Prepared for:

Greater Los Angeles County
Integrated Regional Water Management Plan

The Greater Los Angeles County Open Space for Habitat and Recreation Plan

(Integrated Regional Water Management Plan Update – 2012)

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LIST OF ACRONYMS AND ABBREVATIONS

AF	acre-feet
AF/yr	acre-feet/year
ASBS	Areas of Special Biological Significance
BMP	best management practices
CDFG	California Department of Fish and Game
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 Wetland 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
OSHARP	Open Space for Habitat and Recreation Plan
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	Wetlands 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 Open Space for Habitat and Recreation Plan (OSHARP) planning process was to provide direction to reverse this trend to 1) include open space as a consideration in the development of water management projects, and 2) to inform water management project developers of certain aspects to enhance open space. The objective is to provide a comprehensive regional framework for incorporating open space, both habitat and recreation, into project design features.

The OSHARP 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 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)

<u>Open Space Continuum</u>

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 wetland areas to

coastal tidal wetlands, while the recreation continuum extends from natural open space areas to greenways to park and recreation areas.

By viewing open space habitat and recreation as a continuum that changes with 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 wetlands 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.

Wetlands

To simplify the presentation of wetland planning targets, wetlands, as defined ecologically based on the National Wetlands Inventory, were classified into three general categories: (1) tidal wetlands, (2) freshwater wetlands, and (3) riverine (or riparian) wetlands. Three distinct types of wetland habitat targets were developed: (1) protection of existing wetland habitat, (2) enhancement of existing wetland habitat, and (3) restoration or creation of

wetland habitat. For the GLAC Region, the total wetland area to be benefited by protection, enhancement, restoration or creation is 12,000 acres.

Uplands

Protection of water-dependent or wetland 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 a wetland) and Wildlife Linkages or Corridors (wide areas of native vegetation that connects 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 54,000 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.

Open Space and Ecosystem Services

The benefits of open space lands within the region are extensive. In addition to water related management practices, 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 and create 21,000 acre feet of storage for stormwater quality purposes throughout the GLAC Region if target habitat and recreation lands in areas with high recharge potential and/or poor water quality 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 OSHARP that will mitigate the effects of climate change. Climate benefits include carbon storage and sequestration by natural habitats; providing additional local recreation areas and green travel routes to encourage walking and cycling; and, creating habitat connectivity through wildlife linkages, corridors, and buffers.

Evaluating Open Space Projects

An important component of the IRWMP is the application of scoring metrics to determine the suitability of proposed projects in meeting overall goals and objectives. Recommended criteria to evaluate proposed uplands, wetlands and recreation projects are included in the appendices and are based on the expertise of the Open Space Team, although the GLAC IRWMP Steering Committees will be guiding the scoring process as the final IRWMP is developed.

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 OSHARP 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 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 OSHARP addresses these challenges by providing a series of recommendations, which if implemented over time will aid in achieving the targets.

Overall, one should be optimistic as challenges create opportunities. Judging from the level of participation throughout the development of the OSHARP, the support for open space and water resource management is comprised of a strong and vibrant network of committed public and private sector stakeholders.

Building Blocks for Solutions

The building blocks necessary to create solutions to the GLAC Region's open space habitat and recreation needs exist today.

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. These mountains, hills, and peninsula define the San Fernando and San Gabriel Valleys.

The two largest watersheds of the region together drain 1,500 square miles and formed the Los Angeles basin. The Rio Hondo River hydrologically connects the two rivers. Other major watersheds in the region include Malibu Creek, Topanga Creek, Ballona Creek, and the Dominguez Channel. These rivers, watersheds and dozens of smaller rivers drain directly into Santa Monica or San Pedro Bay.

The diverse landscape, differences in climate, soils, and geology set the stage for a wide array of vegetation and wildlife. These regions' lagoons and freshwater marshes are especially important to over-wintering and migratory song birds and waterfowl in the Pacific Flyway in addition to providing year round habitat to resident species.

Existing outdoor recreation opportunities total approximately 101,000 acres. In addition, there are almost 300,000 acres of public, multiple use lands in the Angeles National Forest.

This is just a summary of the natural capital available in the GLAC Region. The social capital available is as extensive and diverse as the natural capital and is reflected in the existing studies, plans, and reports consulted in the Technical Memorandum for the Integrated Regional Water Management Plan for the Greater Los Angeles County Region as well as the participation in the development of the OSHARP as described previously. Overall, there are thousands of dedicated individuals working to develop projects that

protect and increase the regions open space opportunities. The OSHARP provides a framework to realize many of these opportunities and provides solutions to the GLAC Region's water supply and management needs.

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

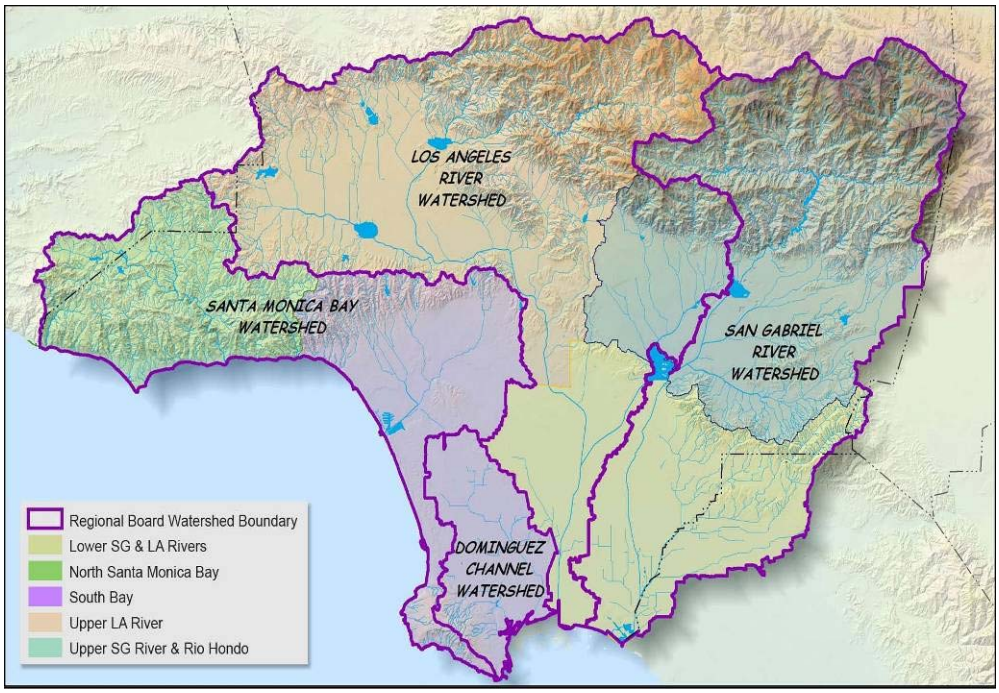

Figure 1. GLAC Subregional and Watershed Boundaries

1.3 2012 IRWMP Update

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 principal goals of the grant application was to develop a long-term open space vision for the GLAC Region that is supported by a clear rationale and based on available science.

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 wetlands). The IRWMP open space planning effort 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 for Habitat and Recreation Plan (OSHARP) 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 Open Space for Habitat and Recreation Plan (OSHARP) Component to the IRWMP

As stated earlier, developing the OSHARP 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 OSHARP 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 OSHARP 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 Significant Regional Planning Efforts

In preparation for OSHARP, many regional Los Angeles County planning efforts were examined. Appendix A, Planning Documents Reviewed, details the projects, studies, and reports that were reviewed for references to watershed issues and habitat linkages.

The OSHARP report 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 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, OSHARP 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 OSHARP draft 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 report.

Table 1. List of Participating Agencies/Groups and Representative(s)

Organization	Representative
Army Corps of Engineers	Erin Jones
Arroyo Seco Foundation	Meredith McKenzie 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 Nancy Steele
Los Angeles County	Timothy Pershing
Los Angeles County Flood Control	Phil Doudar Russ Bryden Rochelle Paras
Los Angeles County Parks and Recreation	Camille Johnson Norma Garcia
Las Virgenes Municipal Water District	Jan Dougall 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 Melina Watts
Rivers and Mountains Conservancy	Belinda Faustinos Mark Stanley 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.

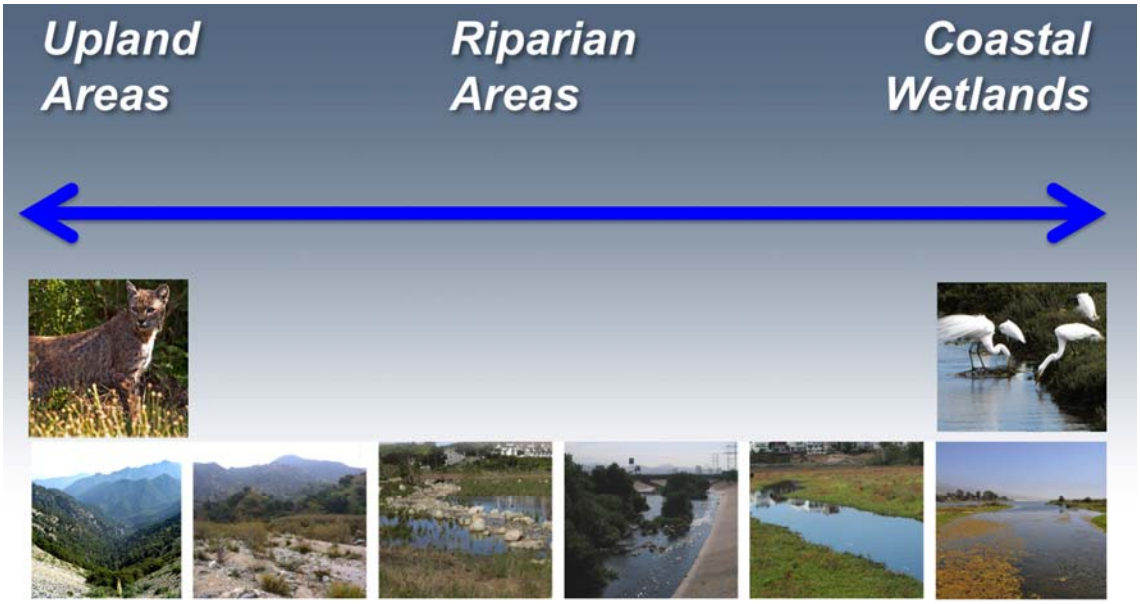

Figure 2. The Open Space Continuum – From Uplands to the Coast

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 90 cities within the GLAC Region. The variations between jurisdictions are generally due to the

[1] State of California, Governor's Office of Planning and Research. *State of California General Plan Guidelines*. 2003.

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 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.

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.

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. In Los Angeles County, wetland losses exceed 95 percent. 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]

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

[3] http://www.fws.gov/carlsbad/TEspecies/CFWO_Species_List.htm

Scientific Name	Common Name	Federal Status
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 palosverdesensis	Palos Verdes blue butterfly	Endangered
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	Endangered

Scientific Name	Common Name	Federal Status
	DPS)	
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
Coast 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.

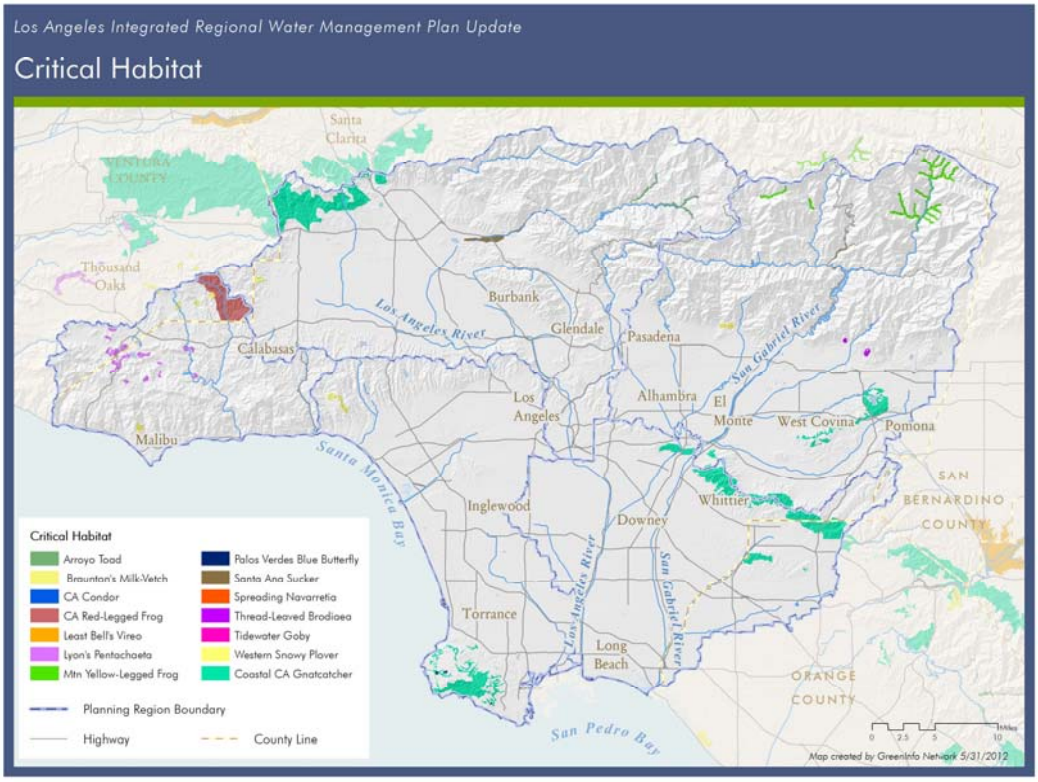

Figure 4. USFWS Designated Critical Habitat Areas

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.

[4] epa.gov/lawsregs/laws/nepa.html

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 are 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 wetlands, 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 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.

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[5] http://dfg.ca.gov/habcon/ceqa/ceqapolicy/html
[6] http://www.fws.gov/habitatconservation/cwa.html

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 wetlands, 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.).

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]

[7] http://www.epa.gov/lawsregs/laws/esa.html
[8] http://www.epa.gov/lawsregs/laws/esa.html

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 wetlands, streams, lakes, and other aquatic sites, mitigation banks must be approved by the USACE. 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]

[9] Ceres.ca.gov/wetlands/permitting/ porter_summary.html

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 wetlands, 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 wetlands, 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.

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]

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[10] http://www.waterboards.ca.gov/water_issues/programs/cwa401/
[11] http://www.campuserc.org/virtualtour/grounds/drains/Pages/NPDES-Overview.aspx
[12] Ceres.ca.gov/wetlands/permitting porter_summary.html

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 Game

Streambed Alteration Agreements (Section 1600 of the Fish and Game Code)

The CDFG 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 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.[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 CDFG to "identify, conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat in California."[14] This Act (Fish and Game Code Section 2050, et. seq.) prohibits the "taking" of California listed species unless a permit is obtained from the CDFG.[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 Game 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

[13] http://ceres.ca.gov/wetlands/permitting/DFG_ summary.html
[14] http://www.energy.ca.gov/glossary/glossary-c.html
[15] http://ceres.ca.gov/wetlands/permitting

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:

- 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.

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 OSHARP 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 wetlands systems more than any other state (Dahl 1990). In Los Angeles County, wetland system losses exceed 95 percent.

The objective in this planning process is to help reverse this trend and to have open space for habitat and recreation considered in the planning of water supply and water quality projects. While opportunities for coastal wetland restoration are limited by extensive development, as well as by geologic and topographic constraints, opportunities to preserve and restore 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 number of viable wetlands 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 – Wetlands

4.2.1 Wetlands

Although southern California is a relatively dry region, the greater Los Angeles area historically contained abundant and diverse wetland resources (Rairdan, 1998; Stein et al., 2007; Dark et al., 2011). Much of the original wetland habitat in the region has been destroyed or converted to other habitat (including concrete-lined rivers), and much of the remaining wetlands have been degraded by poor water quality or other human activities.

The goals of the wetland habitat targets are to protect, restore (re-establish or rehabilitate), and/or enhance existing wetland habitat and to create new wetland habitat in the region.

4.2.1.1 Terminology

There are many different ways to categorize or define wetlands, including approaches based on various ecological or regulatory perspectives. For this project, a wetland is considered to be 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, 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.

This is an ecological definition of wetland, not the regulatory one. Therefore, an area identified as a wetland in this report is not necessarily considered a wetland for regulatory purposes. This may cause some confusion. For example, for the purposes of this report, man-made habitats are considered to be wetlands. However, the wetland regulatory definition considers some 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 wetlands for regulatory purposes even though they may provide ecosystem benefits.

To simplify the presentation of wetland planning targets, wetlands were categorized into three general categories: (1) tidal wetlands, (2) freshwater wetlands, and (3) riverine (or riparian) wetlands based on categories defined by the National Wetlands Inventory (NWI). Although incomplete, the NWI is a very important source of information for the present wetland conditions with the GLAC. Larger, regional areas that function as off-system detention and storage would be considered freshwater wetlands. While it is recognized that rivers and stream beds are not always considered wetlands, for the purposes of these categories they are considered to be riverine wetlands. The definition for each of these categories is as follows:

- *Tidal wetlands* include 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 NWI mapping system, the three categories included in tidal wetlands are estuarine and marine deepwater, estuarine and marine wetland, and tidal wetlands.

- *Freshwater wetlands* include wetlands such as depressional marshes, lakes, and ponds. The NWI category "freshwater wetlands" include freshwater emergent wetland, freshwater forested/shrub wetland, freshwater ponds and lakes, and also considers man-made habitats such as flood control basins and ponds which may include areas of freshwater wetlands. 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 wetlands* include the streambed and wetlands associated with rivers and streams, including upper and lower riverine habitats and dry washes. Man-made habitats considered riverine wetlands include concrete-lined channels and soft-bottomed channels. Note that "riparian" is sometimes used to mean riverine wetlands. 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.

Three distinct types of wetland habitat targets were also developed.

1. Protection of existing wetland habitat
2. Enhancement of existing wetland habitat
3. Restoration or creation of wetland habitat

These activities could occur on public or private lands and include some of the following activities:

- *Protection* entails acquiring existing wetland habitat not previously protected from destruction or degradation or otherwise adding protection measures to prevent an existing wetland from destruction or degradation.
- In *enhancement,* management actions are taken to improve the functions or values of an existing wetland. Enhancement actions could include improving the timing or amount of water source to a wetland, planting native wetland plants, controlling invasive species, and so forth. Improving the quality of water entering a wetland alone would generally not be considered enhancement.

- *Restoration and creation* involve activities of either restoring or creating a wetland in an area that does not currently contain a wetland. The distinction is that if the activity occurs in an area that once contained that type of wetland it is considered to be restoration or re-establishment, whereas creation occurs in an upland area, converting it to a wetland. In both restoration and creation, the focus should be on reintroducing the physical processes and geomorphic form necessary to support a self-sustaining wetland ecosystem.

4.2.1.2 Methodology

Protection, enhancement, and restoration/creation targets were calculated for each wetland type (tidal, freshwater, riverine). Figure 5 summarizes the general approach to calculating wetland habitat targets, with more details about the methodology in Appendix B, Wetland Habitat Methodologies.

For each category, the percentage used to establish numeric targets was chosen after discussion with the Habitat and Open Space Plan Committee. The goal was to develop a numeric target that balanced the benefits of protecting, enhancing or restoring wetland 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, for each subregion.

The restoration/creation habitat targets are based on the area of wetlands lost in each subregion. The historical extent of wetlands in the region (derived from Rairdan 1998; more detail about this data source is provided in Appendix A) is shown in Figure 6 (see Appendices G-K for subregional maps).

Protection and enhancement targets are based on the current extent of wetlands (derived from the National Wetlands Inventory (NWI); more detail about this data source is provided in Appendix A), shown in Figure 7 (Appendices G-K provide information for the subregions).

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 Wetland Habitat Targets

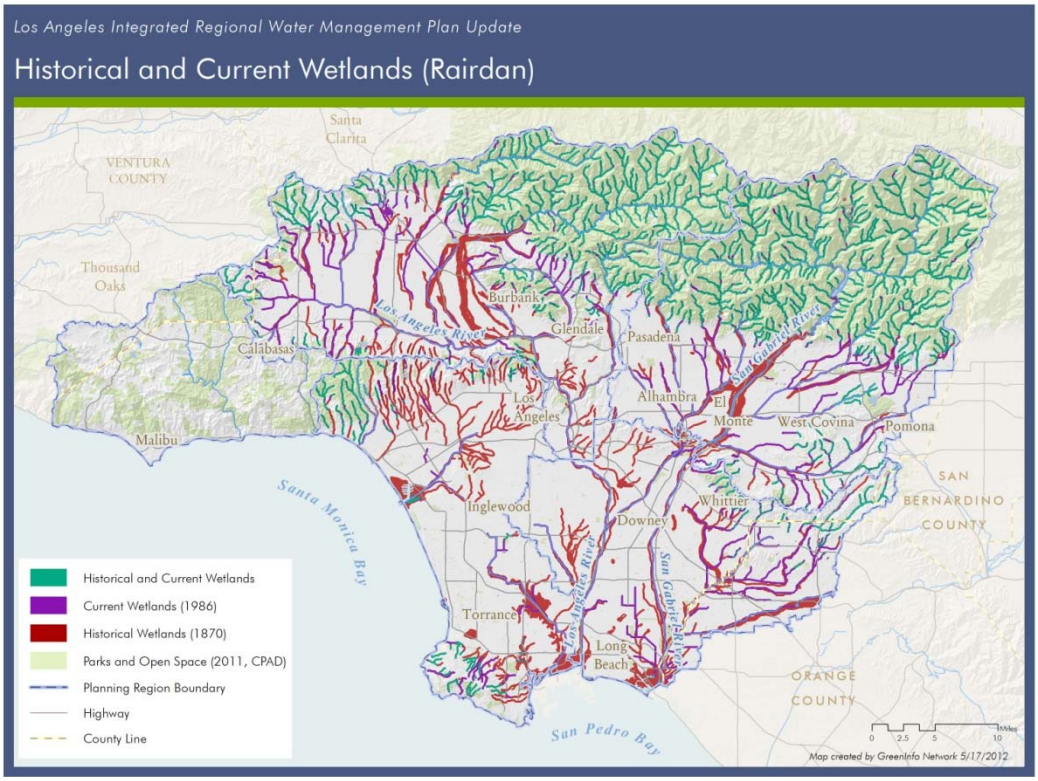

Figure 6. Historical and Current Wetlands (Rairdan) (GLAC Region, except NSMB Subregion)

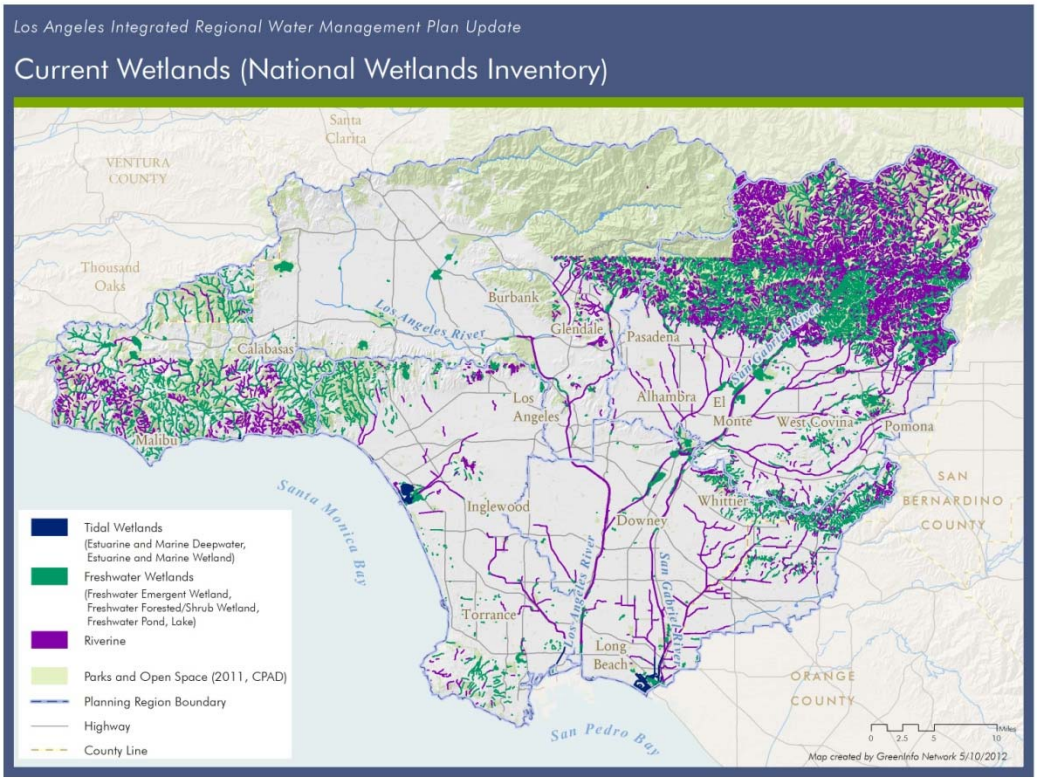

Figure 7. Current Wetlands (NWI) (GLAC Region)

4.2.1.3 Habitat Targets

Table 4 below provides a breakdown of the subregional wetland targets.

Table 4. New Wetland Habitat Targets

	Tidal Wetland	Freshwater Wetland	Riparian (Riverine)	Subtotal for Subregion
Target for Protection or Preservation				
North Santa Monica Bay	0	170	50	**220**
Upper Los Angeles River	0	110	70	**180**
Upper San Gabriel and Rio Hondo Rivers	0	420	280	**700**
Lower San Gabriel and Los Angeles Rivers	110	240	340	**690**
South Santa Monica Bay	100	60	60	**220**
Greater Los Angeles County	210	1,000	800	**2,000**
			Subtotal for Region	**4,000**
Targets for Enhancement				
North Santa Monica Bay	10	290	150	**450**
Upper Los Angeles River	0	820	700	**1,500**
Upper San Gabriel and Rio Hondo Rivers	0	1,300	1,200	**2,400**
Lower San Gabriel and Los Angeles Rivers	160	430	470	**1,100**
South Santa Monica Bay	160	260	140	**560**
Greater Los Angeles County	330	3,000	2,700	**6,000**
			Subtotal for Region	**12,000**
Targets for Restoration or Creation				
North Santa Monica Bay	30	40	20	**90**
Upper Los Angeles River	0	250	830	**1,100**
Upper San Gabriel and Rio Hondo Rivers	0	200	880	**1,000**
Lower San Gabriel and Los Angeles Rivers	330	290	330	**950**
South Santa Monica Bay	400	280	150	**830**
Greater Los Angeles County	760	1,100	2,200	**4,000**
			Subtotal for Region	**8,000**
			TOTAL WETLAND BENEFITS	**24,000**

For the GLAC Region, total wetlands to be benefited by protection, enhancement, restoration, or creation is 12,061 acres.

- The total target acreage for the protection of wetlands is 2,000 acres (200 acres of tidal wetlands, 1,000 acres of freshwater wetlands, and 800 acres of riverine wetlands).
- The total target acreage for enhancement of wetlands is 6,000 acres (300 acres of tidal wetlands, 3,000 acres of freshwater wetlands, and 2,700 acres of riverine wetlands).
- The total target acreage for restoration or creation of wetlands is 4,000 acres (800 acres of tidal wetlands, 1,000 acres of freshwater wetlands, and 2,200 acres of riverine wetlands).

The subregional targets vary across the region due to the differences in the extent of current wetlands and wetland losses. The target for protection was highest for Upper San Gabriel and Rio Hondo Rivers, although the Lower San Gabriel and Los Angeles Rivers target was nearly the same. Both of these subregional targets are around three times higher than targets for the other subregions.

For enhancement, Upper San Gabriel and Rio Hondo Rivers again had the highest target, followed by the Upper Los Angeles River and the Lower San Gabriel and Los Angeles Rivers, with South Bay and North Santa Monica Bay much lower.

For the restoration/creation targets, the Upper San Gabriel and Rio Hondo Rivers, Upper Los Angeles River, Lower San Gabriel and Los Angeles Rivers, and South Bay all have targets of about 1,000 acres. North Santa Monica Bay is dramatically lower, with a target of only 83 acres. The lower target for North Santa Monica Bay could be partially due to the fact that wetland loss for this subregion was not based on the same type of historical analysis as the other subregions, but more likely the lower target is because the region never had extensive tidal wetlands, such as the South Bay or Lower San Gabriel and Los Angeles Rivers, and the mountains are relatively undeveloped.

4.3 Habitiat Planning Targets – Uplands

Urbanization of the Greater Los Angeles County area has caused the loss of wetland 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 wetland 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 wetlands. Wetland 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). Wetland 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).

A wetland 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 wetlands. In the absence of wetland buffers, these impacts are typically magnified and become more damaging.

Wetland buffers can vary in size based on factors such as adjacent land use, land ownership, topography, wetland 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 wetland	100
	Shallow slopes (<5%) or low quality wetland	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 100 in urban area
Flood control	N/A	Variable, depending on elevation of flood waters and potential damages

4.3.1.1 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 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 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 identifies 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.

Figure 8. Habitat Linkages

For the purpose of developing the upland targets, polygons were drawn along the continuous length of the drainages and upland areas with a width of 1,000 feet. Acreage associated with these polygons was determined. This information is provided in Table 6 below. Existing open space and public and private land ownership was then mapped (Figure 9 and Figure 10)

[17] figure adapted from http://criticalhabitat.fws.gov/crithab

Table 6. Measurement of Potential Linkage Areas within the GLAC Region

Subregion	Linear Feet	Acres
North Santa Monica Bay	31,000	710
Lower San Gabriel and Lower Los Angeles Rivers	330,000	7,500
Upper San Gabriel and Rio Hondo Rivers	580,000	13,000
Upper Los Angeles River	520,000	12,000
South Bay	124,000	2,800
Greater Los Angeles County	**1,585,000**	**36,010**

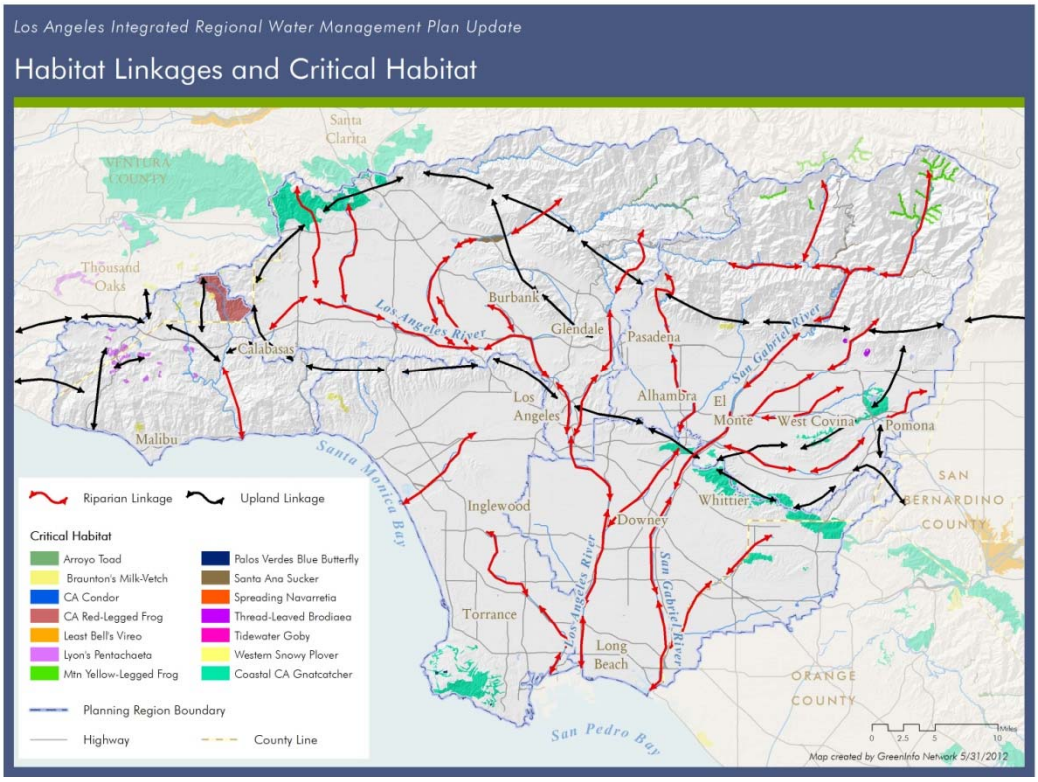

Figure 9. Habitat Linkages with USFWS Designated Critical Habitat Areas

Figure 10. Habitat Linkages with Land Ownership

4.3.1.2 Upland Targets

The target for the acquisition and/or restoration of uplands was then calculated by taking the calculated acreage value from Table 6 and multiplying it by 1.5. This simple formula recognizes that 1,000 feet is a minimum width for a linkage and some of the targeted lands 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 wetland systems.

The subregional targets for Upland Buffers are provided in Table 7. The provision of acquisition and/or restoration of these targets includes the provision of buffer zones.

Table 7. Subregional Upland Targets

Region	Upland Target (acres)
North Santa Monica Bay	1,000
Upper Los Angeles River	18,000
Upper San Gabriel and Rio Hondo Rivers	20,000
Lower San Gabriel and Lower Los Angeles Rivers	11,000
South Bay	4,000
Greater Los Angeles County	**54,000**

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 themselves. 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 5096.142

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
- Habitat areas and wildlands
- School sites
- Existing greenways and those subject to sea-level rise
- Planned greenway concepts
- Existing and planned County trail routes
- Existing urban park and recreation areas

Appendices G-K provide this information for the subregions.

Trail routes are illustrated on Figure 11 and were identified in the draft Los Angeles County 2035 General Plan. 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 90 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.

Figure 11. Existing and Planned Parks, Recreation Areas, Open Spaces Areas, and Greenways

Appendix E lists individual parcels, by subregion, that are accessible to the public for outdoor recreation and environmental education purposes and categorizes them by developed park and recreation areas, open space lands (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 and recreation lands exist, there is no complementary information for land areas at school sites used for outdoor recreation and environmental education.

Table 8 summarizes the existing acreages of these available recreation lands for each of the five GLAC Subregions. Also provided are existing (2010) and projected (2035) populations within each subregion.

Table 8. Existing Recreation Lands

Subregion	Developed Urban Park and Recreation Area (acres)	Open Space Lands			Greenway (acres)	Other / Misc (acres)	Existing <u>Population</u> Projected Population
		Riparian / Upland / Wetland (acres)	Beach / Estuary (acres)	National Forest (acres)			
North Santa Monica Bay	250	57,000	370	0	0	0	<u>107,000</u> 122,000
Upper Los Angeles River	4,600	29,000	0	120,000	430	560	<u>2,270,000</u> 2,590,000
Upper San Gabriel River and Rio Hondo	3,100	14,000	0	178,000	2,100	1,400	<u>1,520,000</u> 1,740,000
Lower San Gabriel and Lower Los Angeles Rivers	7,000	4,700	390	0	550	50	<u>3,030,000</u> 3,460,000
South Santa Monica Bay	3,900	19,000	1,100	0	70	240	<u>2,690,000</u> 3,080,000
Total Acres in Region	**19,000**	**124,000**	**1,800**	**298,000**	**3,200**	**2,300**	**<u>9,630,000</u> 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 Open Space and Recreation and Environmental Education Opportunities

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. Open space areas, depending on their proximity to urban populations and their physical characteristics, may be used for a number of active or passive recreational purposes. The following describes some of the major types of recreational open space areas found in the GLAC Region.

Developed Park and Recreation Areas: Developed lands may consist of neighborhood parks, community parks, and sports complexes that are generally less than 20 acres in size. Typically, these parks provide for a combination of active and passive recreation. Golf courses are another type of developed urban recreation area that may range in size from 60 acres to 120 acres with professional courses up to about 250 acres. Though highly developed, golf courses can also include islands of undisturbed open space lands that provide some habitat value as part of their setting.

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.

Table 9 identifies those major rivers, creeks, and channels and other areas within the GLAC Region that have been identified by local communities. These linear recreation lands would typically connect a series of urban park and recreation areas. They also may connect natural landscape components, including wetland, 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.

Table 9. Existing and Planned Linear Urban Greenways / Parkways / Bikeways with Class 1 Multiple-use Trails

	Linear Urban Greenways / Parkways / Bikeways	North Santa Monica Bay	Upper Los Angeles River	Upper San Gabriel River and Rio Hondo	Lower San Gabriel and Los Angeles Rivers	South Santa Monica Bay
1	Los Angeles River					
2	Arroyo Seco					
3	Bell Creek Greenway					
4	Tujunga Wash					
6	Burbank Western Channel					
8	San Gabriel River					
9	Compton Creek Regional Garden Park					
10	Rio Hondo and San Gabriel (Emerald Necklace)					
11	Santa Anita Wash					
12	Eaton Wash					
13	Rubio Wash					
14	Alhambra Wash					
15	Coyote Creek					
16	Carbon Creek					
17	Brae Creek					
19	La Canada Verde Creek					
20	Fullerton Creek					
21	Whittier Greenway Trail					
22	Walnut Creek					
23	San Jose Creek					
25	Ballona Creek					
26	Sepulveda Channel					
27	Arroyo la Cienaga					
28	Dominguez Channel					
29	Long Beach Greenbelt					
30	Santa Monica Beach and South Bay Bike Path					
31	Shoreline Pedestrian Bikeway					
32	Duarte Bike Trail					
33	Metro Orange Line Bike Path					
34	Chandler Bikeway					
35	Mission City Bike Trail					

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.

Schools: 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. These sites are sometimes not included in park and recreation inventories. School grounds typically provide opportunities for active recreation, such as playgrounds and sports fields.

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.

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.

5.1.2.1 Regional Agencies

A list of federal, state, private, and special districts and associations that provide regional recreation within the region is found in Table 10.

Table 10. 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 Game
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
Sanitation Districts of Los Angeles County
South Bay Cities Sanitation District
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

5.1.2.2 Municipal Park and Recreation Departments / Districts

A list of municipal agencies that provide neighborhood and community parks within the region is found in Table 11.

Table 11. 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

Cities			
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 OSHARP 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:

- Assist in providing urban neighborhood and community park areas that are accessible to underserved populations (and DAC communities) based on average of 4 acres per 1,000 population.
- Enhance existing and planned greenways as shown in Table 11 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 1,000 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.

6.2 Recreation Planning Targets

6.2.1 Methodology

The methodology used for establishing recreation targets focuses on defining and identifying underserved communities where the supply of recreation opportunities does not meet demand based on community standards. This methodology is described in detail in Appendix D.

6.2.2 Recreation Targets

Figure 12 presents targets for development of new urban park and recreation areas developed using the methodology described in Appendix D. Included in these targets is

acreage for greenways that, if developed for recreation purposes, provides equivalent recreation benefits to some aspects of neighborhood and community parks. (Appendix F lists existing school sites and developed park and recreation areas).

A number of additional factors need to be considered during the process to implement these targets. These factors are largely based on the type of facility being developed. 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.

Recreation targets are for year 2035.

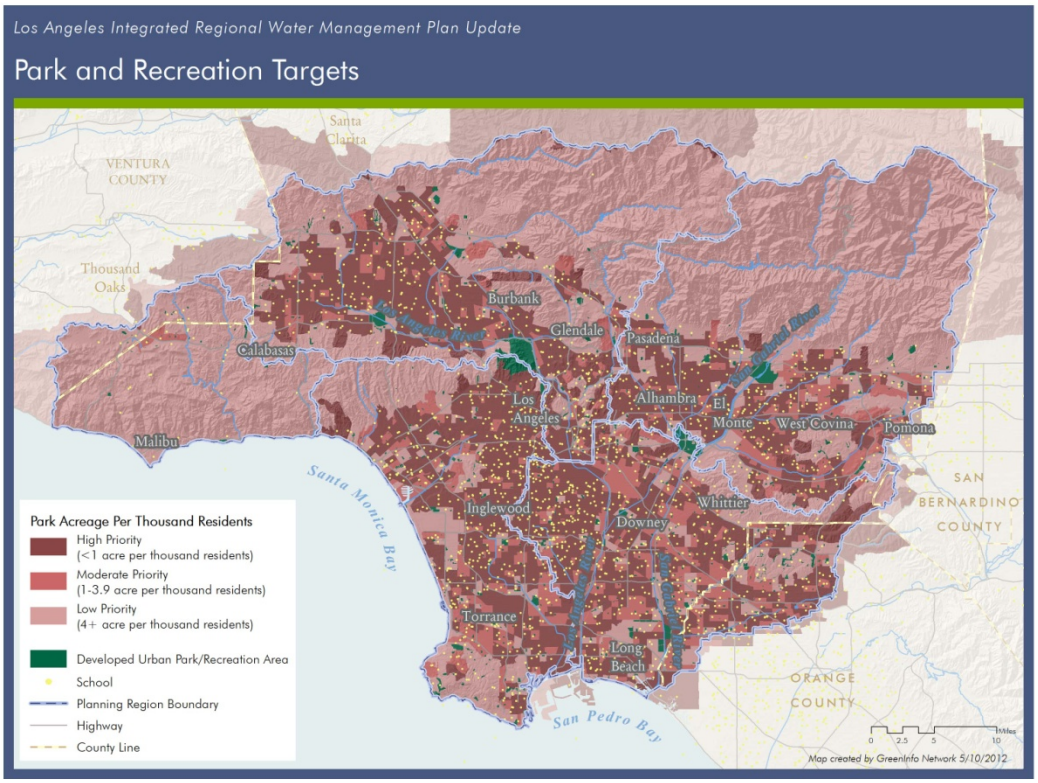

Figure 12. Park and Recreation Targets (GLAC Region)

Table 12 presents targets for the GLAC Region for protecting and developing open space areas for public recreation. These targets provided needed open space areas for public recreation. These targets are based on current and projected (2035) populations.

Table 12. New Recreation Targets for Open Space Areas for Existing Populations

GLAC Region	Existing Open Space Lands Available for Recreation (1) (acres)	Existing Population / Projected Population(2)	Standards (3) (acres)	Targets (acres)
Excluding Angeles National Forest Lands	13,000	**9,630,000** **10,990,000**	58,000 65,926	45,000 53,000
Including Angeles National Forest Lands	27,000	**9,630,000** **10,990,000**	58,000 66,000	30,000 38,000

(1) Open space lands indicated assume 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.

Based on existing standards there is a need for approximately 16,000 acres of additional urban parkland (neighborhood and community parks) within the region. In addition, there is a need for approximately 30,000 to 45,000 acres of additional regional park and open space lands available for recreation. Based on current population projections for the region, this need will rise by the year 2035 to approximately 22,000 acres of urban parkland and between 38,000 and 53,000 acres of regional park and open space lands.

Figure 13 illustrates on the following areas on a regional basis:

- Existing Open Space Areas
- Existing River and Creek Greenways

- Other Greenways
- Greenways planned but not completed
- Planned County trail routes

Figures in Appendices G-K illustrate these areas on a subregional basis.

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.

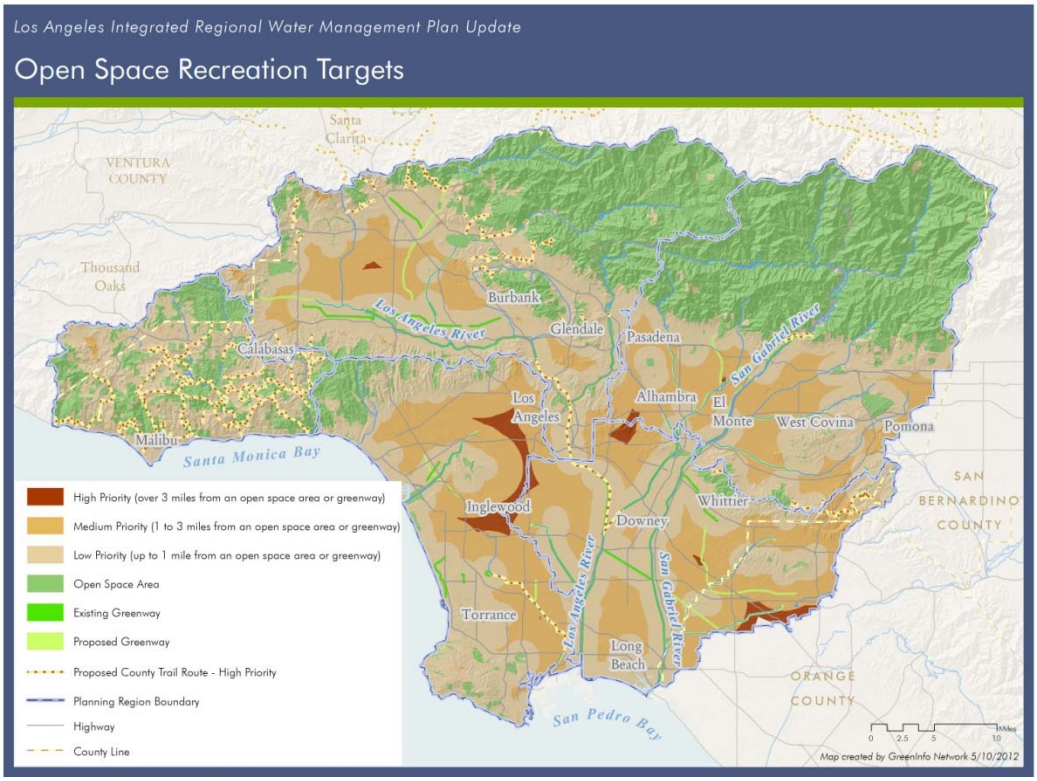

Figure 13. Open Space and Recreation Targets (GLAC Region)

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

Wetlands provide services in all four categories, as is shown in Table 13 (Vymazal, 2011). Wetland ecosystems reduce flood damage to human communities, sequester carbon, and reduce pollutants in runoff entering streams (Brauman et al., 2007). Wetlands 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 wetlands to have global significance and value as ecosystem services: biodiversity support, water quality improvement, flood abatement, and carbon management.

Table 13. Examples of Services Provided by Wetlands, 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 wetland ecosystems
Recreational	Opportunities for recreational activities
Aesthetic	Many people find beauty or aesthetic value in aspects of wetland 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 wetlands, 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.

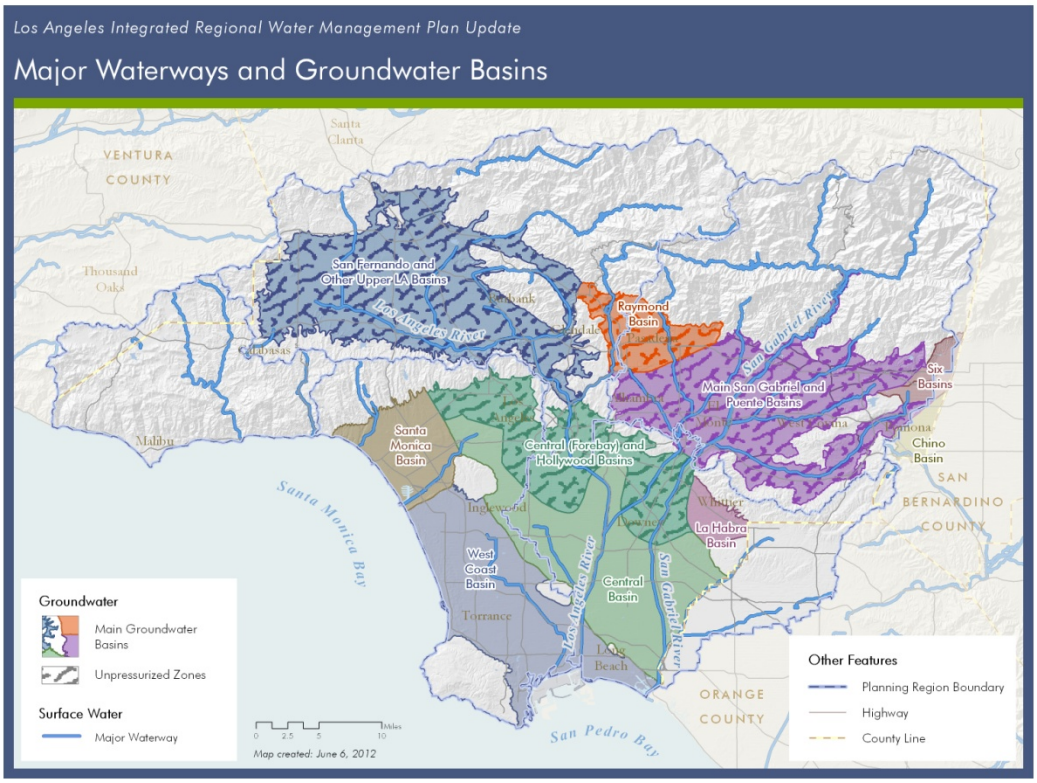

Figure 14. Major Waterways and Groundwater Basins (GLAC Region)

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 Appendix L, 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. Wetlands 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 wetlands. Some pollutants are transformed by processes occurring within wetlands, such as denitrification for the removal of excess nitrogen. Other pollutants, including bacteria, are deactivated by solar radiation while being retained in wetlands. The water quality improvement services of natural wetlands are often exploited when wetlands 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, 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.

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 Appendix L) 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

Wetlands 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 wetlands, 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 wetlands. Because methane is a potent greenhouse gas, the greenhouse gas mitigation potential for salt marshes

is generally higher than for freshwater wetlands. Nonetheless, riparian forests sequester substantial amounts of carbon in their aboveground biomass.

7.6 Providing Aesthetic and Cultural Values

Wetlands provide a variety of aesthetic and cultural values. Wetlands 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 wetlands valued places for viewing birds and other wildlife and plants. Wetlands 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. Wetlands provide opportunities for education and scientific research. Wetlands provide aesthetic values to people who appreciate natural features. This value is particularly important in urbanized settings such as much of GLAC, where wetlands provide views and open space that provide a relief from urban environments. Similarly, wetlands 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-wetland 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 for 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 Appendix M, and the results a presented below.

8.1 Stormwater Infiltration and Potential Groundwater Recharge Benefits

Results from the methodology described in Appendix M 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 14). Figures 15 and 16 show recreation and habitat targets with potential recharge benefits.

Table 14. Infiltration and Potential Groundwater Recharge Benefits from Open Space Projects

	Potential Groundwater Recharge Capacity (AF/yr)		
	Habitat	**Recreation**	**Total**
North Santa Monica Bay	-	-	-
Upper Los Angeles River	2,000	19,000	21,000
Upper San Gabriel and Rio Hondo	3,000	15,000	18,000
Lower San Gabriel and Los Angeles River	1,000	5,000	6,000
South Santa Monica Bay	-	2,000	2,000
Greater Los Angeles County	**6,000**	**41,000**	**47,000**

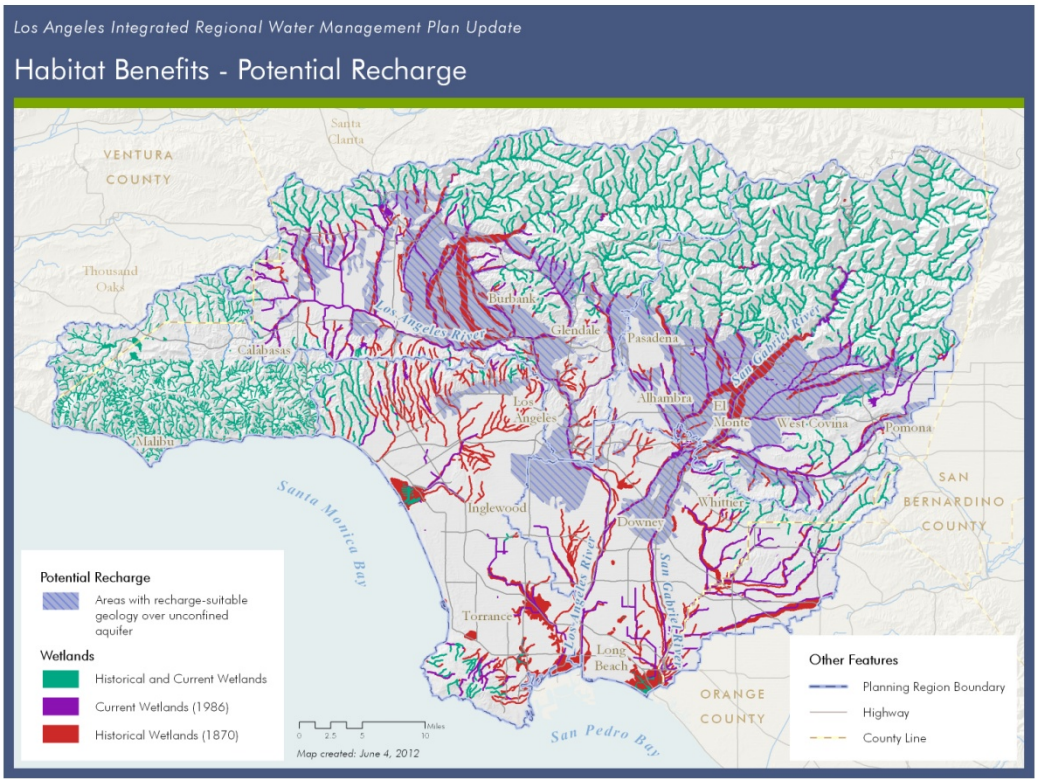

Figure 15. Habitat Targets and Potential Recharge Benefits (GLAC Region)

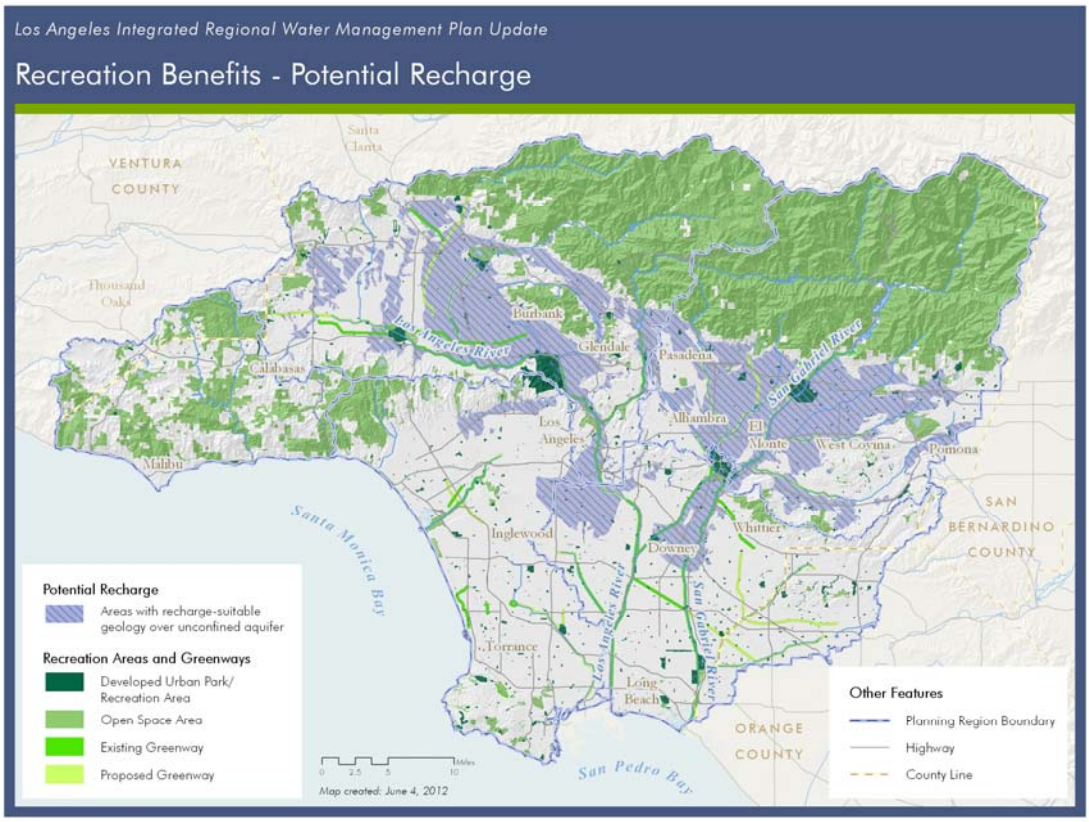

Figure 16. Recreations Targets and Potential Recharge Benefits (GLAC Region)

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 15).

Table 15. Potential Stormwater Quality Benefits from Open Space Projects

	Potential Capture Capacity (AF/yr)		
	Habitat	**Recreation**	**Total**
North Santa Monica Bay	200	200	400
Upper Los Angeles River	600	3,900	4,500
Upper San Gabriel and Rio Hondo	900	2,600	3,500
Lower San Gabriel and Los Angeles River	1,100	4,400	5,500
South Santa Monica Bay	800	6,400	7,200
Greater Los Angeles County	**3,600**	**17,000**	**21,000**

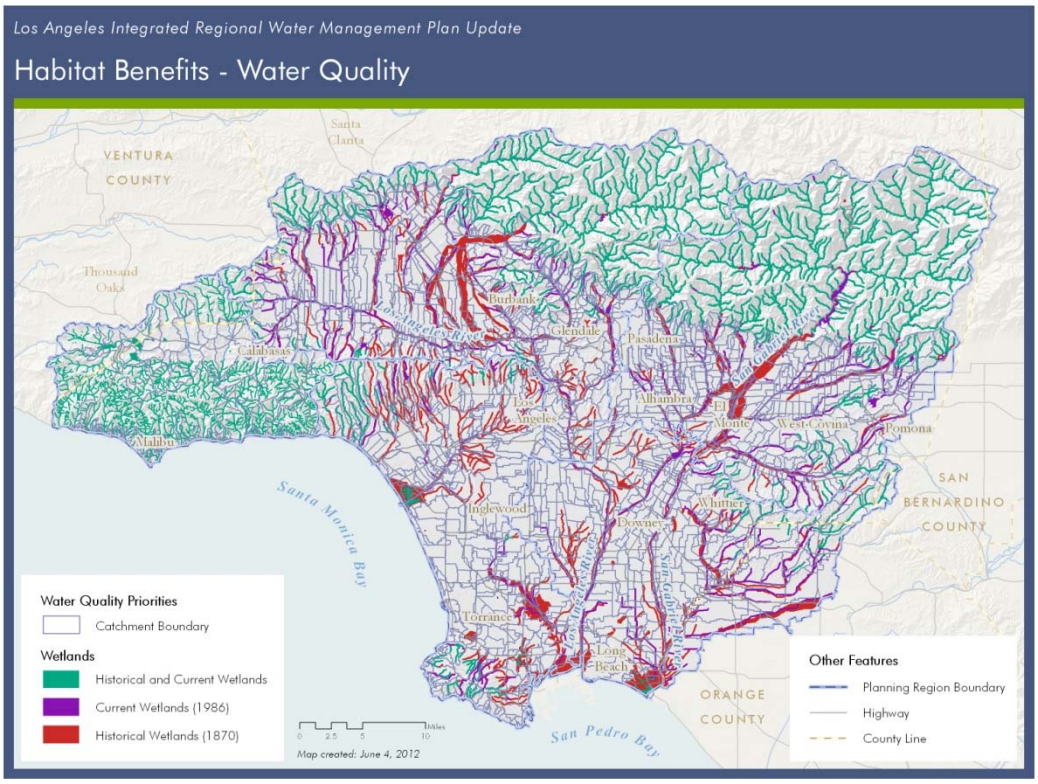

Figure 17. Habitat Targets and Stormwater Quality Benefits (GLAC Region)

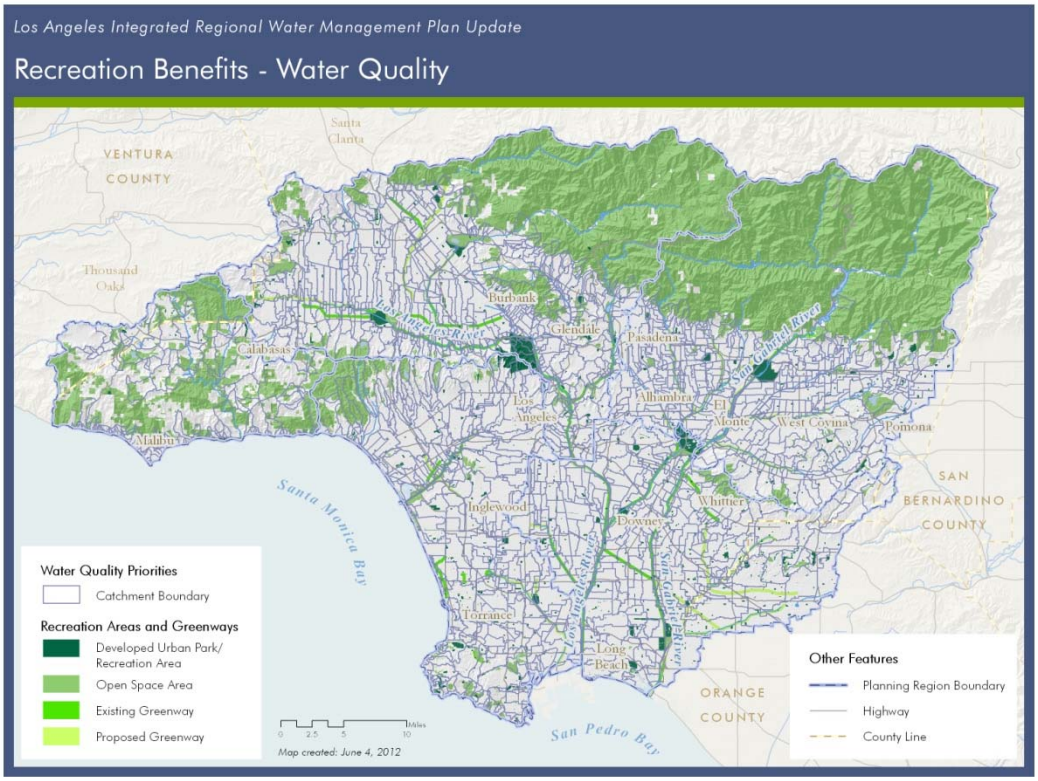

Figure 18. Recreation Targets and Stormwater Quality Benefits (GLAC Region)

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.[18] 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.[19]

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. 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

[18] http://www.opengreenspace.com/
[19] http://ccir.ciesin.columbia.edu/nyc/ccir-ny_q4a.html

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. Wetlands can be excellent habitats for carbon sequestration, especially coastal wetlands (Chmura et al. 2003, Vymazal 2011), so the GLAC wetlands could be managed to maximize carbon sequestration whenever feasible; this would include both wetland protection, which would preserve existing carbon stores, and wetland creation, which could increase carbon sequestration.

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.

Table 16. Summary of Target Tables – Wetlands, Uplands, and Recreation

North Santa Monica Bay	Upper Los Angeles River	Upper San Gabriel and Rio Hondo Rivers	Lower San Gabriel and Los Angeles Rivers	South Santa Monica Bay	Greater Los Angeles County
Targets for Wetland Protection or Preservation (Tidal Wetland, Freshwater Wetland, and Riparian) (in acres)					
220	180	700	690	220	2,000
Targets for Wetland Enhancement (Tidal Wetland, Freshwater Wetland, and Riparian (in acres)					
440	1,500	2,400	1,100	560	6,000
Targets for Wetland Restoration or Creation (Tidal Wetland, Freshwater Wetland, and Riparian (in acres)					
90	1,100	1,000	950	830	4,000
Targets for Upland Habitat (Buffers and Linkages) (in acres)					
1,100	18,000	20,000	11,000	4,000	54,000
Target for Recreational Park Lands (in acres)					
170	4,500	3,000	5,100	6,900	20,000
Target for Natural Recreational Lands (in acres, range for entire region)					
					30,000 - 53,000
Total Open Space Target (in acres)					
2,000	**25,000**	**27,000**	**19,000**	**13,000**	**115,000 – 138,000**

11. EVALUATING OPEN SPACE PROJECTS

An important component of the IRWMP is the application of scoring metrics to determine the suitability of proposed projects in meeting overall goals and objectives. Recommended criteria to evaluate proposed uplands, wetlands and recreation projects are included in the appendices and are based on the expertise of the Open Space Team, although the GLAC IRWMP Steering Committees will be guiding the scoring process as the final IRWMP is developed.

Because proposed open space project proponents will be required to describe specific project benefits, methods for transparently and scientifically evaluating those benefits for comparison is vital to ensuring the best projects are recognized.

11.1 Habitat Project Evaluation

Numerous methodologies for measuring biological or ecological integrity/ecosystem services were evaluated as part of the process for developing evaluation criteria for open space projects as they relate to habitat. The methodologies reviewed included, but were not limited to, the following: Wetlands Evaluation Technique (WET), Rosgen (for stream hydrology), USACE's Functional – Based Performance Standards for Evaluating the Success of Riparian and Depressional/Emergent Marsh Restoration Sites, Habitat Evaluation Procedures (HEP), California Rapid Assessment Methodology (CRAM), Index of Biological Integrity (IBI), Instream Flow Models (for animals and biological communities), Wetland Replacement Evaluation Procedures, Hydrogeomorphic Wetland Assessment Model (HGM), and the Synoptic Approach.

After analyzing these methods for their applicability to IRWMP, design evaluation criteria for the creation, enhancement, and/or restoration of riverine, palustrine, and estuarine systems were developed using the USACE Functional – Based Performance Standards for Evaluating the Success of Riparian and Depressional/Emergent Marsh Restoration Sites and California's CRAM standards to score for habitat benefits provided by open space projects (See Appendix N).

Although CRAM is generally applied to wetland areas, it was adapted with the USACE method to include uplands also as part of the GLAC IRWMP project evaluation methodology. CRAM is preferred because it provides consistent and comparable assessments of wetland conditions for all wetlands and regions in California, yet accommodates special characteristics of different regions and wetland types. While it assesses the overall condition of wetlands, the results of a CRAM condition assessment can

be used to infer a wetland's ability to provide various functions or services for which it is most suited. CRAM assessments have four attributes: landscape context, hydrology, physical structure, and biotic structure. It also identifies key stressors that may be affecting wetland condition.

However, CRAM, and all other assessment methodologies reviewed, only deals with evaluating the condition and/or function of a project area; CRAM does not evaluate the proposed design of a wetland habitat creation, restoration, and/or enhancement project. The proposed IRWMP project evaluation criteria was developed using criteria from CRAM and other assessment methodologies that described the physical characteristics of the systems with the highest value. At this time, the suggested scoring numbers provide an indication of relative importance (note: the scoring system for this and other functions is currently under development).

11.2 Recreation Project Evaluation

Recreation criteria may be applied on an individual project design basis, or on a broader general planning basis for land acquisition or comparative project evaluations.

The methodology for determining recreation benefits and differentiating between projects is essentially one of measured need for recreation opportunities. The evaluation procedures used to characterize recreation need are based on three variables:

- Supply and demand: the availability of existing developed parks and recreation areas, greenways, or open space areas based on accepted community standards
- Accessibility: the usability of developed parks and recreation areas, greenways, or open space areas in terms of their distance from population centers, particularly underserved populations
- Planning Consistency: whether or not linear features such as greenways or regional trails are actively being planned and/or have been adopted in County and City General Plans.

The proposed IRWMP project evaluation criteria directly correlates to these variables. A supply ratio of 4 acres per 1,000 population serves as a baseline to consider the need for new recreation areas. Distance zones were used to identify priority areas vis-a-vis accessibility. Subregion maps (see Appendices G-K) were produced to illustrate these variables.

In some cases, the challenge for providing outdoor recreation and educational opportunities is land acquisition. The methodology for identifying these areas was limited to:

- Regional trail routes identified in the Draft Los Angeles County General Plan.
- An internet survey of greenway opportunities that have been identified and or formally adopted within the GLAC Region.

It should be noted that with 90 cities within the GLAC Region, and Los Angeles County, the identification of those trails and greenways called is a dynamic process, could be amended as new information is presented (such as City trail plans), and should be updated as necessary over time. (See also Appendix O).

Supply and demand criteria were based on the availability of parklands per thousand residents. Thresholds identified include:

- Less than 1 acre
- 1 to 3.9 acres
- Over 4 acres

Accessibility criteria focus on distances between residents and an open space or trail opportunity. These are:

- More than 3 miles from a greenway or trail
- Between 1 and 3 miles away from a greenway or trail
- Less than 1 mile away from a greenway or trail that is extremely accessible from both pedestrians and bicyclists

Criteria identified for the acquisition of new parklands and trail routes included:

- Consistency with the appropriated governing agency plans
- The opportunity to expand an existing public park, open space area, greenway, or trail
- The size of the parcel relative to its intended recreation use
- Immediacy in terms of the threat of development and a lost opportunity
- Consistency with resource conservation priorities

12. IMPLEMENTING THE OPEN SPACE FOR HABITAT AND RECREATION PLAN

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 for habitat and recreation. Another goal is to optimize successful grant-funding opportunities within the state's IRWMP program.

12.1 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 wetlands 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 wetlands will help mitigate the effects of rising sea levels.

The IRWMP serves as roadmap for the region's cities, water resource agencies, and other stakeholders to use as they work together. The establishment of subregional goals and objectives, as well as collective regional goals and objectives, allows for these entities to build upon each other's visions and projects. In addition, the mandated 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, criteria developed in the OSHARP 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 OSHARP. Some issues to consider in the future include the following:

- 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 OSHARP 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.
- The high level of urbanization and land values within the GLAC Region presents a significant challenge in implementing open space conservation. Open space conservation is needed for the region to protect its biodiversity and 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 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 increase potential of fire or flood hazards. 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.
- Implementation of the IRWMP relies, to some extent, on political decision-making. Political consensus, participation by key public organizations, program staffing, and available funding are important for full implementing the IRWMP.

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 2012 IRWMP 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 Barabara 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).

12.2 Gaps in Knowledge

The revised IRWMP is based on the best available science to date. However, information updates (i.e., research, science, and public policies) is 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 OSHARP. Many of the 90 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 OSHARP because of the sensitivity of the metrics applied to open space.

12.3 Recommendations

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 OSHARP is also intended to be reviewed regularly and updated as new information, technologies, and data become available. The following recommendations for the OSHARP 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 wetland habitat targets are based on data about historical and current extent of wetlands and ownership of parcels with wetlands. The best available data were used for calculating the targets, but additional work could be done to improve all of these databases. Recommendations include:

- **Wetland loss**. Rairdan (1998) was used to determine the loss of wetlands in the region. Rairdan's historical wetland 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 wetland extent**. The National Wetlands Inventory (NWI) was used to indicate the current extent of wetlands 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 wetland types as possible, including ephemeral wetlands and streams.
- **Ownership**. Wetland 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 wetland 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 wetlands. 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 wetlands when a suitable method has been developed. A detailed understanding of the ecosystem services provided by existing wetlands is critical for developing improved wetland 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.

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