14,700 AF of new stormwater capture capacity (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[4]. |
| **Enhance Habitat** | | |
| Protect, restore, and enhance natural processes and habitats. | Habitat targets were not developed to the subregional level – only to the regional level. | |
| **Enhance Open Space and Recreation** | | |
| Increase watershed friendly recreational space for all communities. | Open space and recreation targets were not developed to the subregional level – only to the regional level. | |
| **Improve Flood Management** | | |
| Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. | Sediment Management and Integrated Flood Planning | Reduce flood risk in 1,970 acres of flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches.<br>Remove 27.6 million cubic yards of sediment from debris basins and reservoirs. |

[3] Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75", 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed).
[4] High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.

# 4 Partnership and Multi-benefit Opportunities

Many agencies and other entities have successfully been working together for decades on many collaborative projects. Projects that seek to enhance or extend these existing activities should be encouraged, because they will often be the most cost-effective.

Implementation of projects is the vehicle to meeting the objectives and planning targets discussed in Section 3. Integration and collaboration can help these projects achieve synergies and, at times, increase their cost-effectiveness in meeting multiple objectives. In addition to the collaboration described above, the GLAC IRWM Region will continue to build upon a wealth of potential multi-benefit project opportunities for partnership projects including:

- **Local Supply Development:** Alternative supply development such as distributed (smaller, non-centralized) stormwater capture projects are often too costly for a water supply agency to construct on their own for water supply purposes only. The near-term unit cost can be well in excess of the cost of imported water. However, partnerships often help to share the costs, thus providing opportunities for more complex, multi-benefit projects (such as water quality improvement) that otherwise might not be accomplished.
- **Improving Stormwater Quality:** In preparing this update of the IRWM Plan, a methodology to identify priority drainage areas based on their ability to improve water quality for coastal and terrestrial waters was developed. Integrated projects that can provide water quality improvements can be cited relative to that prioritization to achieve the highest benefits.
- **Integrated Flood Management:** Earlier studies, such as the Sun Valley Watershed Management Plan (2004), demonstrated the potential for similar cost-effective synergies between flood control, stormwater quality management, water supply, parks creation and habitat opportunities. Flood control benefits usually achieved through significant traditional construction projects can sometimes be accomplished with alternative multi-benefit projects.
- **Open Space for Habitat and Recreation:** When habitat is targeted for restoration, there are often opportunities for cost-effective implementation of flood control, stormwater management and passive recreation (such as walking and biking trails) as well.

These benefit synergies and cost effectiveness outcomes can best be attained when the unique physical, demographic and agency service area attributes of the region are considered. In addition to existing collaborative processes, the GLAC IRWMP has developed a geodatabase tool to assist in identifying areas and partnerships conducive to both inter-subregional and intra-subregional integrated project development. This section discusses this tool as well as some preliminary analyses on the Upper Los Angeles River Subregion's potential partnerships and integrated project opportunities.

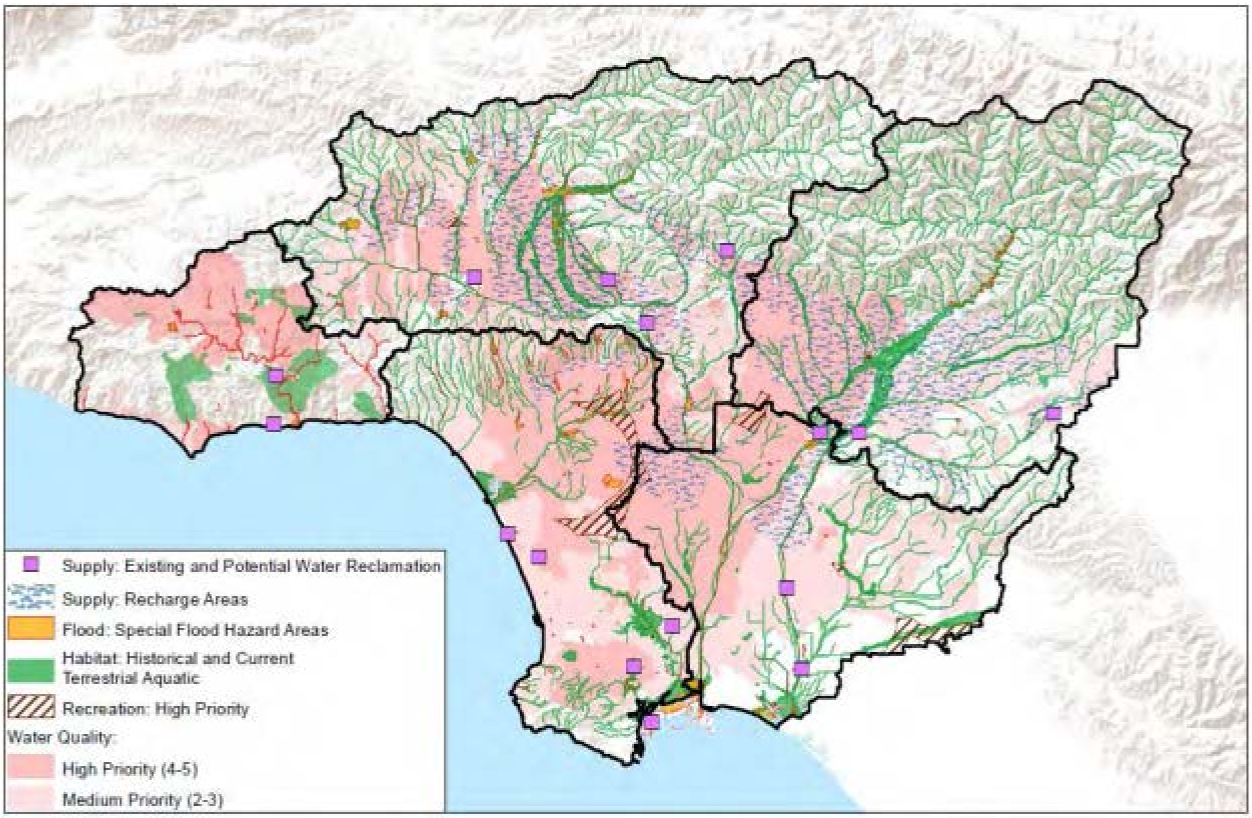
## 4.1 GLAC IRWMP Integration Process and Tools

As part of the objectives and targets update process, the GLAC Region compiled and developed several geo-referenced data layers to assist in spatially identifying priorities and potential opportunities to achieve water supply, water quality, habitat, recreation and flood management benefits. These data layers were initially used individually to determine the objectives and planning targets for each water management area. However, these datasets can also be overlaid to visually highlight areas with the greatest potential to provide multiple benefits. The resulting Potential Benefits Geodatabase (Geodatabase) can also align these areas relative to other layers containing agency service areas and jurisdictions – allowing for project proponents and partners to be identified.

## Potential Benefits Geodatabase

The GLAC IRWMP Potential Benefits Geodatabase is a dynamic tool that should be updated as new data is made available in order to maintain its relevance in the IRWM planning context. However, in order to provide an analysis of potential integration and partnership opportunities for the 2013 GLAC IRWM Plan, current data layers were overlaid and analyzed. The key layers used are shown in Figure 15 and described in Table 12. It should be noted that these datasets may not be complete or in need of further refinement and therefore will be updated on an as-needed basis – which is part of the dynamic process previously described. Therefore, the Geodatabase should only be used as an initial step in identifying multi-benefit potential and by no means used to invalidate the potential for achieving benefits in other areas.

**Figure 16: GLAC Region Potential Benefits Geodatabase Layers**




## Using the Geodatabase

The Geodatabase is a dynamic visual tool. The data layers and maps shown in this Section are only some of a multitude of ways to package and view the datasets to help with the integration process. It is important to note that not all data that could be useful in identifying integration and partnership potential for the region is easily viewed spatially in this format. Therefore the Geodatabase should only be used as one of several potential integration tools or methods.

The Geodatabase can also be used to identify the potential for further integration between existing projects included in an IRWMP. Currently the GLAC Region has web-based project database (OPTI) that geo-references all projects included in the IRWM. As part of the 2013 Plan Update, this dataset of projects will eventually be updated and prioritized. This resulting project dataset could be included as a layer in the Geodatabase or conversely, the existing Geodatabase layers could be uploaded to OPTI for public viewing and made available to OPTI users. In the future, additional layers, such as groundwater quality and general plan areas, can be added to the Geodatabase to enhance the ability of project proponents to identify integration opportunities. Either way, by overlaying the current projects on top of the potential benefit layers, additional benefits could be added to existing project or linked to other projects and proponents through those benefits.

**Table 12: Potential Benefit Geodatabase Layers**

| Data Layer | Description |
|---|---|
| Supply: Recharge Areas[1] | Shows areas where soils suitable for recharging are above supply aquifer recharge zones. Thereby indicating that water infiltrating in these areas has the potential to increase groundwater supplies. |
| Supply: Existing and Potential Water Reclamation[2] | Shows locations of existing wastewater and water reclamation plants. |
| Flood: Special Flood Hazard Areas[3] | Shows some of the areas that would benefit from increased drainage to alleviate flooding potential. |
| Habitat: Historical and Current Aquatic[4] | Shows the combined current and historical habitat areas that would indicate the potential for aquatic habitat protection, enhancement, or restoration benefits to be derived. (Note: North Santa Monica Bay Subregion did not have similar data so it shows Significant Ecological Areas instead[5].) |
| Recreation: High Priority[6] | Shows areas that have the greatest need for open space recreation given the distance from current open space recreation sites. |
| Water Quality: Medium and High Priority[7] | Shows watershed areas with medium and high priority and therefore relative potential to improve surface water quality. |

[1] Created using Los Angeles County's groundwater basins shapefile overlaid with soils and known forebays shapefiles
[2] Created by RMC Water and Environment for the Los Angeles Department of Water and Power's Recycled Water Master Planning program to show sources of wastewater that could be made available for recycled water use.
[3] Created by Federal Emergency Management Agency to define areas at high risk for flooding (subject to inundation by the 1% annual chance flood event) and where national floodplain management regulations must be enforced
[4] From *Regional restoration goals for wetland resources in the Greater Los Angeles Drainage Area: A landscape-level comparison of recent historic and current conditions using GIS* (C. Rairdan, 1998) and additional current aquatic habitat is based on the extent of current habitat derived from the National Wetlands Inventory.
[5] Significant Ecological Areas are those areas defined by Los Angeles County as having ecologically important land and water systems that support valuable habitat for plants and animals.
[6] Created for the *GLAC IRWM Open Space for Habitat and Recreation Plan (2012)*, and shows where there is less than one acre of park or recreation area per one thousand residents.
[7] Created for the *GLAC IRWM Water Quality Targets TM (2012)*, which ranked catchments based on TMDLs, 303(d) listings and catchments that drain into Areas of Special Biological Significance (ASBS).

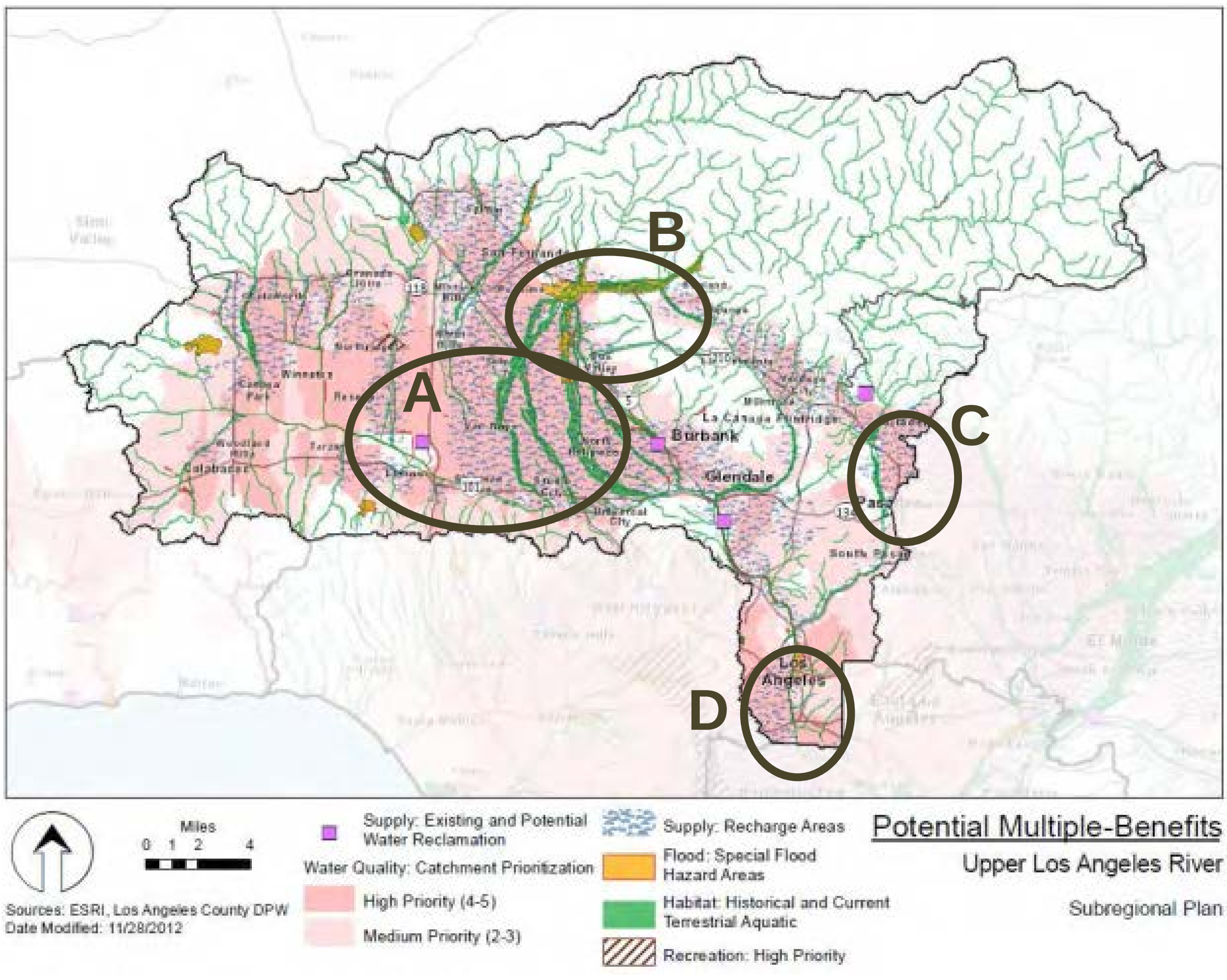
## 4.1 Integration Opportunities in Upper Los Angeles River

Planning for the GLAC Region is primarily done on a sub-regional level, given that each subregion has a unique set of physical characteristics and stakeholders that create opportunities for project identification and collaboration. Therefore, the Geodatabase layers are more useful when examined and discussed on a subregional scale. Figure 16 focuses on the Upper Los Angeles River Subregion and highlights just a few unique areas within the Subregion that have potential for generating multiple benefit projects. These areas described here are meant to provide examples of potential multiple benefits areas and are not meant to be a comprehensive inventory of opportunities. As subregions move forward to identify potential projects, it will be necessary to examine localized site characteristics (such as land uses) to confirm that it will be possible to meet the potential benefits discussed below.

The Subregion's integration potential is notable relative to other subregions in a few ways:

- There are large areas suitable for groundwater recharge and significant sources of local stormwater and recycled water supplies.
- There is a large northern upland open space watershed that drains into areas with a high potential to derive aquatic habitat benefits.
- There is a heavily urbanized valley area but with strong examples of successful integrated flood management facilities and great opportunities for furthering multiple benefit projects.
- The Los Angeles River Watershed provides unique opportunities for integrated flood management projects that would improve habitat and water quality while maintain flood control.

**Figure 17: Upper Los Angeles River Subregion Potential Multiple-Benefits**




The following sections highlight a few areas in the Upper Los Angeles Subregion where integration and partnership opportunities could be found based upon the Geodatabase layers and multiple benefit analysis performed. There are multiple areas beyond those few highlighted here that can be explored by the Upper Los Angeles River stakeholders and project proponents.

## A: San Fernando Valley Local Supply and Water Quality

The Upper Los Angeles River Subregion is dominated by the San Fernando Valley and underlying groundwater basin. This combination of available stormwater and recharge potential provide the area with great potential for stormwater conservation through recharge. Stormwater flows through the heavily urbanized valley areas provide both the sources and transport for contaminants that impact water quality as shown by the high priority drainage areas in Figure 16. Therefore, capture and recharge of stormwater supplies in this area can also provide significant water quality benefits. The majority of all wastewater flows generated in this Subregion pass through the city of Los Angeles' Tillman Water Reclamation Plant. These recycled flows can be made available with stormwater flows to also recharge the basin.

Figure 16 shows the intersection or recharge areas with high priority water quality drainage areas predominately within the City of Los Angeles, Burbank, Glendale and Pasadena. Partnerships with these cities, LACFCD and other NGOs could further expand upon projects completed to maximize the efficacy of existing spreading grounds as well as low impact development and neighborhood stormwater capture and infiltration projects.

## B. Tujunga Area Supply, Quality, Flood and Habitat Benefit

Although nearly the entire San Fernando Valley has recharge and water quality improvement potential, there are also some areas that also provide the potential for habitat benefits given historical and current habitat map layers developed in the Open Space for Habitat and Recreation Plan (OSHARP) as well as increased flood management. As Figure 16 shows, the Tujunga Creek/Hansen Dam area has multiple existing spreading grounds that serve to recharge the San Fernando Basin. As existing open spaces, these areas already provide multiple benefits but still could continue to increase their value through multiple benefit projects that enhance, protect or restore habitat that are also water quality BMPs. Partners in this region are the City and LACFCD as well as neighborhood organizations and other NGOs.

## C. Intra-Regional Raymond Basin Water Supply and Quality

The Raymond Basin and the City of Pasadena are divided between the Upper Los Angeles River and Upper San Gabriel and Rio Hondo Subregions. This provides intra-regional opportunities between the ULAR and USGRH subregions for replenishment of the Raymond Basin to benefit both regions through both stormwater capture and accessing recycled water supplies from the Los Angeles-Glendale Water Reclamation Plant. This area also has been identified as a high priority drainage for achieving water quality benefits and therefore multiple benefits project opportunities. Partnerships between the City of Pasadena, other Raymond Basin pumpers, LACSD and LACFCD could result in very beneficial integrated projects.

## D. Intra-Regional Central Basin Recharge and Los Angeles River

The Los Angeles River Watershed is divided between the Upper and Lower Subregions however there is an obvious connection between the regions from a water supply and quality perspective. The southernmost area of the Subregion is downtown Los Angeles. As Figure 17 shows, the area is suitable for groundwater recharge but it also has a high level of impervious surface meaning low infiltration potential. Given that this area is upstream of the Lower Los Angeles River Subregion, water quality improvements made here would benefit both subregions. The ability to do large scale BMPs may be limited, however smaller scale decentralized LID projects in this area may be able to provide both water quality and supply benefits. Opportunities for integrated flood management projects along the Los Angeles River would seek to preserve current flood but also improve water quality and open space either for recreation and/or habitat. Partnerships could involve both the cities of Los Angeles and those in the LLAR Subregion along with the Water Replenishment District of Southern California and NGOs.

## References


Los Angeles, City of, 2011. *2010 Urban Water Management Plan.*

Los Angeles County Department of Regional Planning (LACDRP), 2011. *Los Angeles County General Plan 2035.* Public Review Draft.

LSA, 2007. *Initial Study / Mitigated Negative Declaration, Puente Hills Landfill Native Habitat Preservation Authority Resource Management Plan.*

Metropolitan Water District of Southern California (MWDSC), 2010. *Integrated Regional Plan.*

Regional Water Quality Control Board - Los Angeles Region (RWQCB), 2011. *Water Management Initiative, Los Angeles River Watershed.* http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/regional_program/wmi/los_angeles_river_watershed/los_angeles_river_watershed.doc

RWQCB, 2011b. Shapefiles of Permitted Storm Sewer System (MS4) Discharges, Industrial General Discharges, and Caltrans Discharges.

State Water Resources Control Board (SWRCB), 2010. *2010 Integrated Report (Clean Water Act Section 303(3) List / 305(b) Report) - Statewide.* http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

Southern California Association of Governments (SCAG), 2012. *Adopted 2012 RTP Growth Forecast.* http://www.scag.ca.gov/forecast/index.htm

2004. *Sun Valley Watershed Mangement Plan Final Program EIR.*

U.S. Census Bureau, 2012. *2010 Census Data*. Census tract.

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# Exhibit A. Regional Imported Water Information

### *State Water Project*

The SWP is a system of reservoirs, pumps and aqueducts that carries water from Lake Oroville and other facilities north of Sacramento to the Sacramento-San Joaquin Delta and then transports that water to central and southern California. Environmental concerns in the Sacramento-San Joaquin Delta have limited the volume of water that can be pumped from the SWP. The potential impact of further declines in ecological indicators in the Bay-Delta system on SWP water deliveries is unclear. Uncertainty about the long-term stability of the levee system surrounding the Delta system raises concerns about the ability to transfer water via the Bay-Delta to the SWP.

The MWD contract with the Department of Water Resources (DWR), operator of the SWP, is for 1,911,500 acre-feet/year. However, MWD projects a minimum dry year supply from the SWP of 370,000 acre-feet/year, and average annual deliveries of 1.4 million acre-feet/ year. These amounts do not include water which may become available from transfer and storage programs, or Delta improvements.

MWD began receiving water from the SWP in 1972. The infrastructure built for the project has become an important water management tool for moving not only annual deliveries from the SWP but also transfer water from other entities. MWD, among others, has agreements in place to store water at a number of groundwater basins along the aqueduct, primarily in Kern County. When needed, the project facilities can be used to move stored water to southern California.

### *Colorado River Aqueduct*

California water agencies are entitled to 4.4 million acre-feet/year of Colorado River water. Of this amount, the first three priorities totaling 3.85 million acre-feet/year are assigned in aggregate to the agricultural agencies along the river. MWD’s fourth priority entitlement is 550,000 acre-feet per year. Until a few years ago MWD routinely had access to 1.2 million acre-feet/year because Arizona and Nevada had not been using their full entitlement and the Colorado River flow was often adequate enough to yield surplus water to MWD. According to its 2010 Regional UWMP, MWD intends to obtain a full 1.2 million acre-feet/year when possible water management programs with agricultural and other holders. MWD delivers the available water via the 242-mile Colorado River Aqueduct, completed in 1941, which has a capacity of 1.2 million acre-feet per year.

The Quantification Settlement Agreement (QSA), executed in 2003, affirms the state’s right to 4.4 million acre-feet per year, though water allotments to California from the Colorado River could be reduced during future droughts along the Colorado River watershed as other states increase their diversions in accord with their authorized entitlements. California’s Colorado River Water Use Plan and the QSA provide numeric baseline to measure conservation and transfer water programs thus enable the shifting to conserve water (such as the lining of existing earthen canals) and to shift some water from agricultural use to urban use. Since the signing of the QSA, water conservation measures have been implemented including the agriculture-to-urban transfer of conserved water from Imperial Valley to San Diego, agricultural land fallowing with Palo Verde, and the lining of the All-American Canal.


# M. Upper San Gabriel River and Rio Hondo Subregional Plan

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# Upper San Gabriel River and Rio Hondo Subregional Plan

# Final

**Prepared by:**

RMC
Water and Environment

In Association with:

Geosyntec
consultants

**October 2013**

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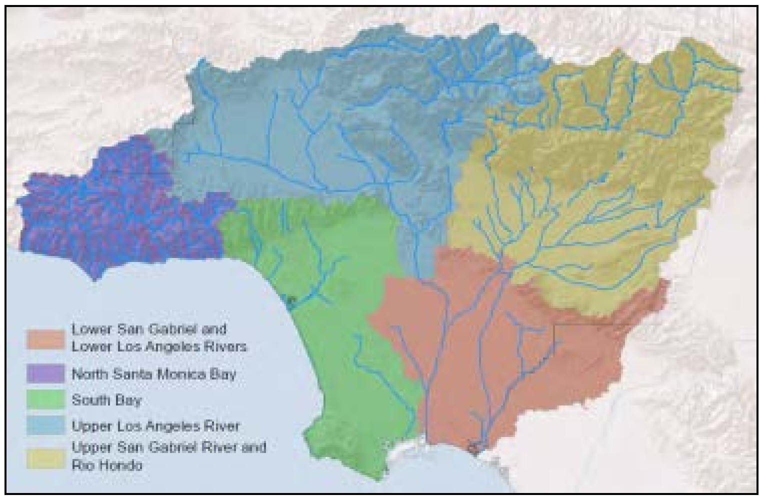
# 1 Background and Purpose of Subregional Plan

The Upper San Gabriel River and Rio Hondo Subregional plan is one of five subregional plans that make up the Greater Los Angeles County (GLAC) Integrated Regional Water Management (IRWM) Plan. This Subregional plan describes the Upper San Gabriel River and Rio Hondo's physical setting, sources of water supply, water quality, environmental resources, planning objectives and targets, and partnership and multi-benefit opportunities. The purpose of the Upper San Gabriel River and Rio Hondo Subregional plan is to outline its expected contribution to meeting the GLAC regional planning goals, objective, and targets.

# 2 Upper San Gabriel River and Rio Hondo Description

## 2.1 Physical Setting

**Figure 1: GLAC Subregional Boundaries**




The Upper San Gabriel River and Rio Hondo Subregion of the GLAC IRWM Region is located in the northeast portion of the Los Angeles County urbanized area (Figure 1). The Upper San Gabriel River and Rio Hondo Watersheds contains large expanses of open space in the San Gabriel Mountains (including much of the Angeles National Forest) and the Puente, and San Jose Hills, with development concentrated in the interior valleys and the surrounding foothills. Several groundwater basins and runoff from the San Gabriel Mountains provide significant water supplies to the Subregion, although groundwater contamination from industrial sources and prior land uses poses a significant challenge in some locations. Although most of the major river and stream channels on the valley floors have been subject to channelization, several of these, including the San Gabriel River, have natural bottoms, which promote in-stream percolation of runoff.

### *Political Boundaries*

The Subregion consists of 45 cities and unincorporated areas of Los Angeles County. Figure 2 depicts the county and city boundaries of the Upper San Gabriel River and Rio Hondo Subregion. The Subregion is home to approximately 2.3 million residents, and is expected to grow to 2.6 million residents by 2035 (Census 2010; SCAG, 2012).

### *Climate, Temperature, and Rainfall*

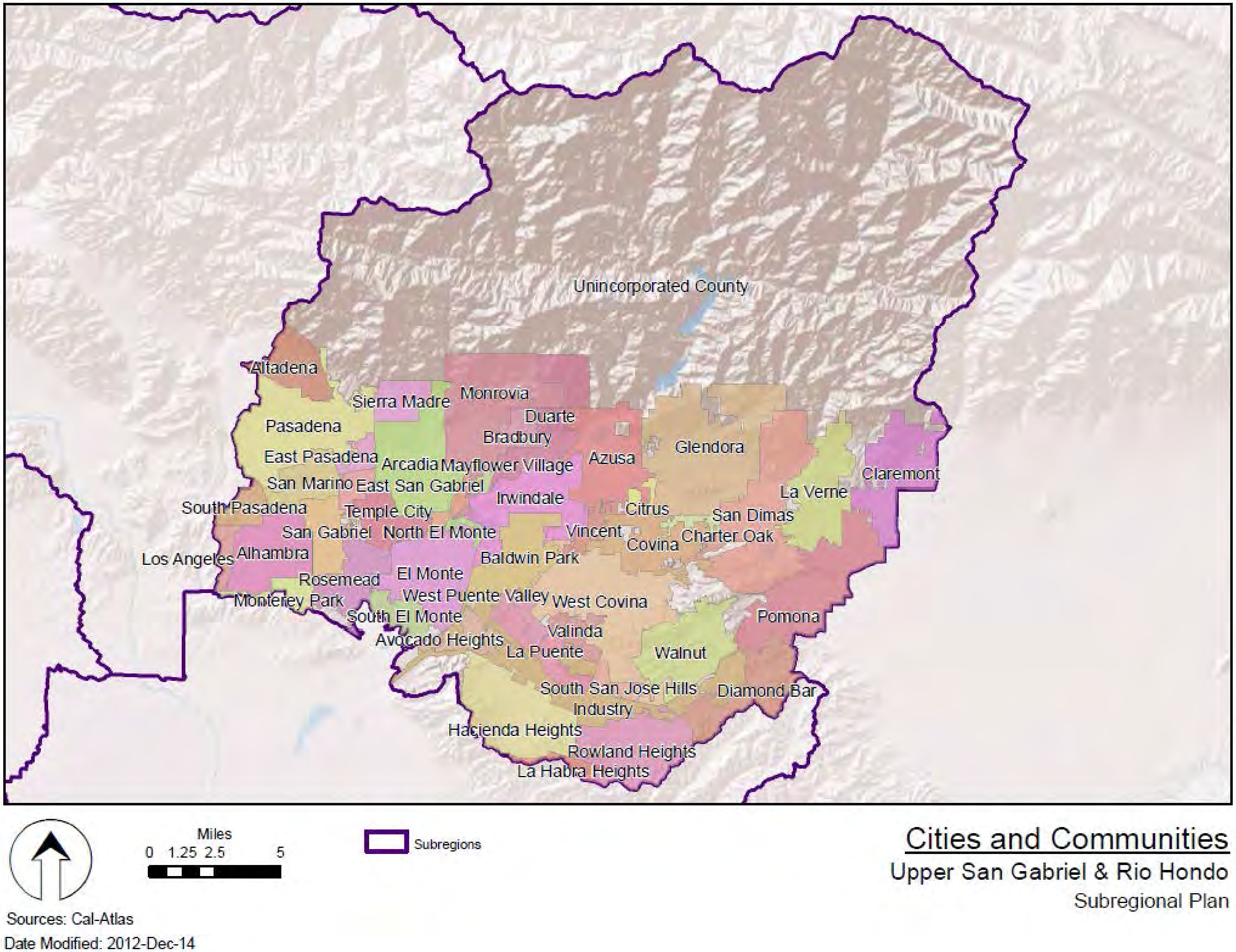
The Upper San Gabriel River and Rio Hondo Subregion is within a Mediterranean climate zone. Summers are typically dry and hot while winters are wet and cool. Precipitation typically falls in a few major storm events between November and March. Precipitation in the Upper San Gabriel and Rio Hondo Subregion averages 17 inches per year, though the foothills and mountains receive considerably more rain than valleys, causing considerable runoff and flooding potential. Due to the topography, portions of the San Gabriel Mountains also receive considerable snow during the winter months.

*Geography and Geomorphology*

The geography of the Upper San Gabriel and Rio Hondo Subregion can generally be divided into three distinct types: inland valleys (e.g. San Gabriel, Pomona, and Walnut), foothills that generally surround the valley, the San Gabriel Mountains, and the Puente Hills. The San Gabriel Mountains are part of the Transverse Ranges, which extend 350 miles east to west from the Eagle Mountains in San Bernardino County to the Pacific Ocean. The San Gabriel Mountains elevation ranges from sea level to over 10,000 feet and separates the Los Angeles basin from the Mojave Desert. The foothills of the San Gabriel Mountains reach 3,000 to 4,000 feet before rising rapidly into the San Gabriel Mountains, to a height of 10,064 feet at Mount San Antonio (or Mount Baldy). The grade of the mountain slopes in the San Gabriel Mountains average 65 to 70 percent, some of the steepest slopes in the world. The Puente Hills, which form the southern boundary of the Subregion, have an elevation ranging from sea level to 1,400 feet.

The San Gabriel Mountains and Puente Hills are young mountains, geologically speaking, and continue to rise at a rate of nearly three-quarters of an inch per year. Because of this instability, they are also eroding at a rapid rate. Alluvial deposits of sand, gravel, clay and silt in the coastal plain are thousands of feet thick in some areas, due in part to the erosive nature of the mountains. The Subregion is extensively faulted, with the San Andreas Fault bordering the north side of the San Gabriel Mountains and the Sierra Madre–Cucamonga fault zone on the south side.

**Figure 2: Cities and Communities in the Subregion**



### 2.1.1 Watersheds and Water Systems

*Watersheds*

The Upper San Gabriel and Rio Hondo Subregion primarily consists of the upper San Gabriel River watershed, and the Rio Hondo watershed (Figure 3). These watersheds begin in the San Gabriel Mountains, and stretch across the San Gabriel Valley, then down to the Pacific Ocean. In the case of the Rio Hondo, the river joins with the Los Angeles River outside of the Subregion. The portion of the San Gabriel River watershed which this Subregional plan is concerned with is the upper watershed located upstream of Whittier Narrows. The upper San Gabriel River watershed is made up of a number of tributaries, including: the west and east fork of San Gabriel River, Big Dalton Wash, Walnut Creek, and San Jose Creek. The Rio Hondo watershed is also made up of a number of tributaries, including the Arcadia Wash, Eaton Wash, Rubio Wash and Alhambra Wash.

*Flood Management and Infrastructure*

Flood management is important to protect human lives and property, particularly in the San Gabriel Mountain region where historically flooding has been an issue and runoff is influenced by wildfires and changes to the natural landscape. The Los Angeles County Flood Control District, with the Army Corps of Engineers, constructed, manages and maintains the Subregion's flood infrastructure, such as storm drains, culverts, dams, stormwater management ponds, and flood control channels. Major flood control facilities are shown in Figure 4.

The dams and reservoirs also operate as water conservation facilities. Many tributary stream channels to the San Gabriel River have concrete banks and bottoms due to frequent and historical flooding. This added imperviousness has reduced the amount of permeable acreage and recharge to the groundwater basin. A number of in-stream and off-stream groundwater replenishment facilities are in place to help offset the impact of the flood control features.

**Figure 3: Watersheds of the Subregion**

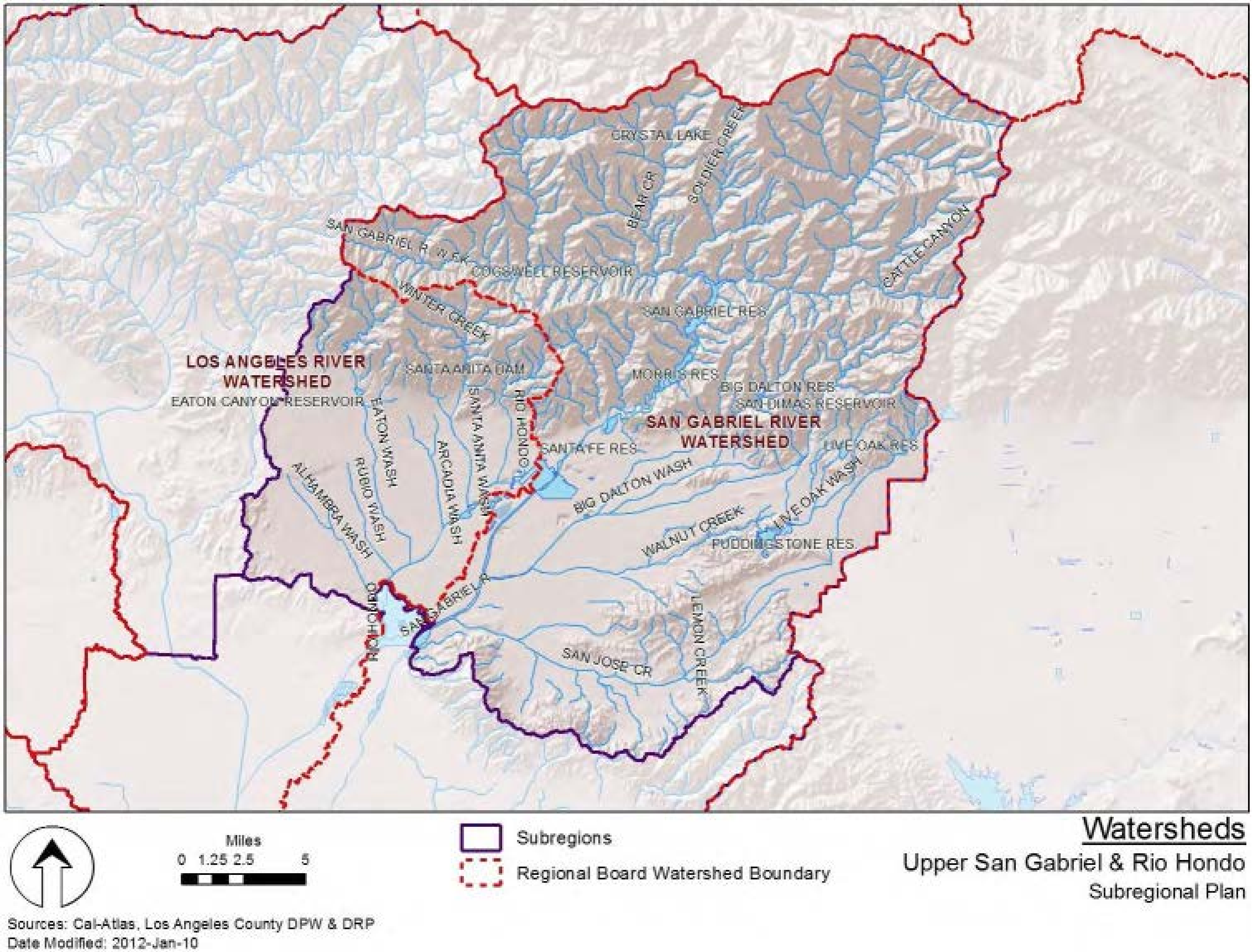
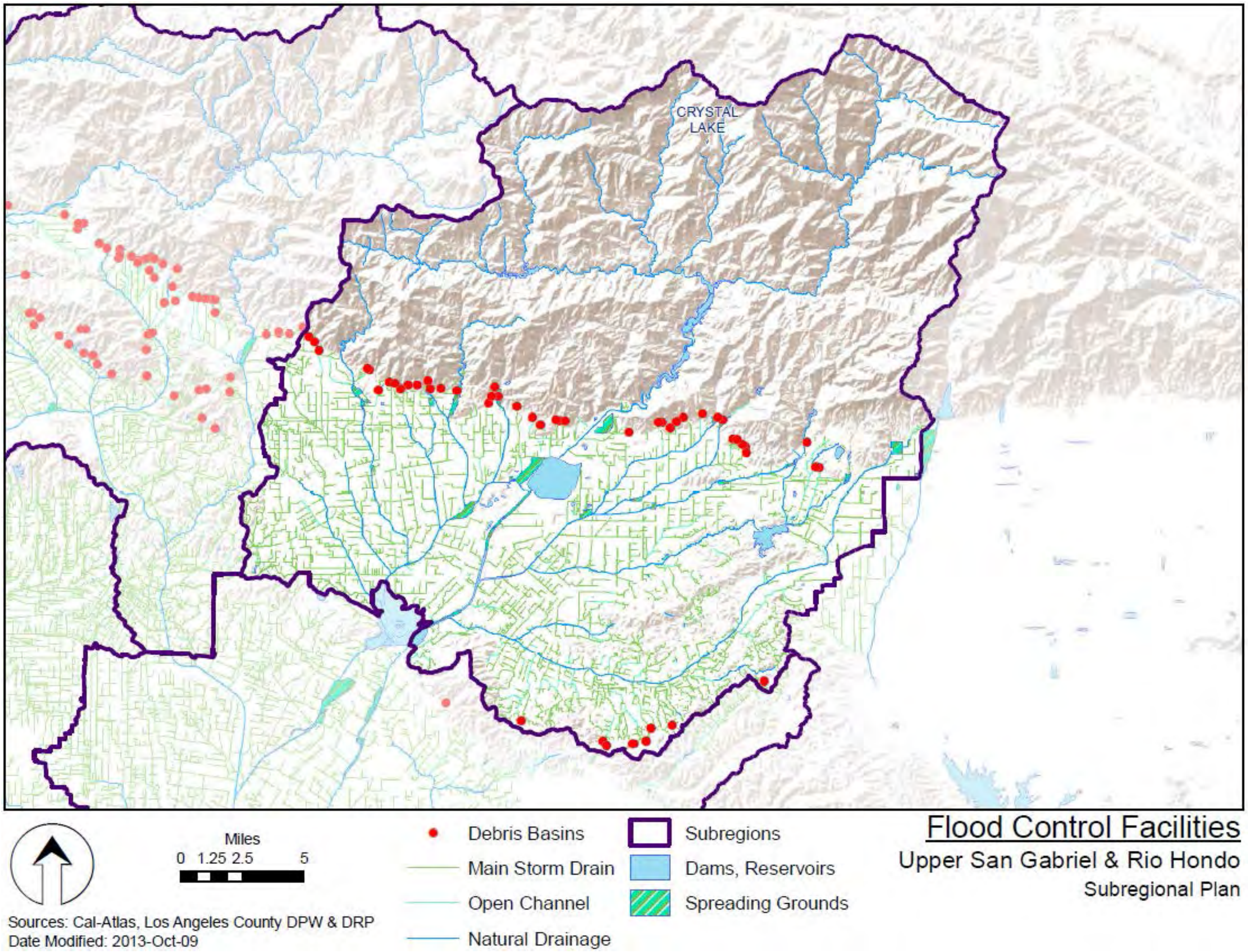


**Figure 4: Flood Control Facilities**



*Water Suppliers and Infrastructure*

The water suppliers in the Subregion can be divided into wholesalers and retailers. Wholesalers (Figure 5) provide imported and/or recycled water and to other agencies, while retailers (Figure 6) sell water to end users. These suppliers use a combination of imported water, recycled water, and groundwater to serve potable and non-potable demand in their service areas. Each of the suppliers show in these figures has written a comprehensive 2010 Urban Water Management Plan (UWMP) to estimate future water supply demand and availability, and which were utilized in the estimation of supplies later in this plan.

## 2.2 Sources of Water Supply

The Upper San Gabriel and Rio Hondo Subregion depends primarily on a combination of groundwater and imported water to meet its water demands. Local water supplies include surface water, recycled water, and groundwater basins. Imported water is provided by Metropolitan Water District of Southern California (MWDSC) and the San Gabriel Valley MWD. MWDSC obtains water through the California State Water Project (SWP) and the Colorado River Aqueduct (CRA), while San Gabriel Valley MWD obtains water from the SWP only. MWDSC calculates that it can reliably deliver water under not only normal conditions but under multiple dry year conditions. Imported supply is provided to the Subregion by MWDSC for replenishment and potable usage, and by the San Gabriel Valley MWD for replenishment at spreading grounds.

Factors that impact reliability of imported water supplies include operational constraints such as court ordered pumping restrictions on imported water from the San Joaquin-Sacramento River Delta (Delta) due to endangered species protection. Water quality concerns such as high salinity levels can require that water from the Colorado River be blended with higher quality SWP water. Invasive species, such as the quagga mussel, can force extensive maintenance of systems reducing operational flexibility. Climate change may impact supply reliability by reducing levels of precipitation impacting the snowpack in the Sierra Nevada Mountains, increasing the intensity and frequency of extreme weather such as droughts, and flooding events that increase the risk of levee failure in the Delta. Agencies, water districts and cities taking delivery of imported water receive an average blend of 75% CRA water and 25% SWP water.

Sources of supply vary throughout the Subregion, as shown in Table 1. The supplies were developed based on 2010 UWMPs from a composite of wholesale and retail agencies whose water service areas cover a majority of the Subregion, as shown below, and were rounded up to account for any remaining, smaller water providers not captured in the below list.

- City of Pasadena (portion in Subregion)
- Foothill MWD (portion in Subregion)
- City of South Pasadena
- City of Alhambra
- California American Water Co. (not including Baldwin Hills)
- San Gabriel County Water District
- San Gabriel Valley Water Company
- City of Arcadia
- Azusa Light and Power
- Three Valleys Municipal Water District
- Suburban Water Systems, San Jose Hills District
- City of Sierra Madre

- City of Monrovia
- Valley County Water District

In addition to retail supply, replenishment supply is needed to supplement the groundwater basins in the Subregion. Table 2 shows the actual supplies to be used to meet replenishment needs.

**Table 1: Actual Retail Supplies (acre-feet per year)**

| Supply | 2010 |
|---|---|
| **Groundwater** | 199,000 |
| **Imported Water** | 101,000 |
| **Recycled Water** | 9,000 |
| **Surface Water** | 13,000 |
| **Desalinated Water** | - |
| **Water Use Efficiency** | 19,000 |
| **Stormwater Reuse** | 0 |
| **Total** | **342,000** |

Data source: 2010 Urban Water Management Plans of agencies listed above

**Table 2: Projected Replenishment Supplies (acre-feet per year)[1]**

| Supply | 2010 |
|---|---|
| **Imported Water** | 33,000 |
| **Recycled Water** | 0 |
| **Stormwater** | 111,000 |
| **Total** | **144,000** |

Data source: Los Angeles County Department of Public Works Hydrologic Reports

[1] Replenishment supplies based on 10-year average of replenishment in the spreading grounds within the Subregion as reported in Los Angeles County Hydrologic reports. Included are groundwater basin recharge (100% contribution to groundwater supply).

**Figure 5: Wholesale Water Suppliers**

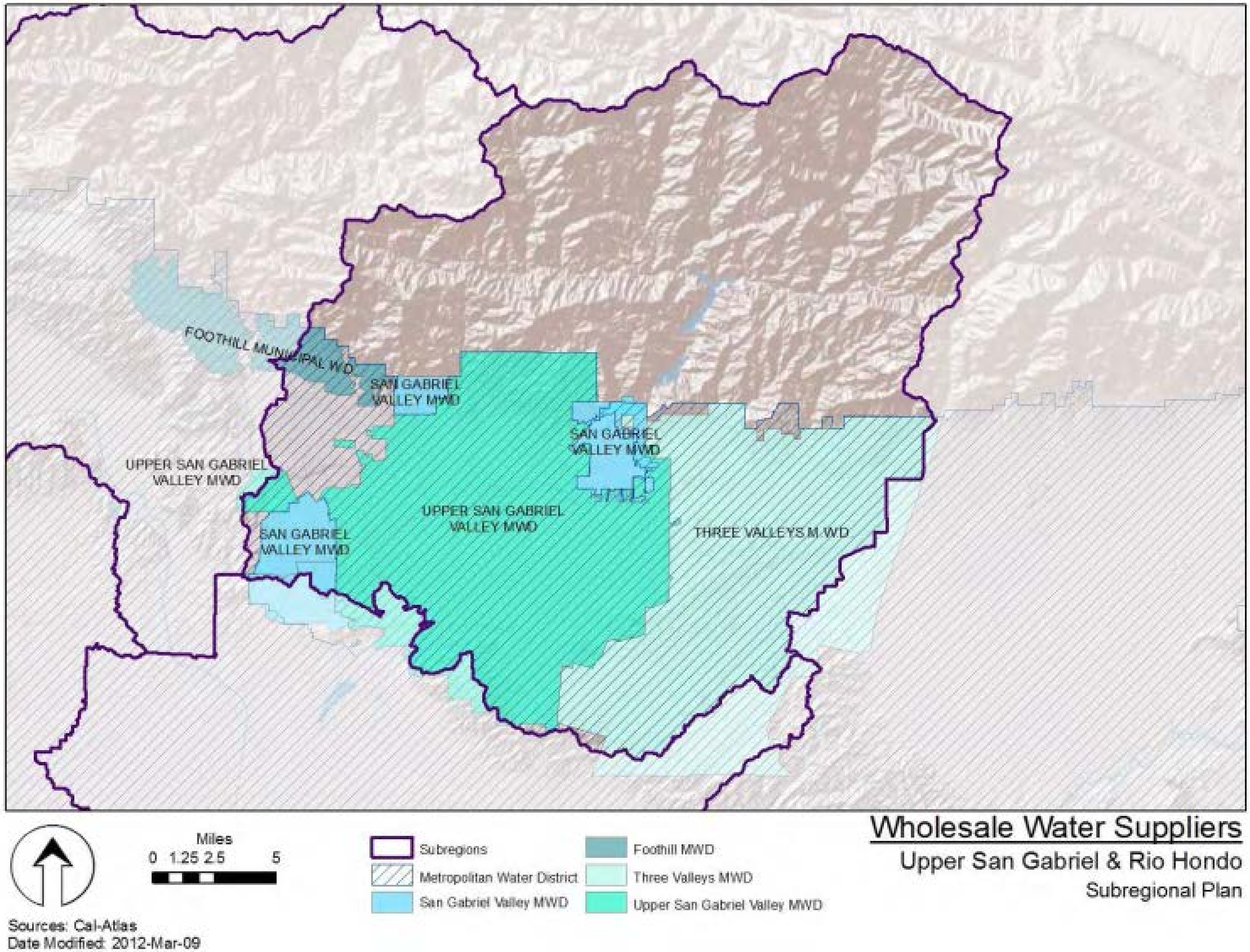
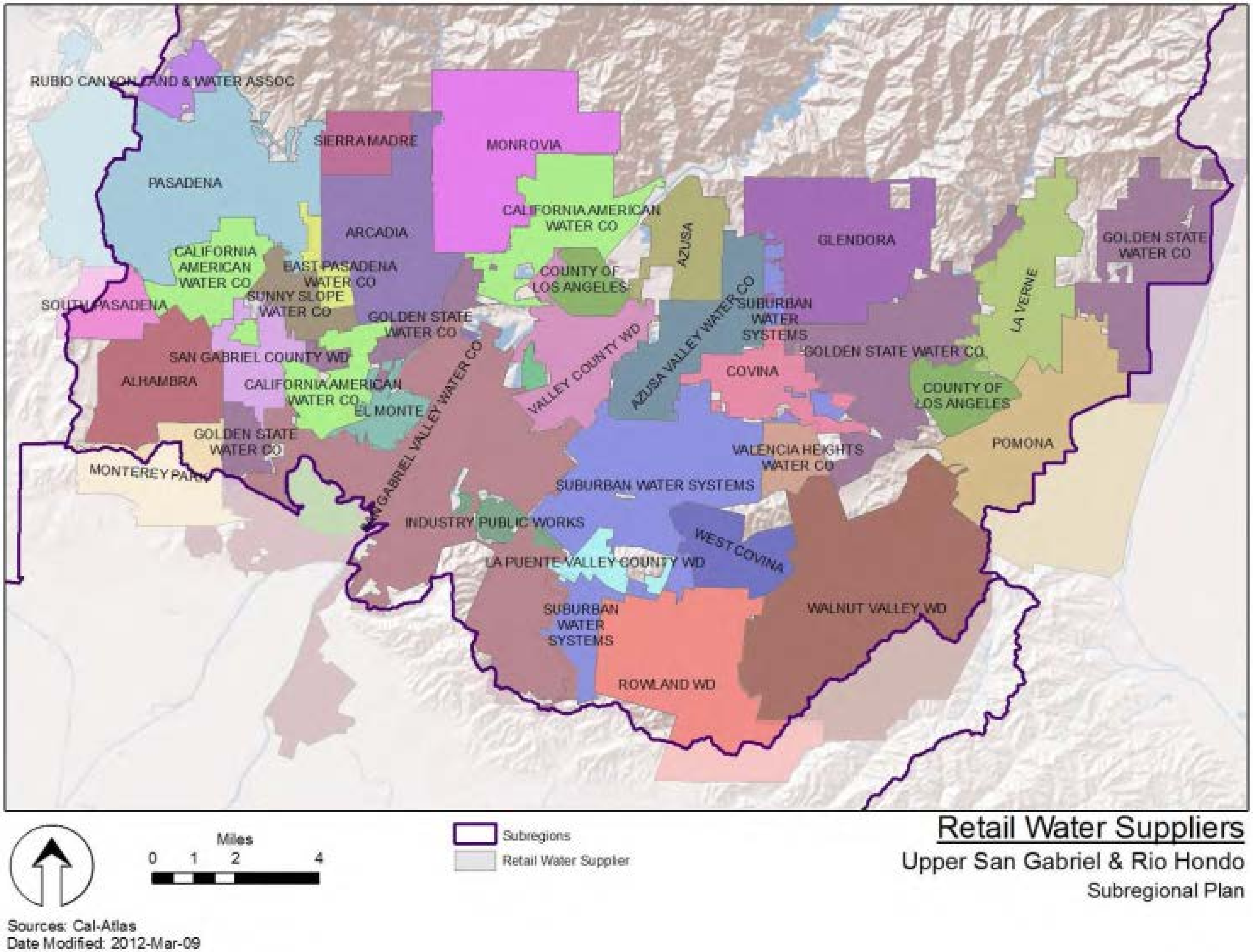


**Figure 6: Retail Water Suppliers**



## Surface Water

The Subregion has developed a system of dams, flood control channels, and percolation ponds and basins for supplying local water and recharging groundwater (Figure 4). The San Gabriel and Rio Hondo rivers efficiently capture over 80 percent of the runoff in their watersheds, where the San Gabriel River alone has a greater than 90% efficiency rate for stormwater runoff conservation. In the upper reaches where this Subregion is located, most runoff is captured in recharge facilities and by rubber dams. (MWDSC RUWMP 2010)

The San Gabriel River and the Rio Hondo drain an area in the San Gabriel Valley of about 490 square miles upstream of Whittier Narrows. It should be noted that the San Gabriel River and the Rio Hondo River are fully appropriated streams, meaning the full water capacity of the river has been allocated and no new rights may be appropriated.

The City of Pasadena has rights to 8.9 cfs of Eaton Canyon runoff, though the yield of the Arroyo Seco and Eaton Canyon are highly variable depending on weather and rain patterns. Azusa Light and Water and Covina Irrigating Company also use the San Gabriel River water for direct use. Other surface water rights holders within the Subregion utilize their rights for groundwater recharge in the many spreading basins in the San Gabriel Valley.

## Groundwater

Groundwater represents a significant portion of local supplies in the Subregion. The majority of groundwater yield in the Subregion is naturally recharged through the percolation of direct rainfall, and stream flow from surface runoff, percolation of imported water, and return flow from applied water. Some areas capture surface runoff and release it into spreading basins for additional percolation into the groundwater basin. Groundwater basins are also recharged with imported supplies by percolation in spreading basins, or in-lieu storage. The Los Angeles County Flood Control District operates several groundwater recharge facilities in the San Gabriel Valley providing recharge to Raymond and the Main San Gabriel basins. The Pasadena Water and Power Water Services Division also operates recharge facilities.

Groundwater basins act as underground reservoirs. During wet years, a basin can store excess water when available in wet years and then withdraw that water in dry years or during emergency situations when other sources are not available. Some basins, such as the Raymond Basin, have ample storage capacity and are able to store water for other agencies through conjunctive use programs. For example, Foothill MWD member agencies can store additional supplies from MWDSC for withdrawal at a later date. MWDSC also stores water in the Main San Gabriel Basin through arrangements with the Upper San Gabriel Valley MWD and TVMWD. The groundwater basins (shown in Figure 7) underlying this Subregion include:

- Main San Gabriel Basin
- Raymond Basin
- Six Basins (including the Canyon, Upper Claremont, Lower Claremont, Live Oak, Ganesha and Pomona Basins)
- Puente Basin
- Spadra Basin

The Raymond Basin is an adjudicated basin bound on the north by the San Gabriel Mountains, on the south and east by the San Gabriel Valley and on the west by the San Rafael Hills. It is replenished by surface water flows from the San Gabriel Mountains, and by rainfall directly on the surface of the valley floor. The Raymond Basin Management Board manages the basin, and tracks the groundwater pumpage of the 16 different water purveyors that pump water from the basin.

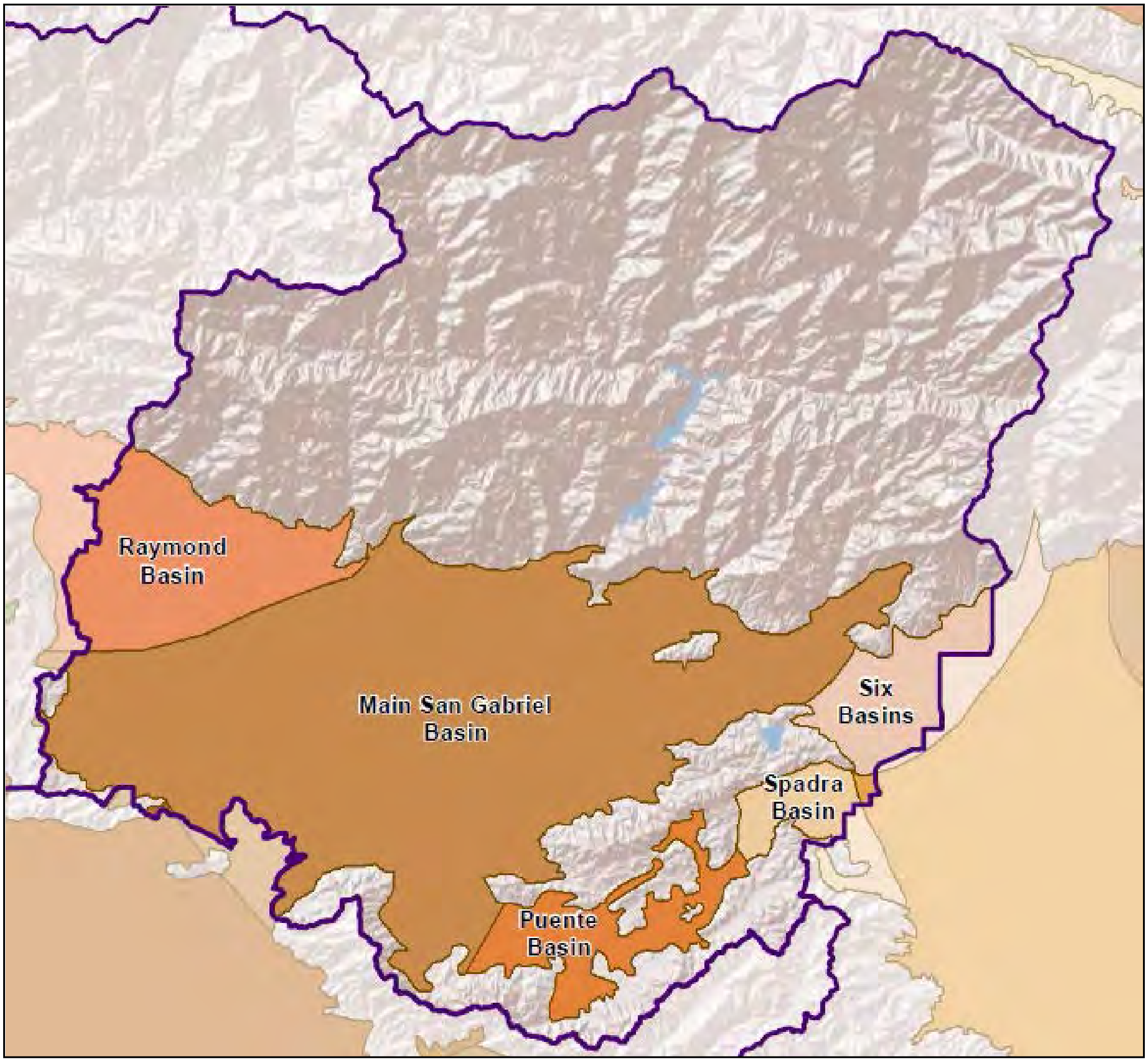
The Main San Gabriel Basin (Main Basin) includes most of the valley floor of the San Gabriel Valley located in the southeastern portion of Los Angeles County, and is also adjudicated. It is replenished by stream runoff from the adjacent mountains and hills, by rainfall directly on the surface of the valley floor, subsurface inflow from the Raymond Basin and Puente Basin, by return flow from applied water, and by imported water. This basin is managed by the Main San Gabriel Basin Watermaster. Three primary wholesale water districts overlay the Main Basin including Upper San Gabriel Valley MWD, San Gabriel Valley MWD, and TVMWD.

Six Basins is an adjudicated basin which includes six small groundwater basins: Canyon, Upper Claremont, Lower Claremont, Live Oak, Ganesha and Pomona Basins. It is replenished primarily by stream runoff from the adjacent mountains and hills, percolation of rainfall, and through replenishment at spreading grounds by stream and imported water. This basin is managed by the Six Basins Watermaster, and has nine different pumpers which include both public and private agencies. Previously, the Six Basins Watermaster was administrated by the TVMWD, but is now administrated by a private consultant as the TVMWD became a pumper within Six Basins. TVMWD is exploring possible projects in which direct stormwater capture is improved in the Live Oak and San Antonio Spreading Grounds, and it is anticipated that these projects will be online and producing additional groundwater for the cities of Claremont, Pomona, La Verne and San Dimas by 2020.

The Spadra Basin is a small, unadjudicated basin located south of the Six Basins area. Spadra Basin is used primarily by the City of Pomona and Cal-Poly Pomona to provide water for primarily non-potable uses, though it is also used by the City of Pomona to provide some potable water. Recharge of this basin is limited due to the conversion of agricultural land to urban and due to the lining of San Jose Creek.

The Puente Basin underlies an area in the south east portion of the Subregion and is not adjudicated, though it is hydrologically connected to the Main San Gabriel Basin. Puente Basin groundwater is used as a non-potable supply by overlying cities and communities (MWDSC, 2007)

**Figure 7: Groundwater Basins of the Subregion**




Sources: Los Angeles County DPW, Cal-Atlas

## Imported Water

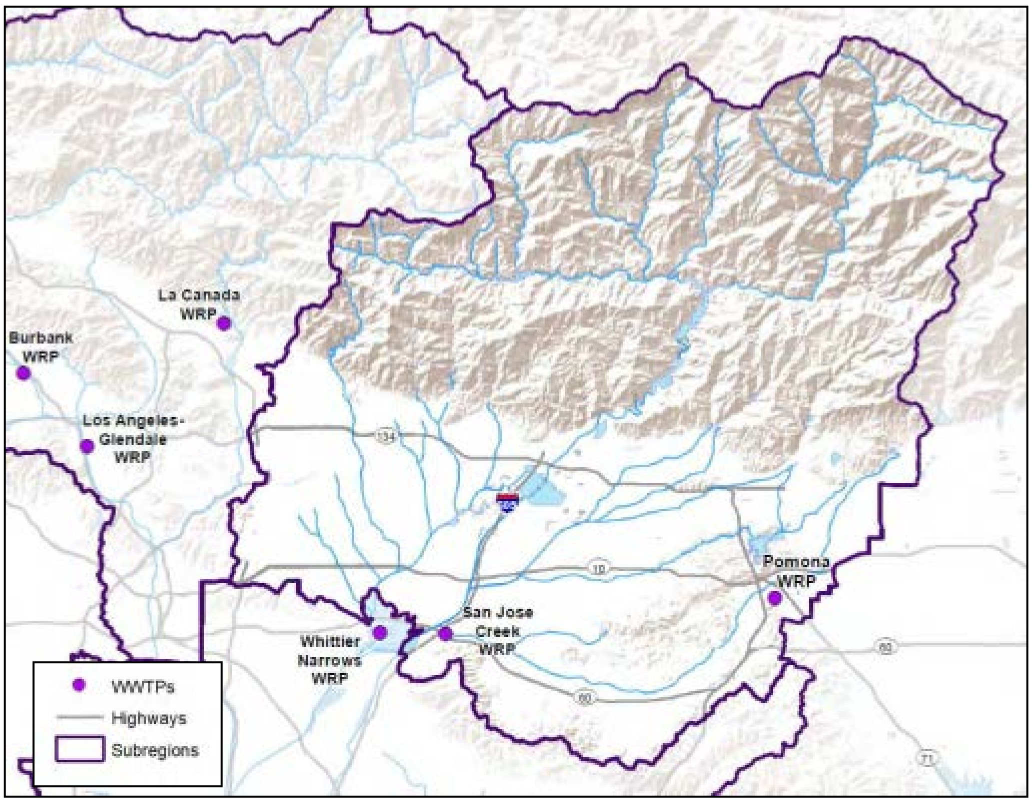
The Subregion significantly depends on imported water. The imported water wholesalers to the Subregion include the San Gabriel Valley MWD, Foothill Municipal Water District (FMWD), Upper San Gabriel Valley MWD, and TVMWD, the last three of which receive water from MWD. MWD imports water from the SWP and the CRA. In addition, San Gabriel Valley MWD receives an imported water allotment from the SWP. Additional information on imported water in the GLAC Region can be found in Exhibit A.

## Recycled Water

Recycled water supplied to the Subregion is produced by the Sanitation Districts of Los Angeles County at the Whittier Narrows Water Reclamation Plant (WNWRP), the San Jose Creek Water Reclamation Plant (SJCWRP) and the Pomona Water Reclamation Plant (PWRP), shown in Figure 8. The WNWRP has been producing recycled water since 1962 and produced approximately 7,860 acre-feet of recycled water in 2010. The SJCWRP, in operation since 1973, produced approximately 77,770 acre-feet of recycled water in 2010. The PWRP has been producing recycled water since 1927 (later rebuilt in 1966) and produced approximately 10,020 acre-feet of recycled water in 2010. These three plants are the source of recycled water for the Subregion's existing and proposed projects. The recycled water produced at these three plants, however, also serve multiple subregions.

In addition, there is potential for additional recycled water flows from these facilities, specifically the potential for increased production of recycled water in the Subregion if funding is available for capital improvements. These capital improvements could be at the treatment plants themselves to increase capacity, or by modifications of the upstream sewer collection system to divert more wastewater to the treatment plants.

**Figure 8: Water Reclamation Facilities in the GLAC Region**




Recycled water projects are being pursued or investigated by Walnut Valley Water District, City of Pomona, California State University Pomona, Rowland Water District, City of Industry, Upper San Gabriel Valley MWD, and Foothill MWD. Many of those projects are supported by MWD's Local Projects Program rebates, California Department of Water Resources grants and loans, State Water Resources Control Board grants and loans, and Title XVI grants from the U.S. Bureau of Reclamation.

For some agencies, recycled water provides a significant portion of total water supplies. Recycled water is typically used for irrigation of large landscapes such as golf courses, freeway medians, parks, sports fields, and cemeteries. Existing recycled water projects in the Subregion are shown in Table 3. The Upper San Gabriel Valley MWD is considering using recycled water for groundwater replenishment in the future. Those projects supported by MWDSC that are under construction, in advanced planning, or undertaking feasibility studies include those shown in Table 4. These projects may potentially increase the recycled water supplies estimated under Section 2.2 out to 2035.

**Table 3: Existing Recycled Water Projects**

| Agency | Project | Ultimate capacity (acre-feet) |
|---|---|---|
| City of Industry | City of Industry Regional Water System | 6,304 |
| City of Pomona | Pomona Reclamation Project | 9,320 |
| Los Angeles County | LA Co. Sanitation District Projects | 4,375 |
| Rowland Water District | Rowland Reclamation Project | 2,000 |
| Upper San Gabriel Valley MWD | Direct Reuse Phases I and IIA | 3,258 |
| Walnut Valley Water District | Walnut Valley Reclamation Project | 4,234 |

**Table 4: Future Recycled Water Projects**

| Agency | Project | Ultimate Capacity (acre-feet) | Proposed Completion Date |
|---|---|---|---|
| City of Pomona | Pomona Reclamation Project | 1,500 | TBD |
| Foothill MWD | Foothill MWD Recycled Water Project | 318 | 2016 |
| TVMWD | Thompson Creek | 3,000 | 2020 |
| La Puente Valley County Water District | Master Plan | 280 | TBD |
| Upper San Gabriel Valley MWD | Direct Reuse, Phase IIA Expansion / Rosemead Extension Project | 620 | 2020 |
| Upper San Gabriel Valley MWD | Direct Reuse, Phase III | 7,000 | 2018 |
| Upper San Gabriel Valley MWD | Direct Reuse | 4,900 | 2020 |
| Upper San Gabriel Valley MWD | Groundwater Reliability Improvement Project (GRIP) | 10,000 | 2020 |

## Desalination

Due to the Subregion's lack of proximity to the ocean, ocean desalination projects would not occur within the Subregion. However, there may be opportunities to partner with an agency along the coast and transfer water through either a groundwater basin or through MWDSC in the future as desalination supplies become more cost competitive with imported water.

### Stormwater Capture and Use

Currently, there are no set programs in place in the Subregion requiring stormwater capture and use, and instead ordinances and voluntary programs are in place to assist in the implementation of stormwater capture and use. For example, Los Angeles County has implemented a low impact development (LID) ordinance that requires new developments and redevelopment constructed after 2009 to include LID best management practices (BMPs) that may be implementable on particular sites.

## 2.3 Water Supply/Demand

As water agency boundaries are not aligned with the Subregional boundaries, an estimate of the actual Subregion's water supply and demand was not readily available for this Plan. Water supply and demand for the region was estimated based on review of 2010 UWMPs.

Estimated demand projections for the Subregion are listed in Table 5. Demand was calculated using the 2010 UWMPs for:

- City of Pasadena (portion in Subregion)
- Foothill MWD (portion in Subregion)
- City of South Pasadena
- City of Alhambra
- California American Water Co. (not including Baldwin Hills)
- San Gabriel County Water District
- San Gabriel Valley Water Company
- City of Arcadia
- Azusa Light and Power
- Three Valleys Municipal Water District
- Suburban Water Systems, San Jose Hills District
- City of Sierra Madre
- City of Monrovia
- Valley County Water District

All agencies have incorporated water conservation measures into water planning and practice. This practice involves the implementation of best management practices (BMPs) as prescribed by the California Urban Water Conservation Council in order to meet the requirements of SBx7-7 (Steinberg, 2009), also known as the 20x2020 Plan. A number of agencies, including both wholesalers and local retailers, assist the Subregion by implementing incentive programs that provide rebates to water conservation and recycled water use projects and programs.

**Table 5: Subregion Demand Projections for Direct Use (acre-feet per year)**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| Demand | 306,000 | 325,000 | 342,000 | 350,000 | 357,000 | 364,000 |
| Supply | 342,000 | 383,000 | 395,000 | 403,000 | 414,000 | 421,000 |

## 2.4 Water Quality

The GLAC Region has suffered water quality degradation of varying degrees due to sources associated with urbanization, including the use of chemicals, fertilizers, industrial solvents, automobiles and household products. Both surface water and groundwater quality have been impacted by this degradation which can be classified as either point or nonpoint sources. Regulations are in place to control both types of sources.

The Federal Water Pollution Control Act Amendments of 1972, amended in 1977, are commonly known as the Clean Water Act. The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the United Sates and gave the USEPA the authority to implement pollution control programs. In California, per the Porter Cologne Water Quality Control Act of 1969, responsibility for protecting water quality rests with the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs).

The SWRCB sets statewide policies and develops regulations for the implementation of water quality control programs mandated by state and federal statutes and regulations. The RWQCBs develop and implement Basin Plans designed to preserve and enhance water quality. The determination of whether water quality is impaired is based on the designated beneficial uses of individual water bodies, which are established in the Basin Plan. As mandated by Section 303(d) of the Federal Clean Water Act, the SWRCB maintains and updates a list of “impaired” water bodies that exceed state and federal water quality standards. To address these impairments, the RWQCBs identify the maximum amount of pollutants that may be discharged on a daily basis without impairing the designated beneficial uses, and are known as Total Maximum Daily Loads (TMDLs). In addition to development of the TMDLs the RWQCBs develop and implement the NPDES permits for discharges from wastewater treatment and water reclamation plants of treated wastewater effluent to surface water bodies.

The Subregion has 303(d) listings related to both human activities and natural sources. Human activity can produce poor water quality due to trash, nutrients from a wastewater treatment plants, metals, and toxic pollutants. These pollutants can be carried in stormwater runoff and through point source discharges, impacting streams, canyon ecosystems, and eventually beaches and offshore waters. Natural sources of contaminants primarily include minerals and metals from underlying local geology.

Even though agencies and cities in the Subregion have significantly reduced pollutants that are discharged to water bodies from individual point sources since the Clean Water Act was established, many of the major water bodies are still considered impaired due to trash, bacteria, nutrients, metals, and toxic pollutants. Water quality issues affecting the Subregion’s local surface waters and groundwater basins are discussed below.

### Surface Water Quality

The watersheds in the Upper San Gabriel River and Rio Hondo Subregion serve many beneficial uses including: municipal and domestic supply, groundwater recharge, recreation, freshwater habitat, wildlife habitat, aquatic habitat, and spawning. Typically, surface water quality is better in the headwaters and upper portions of watershed, and is degraded by urban and stormwater runoff as the rivers move through urban areas. As a result, the major watersheds in the Subregion are 303(d) listed for several constituents as shown in Table 6. (SWRCB, 2012) The locations of permitted dischargers are shown in Figure 9. Please note that Figure 9 does not show MS4 and Caltrans discharges as these are non-point discharge permits.

Investigations are needed to determine natural background levels for some listings which may not be due to anthropogenic causes. However, the reports written in support of the Subregion’s TMDLs conduct a source assessment for each impairment, and determine the major sources of each, as listed below:

- **San Gabriel River East Fork Trash TMDL:** Picnicking and camping
- **San Gabriel River Metals and Selenium TMDL:** Dry weather: Storm drains, WRPs, power plants; Wet weather: stormwater runoff through permitted storm sewer systems, Caltrans permit, general construction storm permits, and industrial storm permits; draining of open space areas, atmospheric deposition
- **Los Angeles River Bacteria TMDL:** Dry and wet weather stormwater system discharges, wildlife, direct human discharge, septic systems, re-growth or re-suspension of sediments
- **Los Angeles River Metals TMDL:** Dry weather: Publically owned treatment works (POTWs) including Tillman WRP, LA-Glendale WRP and Burbank WRP, tributary flows, groundwater discharge and flows from other permitted NPDES discharges; wet weather: storm flow through permitted storm sewer systems; atmospheric deposition, natural geologic conditions
- **Los Angeles River Nutrient TMDL:** Discharges from POTWs, including Tillman WRP, LA-Glendale WRP and Burbank WRP, urban runoff, stormwater, groundwater discharge
- **Trash TMDL for the Los Angeles River Watershed:** Permitted stormwater discharges, direct deposition by people or wind
- **Legg Lake Trash TMDL:** Litter from adjacent land areas, roadways and direct dumping and deposition, storm drain discharge
- **Peck Road Park Lake TMDLs:** Dry and wet weather stormwater system discharges, water diversions, atmospheric deposition
- **Santa Fe Dam Park Lake TMDL:** Supplemental water additions, runoff, parkland irrigation, atmospheric deposition
- **Puddingstone Reservoir TMDLs:** Permitted stormwater discharges, runoff, parkland irrigation, atmospheric deposition

**Table 6: 303(d) Listed Waters with Approved TMDLs**

| 303(d) Listed Waters and Impairments[1] | TMDL |
|---|---|
| **San Gabriel River** | |
| Metals and Selenium | San Gabriel River Metals and Selenium TMDL |
| **San Gabriel River East Fork** | |
| Trash | San Gabriel River East Fork Trash TMDL |
| **San Jose Creek** | |
| Toxics | San Gabriel River Metals and Selenium TMDL |
| **Monrovia Canyon Creek** | |
| Metals: Lead | |
| **Legg Lake** | |
| Trash | Legg Lake Trash TMDL |
| **Rio Hondo** | |
| Nutrients: Ammonia, Nutrients (Algae), pH | Los Angeles River Nutrient TMDL |
| Bacteria | Los Angeles River Bacteria TMDL |
| Metals: Copper, Lead, Zinc, Cadmium | Los Angeles River Metals TMDL |
| Trash | Trash TMDL for the Los Angeles River Watershed |
| **Coyote Creek** | |
| Metals: Copper, Lead | San Gabriel River Metals and Selenium TMDL |
| **Peck Road Park Lake** | |
| Nutrients: Organic Enrichment/Low Dissolved Oxygen | Peck Road Park Lake TMDLs |
| Toxics: Chlordane, DDT | |

| 303(d) Listed Waters and Impairments[1] | TMDL |
|---|---|
| Odor | |
| Trash | |
| Metals: Lead | No TMDL necessary as lead determined to be meeting numeric targets |
| **Santa Fe Dam Park Lake** | |
| pH | Santa Fe Dam Park Lake TMDLs |
| Metals: Copper, Lead | No TMDL necessary as lead determined to be meeting numeric targets |
| **Puddingstone Reservoir** | |
| Metals: Mercury | Puddingstone Reservoir TMDLs |
| Nutrients: Organic Enrichment/Low Dissolved Oxygen | |
| Toxics: Chlordane, DDT, PCBs | |

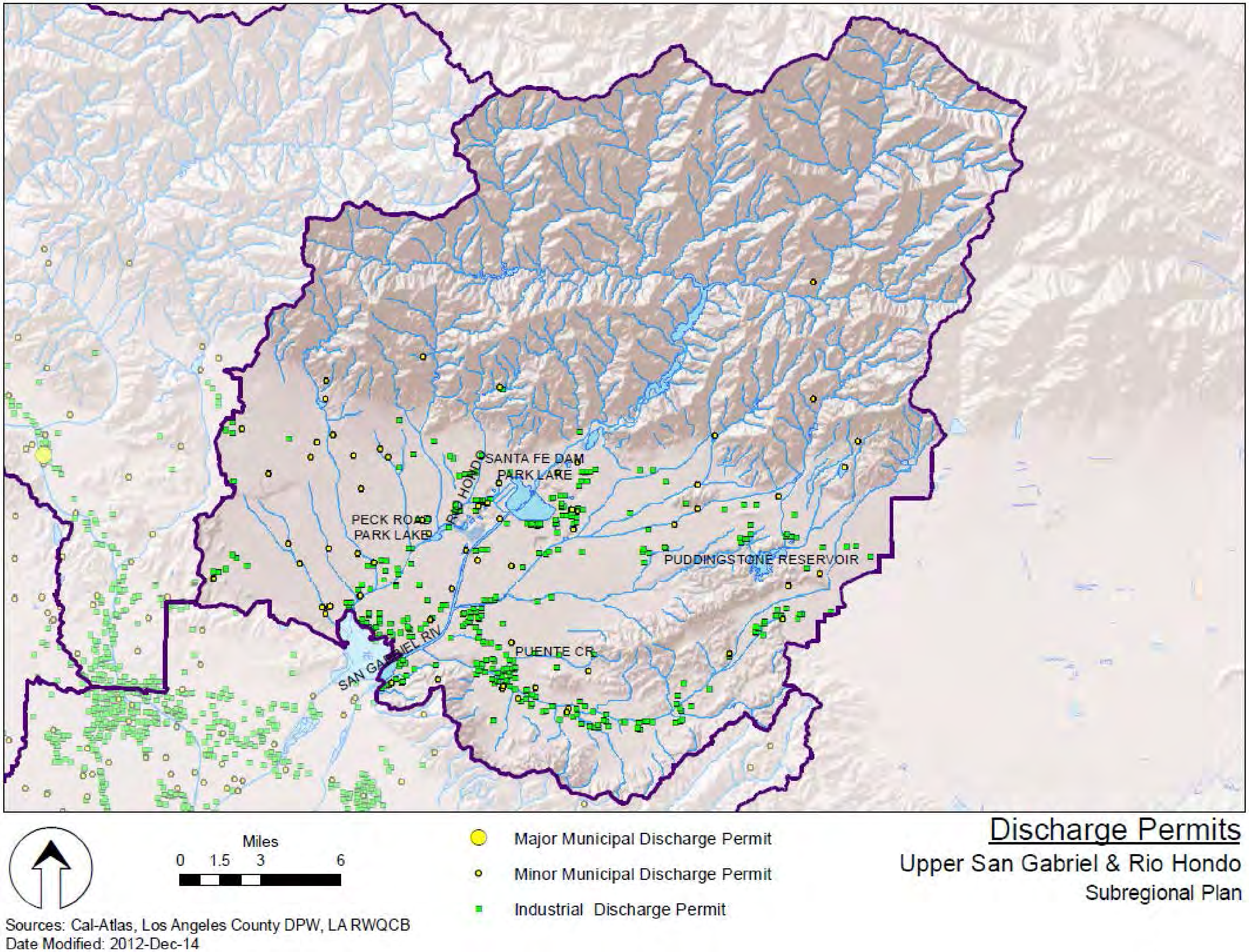
1. According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report

**Table 7: 303(d) Listed Waters without Approved TMDLs**

| 303(d) Listed Waters and Impairments[1] |
|---|
| **San Gabriel River** |
| Indicator Bacteria |
| Nutrients: Ammonia |
| Coliform Bacteria |
| **Walnut Creek Wash** |
| Benthic-Macroinvertebrate Bioassessments |
| Indicator Bacteria |
| pH |
| **San Jose Creek** |
| TDS |
| pH |
| **Coyote Creek** |
| Toxics: Diazinon |
| Indicator Bacteria |
| pH |
| **Sawpit Creek** |
| Bis(2ethylhexyl)phthalate (DEHP) |
| Fecal Coliform |
| **Crystal Lake** |
| Nutrients: Organic Enrichment/Low Dissolved Oxygen |
| **Legg Lake** |
| Nutrients: Ammonia, odor |
| Metals: Copper, Lead |
| pH |

1. According to the US EPA's 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report

**Figure 9: Permitted Dischargers as of 2011**



**Groundwater Quality**

Groundwater quality in the San Gabriel Basin (which includes all basins discussed in the Groundwater Supply section except for Raymond Basin and Six Basins) is managed by the Main San Gabriel Basin Watermaster (Watermaster) under its authority from the court. The Watermaster administers the Main San Gabriel Basin Judgment and enforces its provisions which establish water rights and responsibility for management of quantity and quality of the groundwater. They review and adopt their "Five-Year Water Quality and Supply Plan" each year. In addition, the San Gabriel Basin Water Quality Authority (WQA) was created by the state legislature to promote improvement of groundwater quality in the San Gabriel Basin. Their Basin-wide Groundwater Quality Management and Remediation Plan is reviewed and adopted annually. This plan includes all projects that the WQA is facilitating, and identifies various funding sources to ensure full funding for each project. The San Gabriel Valley's groundwater basin has water quality issues across the basin that are being addressed by WQA projects with a focus on 1) accelerating removal of contaminant mass in the basin, 2) preventing migration of contamination into critical groundwater supplies, 3) integrating cleanup with water supply, and 4) minimizing economic impact to the public.

One of the primary constituents of concern in the groundwater basins of the Subregion is volatile organic compounds (VOCs) which are used primarily in industrial and commercial activities. Over time, VOCs have leached into the groundwater from ground disposal of chemicals. Additionally, the basin has been found to have high levels of NDMA, nitrate, perchlorate, and TDS, primarily caused by industrial and commercial activities. Groundwater quality specific to each basin will be discussed below.

Water pumped from the Main San Gabriel Basin is used as potable supply. Though water quality is good in most areas, constituents of concern for the Main San Gabriel Basin include high TDS, nitrate, VOCs, perchlorate, and NDMA. Due to industrial and commercial contamination, five Operable Units (OUs) have been defined by the US EPA's Superfund Program: Baldwin Park OU, El Monte OU, Puente Valley OU, Whittier Narrows OU, and Area 3 OU. Each of these OUs has a specific plan laid out to address contamination remediation. Several treatment facilities are in place to treat groundwater pumped out of this basin. (San Gabriel Basin Water Quality Authority, 2012)

The Puente Basin underlies an area in the south east portion of the Subregion and is managed by the Puente Basin Watermaster. Puente Basin groundwater is used as a non-potable supply due to its poor quality, and is used for blending with recycled water, construction water and irrigation. Constituents of concern include TDS, Nitrate and VOCs. Remediation is underway to remove VOCs in the US EPA's Puente Valley Operable Unit which is located in the western portion of the basin. (MWDSC, 2007)

Six Basins has varying water quality, much of which can easily be considered potable through blending or other simple remediation efforts. Primary constituents of concern include nitrate, perchlorate and VOCs. Some areas also have high levels of arsenic and radon. Several of the pumpers in Six Basins treat the groundwater for these contaminants. New projects to offset the shutdown of wells due to water quality have been considered and studies are being completed to determine a means of improving this area's groundwater quality. (MWDSC, 2007)

The Raymond Basin underlies the north-western portion of the Subregion and is managed by the Raymond Basin Management Board. This basin provides potable supply, with good to fair groundwater quality in most areas. Constituents of concern include TDS, nitrate, perchlorate, and VOCs. There is one Superfund site located at the Jet Propulsion Laboratory (JPL) due to liquid waste seepage which released perchlorate and VOCs into the groundwater. Water agencies which pump from the Raymond Basin have treatment facilities in place to treat groundwater for VOCs and Perchlorate. (MWDSC, 2007) This basin is an unmanaged basin primarily used as a non-potable supply due to water quality issues. Constituents of concern include nitrate and TDS. Perchlorate and VOCs have also been detected in the basin.

## 2.5 Environmental Resources

The Subregion contains areas that have been highly urbanized as well as areas in the San Gabriel Mountains that provide a variety of natural resources that serve as habitat for wildlife. Below is a discussion of the existing environmental resources found in the Subregion.

### 2.5.1 Habitat

A variety of habitats can be found in the Subregion in the San Gabriel Mountains, Whittier Narrows, and the estuarine area of the San Gabriel River and Rio Hondo watersheds. In terms of water resources, these habitats include both upland and aquatic habitat areas.

Upland habitat provides a buffer to aquatic habitat as well as linkages to species through the landscape. Aquatic habitat areas provide habitat to innumerable species of flora and fauna. Aquatic habitat areas within the Subregion can be seen in Figure 10 and include:

- **Freshwater aquatic habitats:** Aquatic habitats such as depressional marshes, lakes and ponds. For the purposes of this Subregional Plan, freshwater aquatic habitats include man-made habitats such as flood control basins and ponds which may include areas of freshwater aquatic habitats. It is important to note that although some spreading grounds and some stormwater Best Management Practices such as detention basins, swales and depressional areas, also provide ecosystem benefits, they belong under a separate category and should not be subject to the same protection criteria.
- **Riverine aquatic habitats:** Streambed aquatic habitats associated with rivers and streams, including upper and lower riverine habitats. Man-made habitats considered riverine aquatic habitats include concrete-lined channels and soft-bottomed channels. Note that “riparian” is sometimes used to mean riverine aquatic habitats.

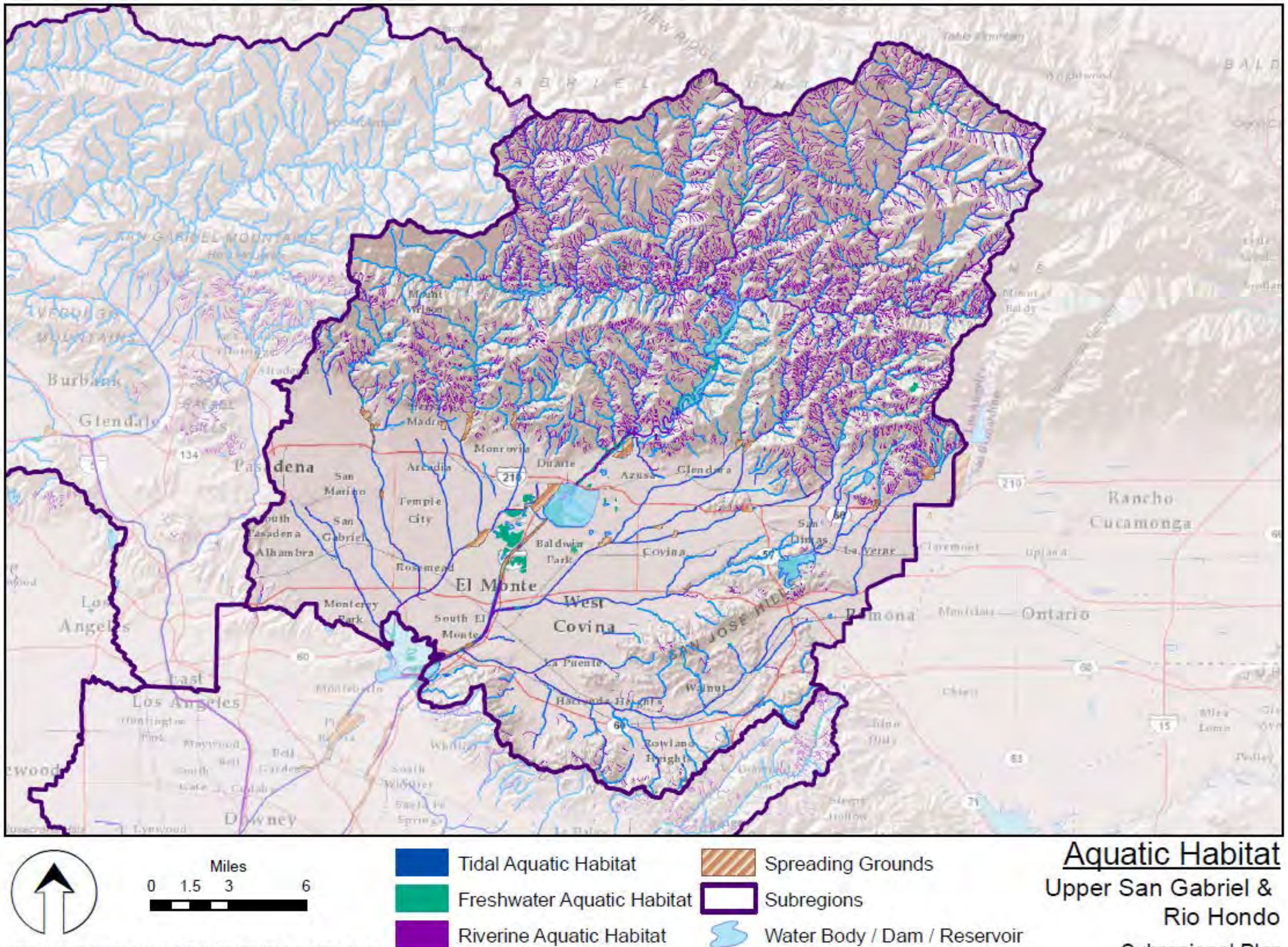
### 2.5.2 Significant Ecological Areas and Environmentally Sensitive Habitat Areas

Los Angeles County developed the concept of significant ecological areas in the 1970s in conjunction with adopting the original general plan for the County.

The Significant Ecological Area (SEA) Program is a component of the Los Angeles County Conservation/Open Space Element in their General Plan. This program is a resource identification tool that indicates the existence of important biological resources. SEAs are not preserves, but are areas where the County deems it important to facilitate a balance between limited development and resource conservation. Limited development activities are reviewed closely in these areas where site design is a key element in conserving fragile resources such as streams, oak woodlands, and threatened or endangered species and their habitat.

Proposed development is governed by SEA regulations. The regulations, currently under review, do not preclude development, but to allow limited, controlled development that does not jeopardize the unique biotic diversity within the County. The SEA conditional use permit requires development activities be reviewed by the Significant Ecological Area Technical Advisory Committee (SEATAC). Additional information about regulatory requirements is available on the Los Angeles County website. (LACDRP, 2011)

**Figure 10: Aquatic Habitats of the Subregion**




Sources: Cal-Atlas, Los Angeles County DPW & DRP, National Wetlands Inventory
Date Modified: 2013-Oct-09

Within the Subregion, SEAs include:

- Buzzard Peak-San Jose Hills
- Duleya Densiflora Population
- Galium Grande Population
- Powder Canyon-Puente Hills
- Rio Hondo Colege Wildlife Sanctuary
- San Antonio Canyon Mouth
- San Dimas Canyon
- Santa Fe Dam Floodplain
- Sycamore-Turnbull Canyons
- Tonner Canyon-Chino Hills
- Way Hill
- Whittier Narrows Dam County Recreation Area

These SEAs can be seen in Figure 11.

### 2.5.3 Ecological Processes

The natural, open space areas in the Subregion include the San Gabriel Mountains to the north and the Puente Hills to the south. This is a biologically rich area that provides critical habitat to endangered species and upland habitat, and connectivity between various habitat types.

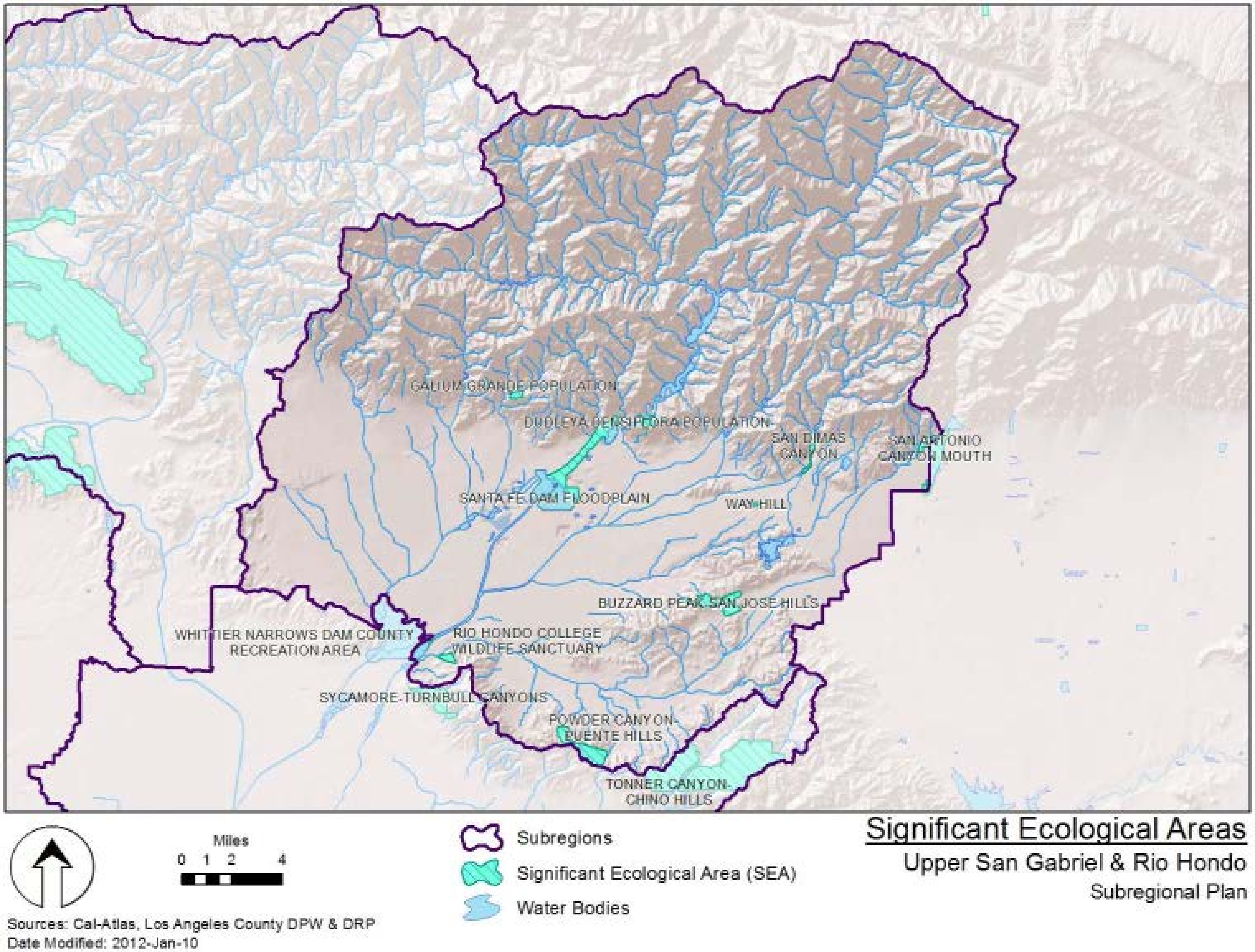
The aquatic habitat and upland habitats found in the Subregion provide a number of ecosystem services including biodiversity support, flood damage reduction, carbon sequestration, pollutant reduction in runoff, consumptive use support (such as hunting and fishing), and non-consumptive use support (such as bird watching) (Brauman et al., 2007).

In addition to ecosystem services which may improve water supply and water quality, major ecological processes may impact water resources, and are listed below.

#### Fire

Fire is an integral and necessary part of the natural environment and plays a role in shaping the landscape. Catastrophic wildfire events can denude hillsides which create opportunities for invasive plants and increase the potential for subsequent rains to result in debris flows that erode the landscape and can clog stream channels, damage structures, and injure inhabitants in the canyons and lower foothill areas.

**Figure 11: Significant Ecological Areas of the Subregion**



### Invasive Species

Invasive species in the Subregion have also substantially affected specific habitats and areas. Along with the rest of California, most of the Subregion's native grasslands were long ago displaced by introduced species. The receptive climate has resulted in the widespread importation of plants from around the globe for landscaping. Some plant introductions have resulted in adverse impacts. In many undeveloped areas, non-native plants such as arundo (*Arundo donax*), tree of heaven (*Alianthus altissima*) tree tobacco (*Nicotiana glauca*), castor bean (*Ricinus communis*), salt cedar (*Tamarix ramosissima*) and cape ivy (*Senecio mikanioides*) are out-competing natives. The removal of these particular species, which requires focused and repeated efforts, can provide substantial dividends in restored species diversity.

### Slope Stability

The Subregion is prone to slope stability problems such as landslides, mudslides, slumping and rockfalls. Shallow slope failure such as mudslides and slumping occur both naturally and where graded cut and fill slopes have been inadequately constructed. Rockfalls are generally associated with seismic ground-shaking or rains washing out the ground containing large rocks and boulders.

### Flooding

Flash flooding is a common occurrence in the canyon areas of the Subregion due to heavy winter storms. As discussed previously, there are a number of debris basins in place to prevent the flow of debris from reaching the urbanized foothills. Riverbank flooding has been greatly reduced with the various flood control measures in place which were discussed previously in this report.

### 2.5.4 Critical Habitat Areas

Critical habitat areas have been established by the endangered species act (ESA) to prevent the destruction or adverse modification of designated critical habitat of endangered and threatened plants and animals. The United States Fish and Wildlife Service (USFWS) through the Endangered Species Act (ESA) defines critical habitat as "a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery."

A critical habitat designation typically has no impact on property or developments that do not involve a Federal agency, such as a private landowner developing a property that involves no Federal funding or permit. However, when such funding or permit is needed, the impacts to critical habitat are considered during the consultation with the USFWS.

Within the Subregion, there is 8,100 acres of designated critical habitat defined for the Brauton's milk-vetch, coast California gnatcatcher, and mountain yellow-legged frog, as shown in Figure 12.

## 2.6 Open Space and Recreation

The Subregion's open space resources are extensive, due to the presence of a large portion of the Angeles National Forest National Recreation Area. The Angeles National Forest Recreation Area provides a large expanse of open space which can absorb rainfall that contributes to groundwater recharge and produce runoff that feeds local streams and rivers.

The preservation of environmental resources within the Angeles Nation Forest Recreation Area is generally the responsibility of the Land Management Plan for the Southern California Forests. Additional open space is located in the undeveloped portions of the foothills south of the Angeles National Forest. Protection of the open space in these areas is generally the responsibility of local Park Agencies and General Plans. Preservation of such spaces can protect existing water resources and native habitat, as these open spaces absorb rainfall, produce runoff that feeds local streams, and may contribute to groundwater.

Open space and recreation areas in the Subregion can be seen in Figure 13. Acreage of recreation and open space lands within the Subregion is shown in Table 8. In total, of the Subregion's 365,000 acres, approximately 199,000 acres (or 55%) are considered open space or recreation land areas. A majority of the areas are National Forest Land within the San Gabriel Mountains.

**Table 8: Existing Recreation and Open Space Land Area**

| Land Type | Acres |
|---|---|
| Developed Urban Park and Recreation Area | 3,100 acres |
| Open Space Lands (including aquatic habitats and National Forest) | 192,000 acres |
| Greenways | 2,100 acres |
| Other/Miscellaneous | 1,400 acres |
| **Total Area in Subregion** | **198,600 acres** |

## 2.7 Land Use

Land use within the Upper San Gabriel River and Rio Hondo Subregion reflects the historic pattern of urbanization as most of the interior valley is occupied with residential, industrial, commercial, and institutional uses while most of the foothills and mountains are principally open space. The overall land use breakdown for the Upper San Gabriel River and Rio Hondo Subregion is as follows: 7 percent commercial and industrial, 21 percent residential, 41 percent open space and recreation, 3 percent transportation, and 24 percent vacant.

Land use types may include the following:

- Residential: duplexes and triplexes, single family residential, apartments and condominiums, trailer parks, mobile home courts and subdivisions
- Commercial: parking facilities, colleges and universities, commercial recreation, correctional facilities, elementary/middle/high schools, fire stations, government offices, office use, hotels and motels, health care facilities, military air fields, military bases, military vacant area, strip development, police and sheriff stations, pre-schools and day care centers, shopping malls, religious facilities, retail centers, skyscrapers, special care facilities, and trade schools
- Industrial: chemical processing, metal processing, manufacturing and assembly, mineral extractions, motion picture, open storage, packing houses and grain elevators, petroleum refining and processing, research and development, wholesaling and warehousing
- Transportation and Communication: airports, bus terminals and yards, communication facilities, electrical power facilities, freeways and major roads, harbor facilities, improved flood waterways and structures, maintenance yards, mixed transportation and utility, natural gas and petroleum facilities, navigation aids, park and ride lots, railroads, solid and liquid waste disposal facilities, truck terminals, water storage and transfer facilities
- Open Space and Recreation: beach parks, cemeteries, golf courses, developed and undeveloped parks, parks and recreation, specimen gardens and arboreta, wildlife preserves and sanctuaries
- Other Vacant Land: Urban vacant, abandoned orchards and vineyards, vacant undifferentiated, and vacant land with limited improvements

A breakdown of land use in the Subregion is depicted on Figure 14. Agricultural areas tend to be located in the easterly portion of the Main Basin and along power transmission rights-of-way corridors adjacent to the San Gabriel River. There are several major industrial areas adjacent to the San Gabriel River and within other portions of the valley. The greatest area of land use is residential and commercial.

**Table 9: Land Use in the Upper San Gabriel River and Rio Hondo Subregion**

| Land Use Type | Acres | Percentage |
|---|---|---|
| Open Space / Recreation | 198,600 | 41% |
| Vacant | 114,307 | 24% |
| Residential | 100,525 | 21% |
| Commercial | 21,569 | 4% |
| Industrial | 12,570 | 3% |
| Transportation, Utilities | 12,766 | 3% |
| Agriculture | 3,737 | 1% |
| Mixed Urban | 3,126 | 1% |
| Water | 2,665 | 1% |
| No Data | 2 | <1% |
| **Total** | **480,723** | **100%** |

**Figure 12: Critical Habitat**

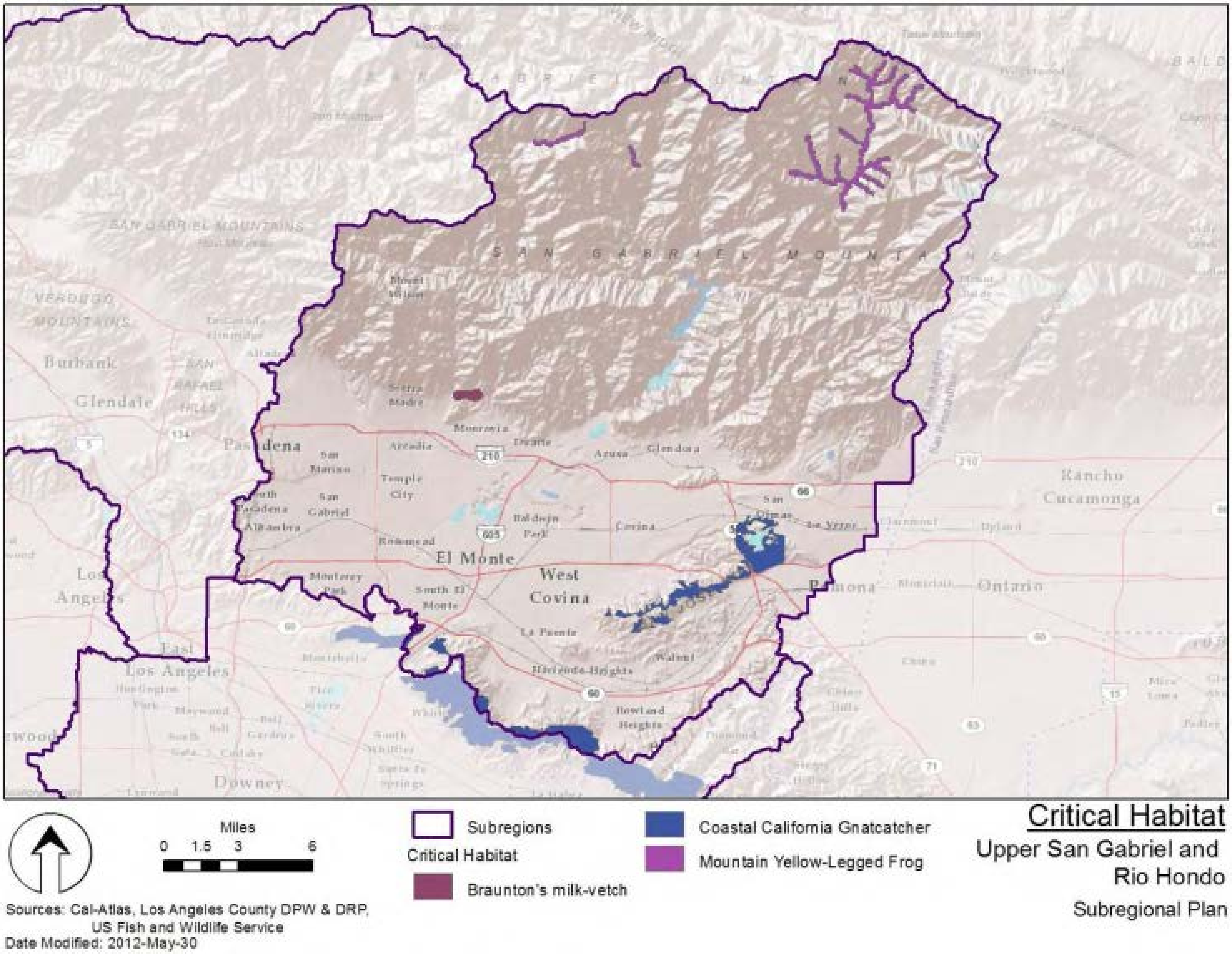


**Figure 13: Parks, Recreation and Other Open Space**

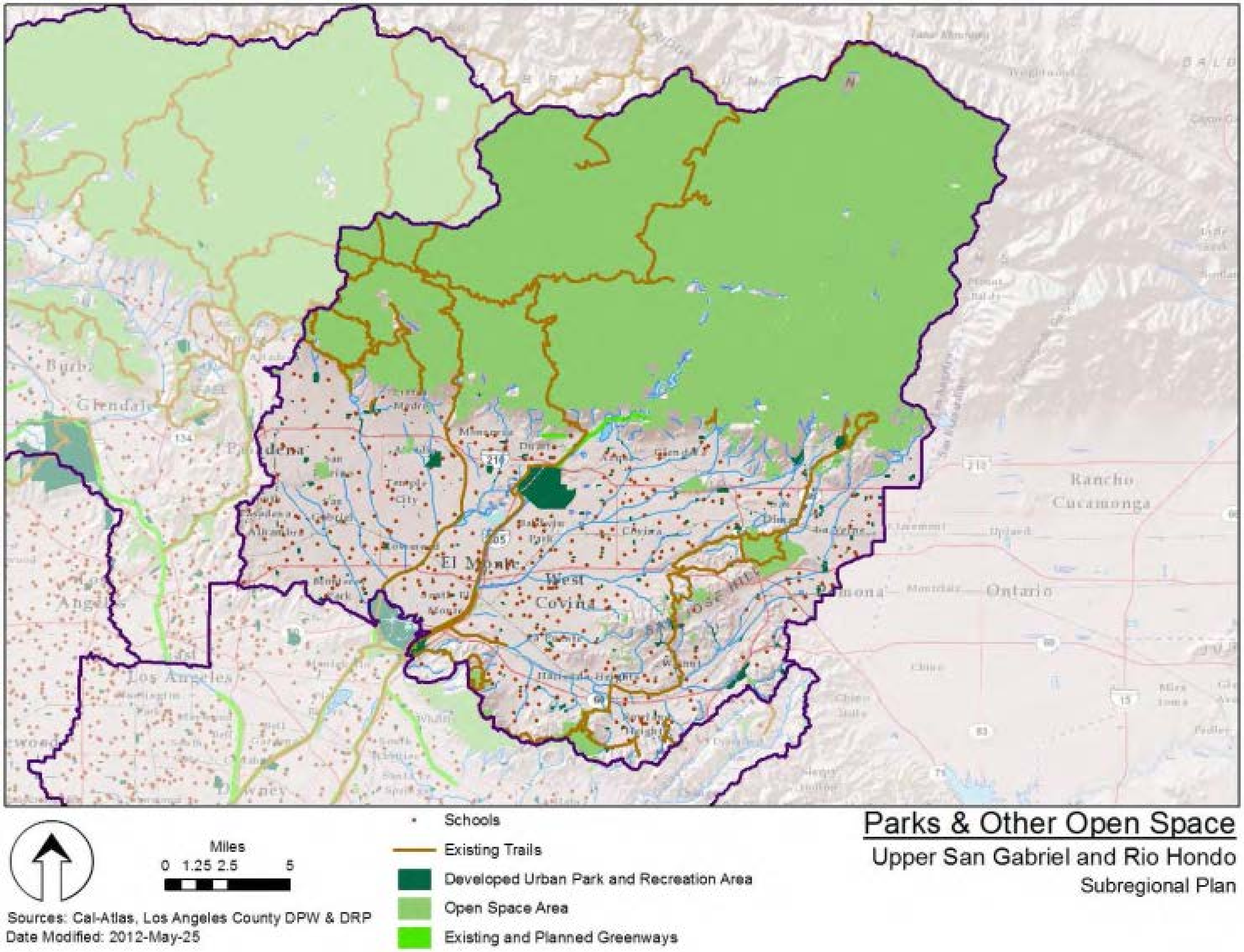
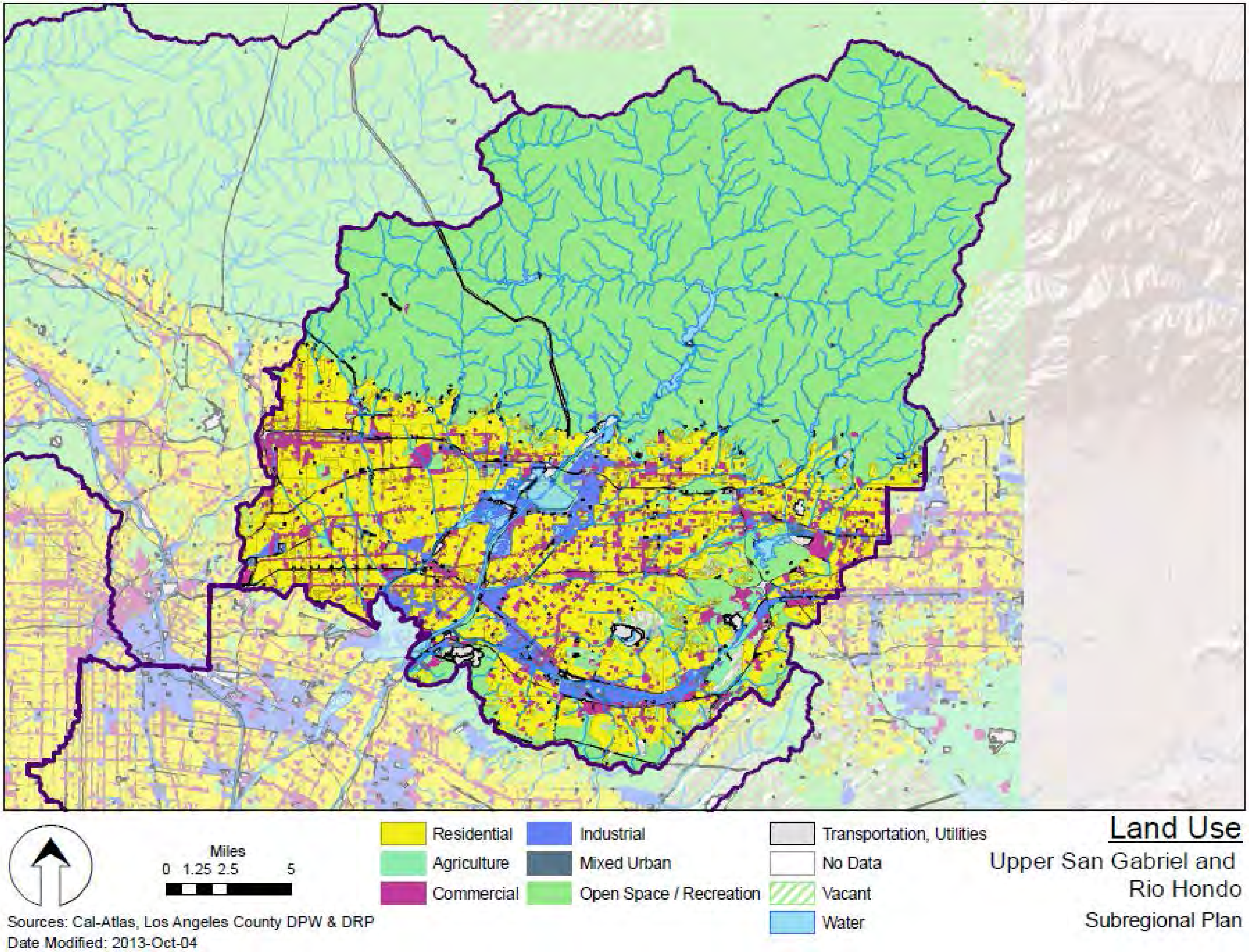


**Figure 14: Land Use**



# 3 Subregional Objectives and Targets

This section identifies the objectives for the Subregion and establishes quantified planning targets to the 2035 planning horizon that can be used to gauge success in meeting the objectives.

## 3.1 Objective and Target Development

The Greater Los Angeles County Regional IRWM Plan has developed regional goals, objectives, and targets. To assist the region in meeting these, objectives and targets have been developed for the Subregion. These objectives and targets are intended to help guide improvements to water supply, water quality, habitat, open space, and flood management to meet the Region's objectives and targets through Subregional planning.

Five objectives have been articulated, based on recent water resource planning documents. Workgroups composed of Stakeholders from within the Region were involved in establishing the Plan's objectives and targets. To establish quantifiable benchmarks for implementation of the plan, planning targets were defined based on much discussion within the regional workgroup. Objectives for five water resource areas were identified for the Subregion, which are discussed below (and summarized in Table 10).

## 3.2 Water Supply

Optimizing local water supply resources is vital for the Subregion to reduce its reliance on imported water and improve reliability of local water supplies should imported water supplies be reduced or interrupted due to environmental and/or political reasons. The Subregion plans on achieving this objective by conserving water through water use efficiency measures, creating an additional ability to pump more groundwater, increasing the indirect potable reuse and non-potable reuse of recycled water, and increasing the infiltration, capture, and use of stormwater. In total, water supply targets will yield an additional 49,000 AFY of local supply for direct use, and 30,000 AFY of local supply for groundwater recharge.

To develop supply targets, water supply planning documents for agencies whose service areas cover a majority of the Subregion were examined for potential supply projects, and planned increases in supply between the years 2010 and 2035. The water supply targets for each Subregion were discussed in the *Water Supply Targets TM*.

## 3.3 Water Quality

Improving the quality of urban and stormwater runoff will reduce or eliminate impairment of rivers, beaches, and other water bodies within and downstream of the Subregion. Improving the quality of urban and stormwater runoff would also make these local water supplies available for groundwater recharge. Additionally, the Subregion will continue to improve groundwater and protect drinking water quality to ensure a reliable water supply.

The Subregion plans on achieving these objectives by increasing the capacity to capture and treat runoff and prevent certain dry weather flows (see table above). The water quality target was determined by setting a goal of capturing ¾" of storms over the Subregion. The Subregion's target is to develop 11,500 AF of new stormwater capture capacity (or equivalent). An emphasis will be given to the higher priority areas which will be determined by project-specific characteristics provided by the project proponent, including land use in the proposed project area, runoff and downstream impairments. The assumptions and calculations used to determine this target and catchment prioritization can be found in the *Water Quality Objectives and Targets TM*.

### 3.4 Habitat Objective and Targets

Protecting, restoring, and enhancing the Subregion's native habitats is vital to preserving areas that will contribute to the natural recharge of precipitation and improve downstream water quality. Additionally, the protection, restoration, and enhancement of upland habitat, aquatic habitat/marsh habitat, riparian habitat and buffer areas will help restore natural ecosystem processes and preserve long-term species diversity. Subregional targets for habitat were not developed, but Regional habitat target development is discussed in the *Open Space, Habitat and Recreation TM*.

### 3.5 Open Space and Recreation Objective and Targets

Open space and recreation areas provide space for native vegetation to create habitat and passive recreational opportunities for the community. In addition, open space and recreation areas may preserve or expand the area available for natural groundwater recharge (though only in the forebay areas), improve surface water quality to the extent that these open spaces filter, retain, or detain stormwater runoff, and provide opportunities to reuse treated runoff for irrigation. Subregional targets for open space and recreation were not developed, but Regional open space and recreation target development is discussed in the *Open Space, Habitat and Recreation TM*.

### 3.6 Flood Management Objective and Targets

Improved integrated flood management systems can help reduce the risk of flooding, and protect lives and property. The Subregion plans on meeting this objective by reducing 250 acres of local unmet drainage needs, and removing 40 million cubic yards of sediment from debris basins and reservoirs. The local unmet drainage target was determined by looking at Special Flood Hazard Areas (SFHAs), also known as flood plains, as defined by FEMA, compared to land uses and the presence of structures. The sediment removal target was established using historical records to estimate sediment inflow, and estimate the sediment trapped within a 20-year period. Detailed assumptions and calculations used to develop the Subregion's flood target can be found in the *Flood Management Objectives and Targets TM*.

**Table 10: Upper San Gabriel River and Rio Hondo Subregion Objectives and Planning Targets**

| Objectives | | Regional Planning Targets |
|---|---|---|
| **Improve Water Supply** | | |
| Optimize local water resources to reduce the Subregion's reliance on imported water. | Water Use Efficiency | Conserve 17,000 AFY of water by 2035 through water use efficiency and conservation measures. |
| | Groundwater | Create ability to pump an additional 14,000 AFY using a combination of treatment, recharge, and storage access |
| | Recycled Water | Develop 13,000 AFY of indirect potable reuse.<br>Increase non-potable reuse of recycled water by 12,000 AFY. |
| | Ocean Desalination | No ocean desalination water supply projected. |
| | Stormwater | Increase capture and use of stormwater runoff by 6,000 AFY that is currently lost to the ocean.<br>Increase stormwater infiltration by 17,000 AFY. |

| Objectives | | Regional Planning Targets |
|---|---|---|
| **Improve Water Quality** | | |
| Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater, and wastewater. | Runoff (Wet Weather Flows) | Develop[2] 11,500 AF of new stormwater capture capacity (or equivalent) spatially dispersed to reduce region-wide pollutant loads, emphasizing higher priority areas[3]. |
| **Enhance Habitat** | | |
| Protect, restore, and enhance natural processes and habitats. | Habitat targets were not developed to the subregional level – only to the regional level. | |
| **Enhance Open Space and Recreation** | | |
| Increase watershed friendly recreational space for all communities. | Open space and recreation targets were not developed to the subregional level – only to the regional level. | |
| **Improve Flood Management** | | |
| Reduce flood risk in flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches. | Sediment Management and Integrated Flood Planning | Reduce flood risk in 250 acres of flood prone areas by either increasing protection or decreasing needs using integrated flood management approaches.<br>Remove 40 million cubic yards of sediment from debris basins and reservoirs. |

[2] Stormwater capture capacity assumes (1) providing storage volume equivalent to runoff from the 0.75”, 24-hour design storm event, (2) designing BMPs to retain the captured volume to the maximum extent practicable via infiltration, evapotranspiration, or harvest and use, and (3) designing BMPs to provide effective treatment to address pollutants of concern for the remaining portion of the captured volume that is not retained. Projects deviating from these specifications may be demonstrated to be equivalent based on comparison of average annual volume captured and/or average annual pollutant load reduction for pollutants of concern. Pollutants of concern are defined as those pollutants expected to be generated from the land uses within the subwatershed and for which the downstream water bodies are impaired (TMDL, 303(d) listed)

[3] High priority areas will be determined based on project-specific characteristics such as project area land use, precipitation, imperviousness and downstream impairments.

# 4 Partnership and Multi-benefit Opportunities

Many agencies and other entities have successfully been working together for decades on many collaborative projects. For instance in this Subregion, the entire system of flood management, conservation of local water supply, and recreation is a longstanding set of activities and facilities that represents collaboration and integration among the Los Angeles County Flood Control District, the Army Corps of Engineers, the Water Replenishment District of Southern California, the Sanitation Districts, Los Angeles County Department of Parks & Recreation and others. Projects that seek to enhance or extend these existing activities should be encouraged, because they will often be the most cost-effective.

Implementation of projects is the vehicle to meeting the objectives and planning targets discussed in Section 3.  Integration and collaboration can help these projects achieve synergies and, at times, increase their cost-effectiveness in meeting multiple objectives. In addition to the collaboration described above, the GLAC IRWM Region will continue to build upon a wealth of potential multi-benefit project opportunities for partnership projects including:

- **Local Supply Development:** Alternative supply development such as distributed (smaller, non-centralized) stormwater capture projects are often too costly for a water supply agency to construct on their own for water supply purposes only. The near-term unit cost can be well in excess of the cost of imported water. However, partnerships often help to share the costs, thus providing opportunities for more complex, multi-benefit projects (such as water quality improvement) that otherwise might not be accomplished.
- **Improving Stormwater Quality:** In preparing this update of the IRWM Plan, a methodology to identify priority drainage areas based on their ability to improve water quality for coastal and terrestrial waters was developed. Integrated projects that can provide water quality improvements can be cited relative to that prioritization to achieve the highest benefits.
- **Integrated Flood Management:** Earlier studies, such as the Sun Valley Watershed Management Plan (2004), demonstrated the potential for similar cost-effective synergies between flood control, stormwater quality management, water supply, parks creation and habitat opportunities. Flood control benefits usually achieved through significant traditional construction projects can sometimes be accomplished with alternative multi-benefit projects.
- **Open Space for Habitat and Recreation:** When habitat is targeted for restoration, there are often opportunities for cost-effective implementation of flood control, stormwater management and passive recreation (such as walking and biking trails) as well.

These benefit synergies and cost effectiveness outcomes can best be attained when the unique physical, demographic and agency service area attributes of the region are considered. In addition to existing collaborative processes, the GLAC IRWMP has developed a geodatabase tool to assist in identifying areas and partnerships conducive to both inter-subregional and intra-subregional integrated project development. This section discusses this tool as well as some preliminary analyses on the Upper San Gabriel and Rio Hondo Subregion’s potential partnerships and integrated project opportunities.

## 4.1 GLAC IRWMP Integration Process and Tools

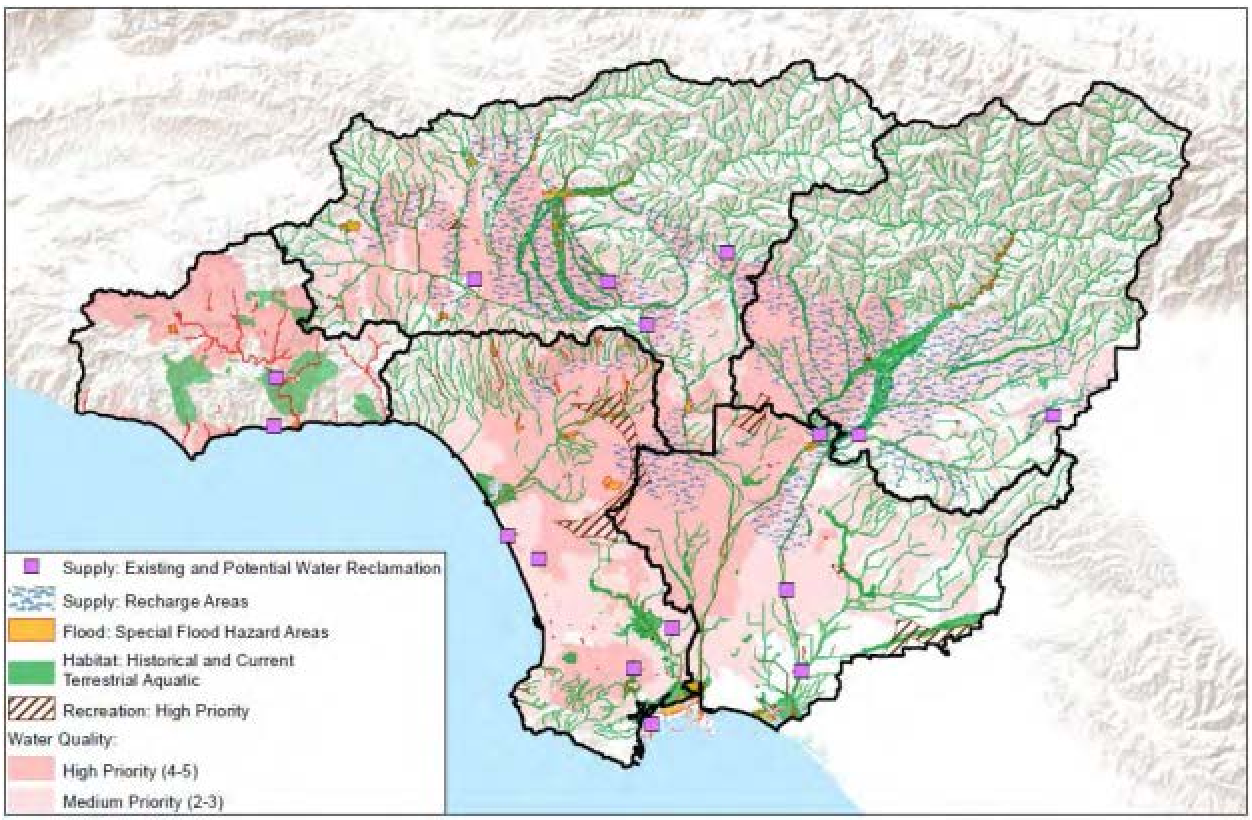
As part of the objectives and targets update process, the GLAC Region compiled and developed several geo-referenced data layers to assist in spatially identifying priorities and potential opportunities to achieve water supply, water quality, habitat, recreation and flood management benefits. These data layers were

initially used individually to determine the objectives and planning targets for each water management area. However, these datasets can also be overlaid to visually highlight areas with the greatest potential to provide multiple benefits. The resulting Potential Benefits Geodatabase (Geodatabase) can also align these areas relative to other layers containing agency service areas and jurisdictions – allowing for project proponents and partners to be identified.

## Potential Benefits Geodatabase

The GLAC IRWMP Potential Benefits Geodatabase is a dynamic tool that should be updated as new data is made available in order to maintain its relevance in the IRWM planning context. However, in order to provide an analysis of potential integration and partnership opportunities for the 2013 GLAC IRWM Plan, current data layers were overlaid and analyzed. The key layers used are shown in Figure 15 and described in Table 11. It should be noted that these datasets may not be complete or in need of further refinement and therefore will be updated on an as-needed basis – which is part of the dynamic process previously described. Therefore, the Geo-database should only be used as an initial step in identifying multi-benefit potential and by no means used to invalidate the potential for achieving benefits in other areas.

**Figure 15: GLAC Region Potential Benefits Geodatabase Layers**




## Using the Geodatabase

The Geodatabase is a dynamic visual tool. The data layers and maps shown in this Section are only some of a multitude of ways to package and view the datasets to help with the integration process. It is important to note that not all data that could be useful in indentifying integration and partnership potential for the region is easily viewed spatially in this format. Therefore the Geodatabase should only be used as one of several potential integration tools or methods.

The Geodatabase can also be used to identify the potential for further integration between existing projects included in an IRWMP. Currently the GLAC Region has web-based project database (OPTI) that geo-references all projects included in the IRWM. As part of the 2013 Plan Update, this dataset of projects will eventually be updated and prioritized. This resulting project dataset could be included as a layer in the Geodatabase or conversely, the existing Geodatabase layers could be uploaded to OPTI for public viewing and made available to OPTI users. In the future, additional layers, such as groundwater quality and general plan areas, can be added to the Geodatabase to enhance the ability of project proponents to identify integration opportunities. Either way, by overlaying the current projects on top of the potential benefit layers, additional benefits could be added to existing project or linked to other projects and proponents through those benefits.

**Table 11: Potential Benefit Geodatabase Layers**

| Data Layer | Description |
|---|---|
| Supply: Recharge Areas[1] | Shows areas where soils suitable for recharging are above supply aquifer recharge zones. Thereby indicating that water infiltrating in these areas has the potential to increase groundwater supplies. |
| Supply: Existing and Potential Water Reclamation[2] | Shows locations of existing wastewater and water reclamation plants. |
| Flood: Special Flood Hazard Areas[3] | Shows some of the areas that would benefit from increased drainage to alleviate flooding potential. |
| Habitat: Historical and Current Aquatic[4] | Shows the combined current and historical habitat areas that would indicate the potential for aquatic habitat protection, enhancement, or restoration benefits to be derived. (Note: North Santa Monica Bay Subregion did not have similar data so it shows Significant Ecological Areas instead[5].) |
| Recreation: High Priority[6] | Shows areas that have the greatest need for open space recreation given the distance from current open space recreation sites. |
| Water Quality: Medium and High Priority[7] | Shows watershed areas with medium and high priority and therefore relative potential to improve surface water quality. |

[1] Created using Los Angeles County's groundwater basins shapefile overlaid with soils and known forebays shapefiles

[2] Created by RMC Water and Environment for the Los Angeles Department of Water and Power's Recycled Water Master Planning program to show sources of wastewater that could be made available for recycled water use.

[3] Created by Federal Emergency Management Agency to define areas at high risk for flooding (subject to inundation by the 1% annual chance flood event) and where national floodplain management regulations must be enforced

[4] From *Regional restoration goals for aquatic habitat resources in the Greater Los Angeles Drainage Area: A landscape-level comparison of recent historic and current conditions using GIS* (C. Rairdan, 1998) and additional current aquatic habitat is based on the extent of current habitat derived from the National Wetlands Inventory.

[5] Significant Ecological Areas are those areas defined by Los Angeles County as having ecologically important land and water systems that support valuable habitat for plants and animals.

[6] Created for the *GLAC IRWM Open Space for Habitat and Recreation Plan (2012)*, and shows where there is less than one acre of park or recreation area per one thousand residents.

[7] Created for the *GLAC IRWM Water Quality Targets TM (2012)*, which ranked catchments based on TMDLs, 303(d) listings and catchments that drain into Areas of Special Biological Significance (ASBS).

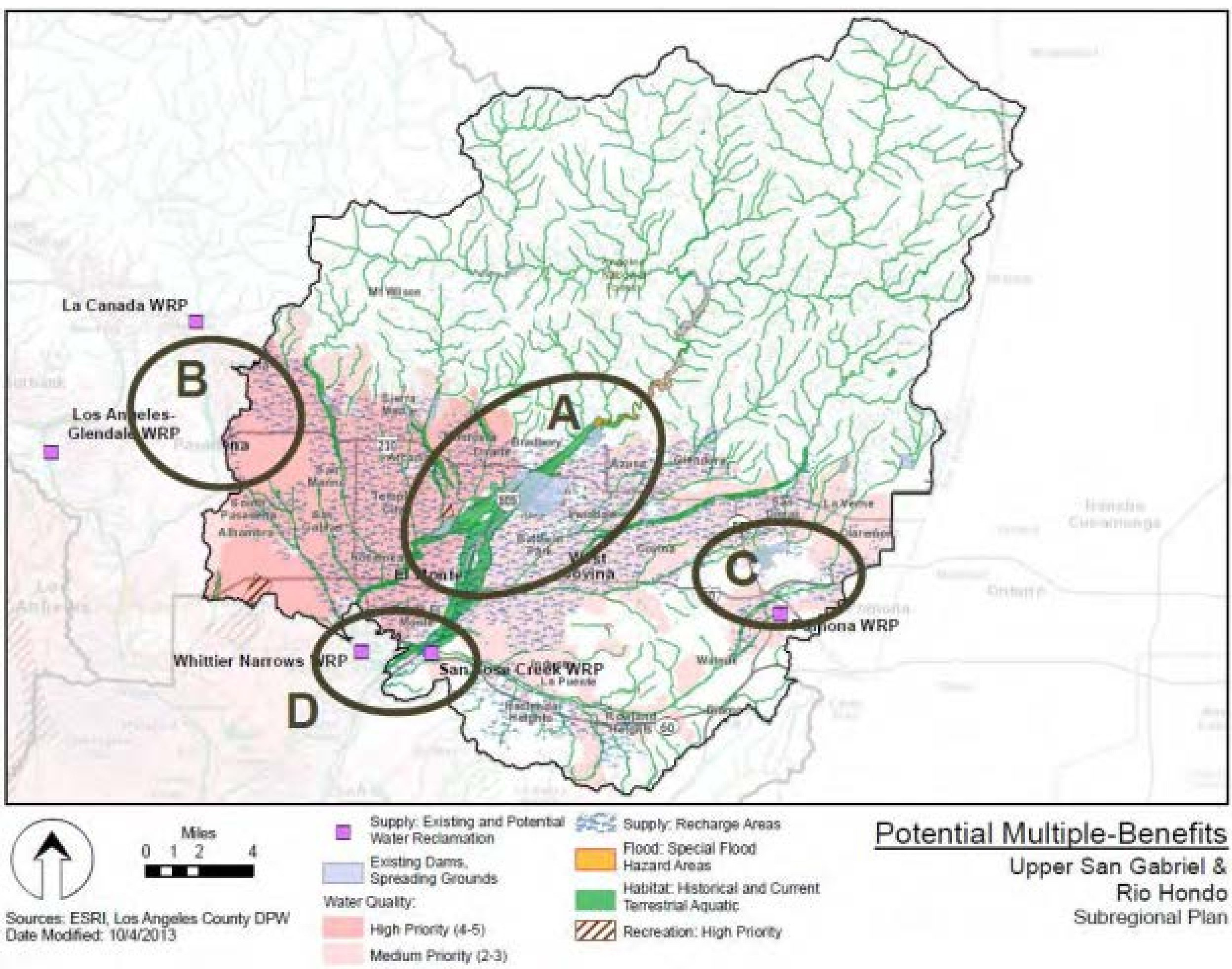
### 4.2 Upper San Gabriel and Rio Hondo Integration and Partnership Opportunities

Planning for the GLAC Region is primarily done on a sub-regional level, given that each subregion has a unique set of physical characteristics and stakeholders that create opportunities for project identification and collaboration. Therefore, the Geodatabase layers are more useful when examined and discussed on a subregional scale. Figure 16 focuses on the Upper San Gabriel and Rio Hondo Subregion and highlights just a few unique areas within the subregion that have potential for generating multiple benefit projects. These areas described here are meant to provide examples of potential multiple benefits areas and are not meant to be a comprehensive inventory of opportunities. As subregions move forward to identify potential projects, it will be necessary to examine localized site characteristics (such as land uses) to confirm that it will be possible to meet the potential benefits discussed below.

The Subregion's integration potential is notable relative to other subregions in a few ways:

- There are significant areas that are suitable for groundwater recharge.
- About half of the watershed is upland open space and half is urbanized.
- Improving groundwater quality and basin replenishment are important supply sources.
- There is access to unused stormwater supply and recycled water supply (though this may be dependent on the time of year or agreements for future supplies).

**Figure 16: Upper San Gabriel and Rio Hondo Subregion Potential Multiple-Benefits**



### A: Main San Gabriel Basin Water Quality and Basin Recharge

The headwaters of the San Gabriel River flow from the upland rural watershed into the lower more urbanized watershed that also serves as the main source of the Main San Gabriel Groundwater Basin. As Figure 16 shows, projects in the area have a great potential to provide water quality, supply habitat and integrated flood management benefits through integrated project development. Proximity to existing recharge and recycled water facilities also provide a foundation for further use of local supplies. Given the urbanized nature of this area, decentralized stormwater capture programs and BMPs could also be implemented. In addition, projects in this area could also include a habitat component to provide valuable habitat benefits.

### B. Inter-Regional Raymond Basin Water Supply and Quality

The Raymond Basin and the City of Pasadena are divided between the Upper Los Angeles River and Upper San Gabriel and Rio Hondo Subregions. This provides intra-regional opportunities between the ULAR and USGRH subregions for replenishment of the Raymond Basin to benefit both regions through both stormwater capture and accessing recycled water supplies from the Los Angeles-Glendale Water Reclamation Plant. This area, which includes the Rio Hondo watershed, also has been identified as a high priority drainage for achieving water quality benefits and therefore multiple benefits project opportunities. Partnerships between the City of Pasadena, other Raymond Basin pumpers, City of Los Angeles/City of Glendale and LACFCD could result in very beneficial integrated projects.

### C. Six Basins/Puente Basin Area Supply and Quality Improvement

The Six Basins and Puente Basin groundwater basins area can provide opportunities to provide regional water supply partnerships that could serve to maximize groundwater use through treatment and supply interties between neighboring agencies. Districts such as Walnut Valley Water District and Rowland Water District could work with neighboring agencies (such as cities of LA Verne, Pomona and Golden State Water Company) to increase water quality to levels that could be useful in offsetting their dependence on imported supply.

### D. Intra-Regional Montebello Forebay Recharge and Open Space

The San Gabriel River Valley narrows in the Montebello area which also provides the dividing line between the Upper San Gabriel and Rio Hondo Subregion and the Lower Los Angeles and San Gabriel Subregion. This area is also the main recharge Forebay for the Central Basin where several spreading ground facilities are located. Although somewhat urbanized relative to other densities in the Region, this area also provides a great deal of open space given those facilities. Preserving and further enhancing the spreading capacity is critical to meeting supply goals, as well as water quality goals. Increased stormwater infiltration will lessen the amount of contaminants able to be transported further downstream. If there are projects that could also incorporate both habitat and recreation elements without compromising these primary functions, there is the potential for achieving further integrated and beneficial results.

Recycled water supplies in this area could be further maximized for increased recharge and supply benefits. Partnerships with WRD, LACSD, LACFCD, Central Basin MWD, Central Basin pumpers and overlying cities could also benefit from above ground open space.

## References

Alhambra, City of, 2011. 2010 Urban Water Management Plan.

Arcadia, City of, 2011. 2010 Urban Water Management Plan.

Azusa Light and Power, 2011. 2010 Urban Water Management Plan.

California American Water Co., 2011. 2010 Urban Water Management Plan.

Foothill MWD, 2011. 2010 Urban Water Management Plan.

Los Angeles County Department of Regional Planning (LACDRP), 2011. Los Angeles County General Plan 2035. Public Review Draft.

Metropolitan Water District of Southern California (MWDSC), 2010. Integrated Regional Plan.

MWDSC, 2007. Groundwater Assessment Study. Report Number 1308. http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/GWAS.html

Monrovia, City of, 2011. 2010 Urban Water Management Plan.

Palos Verdes Peninsula Land Conservancy, 2011. Restoration and Land Stewardship. http://www.pvplc.org/_lands/stewardship.asp

Pasadena, City of, 2011. 2010 Urban Water Management Plan.

Regional Water Quality Control Board - Los Angeles Region (RWQCB), 2011. State of the Watershed - Report on Water Quality, The San Gabriel River Watershed.

RWQCB, 2011b. Shapefiles of Permitted Storm Sewer System (MS4) Discharges, Industrial General Discharges, and Caltrans Discharges.

San Gabriel Basin Water Quality Authority, 2012. *San Gabriel Basin Groundwater Quality Managementand Remediation Plan*. March 21.

San Gabriel County Water District, 2011. 2010 Urban Water Management Plan.

San Gabriel Valley Water Company, 2011. 2010 Urban Water Management Plan.

Sierra Madre, City of, 2011. 2010 Urban Water Management Plan.

State Water Resources Control Board (SWRCB), 2010. 2010 Integrated Report (Clean Water Act Section 303(3) List / 305(b) Report) - Statewide. http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

South Pasadena, City of, 2011. 2010 Urban Water Management Plan.

Southern California Association of Governments (SCAG), 2012. Adopted 2012 RTP Growth Forecast. http://www.scag.ca.gov/forecast/index.htm

Suburban Water Systems, San Jose Hills District, 2011. 2010 Urban Water Management Plan.

Three Valleys Municipal Water District, 2011. 2010 Urban Water Management Plan.

U.S. Census Bureau, 2012. 2010 Census Data. Census tract.

Valley County Water District, 2011. 2010 Urban Water Management Plan.

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# Exhibit A. Regional Imported Water Information

*State Water Project*

The SWP is a system of reservoirs, pumps and aqueducts that carries water from Lake Oroville and other facilities north of Sacramento to the Sacramento-San Joaquin Delta and then transports that water to central and southern California. Environmental concerns in the Sacramento-San Joaquin Delta have limited the volume of water that can be pumped from the SWP. The potential impact of further declines in ecological indicators in the Bay-Delta system on SWP water deliveries is unclear. Uncertainty about the long-term stability of the levee system surrounding the Delta system raises concerns about the ability to transfer water via the Bay-Delta to the SWP.

The MWDSC contract with the Department of Water Resources (DWR), operator of the SWP, is for 1,911,500 acre-feet/year. However, MWDSC projects a minimum dry year supply from the SWP of 370,000 acre-feet/year, and average annual deliveries of 1.4 million acre-feet/ year. These amounts do not include water which may become available from transfer and storage programs, or Delta improvements.

MWDSC began receiving water from the SWP in 1972. The infrastructure built for the project has become an important water management tool for moving not only annual deliveries from the SWP but also transfer water from other entities. MWDSC, among others, has agreements in place to store water at a number of groundwater basins along the aqueduct, primarily in Kern County. When needed, the project facilities can be used to move stored water to southern California.

*Colorado River Aqueduct*

California water agencies are entitled to 4.4 million acre-feet/year of Colorado River water. Of this amount, the first three priorities totaling 3.85 million acre-feet/year are assigned in aggregate to the agricultural agencies along the river. MWDSC's fourth priority entitlement is 550,000 acre-feet per year. Until a few years ago MWDSC routinely had access to 1.2 million acre-feet/year because Arizona and Nevada had not been using their full entitlement and the Colorado River flow was often adequate enough to yield surplus water to MWDSC. According to its 2010 Regional UWMP, MWDSC intends to obtain a full 1.2 million acre-feet/year when possible water management programs with agricultural and other holders. MWDSC delivers the available water via the 242-mile Colorado River Aqueduct, completed in 1941, which has a capacity of 1.2 million acre-feet per year.

The Quantification Settlement Agreement (QSA), executed in 2003, affirms the state's right to 4.4 million acre-feet per year, though water allotments to California from the Colorado River could be reduced during future droughts along the Colorado River watershed as other states increase their diversions in accord with their authorized entitlements. California's Colorado River Water Use Plan and the QSA provide numeric baseline to measure conservation and transfer water programs thus enable the shifting to conserve water (such as the lining of existing earthen canals) and to shift some water from agricultural use to urban use. Since the signing of the QSA, water conservation measures have been implemented including the agriculture-to-urban transfer of conserved water from Imperial Valley to San Diego, agricultural land fallowing with Palo Verde, and the lining of the All-American Canal.


## N. Greater Los Angeles County Detailed Supply Calculations

The detailed supply calculations tables that follow were used to develop the supply numbers cited in Appendix E GLAC IRWMP Water Supply Objectives and Targets.

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**Summary Retail Supply Table**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| GW | 269,654 | 273,989 | 274,846 | 275,208 | 275,673 | 276,291 |
| IW | 116,561 | 106,931 | 106,656 | 100,511 | 98,852 | 92,137 |
| RW | 29,606 | 42,670 | 44,695 | 47,620 | 48,745 | 49,870 |
| Local Surface Water | - | - | - | - | - | - |
| Conser | 327 | 567 | 1,090 | 1,614 | 2,137 | 2,575 |
| Water Trans | - | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 |
| SW Capture & Reuse | - | 80 | 240 | 400 | 640 | 1,000 |
| Desal | - | - | - | 5,000 | 5,000 | 10,000 |
| **Total Supply** | **416,148** | **425,837** | **429,127** | **431,953** | **432,647** | **433,473** |
| **Total Demand** | 348,212 | 378,941 | 387,490 | 396,401 | 398,703 | 400,916 |

**Summary Replenishment Supply Table**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| Imported Water | 23,000 | 23,000 | 23,000 | 23,000 | 23,000 | 23,000 |
| Recycled Water | 41,000 | 41,000 | 41,000 | 41,000 | 41,000 | 41,000 |
| Stormwater | 52,000 | 52,000 | 52,000 | 52,000 | 52,000 | 52,000 |
| **Total** | **116,000** | **116,000** | **116,000** | **116,000** | **116,000** | **116,000** |

**Los Angeles**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *LADWP 2010 UWMP* |
| GW | 11,766 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | *Exhibit 6G, Central Basin* |
| IW | 9,688 | (2,225) | (2,245) | (2,810) | (3,374) | (4,613) | *Demand-Local Supply* |
| RW | 50 | 9,570 | 10,395 | 11,220 | 12,045 | 12,870 | *Exhibit 4F, 4M (Irrigation, Commercial, Industrial)* |
| Local Surface Water | - | - | - | - | - | - | |
| Conser | 327 | 567 | 1,090 | 1,614 | 2,137 | 2,575 | *Area percentage applied* |
| Water Trans | - | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 | *Area percentage applied* |
| SW Capture & Reuse | - | 80 | 240 | 400 | 640 | 1,000 | *Area percentage applied* |
| Desal | - | - | - | - | - | - | |
| **Total Supply** | **21,831** | **24,592** | **26,080** | **27,024** | **28,048** | **28,432** | |
| **Total Demand** | 21,831 | 24,592 | 26,080 | 27,024 | 28,048 | 28,432 | *Area percentage applied* |

**Los Angeles (100%) - Percentage area applied.**

| | Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *LADWP 2010 UWMP* |
| 4% | GW | 76,982 | 40,500 | 96,300 | 111,500 | 111,500 | 110,405 | *Exhibit ES-R* |
| | IW | 463,614 | 540,120 | 508,040 | 481,760 | 484,781 | 477,027 | *Exhibit ES-R (Includes LA Aqueduct and MWD supplies)* |
| | RW | 6,703 | 20,000 | 20,400 | 27,000 | 29,000 | 29,000 | *Exhibit 4J, Exhibit 4L* |
| | Local Surface Water | | | | | | | |
| | Conser | 8,178 | 14,180 | 27,260 | 40,340 | 53,419 | 64,368 | *Exhibit ES-R* |
| | Water Trans | - | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 | *Exhibit ES-R* |
| | SW Capture & Reuse | - | 2,000 | 6,000 | 10,000 | 16,000 | 25,000 | *Exhibit ES-R* |
| | Desal | | | | | | | |
| | **Total Supply** | **555,477** | **656,800** | **698,000** | **710,600** | **734,700** | **745,800** | |
| | **Total Demand** | **545,771** | **614,800** | **652,000** | **675,600** | **701,200** | **710,800** | *Exhibit 2J, Demand Forecast with Passive and Active Water Conservation* |

**Long Beach**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Long Beach 2010 UWMP* |
| GW | 34,655 | 33,000 | 33,500 | 34,000 | 34,500 | 35,000 | *Table 16* |
| IW | 22,237 | 24,520 | 24,046 | 18,551 | 17,477 | 11,929 | *Table 16* |
| RW | 6,556 | 10,100 | 11,300 | 13,400 | 13,700 | 14,000 | *Table 16* |
| Local Surface Water | - | - | - | - | - | - | |
| Conser | - | - | - | - | - | - | |
| Water Trans | - | - | - | - | - | - | |
| SW Capture & Reuse | - | - | - | - | - | - | |
| Desal | - | - | - | 5,000 | 5,000 | 10,000 | *Table 16* |
| **Total Supply** | **63,448** | **67,620** | **68,846** | **70,951** | **70,677** | **70,929** | |
| **Total Demand** | 54,128 | 55,219 | 55,244 | 55,249 | 54,698 | 54,652 | *Table 11, Total water deliveries* |

**Fullerton**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Fullerton 2010 UWMP* |
| GW | 17,273 | 20,029 | 20,386 | 20,248 | 20,213 | 20,331 | *Table 2-9* |
| IW | 12,276 | 12,276 | 12,495 | 12,410 | 12,389 | 12,461 | *Table 2-9* |
| RW | - | - | - | - | - | - | |
| Local Surface Water | - | - | - | - | - | - | |
| Conser | - | - | - | - | - | - | |
| Water Trans | - | - | - | - | - | - | |
| SW Capture & Reuse | - | - | - | - | - | - | |
| Desal | - | - | - | - | - | - | |
| **Total Supply** | **29,549** | **32,305** | **32,881** | **32,658** | **32,602** | **32,792** | |
| **Total Demand** | 27,860 | 32,305 | 32,881 | 32,658 | 32,602 | 32,792 | *Table 2-4+Table 2-5* |

**Central Basin MWD**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Central Basin 2010 UWMP* |
| GW | 205,960 | 205,960 | 205,960 | 205,960 | 205,960 | 205,960 | *Table 3-1* |
| IW | 72,360 | 72,360 | 72,360 | 72,360 | 72,360 | 72,360 | *Table 3-1* |
| RW | 23,000 | 23,000 | 23,000 | 23,000 | 23,000 | 23,000 | *Table 3-1* |
| Local Surface Water | - | - | - | - | - | - | |
| Conser | - | - | - | - | - | - | |
| Water Trans | - | - | - | - | - | - | |
| SW Capture & Reuse | - | - | - | - | - | - | |
| Desal | - | - | - | - | - | - | |
| **Total Supply** | **301,320** | **301,320** | **301,320** | **301,320** | **301,320** | **301,320** | |
| **Total Demand** | **244,393** | **266,825** | **273,285** | **281,470** | **283,355** | **285,040** | *Table 2-4* |

**Summary Retail Supply Table**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| GW | 195 | 188 | 188 | 188 | 188 | 188 |
| IW | 35,202 | 43,233 | 43,184 | 44,410 | 48,214 | 46,716 |
| RW | 5,439 | 5,545 | 6,690 | 7,836 | 8,981 | 9,211 |
| SurfW | - | - | - | - | - | - |
| Desal | - | - | - | - | - | - |
| Conser | - | - | - | - | - | - |
| Water Trans | - | - | - | - | - | - |
| SW Reuse | - | - | - | - | - | - |
| Total | 40,836 | 48,965 | 50,062 | 52,434 | 57,383 | 56,115 |
| Demand | 40,836 | 42,218 | 39,701 | 40,771 | 44,427 | 42,782 |

Las Virgenes (87% in NSMB)

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Las Virgenes 2010 UWMP* |
| GW | 195 | 188 | 188 | 188 | 188 | 188 | *Area percentage applied* |
| IW | 18,454 | 23,153 | 23,962 | 24,780 | 25,561 | 26,306 | *Area percentage applied* |
| RW | 3,934 | 4,244 | 5,381 | 6,519 | 7,656 | 7,884 | *Area percentage applied* |
| SurfW | | | | | | | |
| Desal | | | | | | | |
| Conser | | | | | | | |
| Water Trans | | | | | | | |
| SW Reuse | | | | | | | |
| **Total** | **22,583** | **27,585** | **29,530** | **31,487** | **33,405** | **34,378** | |
| **Demand** | **22,583** | **20,837** | **19,170** | **19,825** | **20,448** | **21,045** | *Area percentage applied* |

Las Virgenes (100%)

| | Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *Las Virgenes 2010 UWMP* |
| 87% | GW | 224 | 216 | 216 | 216 | 216 | 216 | *Table 3.1, Table 3.2* |
| | IW | 21,212 | 26,613 | 27,542 | 28,483 | 29,380 | 30,237 | *Table 3.3* |
| | RW | 4,522 | 4,878 | 6,185 | 7,493 | 8,800 | 9,062 | *Table 4.4* |
| | SurfW | | | | | | | |
| | Desal | | | | | | | |
| | Conser | | | | | | | |
| | Water Trans | | | | | | | |
| | SW Reuse | | | | | | | |
| | **Total** | **25,958** | **31,707** | **33,943** | **36,192** | **38,396** | **39,515** | |
| | **Demand** | **25,958** | **23,951** | **22,034** | **22,787** | **23,504** | **24,190** | *Table ES.2* |

Malibu

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *LA County Waterworks No. 29 2010 UWMP* |
| GW | | | | | | | |
| IW | 5,355 | 7,176 | 7,056 | 7,428 | 10,421 | 8,142 | *Population percentage applied* |
| RW | | | | | | | |
| SurfW | | | | | | | |
| Desal | | | | | | | |
| Conser | | | | | | | |
| Water Trans | | | | | | | |
| SW Reuse | | | | | | | |
| **Total** | **5,355** | **7,176** | **7,056** | **7,428** | **10,421** | **8,142** | |
| **Demand** | **5,355** | **7,176** | **7,056** | **7,428** | **10,421** | **8,142** | *Equal to imported supply projections* |

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *LA County Waterworks No. 29 2010 UWMP* |
| IW | 8289 | 11293 | 11220 | 11922 | 12608 | 13266 | *Table 2.1* |
| **Population Proportions** | | | | | | | |
| Non-MDRey | 20174 | 20977 | 22194 | 23365 | 24514 | 25611 | *Table 1.3* |
| Total Pop. Regi | 31229 | 33011 | 35293 | 37502 | 29660 | 41729 | *Table 1.3* |
| | 65% | 64% | 63% | 62% | 83% | 61% | |

California Water Services Co. Westlake

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *California Water Services, Weslake, 2010 UWMP* |
| GW | | | | | | | |
| IW | 7,633 | 8,416 | 7,497 | 7,532 | 7,563 | 7,598 | *Table 5.2-4* |
| RW | 419 | 421 | 422 | 424 | 425 | 427 | *Table 5.2-4* |
| SurfW | | | | | | | |
| Desal | | | | | | | |
| Conser | | | | | | | |
| Water Trans | | | | | | | |
| SW Reuse | | | | | | | |
| **Total** | **8,052** | **8,837** | **7,919** | **7,956** | **7,988** | **8,025** | |
| **Demand** | **8,052** | **8,837** | **7,919** | **7,956** | **7,988** | **8,025** | *Table 5.2-4* |

Lake Sherwood

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Calleguas MWD 2010 UWMP - Lake Sherwood* |
| **GW** | | | | | | | |
| **IW** | 1,203 | 1,387 | 1,570 | 1,570 | 1,570 | 1,570 | *Appendix C, Table 10* |
| **RW** | 300 | 300 | 300 | 300 | 300 | 300 | *Appendix C, Table 10* |
| **SurfW** | | | | | | | |
| **Desal** | | | | | | | |
| **Conser** | | | | | | | |
| **Water Trans** | | | | | | | |
| **SW Reuse** | | | | | | | |
| **Total** | **1,503** | **1,687** | **1,870** | **1,870** | **1,870** | **1,870** | |
| **Demand** | **1,503** | **1,687** | **1,870** | **1,870** | **1,870** | **1,870** | *Appendix C, Table 10* |

Triunfo Sanitation District

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Triunfo Sanitation District 2010 UWMP* |
| **GW** | | | | | | | |
| **IW** | 2,557 | 3,100 | 3,100 | 3,100 | 3,100 | 3,100 | *Table 4.1.1* |
| **RW** | 786 | 580 | 587 | 593 | 600 | 600 | *Table 4.1.1* |
| **SurfW** | | | | | | | |
| **Desal** | | | | | | | |
| **Conser** | | | | | | | |
| **Water Trans** | | | | | | | |
| **SW Reuse** | | | | | | | |
| **Total** | **3,343** | **3,680** | **3,687** | **3,693** | **3,700** | **3,700** | |
| **Demand** | **3,343** | **3,680** | **3,687** | **3,693** | **3,700** | **3,700** | *Table 4.1.1* |

**Summary Retail Supply Table**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| GW | 89,773 | 52,306 | 108,106 | 123,306 | 119,206 | 122,211 |
| IW | 285,670 | 336,385 | 289,948 | 278,272 | 285,974 | 276,774 |
| RW | 12,898 | 17,719 | 21,009 | 22,432 | 23,854 | 25,140 |
| Desal | - | - | - | - | - | - |
| Local Surface Water | 952 | 952 | 952 | 952 | 952 | 952 |
| Conserv | 4,743 | 9,224 | 17,811 | 25,789 | 33,583 | 40,081 |
| Stormwater Capture ar | - | 1,160 | 3,480 | 5,800 | 9,280 | 14,500 |
| Water Transfer | - | 23,200 | 23,451 | 23,451 | 23,451 | 23,451 |
| **Total Supply** | **394,036** | **440,946** | **464,757** | **480,001** | **496,299** | **503,109** |
| **Total Demand** | **393,727** | **439,111** | **462,331** | **477,376** | **493,481** | **500,228** |

**Glendale**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Glendale 2010 UWMP* |
| GW | 9,788 | 11,656 | 11,656 | 11,656 | 11,656 | 11,656 | *Table 3-3* |
| IW | 16,550 | 17,620 | 17,755 | 17,890 | 18,025 | 18,162 | *Table 3-3* |
| RW | 1,662 | 1,662 | 1,662 | 1,662 | 1,662 | 1,662 | *Table 3-3* |
| Desal | - | - | - | - | - | - | |
| Local Surface Water | - | - | - | - | - | - | |
| Conserv | - | - | - | - | - | - | |
| Stormwater Capture ar | - | - | - | - | - | - | |
| Water Transfer | - | - | - | - | - | - | |
| **Total Supply** | **28,000** | **30,938** | **31,073** | **31,208** | **31,343** | **31,480** | |
| **Total Demand** | **27,691** | **30,110** | **30,196** | **30,326** | **30,460** | **30,591** | *Table 2-1, Table 2-4* |

**Foothill MWD (Crescenta, La Canada ID, Lincoln Ave Water Co, Mesa Crest Water Co, Valley Water Co)**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Foothill MWD 2010 UWMP* |
| GW | - | - | - | - | - | - | |
| IW | 8,813 | 9,696 | 10,246 | 10,523 | 10,806 | 11,105 | *Difference of Demand and RW* |
| RW | 104 | 120 | 120 | 120 | 120 | 120 | *Assumes all RW in ULAR* |
| Desal | - | - | - | - | - | - | |
| Local Surface Water | - | - | - | - | - | - | |
| Conserv | - | - | - | - | - | - | |
| Stormwater Capture ar | - | - | - | - | - | - | |
| Water Transfer | - | - | - | - | - | - | |
| **Total Supply** | **8,917** | **9,816** | **10,366** | **10,643** | **10,926** | **11,225** | |
| **Total Demand** | **8,917** | **9,816** | **10,366** | **10,643** | **10,926** | **11,225** | *Table 2-3* |

**Burbank**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Burbank 2010 UWMP* |
| GW | 9,917 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | *Table 4-2* |
| IW | 9,886 | 8,850 | 7,981 | 8,441 | 8,979 | 9,491 | *Table 4-2* |
| RW | 2,010 | 3,660 | 5,160 | 5,160 | 5,160 | 5,160 | *Table 4-2* |
| Desal | - | - | - | - | - | - | |
| Local Surface Water | - | - | - | - | - | - | |
| Conserv | - | - | - | - | - | - | |
| Stormwater Capture ar | - | - | - | - | - | - | |
| Water Transfer | - | - | - | - | - | - | |
| **Total Supply** | **21,813** | **23,510** | **24,141** | **24,601** | **25,139** | **25,651** | |
| **Total Demand** | **21,813** | **23,511** | **24,141** | **24,601** | **25,139** | **25,651** | *Table 3-10* |

**Summary Replenishment Supply Table**

| Replenishment Supply | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| IW | 2,034 | 2,100 | 500 | 300 | 200 | 100 |
| RW | - | - | - | 15,000 | 22,500 | 30,000 |
| SW | 32,952 | 32,952 | 35,203 | 37,203 | 41,203 | 48,203 |
| | 34,986 | 35,052 | 35,703 | 52,503 | 63,903 | 78,303 |

**LADWP**

| Replenishment Supply | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *LADWP 2010 UWMP* |
| IW | - | - | - | - | - | - | |
| RW | - | - | - | 15,000 | 22,500 | 30,000 | *Exhibit 11E* |
| SW | - | - | 2,000 | 4,000 | 8,000 | 15,000 | *Exhibit 11E* |

40% **Pasadena**

| Replenishment Supply | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Pasadena 2010 UWMP* |
| IW | | | | | | | |
| RW | | | | | | | |
| SW | 2,380 | 2,380 | 3,007 | 3,007 | 3,007 | 3,007 | *Table ES-1 - Included under diversions + average spreading in section 4.3.3* |

**Burbank**

| Replenishment Supply | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Burbank 2010 UWMP* |
| IW | 2,034 | 2,100 | 500 | 300 | 200 | 100 | *Table 3-11* |
| RW | | | | | | | |
| SW | | | | | | | |

**LA County Flood Control District**

| Replenishment Supply | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| IW | - | - | - | - | - | - | |
| RW | - | - | - | - | - | - | |
| SW | 32,000 | 32,000 | 32,000 | 32,000 | 32,000 | 32,000 | *ULARA Watermaster Report, 2009/2010 water year* |

**Pasadena**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Pasadena 2010 UWMP* |
| **GW** | 4,822 | 4,122 | 4,122 | 4,122 | 4,122 | 4,122 | *Area percentage applied* |
| **IW** | 9,610 | 9,450 | 8,460 | 8,460 | 8,460 | 8,460 | *Area percentage applied* |
| **RW** | - | 452 | 820 | 820 | 820 | 820 | *Area percentage applied* |
| **Desal** | - | - | - | - | - | - | *Area percentage applied* |
| **Local Surface Water** | 952 | 952 | 952 | 952 | 952 | 952 | |
| **Conserv** | - | 1,000 | 2,000 | 2,392 | 2,600 | 2,748 | *Area percentage applied* |
| **Stormwater Capture ar** | - | - | - | - | - | - | |
| **Water Transfer** | - | - | 251 | 251 | 251 | 251 | *Area percentage applied* |
| **Total Supply** | **15,384** | **15,976** | **16,604** | **16,996** | **17,204** | **17,352** | |
| **Total Demand** | **15,384** | **15,976** | **16,604** | **16,996** | **17,204** | **17,352** | *Area percentage applied* |

**Pasadena (100%)**

| | Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *Pasadena 2010 UWMP* |
| 40% | **GW** | 12,056 | 10,304 | 10,304 | 10,304 | 10,304 | 10,304 | *Table ES-1* |
| | **IW** | 24,024 | 23,626 | 21,149 | 21,149 | 21,149 | 21,149 | *Table ES-1* |
| | **RW** | - | 1,130 | 2,050 | 2,050 | 2,050 | 2,050 | *Table ES-1* |
| | **SurfW** | 2,380 | 2,380 | 2,380 | 2,380 | 2,380 | 2,380 | *Table ES-1* |
| | **Desal** | - | - | - | - | - | - | |
| | **Conser** | - | 2,500 | 5,000 | 5,980 | 6,500 | 6,870 | *Table ES-1* |
| | **Water Trans** | | | | | | | |
| | **SW Reuse** | - | - | 627 | 627 | 627 | 627 | *Table ES-1* |
| | **Total** | **38,460** | **39,940** | **41,510** | **42,490** | **43,010** | **43,380** | |
| | **Demand** | **38,460** | **39,940** | **41,510** | **42,490** | **43,010** | **43,380** | *Table ES-1* |

**Los Angeles**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|
| | | | | | | | *LADWP 2010 UWMP* |
| **GW** | 65,216 | 25,500 | 81,300 | 96,500 | 92,400 | 95,405 | *Exhibit 6G, San Fernando+Sylmar* |
| **IW** | 238,054 | 287,309 | 241,926 | 229,255 | 235,885 | 225,626 | *Demand-Local Supply* |
| **RW** | 8,534 | 11,191 | 12,443 | 13,696 | 14,948 | 16,200 | *Exhibit 4G+4H, 4N+4O, 4Q(Irrigation, Industrial)* |
| **Desal** | - | - | - | - | - | - | |
| **Local Surface Water** | - | - | - | - | - | - | |
| **Conserv** | 4,743 | 8,224 | 15,811 | 23,397 | 30,983 | 37,333 | *Area percentage applied* |
| **Stormwater Capture ar** | - | 1,160 | 3,480 | 5,800 | 9,280 | 14,500 | *Area percentage applied* |
| **Water Transfer** | - | 23,200 | 23,200 | 23,200 | 23,200 | 23,200 | *Area percentage applied* |
| **Total Supply** | **316,547** | **356,584** | **378,160** | **391,848** | **406,696** | **412,264** | |
| **Total Demand** | **316,547** | **356,584** | **378,160** | **391,848** | **406,696** | **412,264** | *Area percentage applied* |

**Los Angeles (100%) - Percentage area applied to demand only. Supply numbers received via email from LADWP.**

| | Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *LADWP 2010 UWMP* |
| | **GW** | 76,982 | 40,500 | 96,300 | 111,500 | 111,500 | 110,405 | *Exhibit ES-R* |
| | **IW** | 463,614 | 540,120 | 508,040 | 481,760 | 484,781 | 477,027 | *Exhibit ES-R (Includes LA Aqueduct and MWD supplies)* |
| | **RW** | 9,623 | 20,000 | 20,400 | 27,000 | 29,000 | 29,000 | *Exhibit 4J, Exhibit 4L* |
| | **Desal** | - | - | - | - | - | - | |
| | **Local Surface Water** | - | - | - | - | - | - | |
| | **Conserv** | 8,178 | 14,180 | 27,260 | 40,340 | 53,419 | 64,368 | *Exhibit ES-R* |
| | **Stormwater Capture** | - | 2,000 | 6,000 | 10,000 | 16,000 | 25,000 | *Exhibit ES-R* |
| | **Water Transfer** | - | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 | *Exhibit ES-R* |
| Area | **Total Supply** | **558,397** | **656,800** | **698,000** | **710,600** | **734,700** | **745,800** | |
| 58% | **Demand** | **545,771** | **614,800** | **652,000** | **675,600** | **701,200** | **710,800** | *Exhibit 2J, Demand Forecast with Passive and Active Water Conservation* |

**Las Virgenes (13%)**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Las Virgenes 2010 UWMP* |
| **GW** | 29 | 28 | 28 | 28 | 28 | 28 | *Area percentage applied* |
| **IW** | 2,758 | 3,460 | 3,580 | 3,703 | 3,819 | 3,931 | *Area percentage applied* |
| **RW** | 588 | 634 | 804 | 974 | 1,144 | 1,178 | *Area percentage applied* |
| **Desal** | - | - | - | - | - | - | |
| **Local Surface Water** | - | - | - | - | - | - | |
| **Conserv** | - | - | - | - | - | - | |
| **Stormwater Capture ar** | - | - | - | - | - | - | |
| **Water Transfer** | - | - | - | - | - | - | |
| **Total Supply** | **3,375** | **4,122** | **4,413** | **4,705** | **4,991** | **5,137** | |
| **Total Demand** | **3,375** | **3,114** | **2,864** | **2,962** | **3,056** | **3,145** | *Area percentage applied* |

**Las Virgenes (100%)**

| | Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *Las Virgenes 2010 UWMP* |
| 13% | **GW** | 224 | 216 | 216 | 216 | 216 | 216 | *Table 3.1, Table 3.2* |
| | **IW** | 21,212 | 26,613 | 27,542 | 28,483 | 29,380 | 30,237 | *Table 3.3* |
| | **RW** | 4,522 | 4,878 | 6,185 | 7,493 | 8,800 | 9,062 | *Table 4.4* |
| | **SurfW** | - | - | - | - | - | - | |
| | **Desal** | - | - | - | - | - | - | |
| | **Conser** | - | - | - | - | - | - | |
| | **Water Trans** | - | - | - | - | - | - | |
| | **SW Reuse** | - | - | - | - | - | - | |
| | **Total** | **25,958** | **31,707** | **33,943** | **36,192** | **38,396** | **39,515** | |
| | **Demand** | **25,958** | **23,951** | **22,034** | **22,787** | **23,504** | **24,190** | *Table ES.2* |

**Summary Retail Supply Table**

| Retail Supply & Demand Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| **Groundwater Pumping** | 199,376 | 207,696 | 217,764 | 218,766 | 221,376 | 222,609 |
| **Imported Water** | 101,350 | 120,442 | 118,371 | 121,568 | 125,114 | 126,887 |
| **Recycled Water (NPR)** | 8,738 | 12,356 | 15,621 | 17,217 | 18,903 | 20,572 |
| **Local Surface Water** | 13,212 | 18,380 | 18,341 | 18,341 | 18,341 | 18,341 |
| **Desalination** | - | - | - | - | - | - |
| **Conservation** | 19,199 | 22,691 | 24,718 | 27,563 | 30,016 | 32,258 |
| **Water Transfer** | (34) | - | - | - | - | - |
| **Stormwater Capture and Reuse** | 1,428 | 1,428 | - | - | - | - |
| **Total** | **343,269** | **382,993** | **394,816** | **403,456** | **413,751** | **420,668** |
| **Demand** | **305,513** | **325,122** | **341,951** | **349,647** | **357,392** | **363,856** |

**Summary Replenishment Supply Table**

| Replenishment Supply (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | |
|---|---|---|---|---|---|---|---|
| **IW** | 32,775 | 38,015 | 31,255 | 34,255 | 38,255 | 38,255 | |
| **RW** | - | - | 5,000 | 5,000 | 10,000 | 10,000 | |
| **SW (MSGB)** | 110,000 | 110,000 | 110,000 | 110,000 | 110,000 | 110,000 | LA County Hydrologic Reports |
| **SW (Raymond)** | 1,428 | 1,428 | 1,804 | 1,804 | 1,804 | 1,804 | |
| **Total** | **144,203** | **149,443** | **148,059** | **151,059** | **160,059** | **160,059** | |

| USGVMWD (replenishment) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *USGVMWD 2010 UWMP* |
|---|---|---|---|---|---|---|---|
| **IW for recharge** | 21000 | 25000 | 16000 | 19000 | 23000 | 23000 | *Table 6* |
| **RW for recharge** | 0 | 0 | 5000 | 5000 | 10000 | 10000 | *Table 6* |

| TVMWD (replenishment) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *TVMWD 2010 UWMP* |
|---|---|---|---|---|---|---|---|
| **IW for recharge** | 5000 | 5000 | 6000 | 6000 | 6000 | 6000 | *Table 3-4* |

| SGVMWD (replenishment) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *SGVMWD 2010 UWMP* |
|---|---|---|---|---|---|---|---|
| **IW for recharge** | 6775 | 8015 | 9255 | 9255 | 9255 | 9255 | *Table 5* |

**Pasadena (60%)**

| Supply Summary (AF) | | | | | | | *Source* |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Pasadena 2010 UWMP* |
| **GW** | 7,234 | 6,182 | 6,182 | 6,182 | 6,182 | 6,182 | *Area percentage applied* |
| **IW** | 14,414 | 14,176 | 12,689 | 12,689 | 12,689 | 12,689 | *Area percentage applied* |
| **RW** | - | 678 | 1,230 | 1,230 | 1,230 | 1,230 | *Area percentage applied* |
| **SurfW** | 1,428 | 1,428 | 1,428 | 1,428 | 1,428 | 1,428 | *Area percentage applied* |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | 1,500 | 3,000 | 3,588 | 3,900 | 4,122 | *Area percentage applied* |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Recharge** | 1,428 | 1,428 | - | - | - | - | *Included under replenishment supply* |
| **Total** | **24,504** | **25,392** | **24,530** | **25,118** | **25,430** | **25,652** | |
| **Demand** | **23,076** | **23,964** | **24,906** | **25,494** | **25,806** | **26,028** | *Area percentage applied* |
| | 59% | | | | | | |

**Pasadena (100%)**

60%

| Supply Summary (AF) | | | | | | | *Source* |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Pasadena 2010 UWMP* |
| **GW** | 12,056 | 10,304 | 10,304 | 10,304 | 10,304 | 10,304 | *Table ES-1* |
| **IW** | 24,024 | 23,626 | 21,149 | 21,149 | 21,149 | 21,149 | *Table ES-1* |
| **RW** | - | 1,130 | 2,050 | 2,050 | 2,050 | 2,050 | *Table ES-1* |
| **Surface Water use** | 2,380 | 2,380 | 2,380 | 2,380 | 2,380 | 2,380 | *Table ES-1* |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | 2,500 | 5,000 | 5,980 | 6,500 | 6,870 | *Table ES-1* |
| **Water Trans** | | | | | | | |
| **Surface Water Recharge** | 2,380 | 2,380 | 3,007 | 3,007 | 3,007 | 3,007 | *Table ES-1 - Included under recharge* |
| **Total** | **40,840** | **42,320** | **43,890** | **44,870** | **45,390** | **45,760** | |
| **Demand** | **38,460** | **39,940** | **41,510** | **42,490** | **43,010** | **43,380** | *Table ES-1* |

**Foothill MWD (Las Flores WC, Rubio Canon Land-Water Assoc, Kinneloa ID)**

| Supply Summary (AF) | | | | | | | *Source* |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Foothill MWD 2010 UWMP* |
| **GW** | - | - | - | - | - | - | |
| **IW** | 1,170 | 1,478 | 1,293 | 1,363 | 1,436 | 1,510 | *Equal to demand* |
| **RW** | - | - | - | - | - | - | |
| **SurfW** | - | - | - | - | - | - | |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Reuse** | - | - | - | - | - | - | |
| **Total** | **1,170** | **1,478** | **1,293** | **1,363** | **1,436** | **1,510** | |
| **Demand** | **1,170** | **1,478** | **1,293** | **1,363** | **1,436** | **1,510** | *Table 2-3* |
| | 100% | | | | | | |

**South Pasadena**

| Supply Summary (AF) | | | | | | | *Source* |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *South Pasadena 2010 UWMP* |
| **GW** | 4,713 | 1,768 | 4,261 | 4,283 | 4,304 | 4,325 | *Table 5* |
| **IW** | 25 | 15 | 15 | 15 | 15 | 15 | *Table 5* |
| **RW** | - | - | - | - | - | - | |
| **SurfW** | - | - | - | - | - | - | |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Reuse** | - | - | - | - | - | - | |
| **Total** | **4,738** | **1,783** | **4,276** | **4,298** | **4,319** | **4,340** | |
| **Demand** | **4,738** | **4,777** | **4,276** | **4,298** | **4,319** | **4,340** | *Table 8* |

**Alhambra**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Alhambra 2010 UWMP* |
| GW | 15,650 | 15,650 | 16,375 | 16,375 | 17,900 | 17,900 | *Table 13* |
| IW | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | *Table 13* |
| RW | - | - | - | - | - | - | |
| SurfW | - | - | - | - | - | - | |
| Desal | - | - | - | - | - | - | |
| Conser | - | - | - | - | - | - | |
| Water Trans | - | - | - | - | - | - | |
| SW Reuse | - | - | - | - | - | - | |
| Total | 18,650 | 18,650 | 19,375 | 19,375 | 20,900 | 20,900 | |
| Demand | 10,423 | 11,407 | 13,250 | 13,450 | 13,450 | 13,450 | *Table 8, Table 9, Table 10, Table 11* |

**California American Water Co. (not including Baldwin Hills)**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *CalAm 2010 UWMP* |
| GW | 15,886 | 16,102 | 16,102 | 16,102 | 16,102 | 16,102 | *Table 4-1* |
| IW | 937 | 3,944 | 3,024 | 3,516 | 3,990 | 3,990 | *Table 4-1* |
| RW | - | - | - | - | - | - | |
| SurfW | - | - | - | - | - | - | |
| Desal | - | - | - | - | - | - | |
| Conser | - | - | - | - | - | - | |
| Water Trans | - | - | - | - | - | - | |
| SW Reuse | - | - | - | - | - | - | |
| Total | 16823 | 20046 | 19126 | 19618 | 20092 | 20092 | |
| Demand | 15514 | 18410 | 17490 | 17982 | 18457 | 18932 | *Table 3-2* |

**San Gabriel County WD**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *San Gabriel County WD 2010 UWMP* |
| GW | 6,378 | 7,612 | 7,348 | 7,561 | 7,767 | 7,973 | *Table 20* |
| IW | - | - | - | - | - | - | |
| RW | - | - | - | - | - | - | |
| SurfW | - | - | - | - | - | - | |
| Desal | - | - | - | - | - | - | |
| Conser | - | - | - | - | - | - | |
| Water Trans | - | - | - | - | - | - | |
| SW Reuse | - | - | - | - | - | - | |
| Total | 6,378 | 7,612 | 7,348 | 7,561 | 7,767 | 7,973 | |
| Demand | 6,378 | 7,612 | 7,348 | 7,561 | 7,767 | 7,973 | *Table 7* |

**San Gabriel Valley Water Co.**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *San Gabriel Valley Water Co. 2010 UWMP* |
| GW | 35,461 | 34,961 | 43,223 | 44,212 | 44,950 | 45,688 | *Table 9* |
| IW | - | - | - | - | - | - | |
| RW | 2,015 | 3,000 | 4,500 | 5,000 | 6,000 | 7,000 | *Table 9* |
| SurfW | - | - | - | - | - | - | |
| Desal | - | - | - | - | - | - | |
| Conser | - | - | - | - | - | - | |
| Water Trans | - | - | - | - | - | - | |
| SW Reuse | - | - | - | - | - | - | |
| Total | 37,476 | 37,961 | 47,723 | 49,212 | 50,950 | 52,688 | |
| Demand | 37,476 | 37,961 | 47,723 | 49,212 | 50,950 | 52,688 | *Table 7, Table 8* |

**Arcadia**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Arcadia 2010 UWMP* |
| GW | 15,512 | 16,452 | 14,586 | 14,508 | 14,772 | 15,036 | *Table 9* |
| IW | - | - | - | - | - | - | |
| RW | - | - | 300 | 644 | 644 | 644 | *Table 9* |
| SurfW | - | - | - | - | - | - | |
| Desal | - | - | - | - | - | - | |
| Conser | - | - | - | - | - | - | |
| Water Trans | - | - | - | - | - | - | |
| SW Reuse | - | - | - | - | - | - | |
| Total | 15,512 | 16,452 | 14,886 | 15,152 | 15,416 | 15,680 | |
| Demand | 15,798 | 16,475 | 14,909 | 15,173 | 15,438 | 15,702 | *Table 13* |

**Azusa Light and Water**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Azusa 2010 UWMP* |
| **GW** | 16,487 | 24,350 | 24,350 | 24,350 | 24,350 | 24,350 | *Table 2.6, Table 2.7* |
| **IW** | - | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | *Table 2.6, Table 2.7* |
| **RW** | - | - | - | - | - | - | |
| **Local Surface Water** | 5,059 | 10,100 | 10,100 | 10,100 | 10,100 | 10,100 | *Table 2.6, Table 2.7* |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Reuse** | - | - | - | - | - | - | |
| **Total** | **21546** | **38450** | **38450** | **38450** | **38450** | **38450** | |
| **Demand** | **21546** | **21641** | **22582** | **23523** | **24464** | **25405** | *Table 4.1, Table 4.7* |

**Three Valleys MWD**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *TVMWD 2010 UWMP* |
| **GW** | 46,056 | 46,137 | 46,141 | 46,146 | 46,151 | 46,155 | *Table 3-4 (Groundwater Production + Recovery)* |
| **IW** | 64,748 | 77,343 | 77,864 | 80,499 | 83,498 | 85,197 | *Table 3-4 (Full Service Tier I and Tier II)* |
| **RW** | 5,317 | 7,272 | 8,185 | 8,937 | 9,623 | 10,292 | *Table 3-4* |
| **SurfW** | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 | *Table 3-4* |
| **Desal** | | | | | | | |
| **Conser** | 19,199 | 20,381 | 20,908 | 23,165 | 25,306 | 27,326 | *Table 3-4* |
| **Water Trans** | | | | | | | |
| **SW Reuse** | | | | | | | |
| **Total** | **141,820** | **157,633** | **159,598** | **165,247** | **171,078** | **175,470** | |
| **Demand** | **122,620** | **131,620** | **138,690** | **142,082** | **145,772** | **148,144** | *Table 3-4* |

**Suburban Water Systems (San Jose Hills)**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Suburban Water Systems 2010 UWMP* |
| **GW** | 19,294 | 19,294 | 20,441 | 20,441 | 20,441 | 20,441 | *Table 3-1* |
| **IW** | 15,289 | 15,289 | 15,289 | 15,289 | 15,289 | 15,289 | *Table 3-1* |
| **RW** | 1,406 | 1,406 | 1,406 | 1,406 | 1,406 | 1,406 | *Table 3-1* |
| **SurfW** | - | - | - | - | - | - | |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | 810 | 810 | 810 | 810 | 810 | *Table 2-10* |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Reuse** | - | - | - | - | - | - | |
| **Total** | **35,989** | **36,799** | **37,946** | **37,946** | **37,946** | **37,946** | |
| **Demand** | **28,300** | **30,380** | **30,380** | **30,380** | **30,380** | **30,380** | *Table 2-10* |

**Sierra Madre**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Sierra Madre 2010 UWMP* |
| **GW** | 2,525 | 2,579 | 2,296 | 2,297 | 2,298 | 2,298 | *Table 9* |
| **IW** | - | - | - | - | - | - | |
| **RW** | - | - | - | - | - | - | |
| **SurfW** | 225 | 352 | 313 | 313 | 313 | 313 | *Table 9* |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Reuse** | - | - | - | - | - | - | |
| **Total** | **2,750** | **2,931** | **2,609** | **2,610** | **2,611** | **2,611** | |
| **Demand** | **2,750** | **2,930** | **2,609** | **2,610** | **2,611** | **2,611** | *Table 7* |

**Monrovia**

| Supply Summary (AF) | | | | | | | Source |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Monrovia 2010 UWMP* |
| **GW** | 7,600 | 7,450 | 7,300 | 7,150 | 7,000 | 7,000 | *Table #8* |
| **IW** | - | - | - | - | - | - | |
| **RW** | - | - | - | - | - | - | |
| **SurfW** | - | - | - | - | - | - | |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Reuse** | - | - | - | - | - | - | |
| **Total** | **7,600** | **7,450** | **7,300** | **7,150** | **7,000** | **7,000** | |
| **Demand** | **7,411** | **7,266** | **7,123** | **6,983** | **6,847** | **6,847** | *Table #8* |

**Valley County WD**

| Supply Summary (AF) | | | | | | | *Source* |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Valley County WD 2010 UWMP* |
| **GW** | 6,580 | 9,159 | 9,159 | 9,159 | 9,159 | 9,159 | *Table 17* |
| **IW** | 1,767 | 1,197 | 1,197 | 1,197 | 1,197 | 1,197 | *Table 17 (Import from MWD+CIC)* |
| **RW** | - | - | - | - | - | - | |
| **SurfW** | - | - | - | - | - | - | |
| **Desal** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | (34) | - | - | - | - | - | *Table 17* |
| **SW Reuse** | - | - | - | - | - | - | |
| **Total** | **8,313** | **10,356** | **10,356** | **10,356** | **10,356** | **10,356** | |
| **Demand** | **8,313** | **9,201** | **9,372** | **9,536** | **9,695** | **9,846** | *Pg 7* |

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**Summary Retail Supply Table**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| **GW** | 52,519 | 84,858 | 89,589 | 89,589 | 89,589 | 89,589 |
| **IW** | 404,986 | 431,704 | 393,368 | 396,054 | 392,892 | 387,520 |
| **RW** | 26,880 | 28,843 | 47,714 | 49,769 | 54,732 | 56,254 |
| **Local Surface Wat** | - | - | - | - | - | - |
| **Conser** | 17,086 | 20,471 | 31,327 | 36,864 | 43,131 | 47,924 |
| **Water Trans** | - | 15,096 | 15,096 | 15,096 | 15,096 | 15,096 |
| **SW Capture & Reu** | - | 755 | 2,264 | 3,774 | 6,038 | 9,435 |
| **Desal** | - | 500 | 21,000 | 21,000 | 21,000 | 21,000 |
| **Total Supply** | **501,471** | **582,227** | **600,358** | **612,147** | **622,479** | **626,818** |
| **Total Demand** | **425,580** | **477,051** | **498,009** | **507,296** | **517,697** | **521,946** |

**Summary Replenishment Supply Table**

| Replenishment Supply (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| **IW** | 15,274 | 3,500 | 3,500 | 3,500 | - | - |
| **RW** | 7,706 | 16,980 | 16,980 | 16,980 | 20,480 | 20,480 |
| **Total** | **22,980** | **20,480** | **20,480** | **20,480** | **20,480** | **20,480** |

**West Basin MWD (2010 RUWMP, Table 3-5)**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| **IW for recharge** | 15,274 | 3,500 | 3,500 | 3,500 | - | - |
| **RW for recharge** | 7,706 | 16,980 | 16,980 | 16,980 | 20,480 | 20,480 |
| **Total Recharge** | **22,980** | **20,480** | **20,480** | **20,480** | **20,480** | **20,480** |

**West Basin MWD**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *West Basin MWD 2010 RUWMP* |
| **GW** | 36,860 | 45,500 | 45,500 | 45,500 | 45,500 | 45,500 | *Table 4-2* |
| **IW** | 104,985 | 114,647 | 76,797 | 75,386 | 70,598 | 69,761 | *Table 4-2* |
| **RW** | 14,182 | 16,368 | 33,882 | 33,882 | 37,382 | 37,382 | *Table 3-3* |
| **Local Surface Wat** | - | - | - | - | - | - | *Table 4-2* |
| **Conser** | 14,000 | 15,119 | 21,039 | 21,640 | 22,971 | 23,632 | *Table 3-3* |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Reuse** | - | - | - | - | - | - | |
| **Desal** | - | 500 | 21,000 | 21,000 | 21,000 | 21,000 | |
| **Total Supply** | **170,027** | **192,134** | **198,218** | **197,408** | **197,451** | **197,275** | |
| **Total Demand** | **168,987** | **192,134** | **198,218** | **197,408** | **197,451** | **197,275** | *Table 3-3* |

**Torrance**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Torrance 2010 UWMP* |
| **GW** | 2,287 | 8,040 | 8,040 | 8,040 | 8,040 | 8,040 | *Table 2.3, Table 5.4* |
| **IW** | 16,471 | 20,967 | 20,967 | 20,967 | 20,967 | 20,967 | *Table 2.1, Table 5.4* |
| **RW** | 6,445 | 6,500 | 6,500 | 7,150 | 7,150 | 7,150 | *Table 2.5, Table 5.4* |
| **Local Surface Wat** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Capture & Reu** | - | - | - | - | - | - | |
| **Desal** | - | - | - | - | - | - | |
| **Total** | **25,203** | **35,507** | **35,507** | **36,157** | **36,157** | **36,157** | |
| **Demand** | 25,203 | 26,868 | 27,532 | 28,559 | 29,100 | 29,754 | *Table 4.7* |

**Beverly Hills**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Beverly Hills 2010 UWMP* |
| **GW** | 1,311 | 800 | 800 | 800 | 800 | 800 | *Table 2.3, Table 2.4* |
| **IW** | 11,801 | 18,853 | 21,653 | 22,893 | 21,641 | 20,560 | *Table 2.3, Table 2.4* |
| **RW** | - | - | - | - | - | - | |
| **Local Surface Wat** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Capture & Reu** | - | - | - | - | - | - | |
| **Desal** | - | - | - | - | - | - | |
| **Total Supply** | **13,112** | **19,653** | **22,453** | **23,693** | **22,441** | **21,360** | |
| **Total Demand** | 11,562 | 11,654 | 11,786 | 11,913 | 12,036 | 12,153 | *Table 4.1, Table 4.7* |

**Santa Monica**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | *Source* |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Santa Monica 2010 UWMP* |
| **GW** | 2,062 | 12,400 | 12,400 | 12,400 | 12,400 | 12,400 | *Table 2.4, Table 2.7* |
| **IW** | 11,685 | 11,515 | 11,515 | 11,515 | 11,515 | 11,515 | *Table 2.1, Table 2.7* |
| **RW** | 108 | 560 | 560 | 560 | 560 | 560 | *Table 2.5, Table 2.7* |
| **Local Surface Wat** | - | - | - | - | - | - | |
| **Conser** | - | - | - | - | - | - | |
| **Water Trans** | - | - | - | - | - | - | |
| **SW Capture & Reu** | - | - | - | - | - | - | |
| **Desal** | - | - | - | - | - | - | |
| **Total Supply** | **13,855** | **24,475** | **24,475** | **24,475** | **24,475** | **24,475** | |
| **Total Demand** | 13,855 | 14,370 | 14,409 | 14,445 | 14,478 | 14,509 | *Table 4.2, Table 4.8* |

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**Los Angeles**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|
| | | | | | | | *LADWP 2010 UWMP* |
| **GW** | - | - | - | - | - | - | *0% of total groundwater* |
| **IW** | 202,211 | 209,796 | 216,490 | 218,050 | 219,611 | 214,806 | *Demand-Local Supply* |
| **RW** | 676 | 1,026 | 1,926 | 2,826 | 3,726 | 4,626 | *Exhibit 4I, 4P, 4Q* |
| **Local Surface Wat** | - | - | - | - | - | - | |
| **Conser** | 3,086 | 5,352 | 10,288 | 15,224 | 20,160 | 24,292 | *Area percentage applied* |
| **Water Trans** | - | 15,096 | 15,096 | 15,096 | 15,096 | 15,096 | *Area percentage applied* |
| **SW Capture & Reu** | - | 755 | 2,264 | 3,774 | 6,038 | 9,435 | *Area percentage applied* |
| **Desal** | - | - | - | - | - | - | |
| **Total Supply** | **205,973** | **232,025** | **246,064** | **254,971** | **264,632** | **268,255** | |
| **Total Demand** | **205,973** | **232,025** | **246,064** | **254,971** | **264,632** | **268,255** | *Area percentage applied* |

**Los Angeles (100%) - Percentage area applied to demand only. Supply numbers received via email from LADWP.**

| | Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *LADWP 2010 UWMP* |
| | **GW** | 76,982 | 40,500 | 96,300 | 111,500 | 111,500 | 110,405 | *Exhibit ES-R* |
| | **IW** | 463,614 | 540,120 | 508,040 | 481,760 | 484,781 | 477,027 | *Exhibit ES-R (Includes LA Aqueduct and MWD supplies)* |
| | **RW** | 6,703 | 20,000 | 20,400 | 42,000 | 51,500 | 59,000 | *Exhibit 4J, Exhibit 4L* |
| | **Local Surface Water** | | | | | | | |
| | **Conser** | 8,178 | 14,180 | 27,260 | 40,340 | 53,419 | 64,368 | *Exhibit ES-R* |
| | **Water Trans** | - | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 | *Exhibit ES-R* |
| | **Stormwater Cap** | - | 2,000 | 6,000 | 10,000 | 16,000 | 25,000 | *Exhibit ES-R* |
| | **Desal** | | | | | | | |
| Area | **Total** | **555,477** | **656,800** | **698,000** | **725,600** | **757,200** | **775,800** | |
| 38% | **Demand** | **545,771** | **614,800** | **652,000** | **675,600** | **701,200** | **710,800** | *Exhibit 2J, Demand Forecast with Passive and Active Water Conservation* |

**California Water Service Co - Dominguez**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Cal Water Service Co - Dominguez District 2010 UWMP* |
| **GW** | 8,575 | 12,736 | 16,897 | 16,897 | 16,897 | 16,897 | |
| **IW** | 23,645 | 22,492 | 15,319 | 15,930 | 16,551 | 17,183 | |
| **RW** | 5,251 | 4,134 | 4,586 | 5,088 | 5,646 | 6,264 | |
| **Local Surface Water** | | | | | | | |
| **Conser** | | | | | | | |
| **Water Trans** | | | | | | | |
| **SW Capture & Reuse** | | | | | | | |
| **Desal** | | | | | | | |
| **Total Supply** | **37,471** | **39,362** | **36,802** | **37,915** | **39,094** | **40,344** | |
| **Total Demand** | 42,566 | 39,362 | 36,802 | 37,915 | 39,094 | 41,677 | |

**California Water Service Co - Hawthorne**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Hawthorne 2010 UWMP* |
| **GW** | - | 1,882 | 1,882 | 1,882 | 1,882 | 1,882 | |
| **IW** | 4,146 | 3,310 | 3,551 | 3,794 | 4,039 | 4,297 | |
| **RW** | 84 | 100 | 101 | 101 | 102 | 103 | |
| **Local Surface Water** | | | | | | | |
| **Conser** | | | | | | | |
| **Water Trans** | | | | | | | |
| **SW Capture & Reuse** | | | | | | | |
| **Desal** | | | | | | | |
| **Total Supply** | **4,230** | **5,292** | **5,534** | **5,777** | **6,023** | **6,282** | |
| **Total Demand** | 4,230 | 5,292 | 5,534 | 5,777 | 6,023 | 6,282 | |

**California Water Service Co - Hermosa-Redondo**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Cal Water Service Co - Hermosa-Redondo District 2010 UWMP* |
| **GW** | 1,424 | 3,500 | 4,070 | 4,070 | 4,070 | 4,070 | |
| **IW** | 10,958 | 10,482 | 9,535 | 9,904 | 10,282 | 10,670 | |
| **RW** | 134 | 155 | 159 | 162 | 166 | 169 | |
| **Local Surface Water** | | | | | | | |
| **Conser** | | | | | | | |
| **Water Trans** | | | | | | | |
| **SW Capture & Reuse** | | | | | | | |
| **Desal** | | | | | | | |
| **Total Supply** | **12,516** | **14,137** | **13,764** | **14,136** | **14,518** | **14,909** | |
| **Total Demand** | 12,516 | 14,506 | 14,519 | 14,912 | 15,315 | 15,728 | |

**California Water Service Co - Palos Verdes**

| Supply Summary (AF) | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Source |
|---|---|---|---|---|---|---|---|
| | | | | | | | *Cal Water Service Co - Palos Verdes District 2010 UWMP* |
| **GW** | | | | | | | |
| **IW** | 19,084 | 19,642 | 17,541 | 17,615 | 17,688 | 17,761 | |
| **RW** | | | | | | | |
| **Local Surface Water** | | | | | | | |
| **Conser** | | | | | | | |
| **Water Trans** | | | | | | | |
| **SW Capture & Reuse** | | | | | | | |
| **Desal** | | | | | | | |
| **Total Supply** | **19,084** | **19,642** | **17,541** | **17,615** | **17,688** | **17,761** | |
| **Total Demand** | 19,084 | 19,642 | 17,541 | 17,615 | 17,688 | 17,761 | |


## O. Climate Change Vulnerability Exercise

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# GLAC-IRWMP
## Climate Change Vulnerability Exercise

The GLAC IRWM Climate Change Subcommittee conducted an exercise to answer vulnerability questions taken from Box 4-1 of the *Climate Change Handbook* and associated the answers with potential water management issues/vulnerabilities. Table 1 summarizes the analysis. Qualitative vulnerability questions are framed to help assess resource sensitivity to climate change and prioritization of climate change vulnerabilities within a region. Answers to vulnerability questions are given for the GLAC Region with local examples provided as justification for the answer.

**Table 1: Climate Change Vulnerability Indicator Questions**

| Vulnerability Question | Answer | Justification | Vulnerability Issue |
|---|---|---|---|
| **Water Demand** | | | |
| Are there major industries that require cooling/process water in your planning region? | N | Oil companies in southern harbor areas primarily use recycled water for cooling. Scattergood plus other OTC power plants use ocean water for cooling but OTC Policy moving plants off OTC. Aerospace industry needs cooling water, but is considered to be downsizing its presence in the Region. | Industrial demand would increase: increased cooling needs due to higher temperatures |
| Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops? | Y | There are some small-scale farming plots but no major agriculture. Nurseries may be vulnerable, but uncertain if decreasing in size. | Agricultural demand would increase: evapotranspiration will increase per unit of biomass due to higher temperatures |

RMC Water and Environment

| Vulnerability Question | Answer | Justification | Vulnerability Issue |
|---|---|---|---|
| Do groundwater supplies in your region lack resiliency after drought events? | N | Groundwater basins are relatively large in size and have replenishment requirements. During the last drought, however, Main San Gabriel Basin levels were in their lower range, but still had opportunity to recharge. The recharge potential of the Region's basins has not been fully realized and it is critical to further increase recharge so as to offset imported supply and provide longer term and seasonal storage. | Lack of groundwater storage: to buffer drought conditions |
| Are water use curtailment measures effective in your region? | Y | Demand has decreased as a result of conservation programs. Region is already concerned about meeting 20% by 2020 potable use reduction, even without climate change effects. | Decrease ability to meet conservation goals: due to saturation conservation programming or inability to conserve further |
| Does water use vary by more than 50% seasonally in parts of your region? | Y | Current climate requires a strong peak in summer demand for irrigation. | Limited ability to meet higher peaks in demand (both seasonally and annually): infrastructure sized to only existing demand peaks. |
| Are some in-stream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet? | N | The Regional Board requires Tapia WRF to discharge to Malibu Creek when minimum flow criteria are met to provide sufficient aquatic habitat. However, climate change may increase vulnerability. | Habitat demand would increase: exacerbated by decreased flows, which are already challenging |
| No specific question called out in handbook – but vulnerability issue was identified independently. | Y | Increasing population in areas of Region that will have higher temperatures and lower precipitation as a result of climate change. Older development is in cooler and drier parts of the region while more recent development and current development pressure is in hotter and drier areas. | Municipal demand would increase: exacerbated by distribution of population increases |
| **Water Supply** | | | |
| Does a portion of the water supply in your region come from snowmelt? | Y | Some local supply comes from snowmelt in the San Gabriel Mountains. | Decrease in local surface supply: Due to decrease in local snowpack |

| Vulnerability Question | Answer | Justification | Vulnerability Issue |
|---|---|---|---|
| Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region? | Y | Large portion of the Region's supply comes from imported water (both direct uses and replenishment). | Decrease in imported supply: Due to decreases in SWP and Colorado supplies |
| Would your region have difficulty in storing carryover supply surpluses from year to year? | Y | Large system of groundwater basins allows the Region to store seasonal and annual supply in basins, but can only capture so much from storms given limited recharge facility area available  Other parts of the Region without groundwater basins have limited or no capacity to carry over supply surpluses. | Decrease in seasonal water reliability: given recharge facilities and decreases in local and imported surface supply |
| Does part of your region rely on coastal aquifers?  Has salt intrusion been a problem in the past? | Y | Santa Monica and West Coast Basins have salt water intrusion issues. Seawater intrusion barriers have operated since 1950s to mitigate these impacts, however SLR will further exacerbate the current situation. | Decrease in coastal groundwater supply: due to sea level rise increasing intrusion |
| Has your region faced a drought in the past during which it failed to meet local water demands? | Y | There have been droughts in the Region where normal demands were not able to be met so drought management plans were implemented to reduce demands to be more in-line with available supplies. In this way demands were met. | Reduced resiliency to drought: Increased need for rationing and other drought response |
| Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas? | Y | Arundo, quagga mussels (aqueducts) have been detected and could increase -already decreasing infrastructure reliability as well as alter flood regimes and alter wildfire regimes. | Invasives can reduce supply available: Increased invasives leads to increased water consumption (and flood and wildfire regimes) |
| **Water Quality** | | | |
| Are increased wildfires a threat in your region?  If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion? | Y | The 2009 Station fire and others caused great damage and sedimentation issues from large increases in erosion. | Increased erosion and sedimentation: leads to decreased water quality, available supply |

| Vulnerability Question | Answer | Justification | Vulnerability Issue |
|---|---|---|---|
| Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change? | Y | Many of the Region's local surface waters are 303(d) listed for nutrient issues. | Increased nutrient loading and decreased Dissolved Oxygen: leads to decreased water quality through eutrophication |
| Are seasonal low flows decreasing for some water bodies in your region? If so, are the reduced low flows limiting the water bodies' assimilative capacity? | Y | Most streams in the region are naturally ephemeral or intermittent. For example, some streams that were once intermittent are now perennial after being channelized to a depth below the summer water table. Natural streams may have decreased flow, but the only gauged streams are those with significant anthropogenic alteration in upstream watersheds. Seasonal low flows in effluent dependent water bodies are decreasing given conservation and recycled water use.<br><br>Assimilative capacity is already compromised since normal dry season flows are low. Any amount of pollutants added to small volumes of water during low flow will have a proportionally large effect. | Decreased dilution flows: to help dilute contaminants |
| Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues? | Y | There are many beneficial uses in the Region which are not being met. For example, beach closures and fishing restrictions have occurred in the past. | Decrease in recreational opportunity: from poor water quality |
| Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation? | Y | Some areas that treat local surface water have issues with turbidity and first flush contaminant levels during high flows. High intensity storms can also disrupt biological wastewater or stormwater treatment processes that may affect minimum standing time and discharge water quality. | Increase in source control or surface water treatment: for surface waters to meet increases in contaminants |
| **Sea Level Rise** | | | |
| Has coastal erosion already been observed in your region? | Y | Malibu, Santa Monica, and Palos Verdes areas | Decrease in land: From erosion along coasts |

| Vulnerability Question | Answer | Justification | Vulnerability Issue |
|---|---|---|---|
| Are there coastal structures, such as levees or breakwaters, in your region? | Y | Marina areas and ports have breakwaters. | Damage to coastal infrastructure/recreation/ tourism: Due to sea level rise |
| Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region? | Y | Examples of areas at risk due to SLR include wastewater treatment (e.g. Hyperion, Terminal Island), stormwater outfalls at beaches, beach recreation features, also potential for planned desalination facilities. Residences (including DACs) and other non water-related infrastructure/recreation are also at risk along coastal areas of the Region. | |
| Is there land subsidence in the coastal areas of your region? | N | Nothing prevalent known | |
| Are there areas in your region that currently flood during extreme high tides or storm surges? | Y | The FEMA definition of flooding includes coastal wave uprush. There have been flooding events along the coast when high tides and storm surges coincide, generally during El Nino events. | |
| Are there climate-sensitive low-lying coastal habitats in your region? | Y | Ballona Wetlands and Malibu Lagoon are examples. | Damage to ecosystem/ habitat: Due to sea level rise |
| Do tidal gauges along the coastal parts of your region show an increase over the past several decades? | N | There have been documented increases, however, this just indicates that climate change is occurring but is not a vulnerability issue. | No issue just indicates that climate change is happening |
| **Flooding** | | | |
| Does critical (water/wastewater) infrastructure in your region lie within the 200-year floodplain? | Y | Assuming yes | Increases in inland flooding |
| Does aging critical flood protection infrastructure exist in your region? | Y | See Appendix G Flood Management Objectives and Targets. | |
| Have flood control facilities (such as impoundment structures) been insufficient in the past? | Y | Regionally there has generally been sufficient protection, but there is still some localized flooding. Debris basins have been insufficient in the past (O&M issue) and caused debris flows. Long Beach, San Pedro Sun Valley are example areas with inland flooding issues. | |

| Vulnerability Question | Answer | Justification | Vulnerability Issue |
|---|---|---|---|
| Are wildfires a concern in parts of your region? | Y | Annual occurrence of wildfires | Increases in flash flooding |
| Does part of your region lie within the Sacramento-San Joaquin Drainage District? | N | Not applicable | No issue since it is out of Region |
| Ecosystem and Habitat | | | |
| Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues? | Y | Ballona Wetlands, and Malibu Lagoon other riparian areas | Increased impacts to habitat and flow availability for species: from various current issues and those associated with climate change |
| Does your region include estuarine habitats which rely on seasonal freshwater flow patterns? | Y | Malibu Lagoon and Ballona Wetlands are examples | |
| Do climate-sensitive fauna or flora populations live in your region? | Y | Numerous species dependent upon the Mediterranean climate live in the Region | |
| Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life? | Y | Los Angeles River does not yet have flow requirements but could have them in the future – however there are current stressors on aquatic life. There are minimum flow requirements to sustain steelhead trout habitat in Malibu Creek that trigger a requirement to discharge recycled water each summer. | |
| Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region? | Y | A number of endangered and threatened species exist in the Region. The Region is the southern limit to endangered southern steelhead trout; climate change could alter their extent. | |
| Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities? | Y | Beach tourism, creeks and lakes recreation, creek riparian habitat and river adjacent trails | |
| Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement? | Y, Y, N | The Region has natural aquatic habitat areas that are severely fragmented by channelization, impassible culverts and lost riparian areas. There are some corridors, but no new known infrastructure projects are planned that would further fragment aquatic habitat. | |

| Vulnerability Question | Answer | Justification | Vulnerability Issue |
|---|---|---|---|
| Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region? | Y | Not frequent storms but there are exposed beaches and habitats that are at risk during El Nino storm events. | Decrease in habitat protection against coastal storms |
| Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change? | N | None listed. | |
| **Hydropower** | | | |
| Is hydropower a source of electricity in your region? | Y | Small hydropower projects | Decrease in hydropower potential |
| Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region? | Y, N | No future known plans for hydropower generation. | |