CHAPTER 6
PARK SUSTAINABILITY

contents

figures

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6.1 Park Sustainability Overview

The Master Plan design is rooted in the environmental and social values of sustainable design. Responses to the Park Activities and Uses Questionnaire for Community Workshop 02 demonstrate that the community places a high value on amplifying the power of the reservoirs to attract and sustain wildlife, connect with nature and neighbors, and educate. In subsequent questionnaires from Community Workshops 03 and 04 a clear desire was expressed for a park that balances habitat expansion and enhancement with human uses.

When habitat is disappearing and species populations are diminishing at alarming rates, reintroducing wilderness into our cities offers a means to not only offset habitat losses, but also demonstrate how we can coexist with wildlife in our urban environments. In response, the Master Plan design interweaves systems of ecology, water, and education into a balanced whole. These visible forms of sustainability help portray the Silver Lake neighborhood and the City of Los Angeles as leaders in freshwater resource management and leaders in the stewardship of urban wildlife.

The Master Plan incorporates habitat enhancement and expansion that emphasizes re-establishing wetlands at the site, a water management strategy that supports a healthy aquatic ecosystem, and an education facility and programs that engage the community and teach residents, especially youth, about wildlife stewardship and climate adaptation.

6.2 Habitat Enhancement & Expansion

Today, the SLRC is known to be home to a small group of birds including a nesting pair of herons as well as small terrestrial mammals. Additionally, it's a popular spot for migrating waterfowl along the Pacific Flyway. However, up until recently, the Complex has been managed as a sterile reservoir to support the drinking water needs of Los Angeles. Its habitat value is moderate and most significantly, it lacks food resources for birds and small terrestrial species.

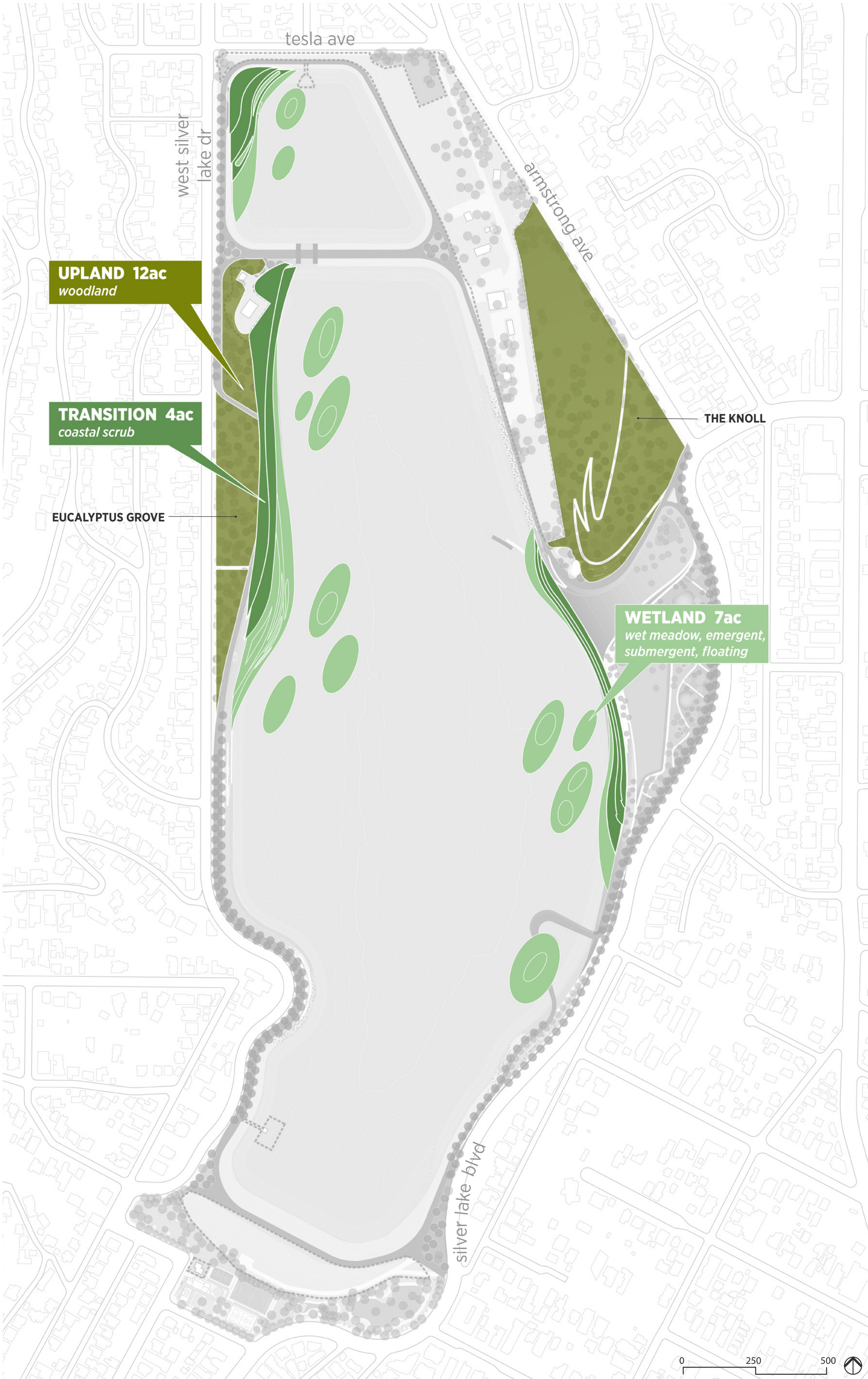
To remedy this, the Master Plan design focuses on increasing habitat diversity and introducing a food web. Many species have complex life cycles and depend on a variety of habitat types for their growth and development. The range of habitats proposed in the Master Plan will support an increasingly diverse array of birds, fish, amphibians, invertebrates, and other aquatic species. To provide this biodiversity, the Master Plan design maximizes the habitat value of existing wooded spaces and creates new habitat resulting in a combined total 23 acres of dedicated habitat area as seen in Figure 6-1.

The Eucalyptus Grove and Knoll are the two primary existing wooded areas in the Complex comprised of large trees, at varying stages of their lifespan, offering some nesting habitat for birds. Together, these woodlands total 12-acres and will be replanted to enhance their habitat value. Expanding from these lands, the reservoir embankments will be altered to create 5 acres of new transition (coastal scrub) and 6 acres of new wetland habitat to increase nesting and foraging resources for birds and terrestrial species. To complete this food web, fish will be re-introduced to the reservoirs.

The Silver Lake community will be connected to natural processes and ecological cycles, while maintaining a balance between public access and sensitive wildlife areas. To achieve this equilibrium, most habitat areas are protected with limited public access along designated pathways, boardwalks over sensitive planting areas, and overlooks and platforms to observe wildlife from a safe distance. Critical to successfully integrating habitat within an urban park is education that fosters an appreciation for conservation and stewardship.

Vibrant ecosystem supporting upland, transition, and wetland habitats.

Figure 6-1 Habit Zones Diagram



6.6.1 Habitat Goals

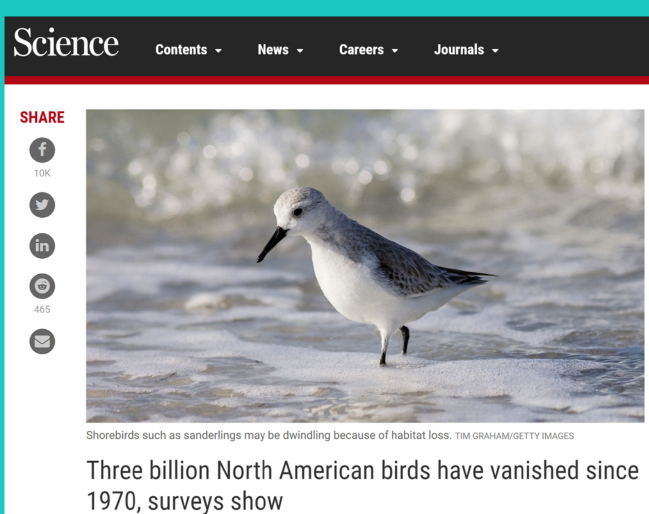
Measurable goals and objectives are essential for guiding the development and implementation of habitat restoration efforts and establishing a means to measure progress and evaluate success. The following goals were developed during the Master Plan process to support the Park's vision.

Goal No. 1: Improve ecological functions of the reservoir, embankments, and upland areas
To improve the ecological functions of the site, hardscape such as the embankments should be converted to native habitat where feasible, water quality and levels should be maintained to sustain wetland habitat, and an aquatic food web should be introduced.

Goal No. 2: Maximize native biodiversity
To maximize biodiversity within the Complex and with a focus on local and migratory birds, wetland habitat should be reintroduced including floating wetland islands. These wetlands should be designed and planted to meet the year-round foraging and nesting needs of a range of waterfowl species, creating shallow shorelines and water depths that vary between less than eight inches to eighteen inches.

Goal No. 3: Enhance existing native wildlife populations
The habitat value of existing wildlife areas, such as the Eucalyptus Grove and Knoll, should be enhanced via replanting strategies that protect and support existing wildlife. Disturbed habitat should be restored and the spread of non-native, invasive species prevented.

Goal No. 4: Balance wildlife and human uses
To create a park that supports wildlife and human uses, dedicated protected habitat areas and buffers between wildlife areas and active park spaces and pathways should be provided. Ecological education, interpretive signage, and outreach programs should be developed to create a platform for public understanding and support of the Park's habitat goals and objectives.


Science
Contents News Careers Journals
SHARE
10K
465
Shorebirds such as sanderlings may be dwindling because of habitat loss. TIM GRAHAM/GETTY IMAGES
Three billion North American birds have vanished since 1970, surveys show

(source: sciencemag.org)

During the Master Plan design process, a September 2019 study was published in *Science* magazine indicating that the number of birds in the United States and Canada have been in sharp decline over the last half-century. Given that the reservoirs are such a large, freshwater resource for local and migratory birds, particularly waterfowl, the Master Plan's habitat recommendations prioritizes these avian species.

BIODIVERSITY

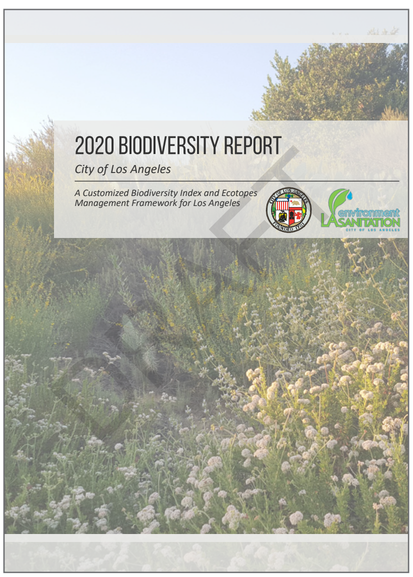
Definition: The flora, fauna, and ecosystems that enrich and sustain natural and urban areas. (source, LASAN).

In urban areas, biodiversity can be thought of as the variety of flora, fauna, and ecosystems that help maintain the balance of nature and sustain cities. Urban natural areas provide habitat connectivity and support the conservation of numerous sensitive species.

In 2017, the City of Los Angeles passed the City's Biodiversity Motion and in response, LASAN began developing a LA Biodiversity Index, planned for release in 2020. As a initial step and also in 2017, the City of Los Angeles measured itself against an established biodiversity index, the Singapore Index on Cities' Biodiversity. The City of Los Angeles then used the Singapore Index as a starting point for developing a separate index customized for the City's specific setting, the LA Biodiversity Index. The LA Biodiversity Index includes indicators that account for three core themes of urban biodiversity: conservation of native biodiversity; social aspects of biodiversity, with a focus on equity; and governance and management activities. The three themes are divided into eight indicators and 23 metrics that will be used to measure progress on biodiversity issues (Figure 6-2).

The Master Plan team recommends that the City applies this index to the implementation of the proposed Park and develop a SLRC Biodiversity Plan.

Figure 6-2 Draft 2020 Biodiversity Report and LA Biodiversity Index



Theme	Indicator CODE	Indicators	Metric CODE	Metrics
1. Native Species Protection & Enhancement	1.1	Habitat Quality	1.1a	% Natural Areas
			1.1b	Habitat Quality of Urban Landscapes, Water Features & Open Space
			1.1c	Connectivity of Natural Areas
			1.1d	Connectivity of Urban Landscapes, Water Features & Open Space
	1.2	Indicator Species	1.2a	% Open Space with Charismatic Umbrella Species
			1.2b	Common Indicator Species Presence in Urban Areas
			1.2c	Sensitive Indicator Species Gained or Lost from Ecotopes
	1.3	Threats to Native Biodiversity	1.3a	Urban Edge Effects on Natural Areas
			1.3b	Presence & Spread of Invasive Plants
			1.3c	Wildfire Frequency Departure from Natural
2. Social Considerations & Biodiversity	2.1	Access to Biodiversity	2.1a	Access to Natural Areas
			2.1b	Neighborhood Landscape/Tree Canopy Footprint
	2.2	Education	2.2a	Schools (K-12) Biodiversity Topics
			2.2b	Off-Campus Natural Area & Biodiversity Educational Visits
			2.2c	Campus & Park Nature Education Gardens/Areas
	2.3	Community Action	2.3a	Community Scientist Activities and App Utilization
			2.3b	# and Acres Certified Biodiversity-Friendly Areas
3. Governance & Management of Biodiversity	3.1	Governance	3.1a	Biodiversity Vision/Action Plan
			3.1b	% Departments with Biodiversity Programs & Policies
	3.2	Management	3.2a	% Protected Natural Areas
			3.2b	Natural Areas Management and Monitoring
			3.2c	Management of Invasive Species & Pests
			3.2d	Management of Threatened, Endangered, & Species of Concern

6.2.1 Habitat Typologies

Three primary habitat typologies are proposed for the new Park to support a healthy ecosystem and food web: Upland, Transition, and Wetland habitats as shown in Figure 6-3.

To create this new ecological transect, the existing steep embankments of the reservoirs will be modified to have a more gentle slope in order to introduce a transition habitat zone planted with coastal scrub species; vegetated habitat trays will then be built to create three distinct wetland habitat sub-types: wet meadow, emergent, and submergent. The differences between these wetlands are described in subsequent pages of this section.

To supplement the habitat trays and provide more protected wildlife areas, floating wetland islands will be introduced. The floating islands will be designed to include all three wetland habitat sub-types. In combination, these elements will increase biodiversity and allow the introduction of fish into the reservoirs. Figure 6-4 is a simplified depiction of the proposed ecosystem with the indicative species anticipated to inhabit the Park when it's completed.

Figure 6-3 Proposed Habitat Typologies

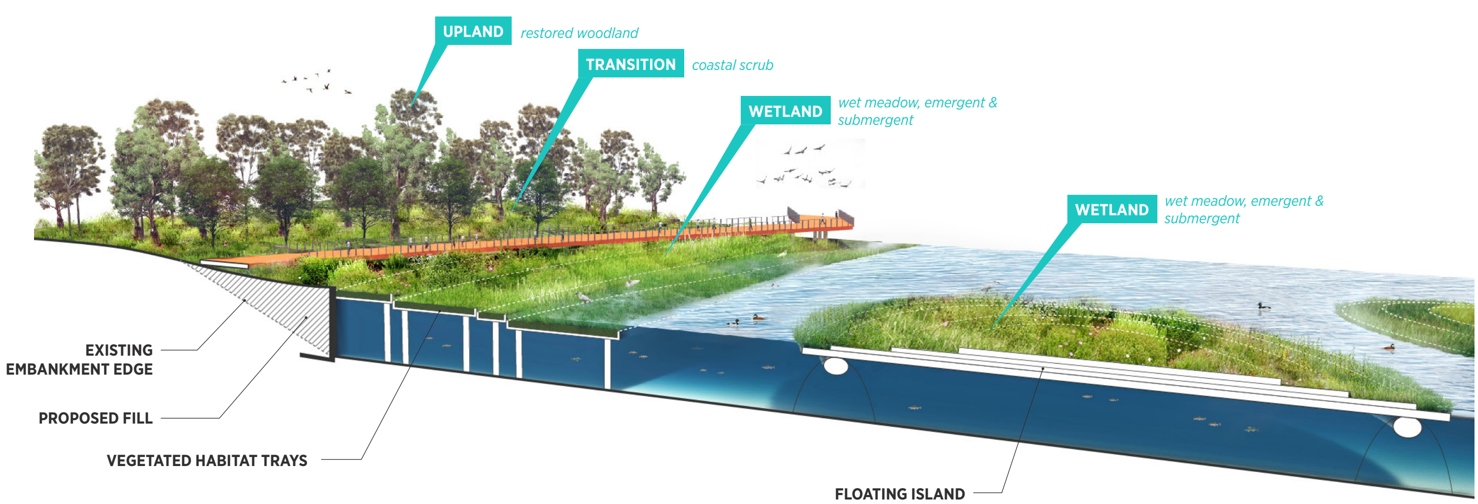
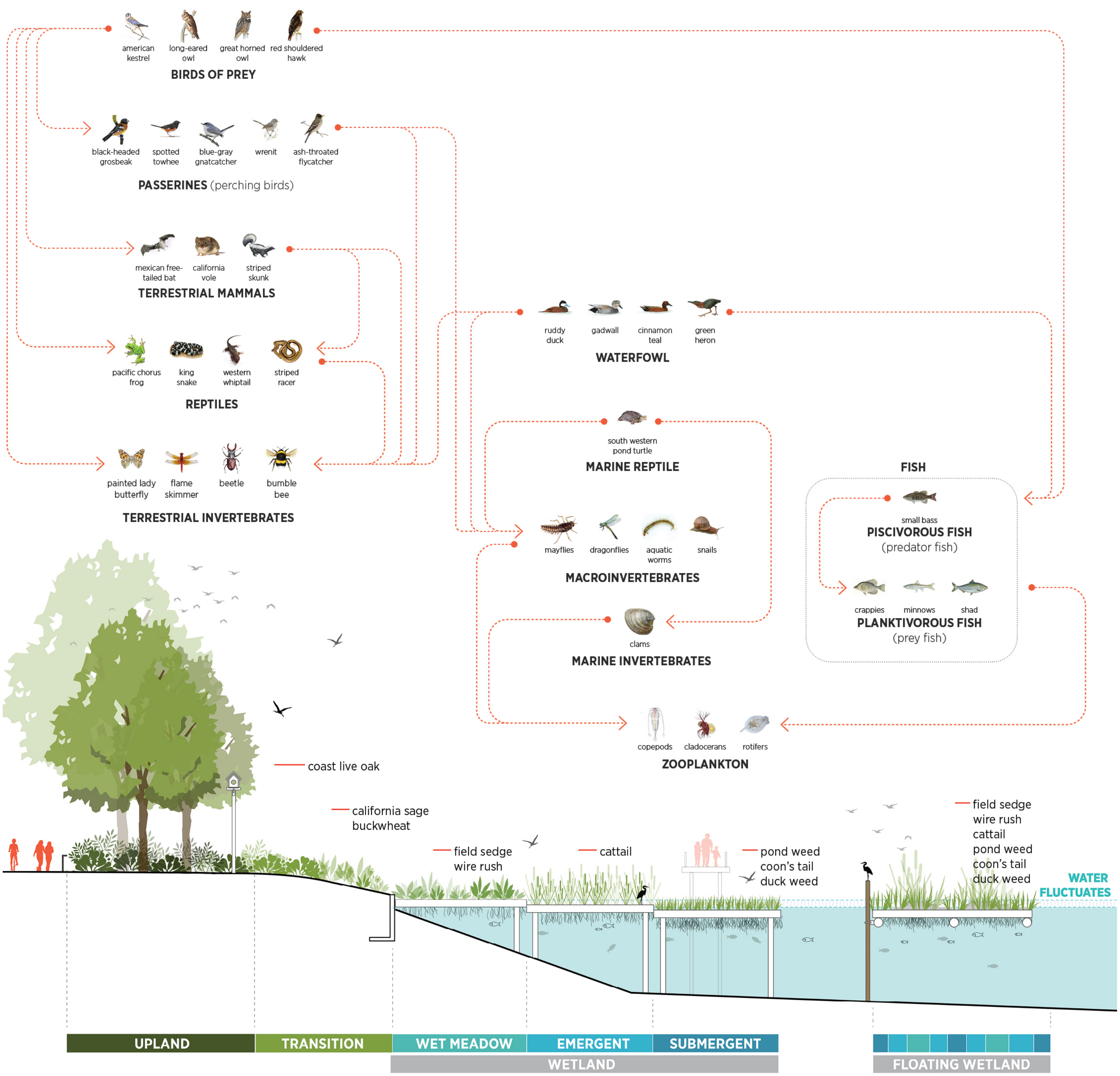


Figure 6-4 Healthy Ecosystem Conceptual Diagram



UPLAND HABITAT

Two existing wooded areas, the Eucalyptus Grove and Knoll shown in Figure in 6-1, are dominated by mature stands of non-native Eucalyptus trees and a mostly non-native understory plant community. Based on field observations, many of these Eucalyptus trees appear to be either nearing the natural end of their lives or are of questionable health. While the Eucalyptus trees offer habitat value for bird nesting they offer limited food resources outside of nectar for insects, the birds that feed on them, as well as directly to nectar feeding birds. The Master Plan recommends the development of a tree succession plan to replant these areas with more native species of higher habitat value such as the sample tree palette provided in Chapter 5 which includes species such as Coast Live Oak and California Sycamore.

Prior to developing a tree succession plan, a tree health assessment will be required for the Complex. A tree succession plan should be developed according to the following considerations:

- Selectively remove trees identified as poor in health and/or posing the risk of falling branches or fungal and pest infestation
- Replace 80% of existing trees over a 15-year timeline
- Provide 75% canopy coverage within 20 years

The tree succession plan should also support improving plant species diversity in the understory. Eucalyptus trees are highly competitive with understory plants since they are efficient consumers of available water and nutrients and can shade out and stifle smaller plants with their large canopies and leaf drop. Chapter 5 of this report offers a sample plant palette for improving upland understory habitat value. Figure 6-5 graphically depicts the tree succession strategy over the course of 15 years.

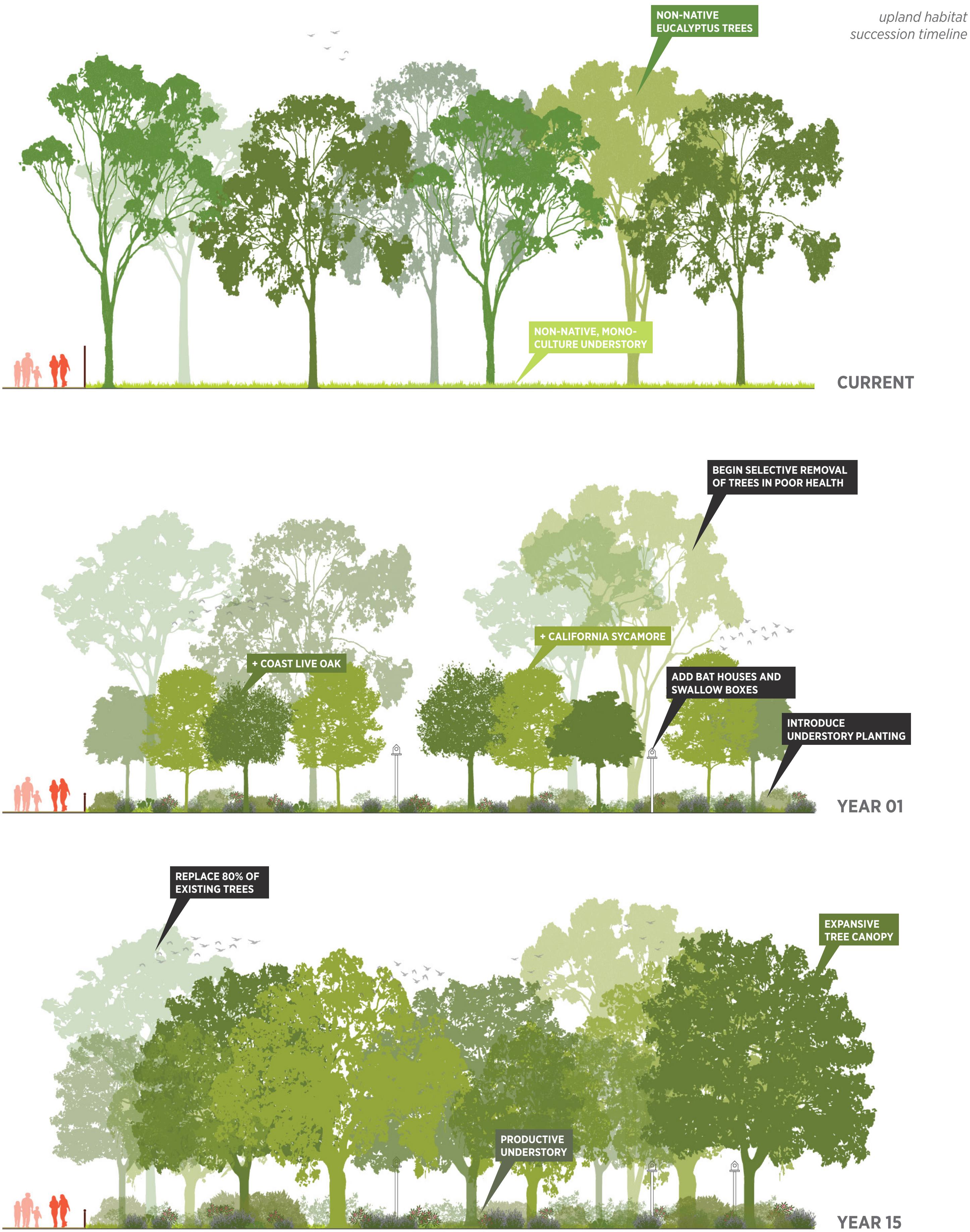
An upland habitat planting strategy for the Eucalyptus Grove and Knoll that priorities plant species diversity and food resources will benefit small mammals such as the Mexican free-tailed bat, California vole, and striped skunk, reptiles, as well as a variety of bird species who nest in large trees, such as the great blue heron and birds of prey such as the great horned owl. Bat houses and swallow boxes are also recommended additions to the upland areas to help control insect populations.

TRANSITION HABITAT

Transition habitat refers to a plant community whose species are adapted to the diverse and varying environmental conditions that occur along the boundary between upland and wetland areas. In Southern California, this zone is characterized by low-growing woody shrubs such as sage and buckwheat species. Transition habitat is a highly productive ecotone and serves a great many wildlife species. It offers food resources as well as cover while they move between aquatic and woodland areas.

A sample planting palette of species recommended for this gradient landscape is provided in Chapter 5. Many are flowering and fruiting shrubs which provide food resources for not only terrestrial mammals and bird species but also terrestrial invertebrates such as pollinators and beetles which are essential to a healthy ecosystem and food web.

Figure 6-5 Sectional Depiction of Tree Succession Strategy



WETLAND HABITAT

Wetlands are areas between terrestrial and aquatic habitats that offer a range of diversity in plant communities and the species which inhabit them. Above the soil surface, wetlands provide cover, food and nesting opportunities for birds, amphibians, turtles, and insects, primarily from vegetation. Below the soil surface, in the root zone, macrophytes (aquatic plants) provide an environment for microorganisms that helps take up nutrients into plant tissue. They are also an indicator species for water quality of the reservoirs.

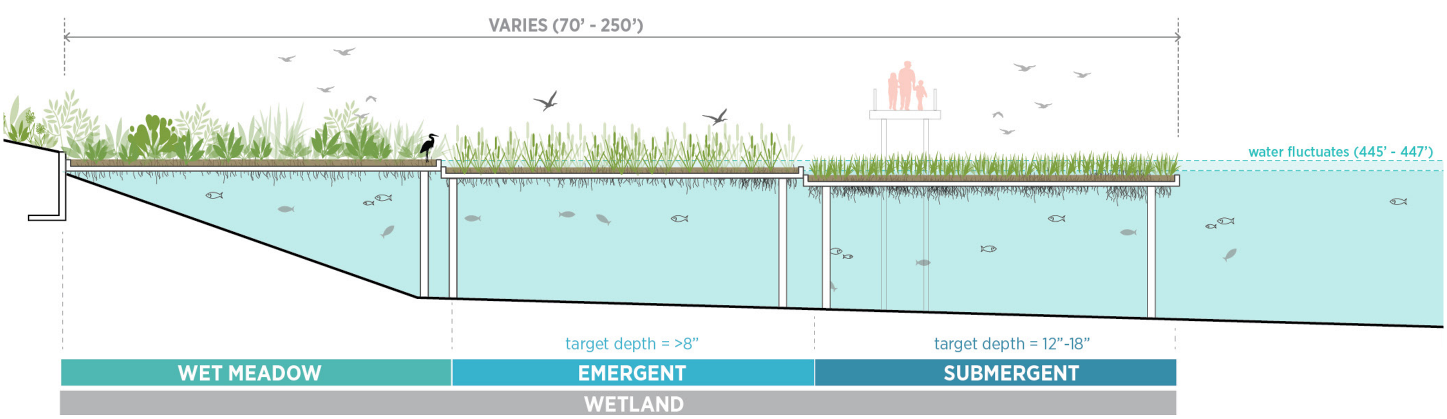
There are three sub-types of wetlands proposed in the Master Plan, each of which correlates with levels of soil saturation and has a direct relationship to the water table of the reservoirs. These wetland sub-types are described below. Sample plant palettes for the wetlands can be found in Chapter 5. Wetlands are proposed to be implemented via constructed habitat terrace trays and floating islands as depicted in Figures 6-6 and 6-7.

Wet Meadows are wetlands with soils that are saturated for part or all of their growing season. They are often referred to as the "sponge" of the local ecosystem. Unlike other wetland types, a wet meadow does not have standing water present throughout the year except for periods during rainy seasons. In Southern California, wet meadows occur with a great variety of plant species, but several are common such as field sedge and wild rush. As a highly diverse habitat, wet meadows attract large numbers of birds, small mammals, and insects — including many species of butterflies. Waterfowl, especially mallard ducks, frequent wet meadows and yellow-headed and red-winged blackbirds occasionally nest in them as do various frog species.

Fresh **Emergent** wetlands flood frequently and typically have saturated soils that support common cattail and bulrushes. While water depths within emergent wetlands can vary, the target depth for the Master Plan design is about eight inches which is ideal foraging habitat for many migratory waterfowl such as dabbling ducks. This wetland type provides food, cover, and water for numerous mammals, reptiles, and amphibians as well as macroinvertebrates such as dragon flies and snails.

Submergent wetlands are continuously inundated with water. Plants found in this habitat type are either rooted to the soil below the water table or they float. Aquatic plants such as pond weed, coon's tail, and duckweed are typical submergent wetland species. Found along the edges of open water, submergent wetlands provide critical habitat for not only waterfowl and amphibians but also for marine invertebrates and zooplankton, the building blocks of aquatic food webs. The target depth for the proposed submergent wetlands is 12 to 18 inches to not only support biodiversity but to also provide a winter refuge for local and migratory waterfowl such as the great blue heron, ruddy ducks, and cinnamon teals.

Figure 6-6 Typical Constructed Habitat Terrace Tray Wetland Section



6.2.2 Floating Wetland Islands

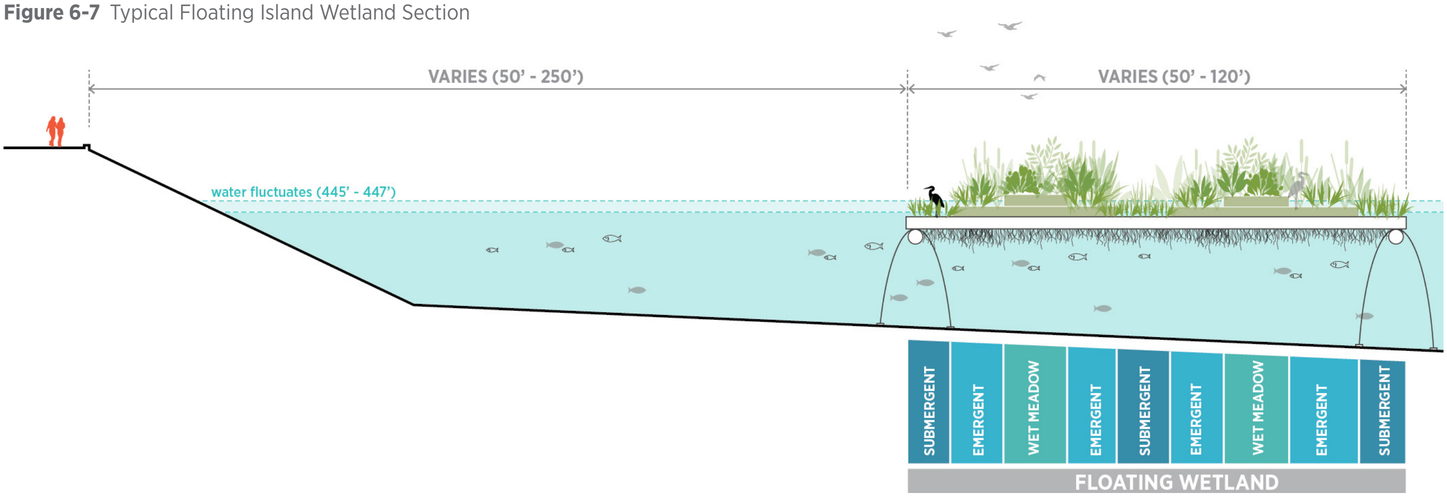
Floating wetland islands are proposed in the Master Plan design to compliment the land-based, constructed habitat terrace trays along the reservoir embankments. They will be designed with undulating soil profiles to accommodate all three wetland habitat sub-types described above to maximize biodiversity and habitat benefits. Unlike land-based wetlands, floating wetlands create habitat underneath them within their below-water root zone making the water column around floating wetlands a highly ecologically productive area that attracts fish and many other aquatic species. Microorganisms that live within this root zone, include algae, grazing snails, clams, insects (egg and larvae stages only), crustaceans, fish, and amphibians. Floating wetlands provide food for fish and other aquatic organisms, as well as shaded and sheltered spawning habitat. Additionally, they are resilient to water level fluctuations and offer a higher degree of protected nesting habitat from both human disturbance and predation than land-based wetlands.

The value of a given island to birds varies according to its location, size, shape, and surface cover. It is also important for the islands to be designed to provide a balance of feeding and nesting areas. In general, the further an island is from the shore, the more attractive it is likely to be to birds, particularly nesting waterfowl.

Floating wetlands may also be preferred nesting sites by many species of wading birds which often nest in woody vegetation either submerged or surrounded by water. The floating islands proposed in the Master Plan design are intended to be varied in size and set-back from the shoreline to offer a variety of foraging and nesting spaces for waterfowl and other aquatic species. To create additional protection for nesting birds, the density of vegetation on the islands should also be varied to provide areas with high vegetation coverage.

Together, the proposed wetland terraces and islands provide a framework to support a healthy, biodiverse aquatic ecosystem and essential access by local and migratory birds to fresh water and foraging habitat. They provide a variety of beneficial functions and value including water storage, water quality protection, habitat for fish, wildlife, and sensitive plants, as well as the opportunity for education and research.

Figure 6-7 Typical Floating Island Wetland Section



6.3 Wildlife

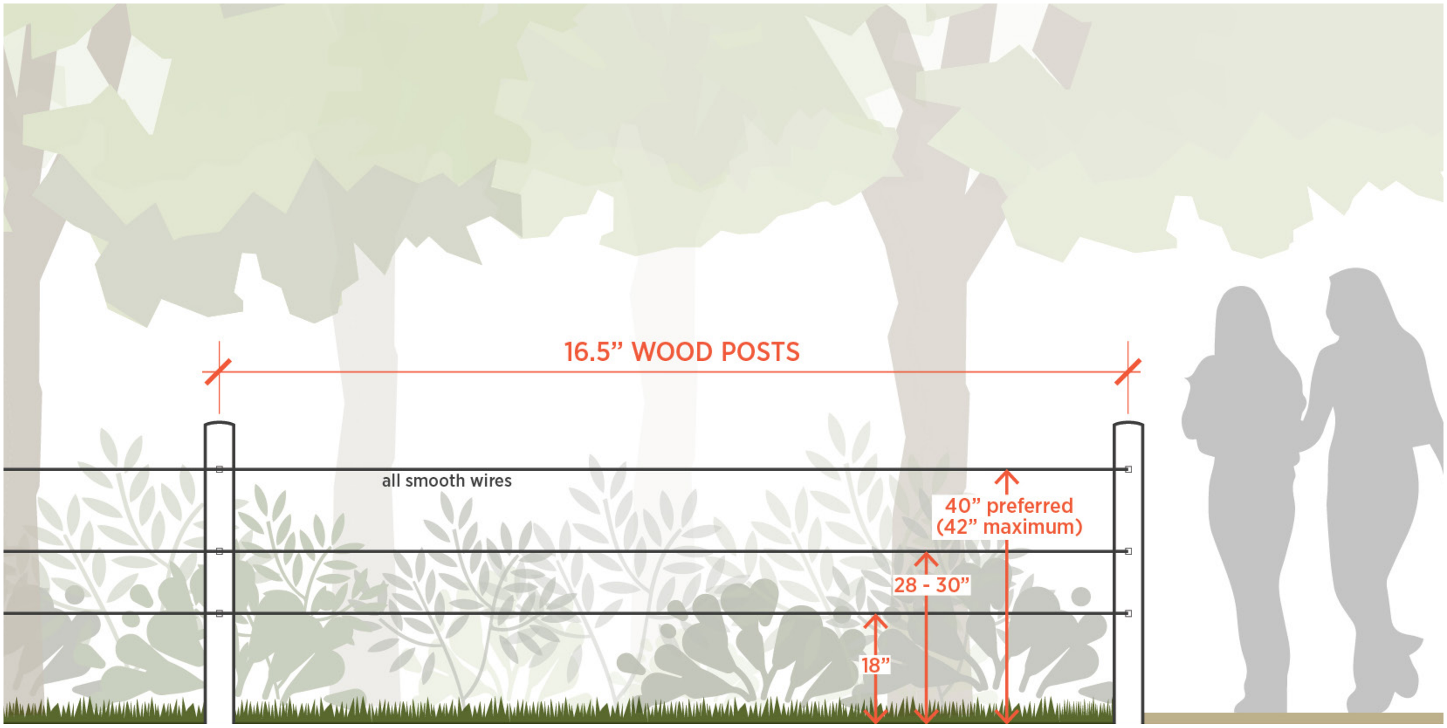
As habitat continues to disappear in our increasingly urbanized world, introducing wildlife habitat back into cities is becoming ever more critical. In so doing, more opportunities for humans and wildlife to come into contact are created. When designing space for humans and wildlife to coexist, it is important to develop suitable habitat areas and incorporate design elements that enhance human / wildlife benefits.

Research indicates that people are happier and healthier when they can experience nature, but both humans and wildlife need to be safe. Human welfare and safety depend on a thorough understanding of urban wildlife and their interactions with the urbanized landscape. Likewise, wildlife welfare depends on creating large, diverse areas of protected habitat that promote foraging and nesting behaviors. To ensure the sucessfull introduction of wildlife to the Complex, a wildlife management plan should be developed prior to implementing the habitat enhancement and expansion features of the design.

Birdwatching in wetlands.

Wildlife-friendly fence and gate.

Figure 6-8 Ideal Wildlife-Friendly Fence



WILDLIFE PROTECTION AND FENCING

In general, fences are not recommended in habitat areas for a variety of reasons. Fences can severely restrict wildlife movement or create a complete barrier for wildlife to access food and water. Tall chain-link and wooden or metal fences with closely spaced vertical or horizontal pickets are especially unfriendly to wildlife. Large, low-flying birds, may collide with fences and break wings, impale themselves on barbs, or become tangled in wires. Ducks, geese, hawks, and owls are especially vulnerable. Waterfowl fly into fences that run along waterways, and hawks and owls may careen into fences when swooping in on prey.

Designing a fence to provide wildlife with unobstructed travel to important habitat areas and corridors, as well as access to water, is ideal. A fence that is friendly to wildlife allows animals to jump over and crawl under easily without injury and should be highly visible to birds. The Silver Lake community has reported sightings of larger mammals such as bobcats, coyote, skunk, and opossum in the Complex. Post and rail fences as described in Chapter 5 and depicted in Figure 6-8 above are ideal for wildlife. The top of the fence should be low enough for adult animals to jump over, preferably 40" or less, and no more than 42" high.

When combined with education about urban wildlife and limiting human access to designated areas, such as paths and viewing platforms, habitat-friendly fences help protect wildlife while increasing their access to important habitat. The Master Plan design proposes to replace tall fences along the perimeter of the Complex with wildlife-friendly fencing along pathways adjacent to habitat areas to not only protect habitat but also maximize wildlife movement and prevent wildlife injuries or mortality.

INTRODUCING FISH

A key aspect to improving habitat value to local and migratory birds as well as biodiversity at the SLRC is introducing aquatic wildlife. Stocking fish in Silver Lake Reservoir is not a new idea. When it was first constructed, the reservoir was stocked with black bass to help maintain water quality. In addition to introducing marine invertebrates such as fresh water clams, a balance of piscivorous (predator) fish such as small bass and planktivorous (prey) fish such as minnows and crappies should be introduced to the reservoirs at a ratio of three prey fish for every predator fish.

6.4 Education and Interpretation

The Master Plan provides a bold vision to re-establish a wetland-focused ecosystem into the heart of Los Angeles and within the context of a public park. Along with the high priority placed on habitat and wildlife in the Master Plan, there is also an inherent responsibility for long-term stewardship. One of the best ways for humans to carefully and responsibility coexist with urban wildlife is through education.

As outlined in Chapter 04, during the community engagement process, participants placed a high value on educational facilities and programs. The Master Plan design provides the foundation to develop a myriad of education and interpretation opportunities from organized tours, classes, school field trips, and volunteer programs to less structured interpretive features and elements.

The SLRC has the potential to become an exemplary model of urban wilderness management and citizen stewardship. Through the lens of a living laboratory, the research and maintenance activities required for the long-term success of the proposed ecosystem can be made legible and transparent by increasing environmental and climate awareness across the community.

Education-based programs that the Master Plan design allows for range from water resource and wildlife management, tree and plant community succession and maintenance, and climate adaptation strategies to understanding ecosystem functions and services, tracking migratory birds, bird watching, pollinator conservation, and contributing to global wildlife and ecology databases through citizen science initiatives. Potential education and interpretation stations are shown in Figure 6-9.

Many of these education/interpretation activities will require ongoing funding to develop and sustain them. The benefits of this investment are enriching and enhancing the lives of a diverse City by fostering a deep connection to nature and the natural processes that sustain a healthy ecosystem.

POTENTIAL PARTNERSHIPS

Partnerships with academic institutions, non-profits, and City departments could greatly expand the educational breadth and outreach to the regional population. Examples of potential partnerships are listed below:

PARTNER WITH SCHOOL DISTRICTS

Use the SLRC as a learning opportunity to bring K-12 school groups to the park to learn about different aspects of sustainability, ecology, culture, and history.

PARTNER WITH THE UNIVERSITY OF CALIFORNIA, LOS ANGELES (UCLA)

UCLA has the La Kretz Center for California Conservation Science which funds projects that bring together academics, resource and land policy professionals, and regulatory experts to optimally use the power of genomics in the conservation of California's threatened and exploited species. UCLA also has an Institute of the Environment & Sustainability which connects students with hands-on environmental research and practice opportunities to fuse thesis research with real field work.

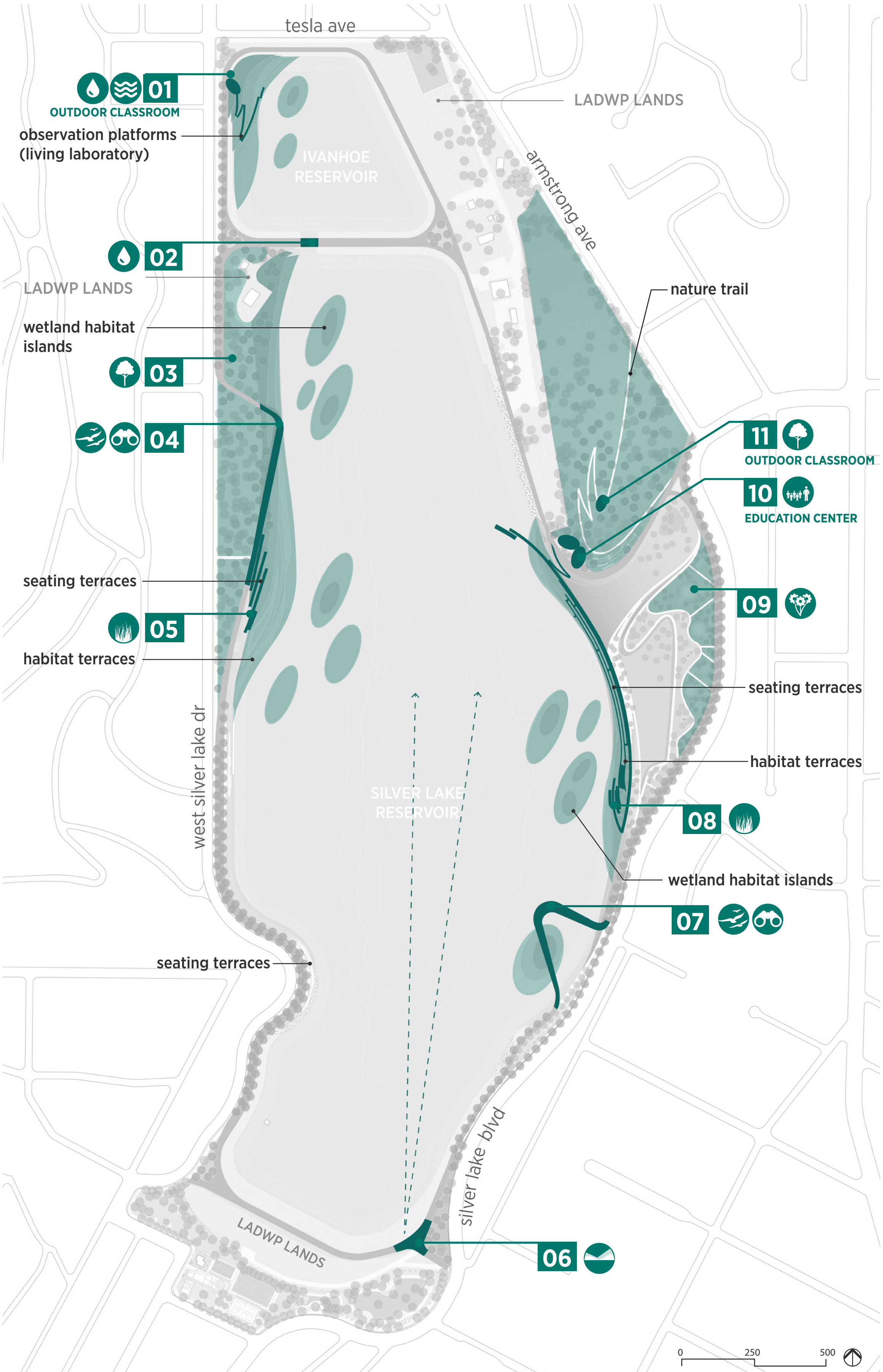
PARTNER WITH THE CITY OF LOS ANGELES

Create a living laboratory at the SLRC to allow the City to test and monitor water quality and plant community and maintenance regimes, as well as test the effectiveness of different habitat creation techniques.

PARTNER WITH THE AUDUBON SOCIETY OR NATURE CONSERVANCY

The SLRC is within the Pacific Flyway migration path. With its emphasis on establishing habitat for migratory waterfowl, the proposed Park will be an ideal place for bird-related research or just enjoyable bird watching.

Figure 6-9 Education And Interpretive Stations Diagram



EDUCATION & INTERPRETATION

01 **OUTDOOR CLASSROOM**
water quality monitoring & water microorganisms

02 recirculation for water quality at spillway

03 california native oak woodland

04 pacific flyway and migratory birds station

05 california fresh water wetlands

06 geology of Ivanhoe Canyon

07 pacific flyway and migratory birds station

08 wetland plant communities and amphibians

09 west coast pollinators and stormwater gardens

10 **EDUCATION CENTER**
classes & citizen science station

11 **OUTDOOR CLASSROOM**
california native oak woodland, living with wildlife

6.5 Water Quality & Park Water Systems

6.5.1 Reservoir Water Quality and Aquatic Habitat

Aquatic invertebrates which include insects, crustaceans, molluscs, arachnids, and annelids, are the building blocks of healthy aquatic ecosystems. They live all or part of their lives in water and their survival depends on water quality. They are also a significant part of the food chain as larger animals, such as fish and birds rely on them as a food source. These various functions aquatic invertebrate species perform are important for maintaining ecosystems services, such as converting live or dead organic material into prey items for larger consumers in complex food webs, while simultaneously providing nutrient cycling and aeration of sediments.

Aquatic invertebrates are used to assess the health of streams, lakes, and wetlands because different species have various tolerances to pollutants. Some species require high dissolved oxygen levels, or clear, non-turbid waters, or they may be predators that require a source of prey. In order to support a diverse array of invertebrates, water quality will need to meet the levels necessary to sustain these species.

6.5.2 Reservoir Water Quality System

The water system at the SLRC has been developed to support the wetland and aquatic habitat aspirations of the Master Plan. Key variables of this system are the reservoirs' water replenishment sources (stormwater and Pollock Well), annual evaporation, aeration, recirculation, nutrient loading, and treatment wetlands.

To understand the Master Plan's impact, such as introducing aquatic habitat, on long-term water quality at SLRC, a Water Quality Model was developed to predict water quality in both Silver Lake and Ivanhoe Reservoirs with the goal of maintaining a level of water quantity and quality that can support the future uses proposed at the site. The full Water Quality Model Technical Memo is available in the Appendix. T

The model, a zero-dimensional mass balance model, was built to mimic the processes that drive water quantity and quality in the SLRC, and it was calibrated against historic water level and water quality data. Four scenarios were constructed for the model as depicted in Figure 6-10. These evaluated isolation baseline conditions without Pollock Well water (Scenario 1), existing baseline conditions including Pollock Well water (Scenario 2), future conditions following the implementation of planned LADWP aeration, recirculation, and stormwater capture projects (Scenario 3), and conditions following the implementation of the Master Plan design which include habitat enhancement and treatment wetlands (Scenario 4). See Chapter 03 for a description of planned LADWP aeration, recirculation, and stormwater capture projects. Impacts to water quality were measured against specific numeric pollutant limits established as water quality goals for the SLRC.

Water Quality Objectives are established by the Los Angeles Regional Water Quality Control Board's Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan), but they can also be established by the United States Environmental Protection Agency (EPA). For the purposes of the model, water quality goal assumptions were based on those established for nearby Echo Park, and are outlined in Figure 6-11. During Master Plan implementation, the Basin Plan may be updated to include revised water quality goals for the Silver Lake and Ivanhoe Reservoirs. In addition to meeting the numerical goals, the SLRC must meet various narrative goals established by the Basin Plan, including minimizing stagnant water, reducing odor, and distributing dissolved oxygen throughout the SLRC.

Figure 6-10 Water Quality Model scenarios

Scenario 1 - Isolation Baseline

precipitation
existing birds
atmospheric deposition

Scenario 2 - Existing Baseline

precipitation
existing birds
atmospheric deposition
+ pollock well

Scenario 3 - LADWP Projects

precipitation
existing birds
atmospheric deposition
pollock well
+ aeration
+ recirculation
+ stormwater capture

Scenario 4 - Master Plan

precipitation
existing birds
atmospheric deposition
pollock well
aeration
recirculation
stormwater capture
+ treatment wetlands

Figure 6-11 Water Quality Model Goals

WATER QUALITY GOALS	
Algae, Ammonia, Eutrophic, Odors	Total Nitrogen: 1 mg/L Ammonia-N: 2.15 mg/L (30-day average) Ammonia-N: 5.95 mg/L (one-hour average) Total Phosphorus: 0.1 mg/L Chlorophyll-a 20 mg/L Dissolved Oxygen: ≥5 mg/L (single sample one foot from bottom)
Copper	22 µg/L
Lead	11 µg/L
pH	6.5 to 8.5
Trash	Zero
Total Coliform	10,000 MPN/100 mL (single sample) 1,000 MPN/100 mL (single sample, Fecal/Total ≥ 0.1) 1,000 MPN/100 mL (geometric monthly mean)
E. coli	235 MPN/100 mL (single sample) 126 MPN/100 mL (geometric monthly mean)
Enterococci	104 MPN/100 mL (single sample) 35 MPN/100 mL (geometric monthly mean)

The results from the model indicated that the addition of wetlands will provide a significant water quality benefit for phosphorus, nitrogen, chlorophyll, and algae. Figures 6-12 and 6-13 show some of the results from the water quality model. Nitrogen peaks which were above the goal of 1 milligram per liter (mg/L) in Scenarios 2 and 3 were reduced to peaks of less than 0.3 mg/L in Scenario 4. Phosphorus, which plays an important role in the generation of chlorophyll-a, was reduced by 87% in Silver Lake Reservoir and by 91% in Ivanhoe Reservoir due to the presence of treatment wetlands. Algae coverage was reduced by 75% in both reservoirs. The model also indicated there would be a meaningful reduction in dissolved solids and in total coliform bacteria due to the treatment wetlands in Scenario 4. Over the twenty-year timespan of the model, total coliform limits were predicted to be exceeded in Ivanhoe Reservoir on fourteen days in Scenario 3 due to stormwater runoff from the future stormwater capture project. This was reduced to just one day in Scenario 4. These reductions in nutrients and bacteria highlight the importance of including wetlands in the SLRC Master Plan design.

6.5.3 Wetlands and Reservoir Water Quality

Constructed wetlands are treatment systems that use natural processes involving wetland vegetation, soils, and their associated microbial assemblages to improve water quality. As water flows through a wetland, many suspended solids, such as sediment, become trapped by vegetation and settle out. Other dissolved pollutants, such as nitrogen and phosphorus are taken up by plants or become inactive. Wetlands also support microorganisms that remove pollutants from the water.

In addition to providing terrestrial and aquatic wildlife habitat, floating wetlands are proposed to enhance water quality. These types of wetlands are considered highly effective since their soil and plant roots are consistently inundated with water and have been shown to reduce a variety of pollutants in water such as nitrogen, phosphorus, total suspended solids, pathogens, and heavy metals.

WETLAND MAINTENANCE

The habitat wetlands proposed in the Master Plan design, can only be considered "treatment wetlands" for water quality if they are maintained properly. Additionally, the water quality benefits derived from treatment wetlands are only achievable over the long term if continuous, comprehensive maintenance is sustained, especially for floating treatment wetlands, which require specialized maintenance. Prior to implementing the wetland elements proposed in the Master Plan, a Wetlands Maintenance Plan will need to be developed. The Wetlands Maintenance Plan should not only describe the maintenance requirements but also specify future funding to guarantee a sustaining source of financial support for wetlands maintenance. A summary of the operation and maintenance requirements for the proposed wetlands is provided in Chapter 08.

6.5.4 Reservoir Water Replenishment

The two sources for reservoir water replenishment are Pollock Well #3 and the Stormwater Capture project as discussed in Chapter 03. To achieve habitat and water quality goals based on the proposed design, the Master Plan recommends establishing an average water elevation of 446-feet in Silver Lake Reservoir with a no greater than a 2-foot fluctuation annually to maintain water levels between 445 and 447 feet. Implementation of this operational change will be coordinated with LADWP and occur when the projects requiring the proposed water elevation are completed. Water levels will require monitoring.

As described in Chapter 03, the operated water elevation for Ivanhoe Reservoir will be at elevation 451 feet once the LADWP Recirculation project is implemented. The proposed wetlands in Ivanhoe Reservoir assume this constant elevation.

Figure 6-12 Ivanhoe Reservoir Water Quality Modeling Results Summary

IVANHOE RESERVOIR					
Pollutant	**Limit**	**Type**	**Scenario 2**	**Scenario 3**	**Scenario 4**
Total Nitrogen	1 mg/L	Maximum	2.2 mg/L	1.6 mg/L	0.3 mg/L
Total Phosphorus	0.1 mg/	Maximum	0.053 mg/L	0.080 mg/L	0.019 mg/L
Chlorophyll-a	20 µg/L	Maximum	11.3 µg/L	15.3 µg/L	5.2 µg/L
Dissolved Oxygen	5 mg/L	Minimum	7.9 mg/L	7.9 mg/L	7.9 mg/L
Total Copper	22 µg/L	Maximum	4.3 µg/L	19.6 µg/L	16.1 µg/L
Total Lead	11 µg/L	Maximum	0.4 µg/L	5.9 µg/L	4.7 µg/L
Total Coliform Bacteria	1,000 MPN per 100 mL	Days Exceeding Limit	0 days	14 days	1 day

Figure 6-13 Silver Lake Reservoir Water Quality Modeling Results Summary

SILVER LAKE RESERVOIR					
Pollutant	**Limit**	**Type**	**Scenario 2**	**Scenario 3**	**Scenario 4**
Total Nitrogen	1 mg/L	Maximum	1.2 mg/L	1.2 mg/L	0.2 mg/L
Total Phosphorus	0.1 mg/	Maximum	0.058 mg/L	0.080 mg/L	0.019 mg/L
Chlorophyll-a	20 µg/L	Maximum	12.0 µg/L	15.4 µg/L	5.2 µg/L
Dissolved Oxygen	5 mg/L	Minimum	7.9 mg/L	7.9 mg/L	7.9 mg/L
Total Copper	22 µg/L	Maximum	8.0 µg/L	19.7 µg/L	16.7 µg/L
Total Lead	11 µg/L	Maximum	0.8 µg/L	5.9 µg/L	4.9 µg/L
Total Coliform Bacteria	1,000 MPN per 100 mL	Days Exceeding Limit	0 days	1 day	0 days

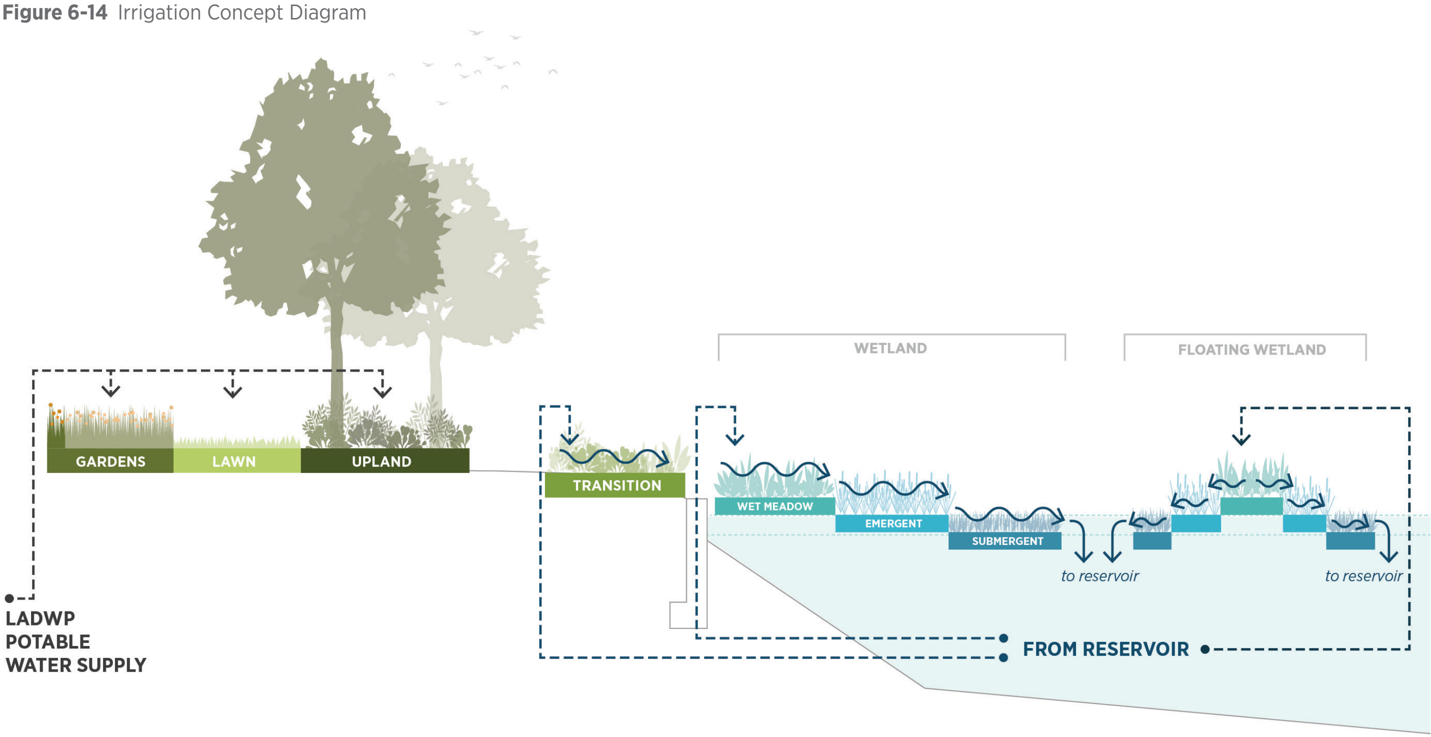
Scenario 2 - Existing Baseline
Scenario 3 - LADWP Projects
Scenario 4 - Master Plan

6.5.5 Irrigation Water System

The wetland and transition habitat areas will utilize reservoir water as the primary source of irrigation. Water will be pumped from the reservoirs to the wet meadow habitat zones which will then flow through the emergent wetlands back into the reservoirs. The water will be treated through sedimentation of suspended solids and filtration as it moves through each of the wetland zones. The wet meadows will go through wetting and drying cycles daily as reservoir water is pumped into them and then allowed to drain out. Transition habitat zones will also be irrigated with reservoir water on a separate cycle appropriate for the drought-tolerant, coastal scrub planting palette envisioned there. This water strategy will need to be validated by reservoir water quality testing and soil analysis.

Remaining upland habitat, lawn areas, and ornamental gardens will be irrigated via a potable water supply available from the LADWP distribution system which will require a dedicated meter. If recycled water is available in the future, it could be used to irrigate ornamental planting. Depending on its nutrient and dissolved solids content, future recycled water may not be suitable to irrigate upland habitat areas without additional filtration or treatment.

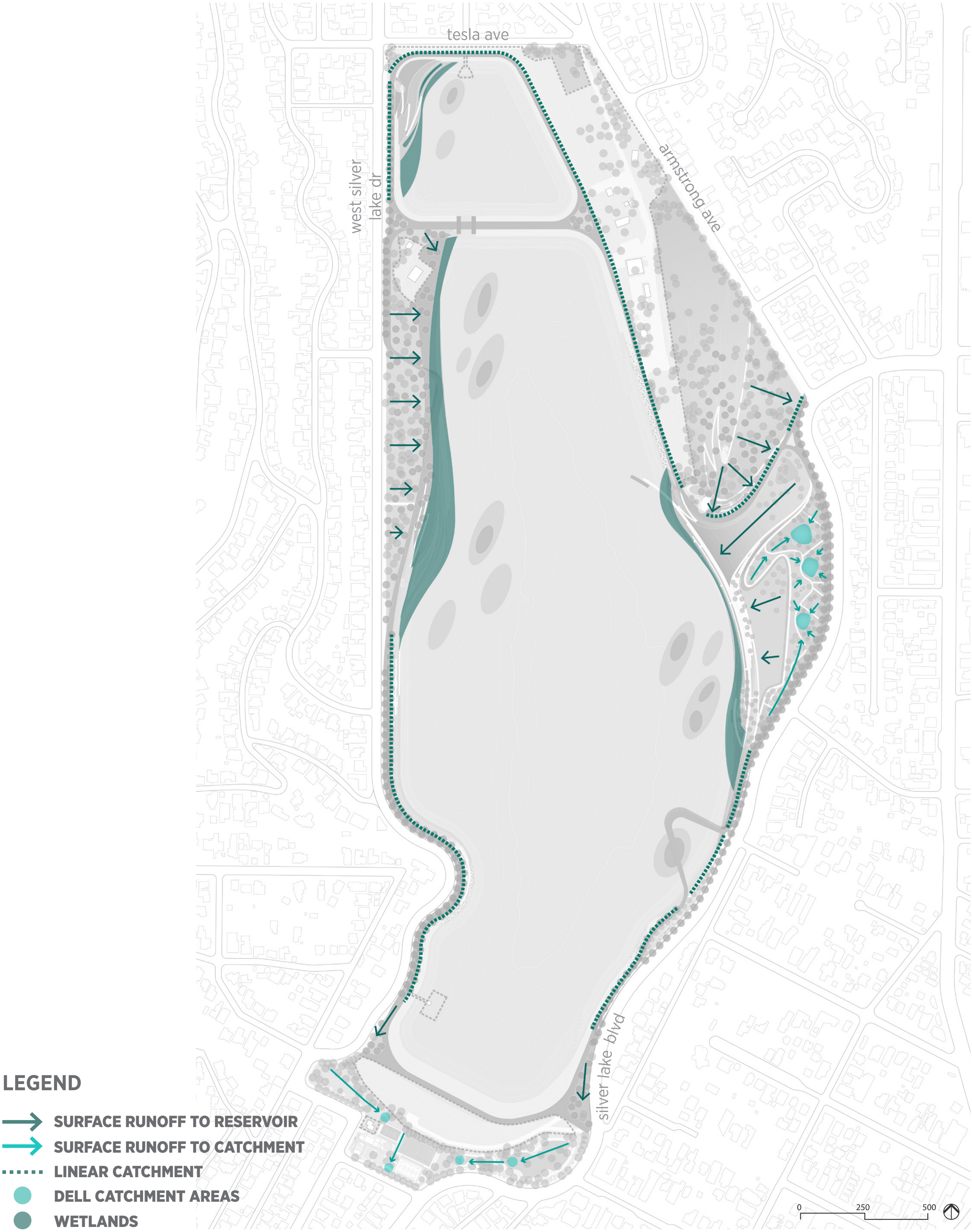
Figure 6-14 Irrigation Concept Diagram



6.5.6 Surface Stormwater Drainage

To protect the reservoir waters from untreated surface runoff within the Complex, a decentralized drainage strategy has been developed. For areas adjacent to treatment wetlands, such as the great lawns and seating terraces, these will be designed for surface runoff to move thorough the wetlands before entering the reservoirs. In other areas, stormwater runoff will be treated by infiltration gardens located throughout the park. For example, the Picnic Grove and Ornamental Gardens will drain to Dells that are depressions in the landscape which will filter stormwater before it's collected and piped into the reservoirs. At the Knoll, runoff from its slopes will be collected in swales adjacent to the Education Center and treated before entering Silver Lake Reservoir. Along the Promenade, biofiltration planting will be incorporated to treat stormwater runoff from its paving surfaces. See Figure 6-15 for a diagram of this drainage concept.

Figure 6-15 Master Plan Drainage Concept Diagram



6.6 Envision Rating

Envision™ is a rating system and best practice resource to help ensure sustainability features and elements are successfully implemented in infrastructure projects. Envision™ measures the sustainability of an infrastructure project from design though construction and maintenance across five categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Resilience.

Quality Of Life | **Leadership** | **Resource Allocation** | **Natural World** | **Climate And Resilience**

The Envision™ Guidelines assign a points value and a level of achievement (LOA) depending on the type and amount of documentation necessary to achieve these points. A City of Los Angeles goal for this project is to achieve Envison's highest rating – Platinum. However, since the Master Plan is a conceptual document, some of the credits necessary to achieve a platinum designation depend on how the project is implemented and requires additional work outside the scope of the Master Plan project. Therefore the project team evaluated the Envision™ credits achievable under two scenarios: Baseline Scenario to achieve an Envision Gold Rating and an Additional Effort Scenario to achieve an Envision Platinum rating as shown in Figure 6-16.

The Baseline Scenario includes LOAs that are achieved through typical minimum required standards for City of Los Angeles public works projects and/or through documentation that is already planned for inclusion during the Master Plan. The Additional Effort Scenario includes LOAs that are achievable by providing additional documentation that is not currently planned, such as a Sustainability Management Plan or modified project specifications and special provisions, but that can be achieved with reasonable effort.

The Envision™ Rating assessment technical memo in the Appendix lists and describes in detail the credits that may be applied to the project to achieve a Gold and Platinum rating.

Envision™ offers four recognition and award levels based on a percentage of points achieved as follows:

Recognition Level	Total Applicable Points (%)
Bronze	20
Silver	30
Gold	40
Platinum	50

Figure 6-16 Envision™ Pre-assessment Checklist

This shows possible points for achieving Baseline and Additional Effort Scenarios.

Under the Baseline Scenario, the project is projected to achieve a Gold rating (42% of applicable points). Under the Additional Effort Scenario, the Master Plan is projected to achieve a Platinum rating (56% of applicable points).

Envision™ Credit	Baseline Scenario Points (Gold)	Additional Effort Scenario Points (Platinum)	Envision™ Credit	Baseline Scenario Points (Gold)	Additional Effort Scenario Points (Platinum)
QL1.1	20	26	RA2.2	0	12
QL1.2	12	12	RA2.3	15	20
QL1.3	10	14	RA2.4	0	0
QL1.4	0	6	RA3.1	12	12
QL1.5	10	10	RA3.2	0	0
QL1.6	2	8	RA3.3	0	8
QL2.1	7	7	RA3.4	0	0
QL2.2	16	16	NW1.1	22	22
QL2.3	14	14	NW1.2	2	2
QL3.1	0	3	NW1.3	N/A	N/A
QL3.2	12	18	NW1.4	24	24
QL3.3	14	14	NW2.1	0	22
QL3.4	11	11	NW2.2	24	24
LD1.1	5	18	NW2.3	9	12
LD1.2	18	18	NW2.4	20	20
LD1.3	18	18	NW3.1	18	18
LD1.4	0	0	NW3.2	20	20
LD2.1	0	18	NW3.3	11	14
LD2.2	9	12	NW3.4	9	12
LD2.3	12	12	NW3.5	8	8
LD2.4	0	0	CR1.1	0	0
LD3.1	0	3	CR1.2	0	0
LD3.2	0	0	CR1.3	0	0
LD3.3	0	0	CR2.1	6	6
RA1.1	0	9	CR2.2	0	0
RA1.2	9	9	CR2.3	0	0
RA1.3	0	14	CR2.4	0	0
RA1.4	7	16	CR2.5	0	0
RA1.5	8	8	CR2.6	0	2
RA2.1	0	0	**TOTALS**	**414/984 (42%)**	**547/984 (56%)**