Mountains Recreation & Conservation Authority

DRAFT

RANDALL PRESERVE/GENGA*

Resource Management Plan

(and Public Access Plan)

MAY 13, 2025

Aerial image: AirViews

*Tribal name to be determined

FUNDERS/GRANTORS

Frank and Joan Randall

California Wildlife Conservation Board

California Natural Resources Agency

State Coastal Conservancy

California Department of Fish and Wildlife

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The Trust for Public Land

Orange County Community Foundation

ADVISORY COMMITTEE

Thank you to the Advisory Committee for their willingness to participate in the planning process.

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Land Acknowledgement

MRCA, CCA, and Dudek acknowledge that Randall Preserve is on the ancestral land of the Tongva, Kizh, and Acjachemen peoples. The village site of Genga/Kenga is within the boundaries of the Preserve and the people of these communities continue to recognize this place by their respective names for the Preserve.

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Acronyms and Abbreviations

Acronyms	Abbreviations
AMSL	above mean sea level
BCC	Birds of Conservation Concern
BMP	best management practice
BRC	Banning Ranch Conservancy
CAL FIRE	California Department of Forestry and Fire Protection
Cal-IPC	California Invasive Plant Council
CCA	Coastal Corridor Alliance
CCC	California Coastal Commission
CDFW	California Department of Fish and Wildlife
CDP	Coastal Development Permit
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CNPS	California Native Plant Society
CRHR	California Register of Historical Resources
CRPR	California Rare Plant Rank
CRS	Coastal Resilience Strategy
CWA	Clean Water Act
EIR	environmental impact report
EMU	Ecological Management Unit
EPA	Environmental Protection Agency
ESHA	Environmentally Sensitive Habitat Area
FESA	federal Endangered Species Act
FP	Fully Protected
GIS	geographic information system
GLA	Glenn Lukos Associates
HCP	Habitat Conservation Plan
HDLLC	Horizontal Drilling LLC
HUC	Hydrologic Unit Code
MBTA	Migratory Bird Treaty Act
MHW	mean high water

Acronyms	Abbreviations
MRCA	Mountains Recreation and Conservation Authority
NBR	Newport Banning Ranch LLC
NCCP	Natural Community Conservation Plan
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWPR	Navigable Waters Protection Rule
OCVC	Orange County Vector Control
OHWM	Ordinary High-Water Mark
PAP	Public Access Plan
PCA	Pest Control Adviser
PEC	potential environmental concern
PMP	Property Management Plan
Preserve	Randall Preserve/Genga [Tribal Name TBD]
RAP	Remedial Action Plan
RMP	Resource Management Plan
RPW	relatively permanent water
RWQCB	Regional Water Quality Control Board
SASAS	Sea and Sage Audubon Society
SLR	sea level rise
SSC	California Species of Special Concern
SWRCB	State Water Resources Control Board
TAEP	Tribal Access and Engagement Plan
TEK	Traditional Ecological Knowledge
TNW	traditional navigable water
TPL	The Trust for Public Land
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WL	Watch List

Executive Summary

This Resource Management Plan (RMP) is intended to support the Mountains Recreation and Conservation Authority (MRCA) Property Management Plan (PMP) for the Randall Preserve/Genga [Tribal Name TBD] (Preserve). The RMP, along with additional planning efforts including a Tribal Access and Engagement Plan (TAEP), Public Access Plan (PAP), and Coastal Resilience Strategy (CRS), will be used to create the MRCA's PMP. As the titleholder, MRCA is responsible for creating and implementing an RMP considerate of public and community interest, fulfilling grantee requirements associated with Preserve establishment, and forming and coordinating an Advisory Committee to facilitate development of the PMP.

The overarching goal of the RMP is to integrate ecological resilience through adaptive management, Tribal co-stewardship, equitable public access, and education and research for the preservation, enhancement, and restoration of the Preserve. The RMP provides a roadmap for implementing the adopted ecological stewardship and public access concepts, including possible co-stewardship opportunities of the Preserve by Tribal Nations as determined through a TAEP being prepared by MRCA. The TAEP will ensure Tribal values, concerns, and community considerations are appropriately translated into plans associated with the Preserve.

The PAP considers opportunities for access and use by the public and the Tribal community, prioritizing equity in public access to the Preserve based on findings from public outreach and an analysis of access gaps and visitor profiles. The PAP will ultimately include a proposed public trail network and describe visitor-oriented programs and facilities including interpretive, educational, and research opportunities that enhance visitor experience and education.

The CRS makes site-specific recommendations for managing impacts from climate change resiliency and incorporates appropriate design features promoting adaptive/successional habitat restoration in anticipation of future sea level rise (SLR) scenarios.

The 387-acre Preserve is located within unincorporated lands in the County of Orange and the City of Newport Beach and features one of the few remaining examples of an intact coastal mesa and lowland/wetland complex. The RMP describes the historical context of the Preserve land, covering Native American context, the Santa Ana River, agricultural use, oil extraction, and community advocacy in response to proposed development. The RMP also describes the physical and biological characteristics and documented cultural resources of the Preserve and includes a description of federal, state, and local regulations and local conservation and mitigation plans relevant to the future implementation of restoration activities and public access improvements and amenities.

Recommended administration of the Preserve is guided by relevant federal, state, and local regulations, local conservation and mitigation plans, and the MRCA Park Ordinance. Management of the Preserve is organized into three Management Levels that consider the full range of management, planning, and restoration needed to realize the adopted Preserve goals and objectives. While activities associated with each Management Level present unique benefits and constraints, a high degree of effort and associated costs distinguish Management

Levels. Restoration opportunities are evaluated against specific site constraints including existing cultural resources, remediated oil wells, existing easements and mitigation sites, vernal pools and other listed and sensitive plants, wildlife and habitats. Ecological performance guidelines are established and are intended to provide target values to achieve the Preserve's goals and objectives.

Future stewardship activities for maintaining Preserve areas not subject to active habitat restoration include vegetation management and maintenance, general property stewardship (trash, fencing, pest control, etc.), and invasive species control. The full extent of Tribal access and stewardship of the Preserve is still being determined and will ultimately be described within the Tribal Access and Engagement Plan (TAEP) with relevant aspects incorporated into a future version of this RMP.

Focused quantitative monitoring of the entire Preserve on a regular basis presents a challenge in regard to funding and available resources to implement a large-scale monitoring program. Monitoring of each active restoration area should be selected based on the needs of the area and vegetation communities contained within them as well as available resources to implement monitoring programs. Adaptive management will be implemented in the event of unforeseen or unpredictable circumstances. Adaptive management is defined as a flexible, iterative approach to the long-term management of the suite of species on the Preserve. Individual environmental stressors are discussed, along with an anticipated range of management responses to correct any damage that may occur to the revegetation site.

An operating plan should be prepared on an annual basis at the end of each operating year. In addition, a report summarizing active restoration area progress within the Preserve should be prepared on an annual basis, as funding allows.

1 Introduction

This Resource Management Plan (RMP) is intended to support the Mountains Recreation and Conservation Authority (MRCA) Property Management Plan (PMP) for the Randall Preserve/Genga [Tribal Name TBD] (Preserve) in coordination with additional planning efforts, including a Tribal Access and Engagement Plan (TAEP), Public Access Plan (PAP), and Coastal Resilience Strategy (CRS), that collectively will be utilized to create the MRCA's PMP. A description of the land, its characteristics, and the natural and Tribal history of the Preserve is provided in Section 2. Section 3 describes the recommended administration of the Preserve, reviews the regulatory context for implementing RMP activities in the future, and presents an ecological restoration program developed in accordance with the PAP and CRS. Sections 4 through 6 describe the anticipated stewardship actions, including maintenance of the Preserve's public features and restored habitats, as well as potential Tribal co-stewardship opportunities and anticipated long-term funding requirements.

1.1 Establishment of Randall Preserve/Genga

The Preserve was established after years of local and Tribal support and collaboration between environmental groups to maintain the property as a coastal open space. This was achieved after substantial community organization, advocacy for preservation, and, in some cases, litigation, in opposition to multiple iterations of planned developments at the former Newport Banning Ranch property. In early 2018, following a unanimous California Supreme Court decision that vacated the City of Newport Beach's 2012 approval of a draft environmental impact report (EIR) for an 895-home project proposal, the landowner engaged with the Banning Ranch Conservancy (BRC; now Coastal Corridor Alliance [CCA]) and The Trust for Public Land (TPL) to explore the sale of the property. In 2019, a significant private gift of $50 million from Frank and Joan Randall provided the catalyst funding for the property's conservation purchase. Later, funding came from the California Wildlife Conservation Board, California Natural Resources Agency, State Coastal Conservancy, California Department of Fish and Wildlife (CDFW), United States Fish and Wildlife Service (USFWS), and state funding through a member request from Assemblymember Cottie Petrie-Norris. Upon completion of the due diligence phase, MRCA received the title to the property via directed deed from TPL in 2022. In collaboration with CCA, MRCA set forth the process of creating a PMP to steward the Preserve's plants, wildlife, and habitats in a manner that provides for passive public access and robust engagement for all local and Tribal community members in accordance with the Randalls' gift and state and federal funding requirements.

1.2 Mountains Recreation and Conservation Authority's Responsibilities

As the titleholder, MRCA is responsible for creating and implementing an RMP taking into account public and community interest while adhering to the significant grantee requirements associated with the funding that established the Preserve. This involves all aspects of project management, including conception and initiation, planning, execution, performance and monitoring, and completion of the RMP. Additionally, MRCA is responsible for forming and coordinating an Advisory Committee (described in detail below) that will facilitate development of the PMP.

1.2.1 ADVISORY COMMITTEE

The role of the Advisory Committee is to provide feedback and recommend MRCA Board-approval of the PMP planning documents (RMP, CRS, PAP) for the Preserve. MRCA administered the process of forming this Committee by drafting guidelines, meeting schedules, and meeting framework and facilitating communication and coordination with interested parties. Specific committee objectives are as follows:

- Review and evaluate components of the PMP, composed of the RMP, PAP, and CRS.
- Identify potential conflicts within the RMP, PAP, and CRS and ensure recommendations are compliant with existing funding and regulatory requirements.
- Improve the understanding and communication of the Plans to the public.
- Establish priorities for the Plans and ensure local and regulatory concerns are addressed.
- Ensure equity and inclusiveness is reflected in the Plans to make the Preserve publicly accessible to all.
- Provide recommendations to the MRCA Governing Board regarding approval and implementation of the Plans.
- Ensure consistency between the TAEP and PMP.

The Committee composition is intended to represent and reflect all communities and Tribes that represent the areas surrounding the Preserve, with emphasis on the involvement of disadvantaged communities and the regulatory agencies that are involved in the Preserve. The Committee includes local representation from the Randall family, designated non-profits, Tribal leaders, elected officials, funding agencies, and others. Four publicly accessible meetings will be held to discuss and provide input during the development of the RMP.

1.3 Planning Process Components

This section provides an overview of the various planning components in the RMP, summarizing the scope and purpose of each component and how it interacts with (in the case of the TAEP) or is incorporated into the RMP.

1.3.1 RESOURCE MANAGEMENT PLAN

The RMP is a roadmap for implementing the adopted ecological stewardship and public access concepts that incorporate possible co-stewardship opportunities of the Preserve by Tribal Nations as determined through the TAEP (described below). The RMP utilizes historical and updated data and recommendations drawn from parallel planning efforts (TAEP, PAP, CRS) to establish baseline biological conditions and provide restoration design alternatives and management strategies that balance natural resource preservation with public accessibility and Tribal use and co-stewardship.

1.3.2 TRIBAL ACCESS AND ENGAGEMENT PLAN

The purpose of the TAEP is to ensure that Tribal values, concerns, and community considerations are appropriately translated into all restoration and management plans associated with the Preserve. The TAEP considers Traditional Ecological Knowledge (TEK), contemporary Tribal community access and use for traditional educational purposes, and a review of Tribal values relative to plant lists and landscape considerations. Conclusions drawn from the TAEP have been incorporated into the RMP. For example, relevant public access design elements are included to increase cultural resiliency by revitalizing traditional knowledge. This includes incorporating traditional Tribal food, textiles, medicinal resources, and access elements that allow for collection of culturally valuable resources by members of the Tribal community.

1.3.3 PUBLIC ACCESS PLAN

The PAP considers opportunities for access and use by the public and the Tribal community. In an effort to prioritize equity in public access to the Preserve, the study addresses findings from public outreach and analyzes access gaps for visitors of different profiles. Operating within the greater framework of this land conservation effort, the PAP establishes goals and principles that minimize public impacts on habitat and wildlife while providing opportunities for open space, passive recreation, education, interpretation, Tribal knowledge, and resource revitalization. The PAP will include a proposed public trail network, defining the long-range vision to connect neighbors and visitors of all types from their arrival point on site to destinations for viewing and other permitted uses. The PAP will also describe visitor-oriented programs and facilities and interpretive, educational, and research opportunities that enhance visitor experience and education.

1.3.4 COASTAL RESILIENCE STRATEGY

The CRS makes site-specific recommendations for managing impacts from climate change and incorporates appropriate design features promoting adaptive/successional habitat restoration in anticipation of future sea level rise (SLR) scenarios. SLR projections out to 2080 indicate site inundation that lacks tidal connection, potentially due to elevated groundwater levels caused by seawater intrusion. This inundation may convert valuable salt marsh habitat to non-vegetated mudflats. Tidal connection that would create the tidal exchange necessary to maintain and support high-quality coastal wetlands is not projected until 2100. This nuanced insight informs the identified restoration opportunities and constraints and overall resource management approach regarding coastal wetland restoration design and management factored into this RMP.

1.4 Goals and Objectives

The overarching goal of the RMP is to integrate ecological resilience through adaptive management, Tribal co-stewardship, equitable public access, and education and research for the preservation, enhancement, and restoration of the Preserve. Each of these goals and associated objectives are listed below.

Goal: Ecological Resilience and Sustainability (ECO)

ECO-1: Prioritize maintaining and improving species diversity and abundance.

1.1 Elevate the protection of sensitive, threatened, and/or endangered flora and fauna no longer present on the Preserve, including the reintroduction of flora that is culturally significant to local Tribes.

1.2 Seek to understand the existing components of ecological integrity that make the Preserve unique.

1.3 Improve ecological contiguity between the Preserve and adjacent lands and waters.

1.4 Revisit the RMP regularly and update plan goals based on adaptive management practices as needed.

ECO-2: Increase the ecological and climate resilience of the Preserve.

2.1 Utilize nature-based solutions and TEK to inform the management activities of the Preserve, including, but not limited to, restoration of tidal wetlands, reintroduction of native species, and cultural burning for fuel and invasive plant management.

2.2 Apply science-based and traditional Tribal approaches to understanding and mitigating impacts from stressors such as wildfire, invasive species, pests, and human impact.

2.3 Maintain and enhance Environmentally Sensitive Habitat Areas (ESHAs) and associated buffers where appropriate

Goal: Tribal Access and Stewardship (TAS)

TAS-1: Identify and protect Tribal resources and spaces on the Preserve by limiting or prohibiting public access to these areas.

1.1 Identify areas for Tribal activities to take place.

1.2 Prioritize and respect scheduled access for Tribal practices on site, including the sustainable cultivation and harvesting of sacred plants in protected areas for Native Tribes.

1.3 Accept the Cultural Gathering Guidelines for plants and minerals managed through a separate permitting process as outlined in the TAEP.

1.4 Recognize that traditional cultural activities will be practiced in accordance with safety guidelines outlined in the TAEP.

1.5 Identify restricted ceremonial spaces reserved for Tribes to practice ceremonies and to be closed to the public for a period determined by the Tribes including the temporary or permanent construction of traditional structures.

Goal: Public Access (PAP)

PAP-1: Apply adaptive science to trail compatibility and connectivity with protecting habitats and species.

1.1 Limit hours of operation and use of the property to minimize human impacts.

1.2 Identify points of entry, trails, gathering spaces, and other publicly accessible spaces for passive public recreation use based on an evaluation of sensitive ecological zones, like temporary trail closures for nesting season.

1.3 Use context-sensitive site analysis to design pathways to accommodate topography, seasonal changes, wetlands creation, and accessibility that are strategically designed to keep visitors, ecological sites, and Tribal resources safe and preserved.

1.4 Incorporate multi-lingual educational signage that details site history and context.

PAP-2: Sensitivity to the needs of nearby communities and attention to the regional nature of this site.

2.1 Identify barriers and engage in developing solutions to address historical spatial inequities for neighboring communities.

2.2 Supervise recreational access to ensure the management goals are met when the public gains access to the land.

2.3 Work with appropriate municipal agencies to provide regional trail connections and improve access to the site, including support for reliable public transportation, complete streets, and coordinating with organizations to accommodate vanpools and shuttles.

2.4 Support periods of high use with sufficient capacity on site to limit disturbance of neighboring communities.

2.5 Provide basic facilities on site such as accessible restrooms, parking, seating areas, and recreational paths.

Goal: Equitable Education and Programming (EEP)

EEP-1: Provide multi-lingual educational and interpretive programs.

1.1 Encourage community connection and support ecological, cultural, and Traditional Tribal resource awareness (i.e., TEK), protection, and enhancement.

1.2 Coordinate with local organizations and culturally affiliated Tribes to provide hands-on volunteer opportunities, such as community science programs, invasive weed removal, native plant installation, or trail maintenance crews.

1.3 Prioritize input from California Native American Tribal Governments identified by the Native American Heritage Commission as culturally affiliated with the Preserve, with partners that have capacity and experience with the Preserve.

1.4 Facilitate research and partnerships that improve understanding of coastal resources and offer learning experiences for educators, scientists, and students.

Goal: Management Coordination (MGT)

1.1 Work collaboratively to ensure compliance with natural resource and regulatory agencies.

1.2 Coordinate ranger services with California Law Enforcement agencies and appropriate supportive services to ensure management goals are met.

1.3 Align the TAEP, CRS, and PAP goals and implementation activities with the RMP for a cohesive and functional PMP.

2 Site Description

The 387-acre Preserve is located within unincorporated lands in the County of Orange and the City of Newport Beach and features one of the few remaining examples of an intact coastal mesa and lowland/wetland complex. The Santa Ana River and the City of Huntington Beach border the Preserve to the west, Newport Beach borders the southern and southeastern portions, and the City of Costa Mesa lies immediately to the north and east (Figure 2-1 and 2-2). The Pacific Coast Highway abuts the southern limit of the site. The primary public access to the Preserve is via 17th Street in Costa Mesa. Adjacent land uses along the eastern boundary of the Preserve include a mixture of residential, commercial, light industrial, and education uses. Talbert Regional Park lies immediately to the north of the Preserve, and the United States Army Corps of Engineers (USACE) Lower Santa Ana River Salt Marsh Project is located immediately to the south and west. The Newport Shores community lies to the south, and Sunset Ridge Park borders the southeastern portion of the Preserve.

Although much of the Preserve consists of roads and disturbed areas left behind from decades of oil drilling activity, the site is home to an array of native and rare upland scrub, grassland communities, and vernal pools atop the coastal mesa. A mosaic of brackish and freshwater wetlands and riparian areas occupy the lowlands. The Preserve also includes a number of mitigation areas scattered throughout the site. These are areas of habitat restoration implemented to offset impacts associated with former oil operations on the property (Figure 2-2). While oil extraction activities within the Preserve have permanently ceased (and are subject to ongoing remediation), oil operations have been consolidated and will continue adjacent to the Preserve within a 14-acre inholding with access off the Pacific Coast Highway.

2.1 Historical Context

This section provides a historical overview of the Preserve and the surrounding lands as important context for understanding the current condition of the natural and cultural resources on site. A topographic map from 1896 depicts the historical condition of the lands within the Preserve and the relationship between the Santa Ana River and its prior connection to the Pacific Ocean via the Semeniuk Slough and Newport Bay before the river was channelized in the early 1900s (Figure 2-3). Likewise, a pair of aerial photographs from 1938 and 1963 show the condition of the lands within the Preserve before and after the start of oil extraction activities in the 1940s (Figures 2-4 and 2-5).

2.1.1 NATIVE AMERICAN CONTEXT

Information relating to past use by Native Americans is held by the living descendants of these communities and is informed by archaeological, ethnographic, and other archival documentation. At the time of European contact in 1769, the Santa Ana plain was occupied by Gabrielino Native American Tribes, so called by the Spanish after the nearby Mission San Gabriel Archangel. While this term, *Gabrielino*, does reference Indigenous communities that shared overarching social, ethnolinguistic, and cultural heritage and relationships, it is important to recognize that the term also reflects a shared, complex history of colonialism, enslavement, and missionization. Tribes traditionally and culturally associated with this area also identify as *Gabrieleño*, *Acjachemen*, *Tongva*, and *Kizh*. In addition to the area presently identified as the Los Angeles Basin, Gabrielino Tribes occupied the offshore islands of Santa Catalina, San Nicolas, and San Clemente. Surrounding Native groups included the Chumash and Tataviam to the northwest, the Serrano and Cahuilla to the northeast, and the Juaneño and Luiseño to the southeast. These Tribes may additionally have traditional cultural relationships with this area, either directly, as a result of the movement of Indigenous people during the period of missionization or later, or indirectly, through the movement of goods and the process of trade.

Direct historical records concerning ethnohistoric Gabrielino populations are limited; however, it has been thought that as many as 50 to 100 villages were simultaneously occupied throughout the broader region. Like most neighboring Tribes, the Gabrielino largely employed a hunter/gatherer subsistence strategy that maximized seasonal availability of important resources and lived in sedentary or semi-sedentary groups of 50 to 100 persons. The majority of villages were occupied by at least some people all of the time. One principal resource that determined how intensively a village was utilized was water availability, though the availability of other resources, trade, and social relationships were also of key importance. Within each village, houses were circular in form and constructed of sticks covered with thatch or mats. Each village had a sweat lodge and a sacred enclosure. Their subsistence relied heavily on plant foods, such as acorns, but was supplemented with a variety of protein sources especially from marine resources. Procuring food consisted of hunting, fishing, and gathering plant foods and shellfish. Hunting technology included bow and arrow use for deer and smaller game, in addition to stick-throwing, snares, traps, and slings. Fishing was conducted with the use of shell fishhooks, bone harpoons, and nets. Seeds were gathered with beaters and baskets. Food was stored in baskets and was processed through grinding implements, including hand stones and milling slabs and mortars and pestles. Food was cooked in baskets, often coated with asphaltum, in stone pots, on steatite frying pans, and by roasting in earthen ovens.

Additional information regarding the Native American use of the Preserve is being developed through an ethnographic study being conducted on behalf of the MRCA for the TAEP.

Figure 2-1. Preserve Location

Figure 2-2. Preserve Location and Surrounding Land Uses

Figure 2-3. Historical Context – 1896 Topographic Map

Figure 2-4. Historical Context – 1938 Aerial Photo

Figure 2-5. Historical Context – 1963 Aerial Photo

2.1.2 SANTA ANA RIVER

The Santa Ana River begins in the San Bernardino Mountains and flows nearly 110 miles through San Bernardino, Riverside, and Orange Counties before emptying into the Pacific Ocean in Huntington Beach along the western border of Preserve (SARWQCB 2025). It drains an area of 2,650 square miles and is the largest watershed entirely contained within Southern California (USACE 2024). Flows from the Santa Ana River, including more than 93 million gallons per day of treated wastewater effluent, recharge the Orange County Groundwater Basin. The river provides habitat for a variety of plants and wildlife and provides recreational opportunities via the Santa Ana River Trail.

The Lower Santa Ana River borders the Preserve to the west. The Santa Ana River is divided into six distinct segments from the San Bernardino Mountains to the Pacific Ocean. These are called "reaches." This reach, near the Preserve, was uncontrolled until it was initially channelized in 1903 following heavy flooding. Prior to being channelized, the Santa Ana River was connected to Newport Bay via the Semeniuk Slough. In 1989, USACE acquired 92 acres of land south and east of the Lower Santa Ana River from West Newport Oil to restore coastal salt marsh habitat as part of the Lower Santa Ana River Marsh Project (completed in 1992). Restoration focused on creating habitat for coastal salt marsh plants and wildlife, including California least tern (*Sternula antillarum browni*), coastal California gnatcatcher (*Polioptila californica californica*), Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), and light-footed Ridgway's rail (*Rallus obsoletus levipes*). The marsh is separated from the Lower Santa Ana River by the Santa Ana River levee. USACE installed tide gates and drains within the Lower Santa Ana River Marsh in 1993 to control marsh flooding and drainage to maintain the salt marsh habitat and protect adjacent properties from flooding. Tide gates shut during extreme high tides and Santa Ana River flood events to prevent extreme inundation, and drains allow the marsh to drain while the tide gates are closed. This tidally influenced system provides controlled inundation to the Preserve that maintains its coastal marsh habitat.

2.1.3 AGRICULTURAL HISTORY

In 1883, the title to Rancho Santiago de Santa Ana, encompassing 81,855 acres of land east of the Santa Ana River, was passed to relatives of Juan Pablo Grijalva and Jose Antonio Yorba. The Rancho became one of the largest ranchos in California through marriages and offspring between the Yorba, Peralta, and Grijalva families. Andrew Glassell, an attorney from Los Angeles, was given 4,077 acres of the rancho land as payment for legal services, which was subsequently sold to Mary Hollister in 1874. Mary Hollister was a wealthy heiress who married Phineas Banning, a businessman who was "the Father of the Port of Los Angeles," in 1870. The resultant surname change following this marriage supplied the namesake title of "Banning Ranch" to the property. In the years after Mary Hollister Banning purchased the 4,077-acre property, she leased portions of the land to various farmers that produced wheat, oats, barley, and grain. Beginning in the mid-1920s Mary's daughter, Mary Banning Norris, began leasing portions of the property to oil companies for oil extraction until her death in 1956. Banning Ranch became the holding of Beeco Ltd, a real estate company owned by Banning family members.

2.1.4 OIL EXTRACTION

Prior to acquisition, the Preserve was used as an oil and natural gas production facility continuously beginning in the 1940s (Geosyntec 2022). Horizontal Drilling LLC (HDLLC) operated the oil field with its affiliates West Newport Oil Company and Armstrong Petroleum Company. While oil production was shut down, HDLLC retained the ability to drill and operate wells within two future oil remediation areas through a California Coastal Commission (CCC) Coastal Development Permit (CDP), subject to necessary approvals. Numerous environmental investigations and remedial actions have been conducted at the Preserve since 1986, and the results of these actions indicate that the site is primarily impacted by crude oil. The list of constituents of potential concern is well documented and understood, and impacts from oil production are generally limited to specific oil operation areas. Remaining oil operation infrastructure within the Preserve consists of abandoned oil production wells and associated equipment, including pipeline networks, tanks, maintenance areas, small buildings, pole-mounted utilities, and roads. This remnant infrastructure primarily exists within bare, non-vegetated former work areas of the Preserve and is the target of ongoing remediation that includes the removal and cleanup of historic oil field equipment and remediating/recycling the impacted soils.

2.1.5 PROPOSED DEVELOPMENT AND COMMUNITY ADVOCACY

Prior to acquisition and establishment as a preserve, the property (previously Banning Ranch) was subject to legal action by competing interests: entities in pursuit of development rights and those that sought to conserve the coastal open space. In response to a 1,750-home development proposal by Taylor Woodrow in 1999, the Sierra Club Banning Ranch Park and Preserve Task Force (originally Sierra Club Santa Ana River Estuary and Bluffs Task Force) was formed to oppose development and create an open space wildlife preserve and public wilderness park there. Taylor Woodrow ceased pursuit of the proposed development shortly after preparing a draft EIR in 2000, but by 2005 Cherokee Investment Partners purchased a 50% share of the land and, in partnership with Aera Energy LLC and Brooks Street (developer), formed Newport Banning Ranch LLC (NBR) and began to seek development entitlements.

The City of Newport Beach General Plan underwent an update in 2006 that prioritized preservation of Banning Ranch as open space and limited any project proposal on the property to 1,375 homes. NBR announced a proposed 1,375-home project during the same year, leading to the formation of the BRC 501 (c) 3 non-profit organization in 2008, whose mission was to "preserve, acquire, conserve and manage the entire Banning Ranch as a permanent public open space, park, and coastal nature preserve." Upon certification of NBR's EIR by the City of Newport Beach, BRC, in cooperation with multiple environmental organizations, filed a lawsuit in opposition of the development project on the basis of inconsistencies with the California Environmental Quality Act (CEQA) and the updated Newport Beach General Plan. BRC won this suit but lost following an appeal of the ruling by the City of Newport Beach in 2015. This led BRC to file a petition for hearing by the California Supreme Court. During this time, NBR reduced their project size and design in an effort to acquire a CDP from the CCC. The CDP was ultimately denied due to significant impacts to ESHAs and the project's inconsistency with the California Coastal Act. In 2017, the California Supreme Court ruled in favor of BRC and required the City of Newport Beach to vacate its original approval of NBR's development project. Following this loss, NBR began the process of negotiating a conservation transaction of Banning Ranch to TPL, which set forth the publicly supported process of durably protecting the land as a nature preserve.

2.2 Physical Characteristics

2.2.1 LANDFORM AND TOPOGRAPHY

The Preserve is largely divided into two areas topographically: a mesa comprising native and disturbed upland habitats including vernal pools and a series of arroyos spanning the eastern, central, and southern portions of the site, and the lowlands, featuring native and disturbed brackish and freshwater wetlands and riparian areas occupying over 100 acres in the northern and western portions of the site. The mesa reaches elevations up to 119 feet above mean sea level (AMSL) and includes coastal bluffs overlooking the Pacific Coast Highway to the south and the lowland area and the Santa Ana River to the west. The mesa includes a series of canyons and associated riparian areas that generally drain from east to west. The lowlands are connected in the south to the Lower Santa Ana River Salt Marsh via the associated marsh lands with elevations from approximately 3 to 10 feet AMSL. The geology of the Preserve is classified as quaternary alluvium and marine deposits. Preserve geology is associated with mostly alluvium, lake, playa, and terrace deposits. It also consists of faults within the area (USGS 2025a).

2.2.2 SOILS

There are 10 soil types mapped in the Preserve: Riverwash; Tidal flats; Myford sandy loam, 0% to 2% slopes; Myford sandy loam, 2% to 9% slopes; Myford sandy loam, 9% to 30% slopes, eroded; Marina sandy loam, 2% to 9% slopes; Capistrano sandy loam, 9% to 15% slopes; Bolsa silt loam; Pits; and Beaches (USDA 2025a). Riverwash consists of very deep alluvial materials in stream channels that are frequently flooded. Tidal flats consist of unconsolidated sediment, mostly clays, silts, and/or sands and organic materials (SSSA 2025). The Myford series consists of deep, moderately well-drained soils formed on terraces. The Marina series consists of very deep, somewhat excessively drained soils formed in old aeolian deposits. The Bolsa series consists of deep, somewhat poorly drained soils formed in mixed alluvium. The Pit series consists of very deep, poorly drained soils that formed in fine-textured alluvium weathered from extrusive and basic igneous rocks. The Beach series consists of very shallow and shallow, well-drained, moderately permeable soils that formed in residuum from hard, very fine grained, metamorphic sandstone (USDA 2025b).

2.2.3 HYDROLOGY

The Preserve occurs in the Greenville Banning Channel-Santa Ana River unit (Hydrologic Unit Code [HUC] 180702031003) of the Santa Ana watershed (HUC 18070203) (USGS 2025b). The USFWS National Wetlands Inventory identifies the following wetland types in the Preserve: estuarine and marine wetland, freshwater emergent wetland, freshwater forested/shrub wetland, freshwater pond, and riverine (USFWS 2025). In addition, the western portion of the Preserve is within the Area with Reduced Risk Due to Levee according to the Federal Emergency Management Agency, with the eastern portion of the area being within the area of minimal risk (FEMA 2025).

The Preserve is hydrologically influenced by saline and brackish inputs from the Lower Santa Ana River to the west and Pacific Ocean to the south. This tidal water supports a series of depressional wetlands in the lowland area of the Preserve. In addition, the Preserve receives a combination of urban and freshwater storm runoff from offsite sources at two locations along the eastern boundary (Drainage A and Drainage B) and at one location along the boundary with Talbert Regional Park. Drainage A, the northernmost drainage, conveys a combination of urban and storm water runoff from offsite areas via a concrete culvert along the eastern boundary. Drainage A contains riparian habitat dominated by willows (*Salix* spp.) and mulefat (*Baccharis salicifolia*) and flows south to north before combining with a drainage originating near the end of 19th Street in Talbert Regional Park. The combined flows are conveyed along the northern Preserve and ultimately drain into the off-site tidal channel via a culvert at the western Preserve boundary. Drainage B receives a combination of urban and storm water runoff from a large concrete outlet at the base of the retaining wall along the eastern Preserve boundary and flows northeast to southwest. Drainage B terminates at a graded road at the edge of the lowlands and provides freshwater input that supports stands of riparian vegetation in the central portion of the Preserve. A third drainage feature on site (Drainage C) drains runoff from the uplands in the southern portion of the Preserve and flows northeast to southwest. Drainage C spans nearly the entirety of the Preserve and terminates at an existing culvert that ultimately outlets offsite into the canal opposite Industrial Park Way. A fourth on-site drainage (Drainage D) consists of a small erosional feature at the southern end of the Preserve. The potential jurisdictional status of the drainages on site are discussed in Section 2.3.5, Wetlands. In addition to these drainages, the upland portion of the Preserve contains vernal pools and other ephemeral features.

2.2.4 GROUNDWATER

The Preserve is located within the Coastal Plain of Orange County Groundwater Basin underlying the Lower Santa Ana River watershed and is managed by the Orange County Water District. There are three zones recognized within this aquifer system. The upper aquifer system consists of mostly sand, gravel, and conglomerate with some silt and clay beds and provides most of the basin's irrigation water. The middle aquifer system consists of sand, gravel, and low quantities of clay and provides most of the basin's groundwater. The lower aquifer consists of sand and conglomerate and is not in groundwater production (DWR 2004). Aquifers within this management area extend up to 2,000 feet in depth (DWR 2004). The groundwater on site is considered brackish due to the influx of seawater intrusion from the Pacific Ocean (Geosyntec 2024; DWR 2004). The depth-to-water on site is variable based on seasonal precipitation and tidal influences but ranges from 3 to 5 feet (Geosyntec 2024) and was estimated to be around 5.75 feet for the year 2024 (DWR 2024). According to the 2024 annual groundwater monitoring event performed on site, impacts on the groundwater include low concentrations of dissolved phase hydrocarbons (DWR 2004; Geosyntec 2024).

2.3 Biology

The baseline biological conditions described in the RMP represent a summation of historical and recent biological information. Biological data for the property documented prior to the establishment of the Preserve has been compiled into an historical database that includes the results of decades of focused surveys, quantitative habitat assessments, and numerous reconnaissance visits conducted by contracted biological consultants and non-profit organizations between 1997 and 2016. Recent biological data includes the results of surveys conducted by Dudek biologists in 2024 and 2025 to support preparation of this RMP, as well as the results of avian surveys conducted by Sea and Sage Audubon Society (SASAS) and CCA volunteers.

Dudek biologists conducted directed surveys for special-status birds in riparian and upland habitats and conducted focused surveys for coastal California gnatcatcher over multiple visits in spring and summer 2024. Dudek biologists also surveyed for western spadefoot toad (*Spea hammondii*) during and following winter storm events in January and February 2025 and evaluated the status of wetlands on the Preserve during a reconnaissance survey in March 2025. Monthly bird surveys conducted by SASAS and CCA volunteers were initiated in September 2023 and are ongoing; results of the monthly surveys through March 2025, including avian species lists and incidental plant and wildlife observations, were compiled and are reflected in this RMP.

An updated vegetation map of the Preserve was developed based on vegetation community classifications and land use types previously determined for the former Newport Banning Ranch property. Reconnaissance surveys by Dudek biologists in 2024 verified or updated vegetation classifications based on current conditions, including the location and extent of special-status plant populations known to occur in the Preserve. The reconnaissance surveys also mapped the location and extent of invasive plant populations. Native vegetation stands with high cover of invasive species were noted as “disturbed” but were otherwise classified as a native vegetation type. Existing vegetation classifications based on dominant species present were updated to the association or alliance level according to current CDFW vegetation standards (CDFW 2025).

Weather conditions during the surveys were favorable for the identification of fauna and flora. Limitations on the general wildlife surveys are primarily due to season and daytime-only surveys. Many fall and spring migratory birds that may use habitat within or pass through the Preserve would have been observed. Surveys for special-status plants and wildlife were favorable for blooming flora and breeding wildlife because surveys were conducted in both spring and summer, though some late-blooming plants may not have been observed due to a lack of fall vegetation surveys.

Surveys were conducted during the daytime to maximize visibility for the detection of plants and most animals. Birds represent the largest component of the vertebrate fauna, and because most are active in the daytime, diurnal surveys maximize the number of observations of this group. In contrast, daytime surveys usually result in few observations of mammals, reptiles, and amphibians, many of which may be more active at night.

2.3.1 VEGETATION COMMUNITIES AND LAND COVERS

Vegetation communities and land covers were mapped within the Preserve based on general physiognomy and species composition. Including native vegetation types denoted as "disturbed," a total of 67 vegetation communities and land covers are present in the Preserve, consisting of 46 native vegetation types and 21 non-native, semi-natural, or unvegetated communities and land covers. Of the 46 native or naturalized vegetation communities, 22 (including disturbed forms) are considered sensitive by CDFW (S1-3). Although mapping was conducted at the association level whenever possible and is recorded accordingly in the vegetation database for the Preserve, vegetation communities and land covers shown on Figure 2-6 are presented based on a combination of generalized habitat categories and non-native vegetation communities. The acreages listed in Table 2-1 are grouped by vegetation type and consolidated at the alliance level, with vegetation descriptions below similarly listed by vegetation alliance. Vegetation alliances with one or more associations mapped in the Preserve are described accordingly.

Table 2-1. Vegetation Communities and Land Covers in the Preserve

Type	Alliance/Association	Acres*
Forest and Woodland	Arroyo Willow Thickets	3.8
	Eucalyptus Groves	1.1
	Goodding's Willow Riparian Woodland and Forest**	17.2
	Mulefat Thickets	26.7
	Forest and Woodland Subtotal	*48.9*
Shrubland and Grassland	Alkali Heath Marsh**	5.3
	California Brittlebush/Coast Prickly Pear Scrub	23.0
	California Brittlebush Scrub**	54.7
	California Buckwheat Scrub	1.0
	California Bulrush Marshes**	0.7
	California Sagebrush Scrub	1.1
	Clustered Tarweed Fields**	2.9
	Coast Prickly Pear Scrub**	1.5
	Coyote Brush Scrub	0.4
	Deerweed Scrub	0.1

Table 2-1. Vegetation Communities and Land Covers in the Preserve

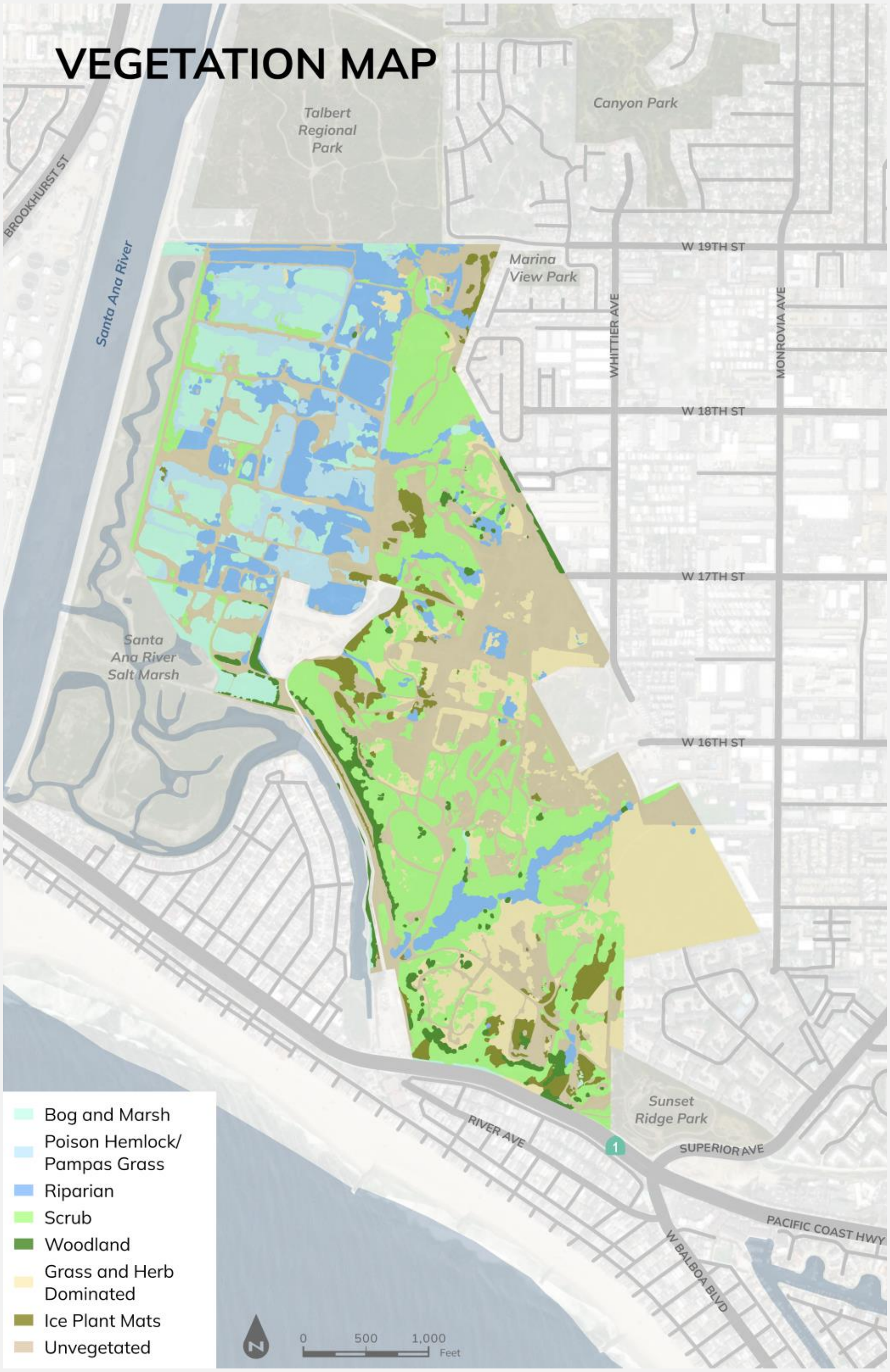
Type	Alliance/Association	Acres*
	Menzie's Goldenbush Scrub**	8.3
	Pickleweed Mats**	28.4
	Poison Hemlock Patches	11.4
	Purple Needlegrass Grassland**	4.1
	Quailbush Scrub	0.5
	Salt Grass Flats	4.9
	Shrubland and Grassland Subtotal	*148.0*
Non-Natural Land Covers and Unvegetated Communities	Australian Wattle Ruderal Patches	1.0
	Common and Giant Reed Marshes	1.9
	Ice Plant Mats	14.2
	Non-Native Grassland	17.1
	Pampas Grass Patches	13.7
	Pepper Tree or Myoporum Groves	7.5
	Russian Thistle–Dyer's Wood–Fivehook Bassia Fields	1.1
	Saltpan/Mudflats	1.4
	Upland Mustards or Star-Thistle Fields	11.6
	Wild Oats and Annual Bromes Grasslands	13.1
	Disturbed Habitat	47.2
	Urban/Developed	59.1
	Non-Natural Land Covers and Unvegetated Communities Subtotal	*188.9*
	Total	385.8

Note:

* Totals may not exactly sum due to rounding.

** Ranked by the California Department of Fish and Wildlife (CDFW) as Sensitive Vegetation Communities (S1-3).

Figure 2-6. Vegetation Map



NATIVE OR NATURALIZED VEGETATION COMMUNITIES

Forest and Woodland Alliances

Arroyo Willow Thickets

The arroyo willow (*Salix lasiolepis*) thickets alliance includes arroyo willow as the dominant or co-dominant tree in the canopy. The alliance has an open to continuous tree canopy less than 65 feet (20 meters) in height with an open to intermittent shrub canopy and a variable ground layer (Sawyer et al. 2009). Arroyo willow thickets occur in the northeastern and southeastern portions of the Preserve (Figure 2-6). The disturbed form of this vegetation community is co-dominated by non-native castor bean (*Ricinus communis*) and occurs in a singular fragmented patch on the northwestern portion of the Preserve.

Arroyo Willow Thickets

Goodding's Willow Riparian Woodland and Forest

Stands of Goodding's willow in the Preserve are classified in the *Salix gooddingii* association of the Goodding's willow (*Salix gooddingii*)–red willow (*Salix laevigata*) riparian woodland alliance where the species are co-dominant trees in the canopy. The alliance has an open to continuous tree canopy less than 500 feet (30 meters) in height with an open to continuous shrub canopy and a variable ground layer (Sawyer et al. 2009). Goodding's willow riparian woodland occurs in the lowlands on the southwestern and northern portions of the Preserve (Figure 2-6). The disturbed form of this habitat is co-dominated by non-native castor bean and occurs within the northern portion of the Preserve. This vegetation community is considered sensitive (S3) by CDFW, may provide suitable habitat for special-status species, and is often regulated as a jurisdictional aquatic resource.

Goodding's Willow Riparian Woodland and Forest

Eucalyptus Groves

Eucalyptus trees in the Preserve are mapped within the *Eucalyptus* ssp./tree of heaven (*Ailanthus altissima*)/black locust (*Robinia pseudoacacia*) grove alliance, a semi-natural community that includes *Eucalyptus* ssp., tree of heaven, or black locust as the dominant species in the tree canopy. It has a tree canopy of less than 200 feet and is open to continuous (Sawyer et al. 2009). The shrub layer and herbaceous layer are sparse to intermittent. Eucalyptus woodland occurs along the fence line of the northeastern Preserve boundary and in small, fragmented stands on the mesa in the southern portion of the Preserve. Within this alliance, the *Eucalyptus (E. globulus, E. camaldulensis)* association occurs on site. This vegetation community is not considered sensitive by CDFW.

Eucalyptus Groves

Mulefat Thickets

The mulefat thickets alliance includes mulefat as the dominant or co-dominant shrub. The community has a continuous shrub canopy with two tiers at less than 7 feet (2 meters) and less than 15 feet (5 meters) in height, a tree layer that may be present at low cover, and a sparse herbaceous layer (Sawyer et al. 2009). Species associated with the alliance include arroyo willow, sandbar willow (*Salix exigua*), California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), tree tobacco (*Nicotiana glauca*), and laurel sumac (*Malosma laurina*). Other tree species that may be present include California sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), oaks (*Quercus* sp.), and willows (Sawyer et al. 2009). Mulefat thickets are scattered throughout the Preserve in fragmented patches (Figure 2-6). Some patches may include salt grass as dominant in the herbaceous layer. The disturbed form of mulefat thickets is co-dominated by non-natives, including castor bean, upland mustards (*Brassica* spp., *Hirschfeldia incana*), and pampas grass (*Cortaderia jubata*, *C. selloana*) patches, and also occurs throughout the Preserve, predominantly the northern half. Within this alliance, the *Baccharis salicifolia* association occurs on site. This vegetation community is not considered sensitive by CDFW but may provide suitable habitat for special-status species and is often regulated as a jurisdictional aquatic resource.

Mulefat Thickets

Shrubland and Grassland Alliances

Alkali Heath Marsh

The alkali heath (*Frankenia salina*) marsh alliance includes alkali heath as dominant in the herbaceous and subshrub layer. The community has an open to continuous cover less than 25 inches (60 centimeters) in height (Sawyer et al. 2009). This community occurs in coastal salt marshes and alkali meadows. Species associated with the association include Pacific bentgrass (*Agrostis avenacea*), Parish's glasswort (*Arthrocnemum subterminale*), saltbush (*Atriplex* sp.), turtleweed (*Batis maritima*), alkali weed (*Cressa truxillensis*), salt grass (*Distichlis spicata*), Pacific swampfire (*Salicornia pacifica*), western marsh rosemary (*Limonium californicum*), goldfields (*Lasthenia* sp.), and seablite (*Suaeda* sp.). Alkali health marsh occurs in the lowlands within isolated patches in the southern, northwestern, and northern portions of the Preserve (Figure 2-6). The disturbed form of alkali heath marsh is co-dominated by non-native herbaceous ruderal forbs and grasses and occurs in patches within the northern half of the Preserve. Within this alliance, the *Frankenia salina* association occurs on site. This vegetation community is considered sensitive (S3) by CDFW, may provide suitable habitat for special-status species, and is often regulated as a jurisdictional aquatic resource.

Alkali Heath Marsh

California Bulrush Marshes

The *Schoenoplectus californicus* association is a part of the hardstem (*Schoenoplectus acutus*) and California bulrush (*Schoenoplectus californicus*) marshes herbaceous alliance and includes hardstem or California bulrush as dominant in the herbaceous layer. The community has an intermittent to continuous cover less than 13 feet (4 meters) in height (Sawyer et al. 2009). The California bulrush marsh habitat occurs in two isolated patches in the northern central half of the Preserve (Figure 2-6). Within this alliance, the *Schoenoplectus californicus* association occurs on site. This vegetation community is considered sensitive (S3) by CDFW, may provide suitable habitat for special-status species, and is often regulated as a jurisdictional aquatic resource.

California Bulrush Marshes

Clustered Tarweed Fields

The clustered tarweed (*Deinandra fasciculata*) fields herbaceous alliance includes clustered tarweed as co-dominant or conspicuous in the herbaceous layer with fiddleneck (*Amsinckia menziesii*), star-thistles (*Centaurea* ssp.), silverscale saltbush (*Atriplex argentea*), shortpod mustard (*Hirschfeldia incana*), sand-aster (*Corethrogyne filaginifolia*), barley (*Hordeum* ssp.), Fremont's goldfields (*Lasthenia fremontii*), popcornflower (*Plagiobothrys* spp.), and clover (*Trifolium* spp.). The alliance has a variable canopy less than 3 feet (1 meter) in height with open to continuous cover in the herbaceous layer (Sawyer et al. 2009). Emergent shrubs may be present at low cover, including California sagebrush, California buckwheat (*Eriogonum fasciculatum*), snakeweed (*Gutierrezia* spp.), and sawtooth goldenbush (*Hazardia squarrosa*) (Sawyer et al. 2009). Clustered tarweed fields occur throughout the central and eastern portions of the Preserve (Figure 2-6). Within this alliance, the *Deinandra fasciculata* annual grass association occurs on site. This vegetation community is considered sensitive (S2) by CDFW and may provide suitable habitat for special-status species.

Clustered Tarweed Fields

Pickleweed Mats

The pickleweed (*Sarcocornia pacifica*) mats alliance (*Salicornia depressa*) herbaceous alliance includes pickleweed as the dominant or co-dominant herb in the subshrub or herbaceous layer. The community has an intermittent to continuous cover less than 5 feet (1.5 meters) in height

(Sawyer et al. 2009). Species associated with the alliance include salt marsh bulrush (*Bolboschoenus maritimus*), Veatch's dodder (*Cuscuta nevadensis*), salt grass, alkali heath, gum plant (*Grindelia stricta*), marsh jaumea (*Jaumea carnosa*), smartweed (*Persicaria lapathifolia*), and estuary seablite (*Suaeda esteroa*) (Sawyer et al. 2009). Pickleweed mats dominate the lowlands in the western portion of the Preserve and also occur in one isolated patch along the southwestern Preserve boundary (Figure 2-6). Within this alliance, the *Sarcocornia pacifica/Frankenia salina* association, *Sarcocornia pacifica–Distichlis spicata* association, *Sarcocornia pacifica* tidal association, and *Sarcocornia pacifica*/algae association occur on site. Pickleweed mats are a native vegetation community ranked sensitive (S3) by CDFW, may provide suitable habitat for special-status species, and are often regulated as a jurisdictional aquatic resource.

Pickleweed Mats

Quailbush Scrub

The quailbush (*Atriplex lentiformis*) scrub alliance includes quailbush as the dominant shrub in the canopy. The alliance has an open to intermittent shrub canopy less than 16 feet (5 meters) in height with variable herbaceous layer (Sawyer et al. 2009). Some species associated with the alliance include California sagebrush, fourwing saltbush (*Atriplex canescens*), coyote brush, California brittlebush (*Encelia californica*), laurel sumac, arrow weed (*Pluchea sericea*), alkali sacaton (*Sporobolus airoides*), and woolly seablite (*Suaeda taxifolia*) (Sawyer et al. 2009).

Quailbush scrub habitat occurs along the southern and northwestern Preserve boundaries, as well as an isolated patch in the center of the Preserve (Figure 2-6). This vegetation community is not considered sensitive by CDFW.

Quailbush Scrub

Salt Grass Flats

Salt grass flats herbaceous alliance consists of salt grass, spiny rush (*Juncus acutus*), or Cooper's rush (*Juncus cooperi*) as dominant or co-dominant in the herbaceous layer. The cover is open to continuous, and the herbaceous layer is less than 5 feet (1.5 meters) tall (Sawyer et al. 2009). Salt grass habitat occurs predominantly on the southern portion of the Preserve, with isolated patches in the central and northwestern portions of the Preserve as well (Figure 2-6). The disturbed form of this vegetation community is co-dominated by non-native ruderal species in the herbaceous layer and is present in the central portion of the Preserve. This vegetation community is not considered sensitive by CDFW but may provide suitable habitat for special-status species and is often regulated as a jurisdictional aquatic resource.

Salt Grass Flats

California Brittlebush Scrub

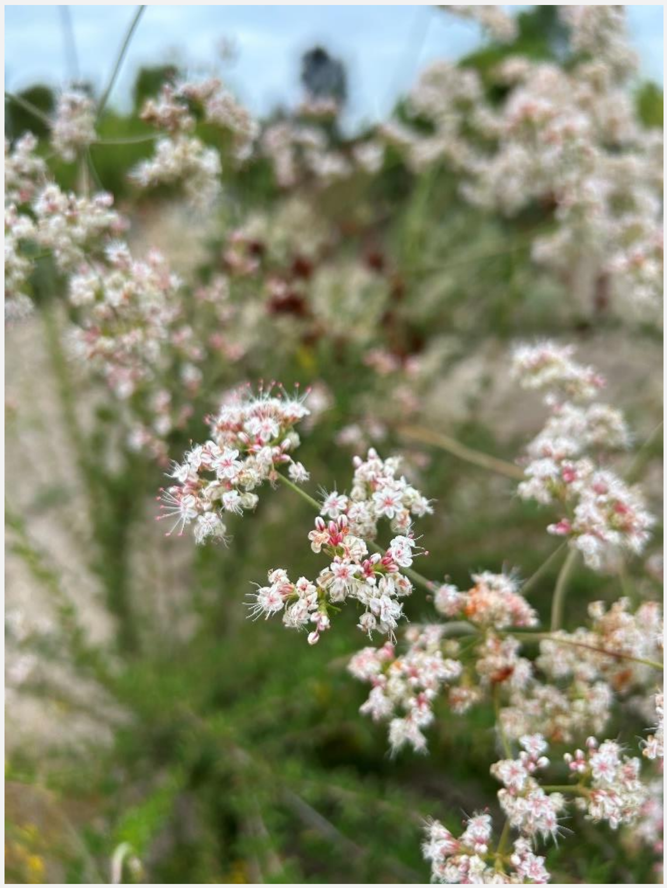
Stands of California brittlebush scrub in the Preserve are classified within the California brittlebush and ashy buckwheat (*Eriogonum cinereum*) scrub alliance in which either species is co-dominant in the shrub canopy. The alliance has an intermittent to continuous canopy less than 3 feet (1 meter) in height with a variable herbaceous layer (Sawyer et al. 2009). Some species associated with the alliance include California sagebrush, coyote brush, bladderpod (*Cleome isomeris*), California buckwheat, sticky monkeyflower (*Diplaucus auranticus*), chaparral yucca (*Hesperoyucca whipplei*), Menzies' goldenbush (*Isocoma menziesii*), deerweed (*Acmispon glaber*), laurel sumac, lemonade berry (*Rhus integrifolia*), coast prickly pear (*Opuntia littoralis*), chaparral mallow (*Malacothamnus fasciculatus*), California four o'clock (*Mirabilis laevis* var. *crassifolia*), white sage (*Salvia apiana*), and purple sage (*Saliva leucophylla*) (Sawyer et al. 2009). California brittlebush scrub occurs throughout the southern, central, and northeastern portions of the Preserve (Figure 2-6). Portions of this vegetation community may include mulefat, ice plant (*Carpobrotus edulis*) mats, California buckwheat, or Menzie's goldenbush as dominant within the shrub layer, or purple needlegrass (*Nassella pulchra*) or upland mustard within the herbaceous layer. The disturbed form is co-dominated by non-native herbaceous plants. The California brittlebush scrub in the Preserve includes *Encelia californica–Artemisia californica* association and *Encelia californica* association. This vegetation community is considered sensitive (S3) by CDFW and may provide suitable habitat for special-status species.

California Brittlebush Scrub

California Buckwheat Scrub

The California buckwheat scrub alliance includes California buckwheat or chaparral yucca as dominant or co-dominant in the shrub canopy in cismontane stands. It has a continuous to intermittent canopy less than 7 feet in height (Sawyer et al. 2009). Species associated with the alliance include California sagebrush, coyote brush, sticky monkeyflower, California brittlebush, Menzies' goldenbush, deerweed (*Acmispon glaber* var. *glaber*), chaparral mallow, white sage, and black sage (*Salvia mellifera*). Emergent trees may be present at low cover including California juniper (*Juniperus californica*). California buckwheat scrub occurs in four isolated patches within the southwestern, central, and northeastern portions of the Preserve (Figure 2-6). Within this alliance, the *Eriogonum fasciculatum* association occurs on site. This vegetation community is not considered sensitive by CDFW but may provide suitable habitat for special-status species.

California Buckwheat Scrub



California Sagebrush Scrub

Stands of California sagebrush scrub in the Preserve are classified in the *Artemisia californica* association within the California sagebrush–(Purple Sage) scrub alliance. This alliance includes California sagebrush as dominant in the shrub canopy with chamise (*Adenostoma fasciculatum*), sages (*Salvia* spp.), coyote brush, sticky monkeyflower, California brittlebush, brittlebush (*Encelia farinosa*), ashy buckwheat, California buckwheat, chaparral yucca, Menzies' goldenbush, bladderpod, deerweed, laurel sumac, coast prickly pear, lemonade berry, sugar bush (*Rhus ovata*), California ephedra (*Ephedra californica*), white sage, black sage, and poison oak (*Toxicodendron diversilobum*). The alliance has a variable canopy less than 3 feet (1 meter) in height with a variable herbaceous layer (Sawyer et al. 2009). Other species associated with the alliance include hollyleaf redberry (*Rhamnus ilicifolia*), heartleaf keckiella (*Keckiella cordifolia*), yellow yarrow (*Eriophyllum confertiflorum*), southern honeysuckle (*Lonicera subspicata*), and linear goldenbush (*Ericameria linearifolia*) (Sawyer et al. 2009). Emergent trees or tall shrubs may be present at low cover, including blue elderberry (*Sambucus mexicana*), California juniper, and coast live oak (*Quercus agrifolia*). California sagebrush scrub predominantly occurs on the southwestern portion of the Preserve (Figure 2-6). This vegetation community is not considered sensitive by CDFW but may provide suitable habitat for special-status species.

California Sagebrush Scrub

Coast Prickly Pear Scrub

The coast prickly pear (*Opuntia littoralis, O. oricola, Cylindropuntia prolifera*) shrubland alliance includes coast prickly pear and/or other cacti that are dominant or co-dominant in the shrub canopy with California sagebrush, bladderpod, California brittlebush, California buckwheat, chaparral yucca, laurel sumac, lemonade berry, black sage, bush rue (*Cneoridium dumosum*), snake cholla (*Cylindropuntia californica*), cliff spurge (*Euphorbia misera*), box-thorn (*Lycium* spp.), and California four o'clock. Emergent trees may be present at low cover, including Peruvian pepper tree (*Schinus molle*). The herbaceous layer is less than 7 feet in height, open to continuous, and diverse (Sawyer et al. 2009). Coast prickly pear scrub occurs in small, fragmented patches within the southern and central portions of the Preserve (Figure 2-6). The disturbed form of this vegetation community is co-dominated by non-native ruderal species in the herbaceous and shrub layers, located in the southern, central, and northern portions of the Preserve. Within this alliance, the *Opuntia littoralis* association occurs on site. This vegetation community is considered sensitive (S3) by CDFW and may provide suitable habitat for special-status species.

Coast Prickly Pear Scrub

California Brittlebush/Coast Prickly Pear Scrub

The California brittlebush/coast prickly pear vegetation community includes California brittlebush and coast prickly pear and/or other cacti that are co-dominant in the shrub canopy. This vegetation community is not described by the Manual of California Vegetation (Sawyer et al. 2009) but was included to best describe the co-dominance of the cacti and coastal scrub plants observed on the Preserve. The California brittlebush/coast prickly pear vegetation community occurs throughout the central portion of the Preserve (Figure 2-6). The disturbed form is co-dominated by non-native ruderal species in the shrub layers, located in the central portion of the Preserve as well as along the southern and southwestern Preserve boundaries. This vegetation community may provide suitable habitat for special-status species.

California Brittlebush/Coast Prickly Pear Scrub

Coyote Brush Scrub

A single stand of coyote brush in the Preserve is mapped in the *Baccharis pilularis* association of the coyote brush scrub alliance. The alliance has a variable canopy less than 3 feet (1 meter) in height with a variable herbaceous layer (Sawyer et al. 2009). Some species associated with the alliance include California sagebrush, California buckwheat, common deerweed, white sage, and purple sage (Sawyer et al. 2009). Coyote brush scrub occurs in a singular, isolated patch within an existing mitigation area in the northern portion of the Preserve (Figure 2-6). This vegetation community is not considered sensitive by CDFW but may provide suitable habitat for special-status species.

Coyote Brush Scrub

Deerweed Scrub

A stand of deerweed (*Lotus scoparius*) in the Preserve is classified in the *Lotus scoparius* association of the deerweed–silver lupine–yerba santa scrub alliance. This shrub community has an open to intermittent canopy that can be two-tiered and is less than 13 feet in height, with a sparse to intermittent herbaceous layer (Sawyer et al. 2009). Species associated with this alliance include chamise, California sagebrush, coyote brush, California aster, sticky monkeyflower, California ephedra, California buckwheat, chaparral yucca, white sage, blue elderberry, sugar bush, and poison oak among many others. Emergent trees may be present at low cover. Deerweed scrub occurs in a singular, fragmented patch on the mesa in the southern portion of the Preserve (Figure 2-6). This vegetation community is not considered sensitive by CDFW.

Deerweed Scrub

Menzies's Goldenbush Scrub

The Menzies's goldenbush scrub alliance includes Menzies's goldenbush as dominant or co-dominant in the canopy. The alliance has an open to intermittent shrub canopy less than 3 feet (1 meter) in height with an open to continuous herbaceous layer (Sawyer et al. 2009). Some species associated with the alliance include California saltbush (*Atriplex californica*), desertbroom (*Baccharis sarothroides*), San Joaquin snakeweed (*Gutierrezia californica*), and Virginia glasswort (*Salicornia depressa*) (Sawyer et al. 2009). Menzies' goldenbush scrub occurs throughout the southern, western, and northwestern portions of the Preserve (Figure 2-6). The disturbed form of this vegetation community is co-dominated by non-natives in the herbaceous and shrub layers and occurs on the southern, central, and northwestern portions of the Preserve (Figure 2-6). Within this alliance, the *Isocoma menziesii* association occurs on site. Menzies's goldenbush scrub is a native vegetation community ranked sensitive (S3) by CDFW.

Menzies's Goldenbush Scrub

Purple Needlegrass Grassland

Grassland areas with purple needlegrass are mapped within the *Nassella pulchra* association. This association is a native vegetation community ranked sensitive (S3) by CDFW within the needlegrass (*Nassella pulchra)*–melic grass (*Melica californica*) grassland herbaceous alliance, which includes needlegrass or melic grass as dominant in the herbaceous canopy with other native perennial grasses and herbs present. The alliance is less than 3 feet (1 meter) in height with an open to continuous herbaceous layer (Sawyer et al. 2009). Purple needlegrass grassland occurs throughout the southern, central, and northeastern portions of the Preserve (Figure 2-6). Purple needlegrass grassland is a native vegetation community ranked sensitive (S3) by CDFW.

Poison Hemlock Patches

Patches of poison hemlock (*Conium maculatum*) in the Preserve are mapped in the *Conium maculatum* association of the poison hemlock or fennel (*Foeniculum vulgare*) patches semi-natural alliance. The alliance is characterized by areas dominated by poison hemlock, fennel, or another non-native invasive plant of the Apiaceae family in the herbaceous layer. The semi-natural community has an open to continuous cover less than 7 feet (2 meters) in height. Emergent trees and shrubs may be present at low covers, including oak or coyote bush (Sawyer et al. 2009). Poison hemlock is present within the northwestern portion of the Preserve (Figure 2-6). This vegetation community is not considered sensitive by CDFW.

Poison Hemlock Patches

NON-NATURAL LAND COVERS AND UNVEGETATED COMMUNITIES

Common and Giant Reed Marshes

The common and giant reed (*Arundo donax*) marshes semi-natural alliance consists of giant reed as the dominant or co-dominant species in the herbaceous layer with common reed (*Phragmites australis*) (Sawyer et al. 2009). The canopy cover is continuous and less than 25 feet (8 meters) in height. Other herbaceous species associated with this alliance include western ragweed (*Ambrosia psilostachya*), yerba mansa (*Anemopsis californica*), salt grass, rush (*Juncus* spp.), cattails (*Typha* spp.), bulrush (*Schoenoplectus* spp.), and rough cocklebur (*Xanthium strumarium*). Emergent trees may be present at low cover, including willows and Fremont's cottonwood. Common and giant reed marshes are known to occur in disturbed riparian and wetland habitats. Common and giant reed marshes are located within the northern portion of the Preserve (Figure 2-6). Within this alliance, the *Arundo donax* association occurs on site. This vegetation community is not considered sensitive by CDFW.

Common and Giant Reed Marshes

Ice Plant Mats

The ice plant alliance is a semi-natural alliance characterized by areas dominated or co-dominated by sea fig (*Carpobrotus chilensis*), ice plant, common ice plant (*Mesembryanthemum crystallinum*), or other ice plant taxa. This community is intermittent to continuous cover in the herb layer with less than 20 inches (50 centimeters) in height (Sawyer et al. 2009). Emergent trees and shrubs may be present at low cover. Ice plant mats occur within the southern, central, and northeastern portions of the Preserve (Figure 2-6). Within this alliance, the *Carpobrotus edulis* association occurs on site. This vegetation community is not considered sensitive by CDFW.

Ice Plant Mats

Saltpan/Mudflats

The saltpan/mudflats land cover is not described by a Manual of California Vegetation (Sawyer et al. 2009) but is described within the Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008). Mudflats are coastal wetlands that form when mud is deposited by the tides or rivers. They are commonly found in sheltered areas such as bays and estuaries. For a majority of the time, saltpans are expanses of ground covered in salt or other minerals formed from evaporated water. Saltpans generally pool water when it rains, forming mudflats (Oberbauer et al. 2008). Saltpan/mudflats occur on the western-central portion of the Preserve (Figure 2-6).

Saltpan/Mudflats

Pepper Tree or Myoporum Groves

Pepper tree (*Schinus molle, S. terebinthifolia*) or myoporum (*Myoporum laetum*) groves forest and woodland semi-natural alliance consists of myoporum or pepper trees as dominant in the tree canopy. The canopy is open to continuous with trees less than 60 feet (18 meters) tall, shrubs are infrequent to diverse, and the herbaceous layer is simple to diverse (Sawyer et al. 2009). Pepper tree/myoporum groves are located along the southern and southwestern boundaries of the Preserve, as well as in isolated patches within the northeastern portion of the Preserve (Figure 2-6). This non-native/ornamental hardwood vegetation community is not considered sensitive by CDFW.

Pepper Tree or Myoporum Groves

Australian Wattle Ruderal Patches

Stands of golden wattle (*Acacia pycnantha*) and Sydney golden wattle (*Acacia longifolia*) in the Preserve are classified within the Australian wattle/*Grevillia*/tree of heaven shrubland semi-natural alliance, which consists of *Acacia* spp., *Grevillia* spp., or tree of heaven as dominant or co-dominant in the shrub or small tree canopy. The herbaceous layer is open, with an intermittent to continuous canopy less than 33 feet (10 meters) in height (Sawyer et al. 2009). Australian wattle ruderal patches occur in the northeastern portion of the Preserve (Figure 2-6). This non-native vegetation community is not considered sensitive by CDFW.

Australian Wattle Ruderal Patches

Russian Thistle–Dyer's Wood–Fivehook Bassia Fields

This non-native community is naturalized in California with Russian thistle (*Salsola tragus*), Dyer's wood (*Isatis tinctoria*), and/or fivehook bassia (*Bassia hyssopifolia*) as the dominant or co-dominant species (Sawyer et al. 2009). Other ruderal herbaceous species may be present at low cover. Fivehook bassia tends to occur in disturbed habitats. The Russian thistle–Dyer's wood–fivehook bassia fields alliance is present the central portion of the Preserve and includes Russian thistle in the herbaceous layer (Figure 2-6). Within this alliance, the *Bassia hyssopifolia–B. scoparia* association occurs on site. This vegetation community is not considered sensitive by CDFW.

Russian Thistle–Dyer's Woad–Fivehook Bassia Fields

Upland Mustards or Star-Thistle Fields

This community is a naturalized vegetation type that has an herbaceous layer dominated by star-thistles. Similar ruderal forbs, including mustards, may be present in the herbaceous layer. Star-thistle fields consist of an open to continuous canopy less than 10 feet (3 meters) in height and typically occur in recently disturbed areas, such as fallow fields, grasslands, and roadsides (Sawyer et al. 2009). Upland mustards or star-thistle fields occur throughout the southern, central, and northern portions of the Preserve (Figure 2-6). Within this alliance, the *Centaurea melitensis* association and *Hirschfeldia incana* association occur on site. This vegetation community is not considered sensitive by CDFW.

Upland Mustards or Star-Thistle Fields

Non-Native Grassland

Non-native grassland herbaceous semi-natural alliance is not described by the Manual of California Vegetation (Sawyer et al. 2009) but is described as "ruderal" in the Orange County Habitat Classification System (Gray and Bramlet 1992). It typically occurs in disturbed areas, resulting in the growth of very few native perennials and proliferation of ruderal species including oats (*Avena* spp.), bromes (*Bromus* spp.), star-thistles, and mustards. Other non-native, invasive species may be present in the herbaceous layer. Non-native grassland was observed in the southern and northeastern portions of the Preserve (Figure 2-6). The disturbed form of non-native grassland is co-dominated by ruderal non-native herbaceous plants and occurs as an isolated patch within the southern portion of the Preserve. This vegetation community is not considered sensitive by CDFW.

Non-Native Grassland

Wild Oats and Annual Bromes Grassland

The wild oats and annual bromes herbaceous semi-natural alliance consists of wild oats and bromes as dominant or co-dominant with other non-natives in the herbaceous layer. This non-native herbaceous vegetation community supports an open to continuous canopy at less than 5 feet (1.5 meters) in height (Sawyer et al. 2009). Emergent trees and shrubs may be present at low cover. The wild oats and annual bromes grassland alliance occurs in the southeastern portion of the Preserve (Figure 2-6). This vegetation community is not considered sensitive by CDFW.

Wild Oats and Annual Bromes Grassland

Pampas Grass Patches

The pampas grass patches herbaceous semi-natural alliance consists of pampas grass as dominant in the herbaceous and shrub canopies. The canopy cover is open to continuous and less than 13 feet (4 meters) in height. Emergent trees and shrubs may be present at low cover (Sawyer et al. 2009). Pampas grass patches tend to occur in disturbed areas, estuaries, grasslands, urban areas, and wetlands. Pampas grass patches occur throughout the northern portion of the Preserve (Figure 2-6). This non-native vegetation community is not considered sensitive by CDFW.

Pampas Grass Patches

Disturbed Habitat

Disturbed habitat typically occurs in areas where soils have been recently or repeatedly disturbed by grading or compaction, resulting in the growth of very few native perennials. It is usually dominated by bare ground or non-native dicotyledonous species, including redstem stork's bill (*Erodium cicutarium*), black mustard (*Brassica nigra*), thistles (e.g., artichoke thistle [*Cynara cardunculus*], Italian plumeless thistle [*Carduus pycnocephalus*], and Maltese star-thistle [*Centaurea melitensis*]), dove weed (*Croton setiger*), and others. Disturbed habitat includes exposed ground that lacks vegetative cover due to repeated human alteration and is present throughout the Preserve (Figure 2-6).

Disturbed Habitat

Urban/Developed

The urban/developed land cover is not described by A Manual of California Vegetation (Sawyer et al. 2009) but is described by the Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008). Urban and developed land is characterized by impermeable, human-altered surfaces that have no exposed soils or vegetation cover. Urban and developed land occurs throughout the Preserve and consists of graded roads, buildings, and parking areas (Figure 2-6).

Urban/Developed

2.3.2 PLANTS

Within the Preserve, there is a high degree of plant diversity representative of various native California habitats, including coastal sage scrub, coastal salt marsh, riparian woodland, and grassland. Common non-native plant species, such as pampas grass and upland mustards, are also present throughout the Preserve. A total of 135 species of vascular plants, including 65 native or naturalized species (48%) and 70 non-native species (52%), have been recorded within the Preserve. A cumulative list of plant species observed in the Preserve based on historical and recent survey data is provided in Appendix A: Plant Compendium.

2.3.3 WILDLIFE

Despite the Preserve's developed surroundings, the site supports a relatively high diversity of wildlife species with a total of 214 species recorded on the Preserve, including 203 native species and 11 non-native species. Wildlife in the Preserve consists of both common, urban-adapted species, and many rare and migratory birds. Four common reptiles, western fence lizard (*Sceloporus occidentalis*), common side-blotched lizard (*Uta stansburiana*), tiger whiptail (*Aspidoscelis tigris*), and gopher snake (*Pituophis catenifer*), and two common amphibian species, western toad (*Anaxyrus boreas*) and Baja California treefrog (*Pseudacris* *hypochondriaca*), have been observed on the Preserve. A total of 177 bird species have been observed, 42 of which are considered special status. Evidence of 10 common mammal species, including California ground squirrel (*Otospermophilus beecheyi*), desert cottontail rabbit (*Sylvilagus audubonii*), and coyote (*Canis latrans*), have been observed on the Preserve. A total of 20 invertebrate species, including 16 butterflies, two branchiopods, one ant species, and one bee species have been observed on the Preserve. Three of these, specifically monarch butterfly (*Danaus plexippus*), Crotch's bumble bee (*Bombus crotchii*), and San Diego fairy shrimp (*Branchinecta sandiegonensis*), are special-status species and are described in detail below. Numerous other insects and invertebrates are expected to occur in the Preserve. A cumulative list of wildlife species observed in the Preserve based on historical and recent survey data is provided in Appendix B: Wildlife Compendium.

2.3.4 SPECIAL-STATUS SPECIES

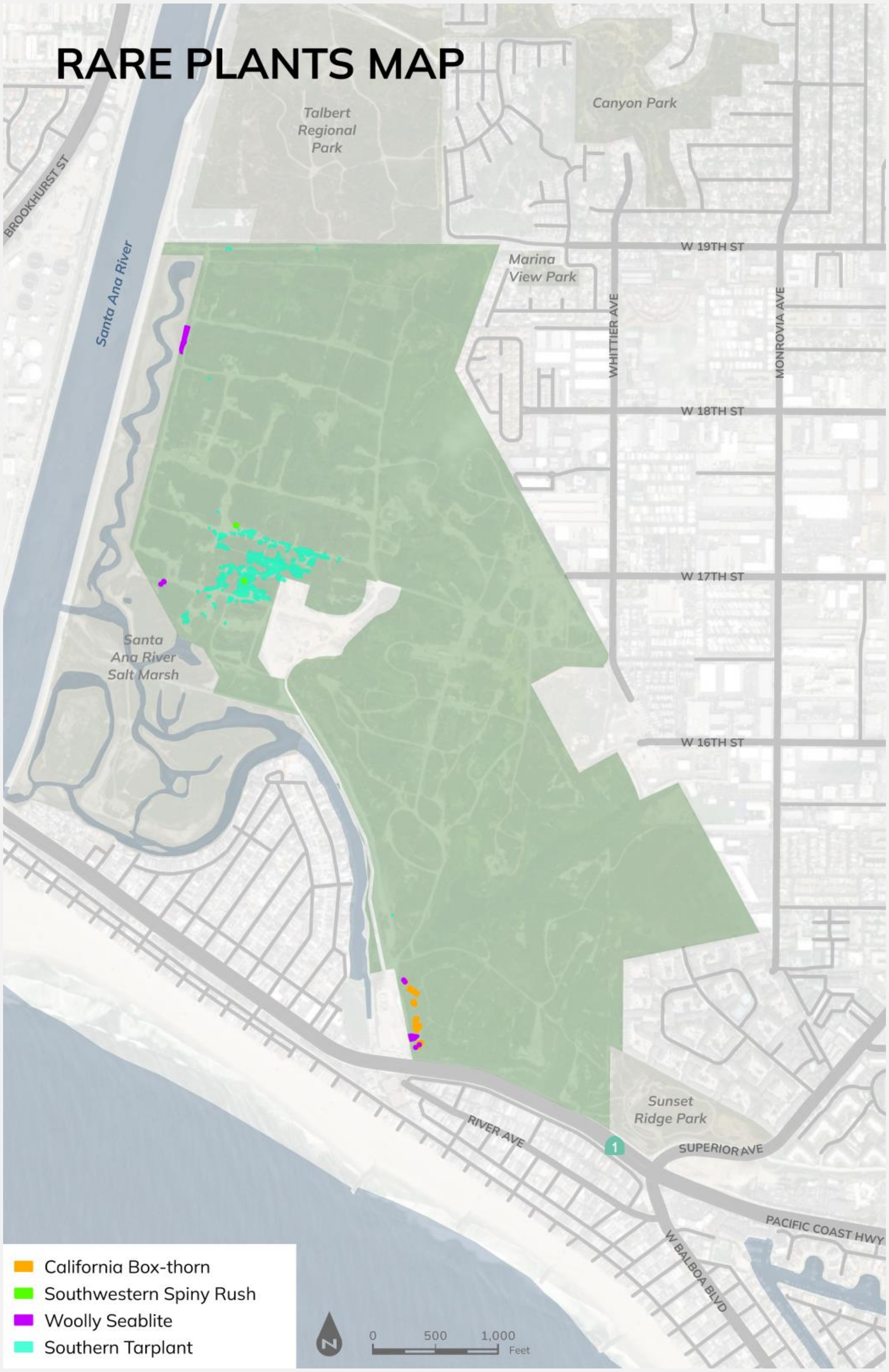
For the purposes of this RMP, special-status species include (1) endangered or threatened species listed under the California Endangered Species Act (CESA) and/or the federal Endangered Species Act (FESA); (2) plant species with a California Rare Plant Ranking (CDFG 2012; CNPS 2012) (lists 1 through 4); (3) California Species of Special Concern (SSC) and Watch List (WL) species, as designated by CDFW (CDFG 2011); (4) mammals and birds that are Fully Protected (FP) species, as described in Fish and Game Code, Sections 4700 and 3511; (5) Birds of Conservation Concern (BCC), as designated by USFWS (2008); and (6) plant and wildlife species that are "covered" under the Central–Coastal Subregion Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) (County of Orange 1996).

The Preserve is home to a number of special-status plant and wildlife species. Many of the special-status plant and wildlife species documented on site are recorded in the historical database for the property, which contains observations from a variety of surveys conducted in the years and decades before the Preserve was established. These historical species records have been compiled into a geographic information system (GIS) database along with more recent survey data to establish the baseline biological conditions described for the Preserve in this RMP.

Special-Status Plants

No federal or state-listed endangered or threatened plant species are known to occur within the Preserve. However, all four of the special-status plant species documented in the historical database were confirmed to be present during rare plant surveys conducted by Dudek biologists in spring 2024 (Figure 2-7). These species are listed with a California Rare Plant Rank (CRPR) of 1 through 4, as designated by the California Native Plant Society (CNPS) and CDFW and include southern tarplant (*Centromadia parryi* ssp. *australis*; CRPR 1.B.1), southwestern spiny rush (*Juncus acutus* ssp. *leopoldii*; CRPR 4.2), woolly seablite (CRPR 4.2), and California box-thorn (*Lycium californicum*; CRPR 4.2). Plants listed as CRPR 1-3 are considered sensitive by CDFW. These four rare plant species are described in further detail below, and their locations are shown on Figure 2-7.

Figure 2-7. Rare Plants



Southern Tarplant

Southern tarplant is seriously rare, endangered, or threatened in California and elsewhere (CRPR 1B.1). This annual herb occurs in marshes and swamps, valley and foothill grassland, and vernal pools from sea level to 1,575 feet AMSL and blooms between May and November (CNPS 2025). Southern tarplant individuals occur within various vegetation communities in the lowlands throughout the northern and western portions of the Preserve.

Southwestern Spiny Rush

Southwestern spiny rush is of limited distribution and moderately threatened in California (CRPR 4.2). This perennial rhizomatous herb occurs in coastal bluff scrub, coastal dunes, and the coastal margins of marshes and swamps from 10 feet to 2,955 feet AMSL and blooms generally between May and June (CNPS 2025). Southwestern spiny rush individuals were observed within mulefat and alkali heath communities in the eastern lowland region of the Preserve.

Woolly Seablite

Woolly seablite is of limited distribution and moderately threatened in California (CRPR 4.2). This perennial evergreen shrub occurs in coastal bluff scrub, coastal dunes, and the coastal margins of marshes and swamps from sea level to 165 feet AMSL (CNPS 2025). Woolly seablite individuals occur within various vegetation communities throughout the northwestern, western, and southwestern portions of the Preserve.

California Box-Thorn

California box-thorn is of limited distribution and moderately threatened in California (CRPR 4.2). This perennial shrub occurs in coastal bluff scrub and coastal scrub at elevations from 15 feet to 490 feet AMSL and blooms between March and August (CNPS 2025). California box-thorn individuals occur within various vegetation communities throughout the southern and central portions of the Preserve.

Special-Status Wildlife

A total of 42 special-status birds and three special-status invertebrates have been observed on the Preserve. Table 2-2 lists all 45 special-status wildlife species observed in the Preserve and the corresponding source from which the species was documented. Species documented in the historical database are compiled from directed surveys and other activities conducted before the Preserve was established from approximately 1997 to 2016. Species recorded by SASAS and CCA volunteers were observed during ongoing monthly bird surveys from September 2023 to the present. Species recorded by Dudek biologists were documented during directed surveys and reconnaissance of the Preserve conducted from March 2024 to March 2025. Of the 45 special-status species observed in the Preserve, 6 species are federally or state-listed as endangered or threatened or are candidates for federal or state listing as endangered or threatened and are bolded in Table 2-2 and described in further detail below (Figure 2-8).

Table 2-2. Special-Status Wildlife Species Observations in the Preserve

Species	Status (Federal/State)	Database	SASAS	Dudek
American avocet	BCC/None		x	
American white pelican	BCC/SSC		x	
Belding's savannah sparrow	BCC/SE	x	x	x
Black skimmer	BCC/SSC		x	
Black-throated gray warbler	BCC/None	x		
Bullock's oriole	BCC/None		x	
Burrowing owl	BCC/SCL	x		
California gull	BCC/WL		x	
California thrasher	BCC/None		x	
Coastal cactus wren	None/SSC	x	x	
Coastal California gnatcatcher	FT/SSC	x	x	x
Cooper's hawk	None/WL	x	x	x
Costa's hummingbird	BCC/None	x	x	
Crotch's bumble bee	None/SCE		x	
Double-crested cormorant	None/WL		x	x
Elegant tern	BCC/WL		x	x
Forster's tern	BCC/None		x	x
Grasshopper sparrow	BCC/None	x		
Heermann's gull	BCC/None	x		
Lawrence's goldfinch	BCC/None		x	
Least Bell's vireo	FE/SE		x	x
Lesser yellowlegs	BCC/None		x	
Loggerhead shrike	None/SSC		x	
Long-billed curlew	None/WL		x	
Marbled godwit	BCC/None		x	
Merlin	None/WL		x	
Monarch (overwintering population)	FPT/None		x	
Northern harrier	BCC/SSC		x	x
Nuttall's woodpecker	BCC/None		x	x

Table 2-2. Special-Status Wildlife Species Observations in the Preserve

Species	Status (Federal/State)	Database	SASAS	Dudek
Olive-sided flycatcher	BCC/SSC		x	
Osprey	None/WL		x	x
Prairie falcon	None/WL			x
Redhead	None/SSC		x	
Rufous hummingbird	BCC/None		x	x
San Diego fairy shrimp	FE/None	x		
Sharp-shinned hawk	None/WL		x	
Vaux's swift	BCC/SSC		x	
Western gull	BCC/None		x	
White-faced ibis	None/WL		x	
White-tailed kite	None/FP		x	x
Willet	BCC/None		x	
Wrentit	BCC/None		x	
Yellow warbler	None/SSC		x	x
Yellow-breasted chat	None/SSC		x	x
Yellow-headed blackbird	None/SSC		x	
	Species Subtotal	*10*	*39*	*15*
	Total Special-Status Species Observed	45		

Notes: Database = historical species records from 1997 to 2016; SASAS = species observations from monthly bird surveys by Sea and Sage Audubon Society from September 2023 to March 2025; Dudek = species observations from directed surveys by Dudek from March 2024 to March 2025. Bolded species are state or federally listed or proposed as threated or endangered.

Listing Status Designations:

Federal

BCC = USFWS Bird of Conservation Concern

FE = Federally listed as endangered

FPT = Federally proposed for listing as threatened

FT = Federally listed as threatened

State

FP = CDFW Fully Protected species

SCE = State candidate for listing as endangered

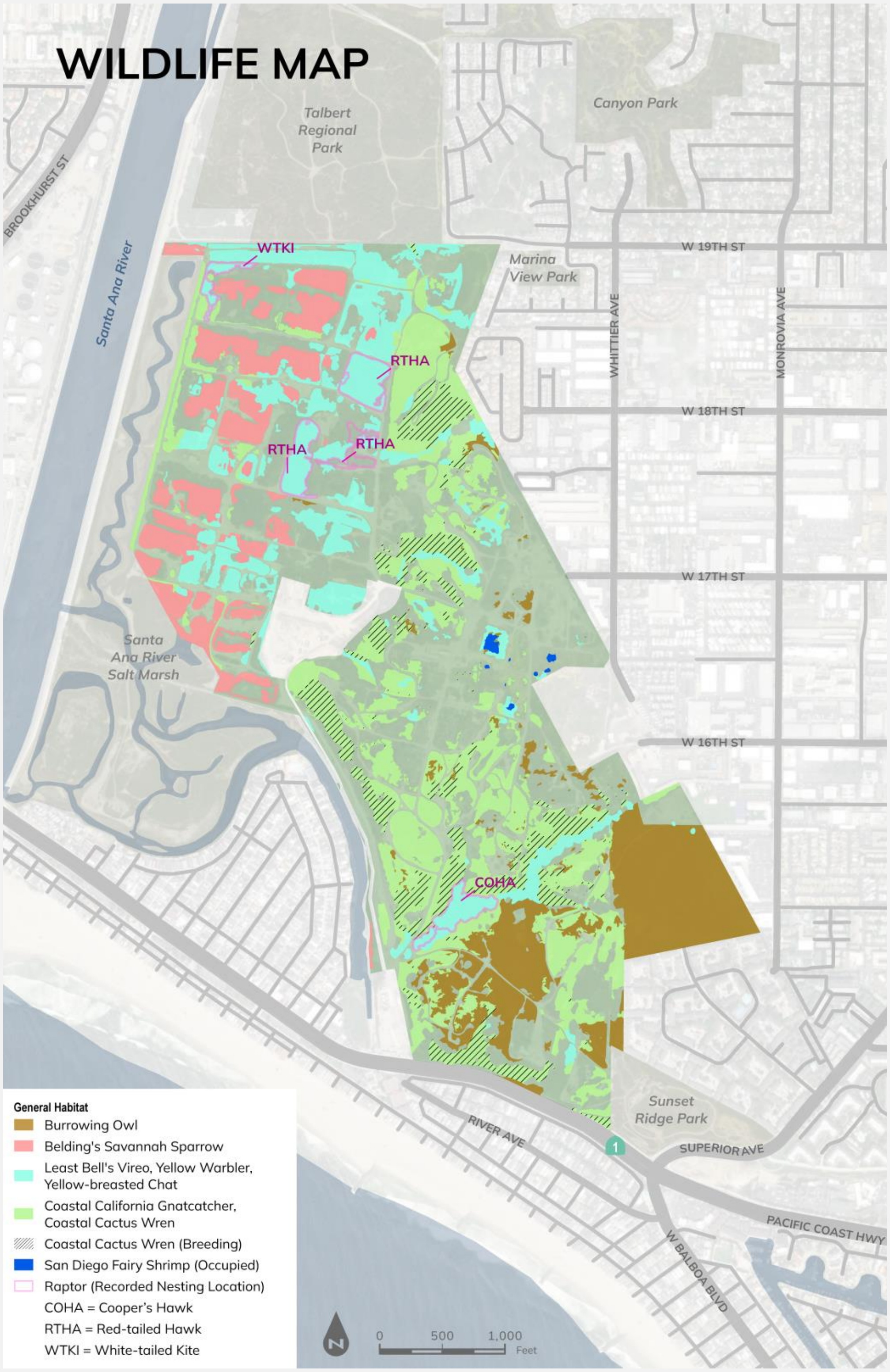
SCL = State candidate for listing as threatened or endangered

SE = State listed as endangered

SSC = California Species of Special Concern

WL = CDFW Watch List species

Figure 2-8. Wildlife Map



San Diego Fairy Shrimp

The San Diego fairy shrimp is a federally endangered species that is restricted to coastal vernal pools and other non-vegetated ephemeral basins that are between 2 to 12 inches in depth. It is found in Riverside, Orange, and San Diego Counties and in northwestern Baja California, Mexico. San Diego fairy shrimp are usually observed from January to March when seasonal rainfall fills vernal pools and initiates egg hatching (USFWS 2007). San Diego fairy shrimp have been observed in eight vernal pools and seasonal features within the upland region of the Preserve (Figure 2-6). Although new focused surveys for vernal pool branchiopods have not been conducted recently to confirm the status of the species, it is assumed that San Diego fairy shrimp continue to occupy the pools where they were previously documented, and the RMP has been developed accordingly.

Burrowing Owl

The burrowing owl (*Athene cunicularia*) is a BCC and state candidate for listing as threatened or endangered. In California, burrowing owls are yearlong residents of flat, open, dry grassland and desert habitats at lower elevations (Bates 2006). They typically inhabit annual and perennial grasslands and scrublands characterized by low-growing vegetation and may occur in areas that include trees and shrubs if the cover is less than 30% (Bates 2006); however, they prefer treeless grasslands. They have also been observed in fallow agriculture fields, golf courses, cemeteries, road rights-of-way, airports, vacant lots in residential areas and university campuses, and fairgrounds when nest burrows are present (Bates 2006; Haug et al. 1993; Gervais et al. 2008). The availability of numerous small mammal burrows, such as those of California ground squirrel (*Otospermophilus beecheyi*), is a major factor in determining whether an area with apparently suitable habitat supports burrowing owls (Coulombe 1971). Burrowing owls exhibit high site-fidelity and reuse burrows year after year (Gervais et al. 2008). They breed from March through August, with a peak in April and May. Burrowing owls were observed overwintering in the Preserve on numerous occasions during overwintering surveys in the upland region of the Preserve (Figure 2-8). Burrowing owls have not been observed on the Preserve during the breeding season.

Monarch Butterfly

The monarch butterfly is proposed for federal listing as threatened. Wintering sites in California are associated with wind-protected groves of large trees (primarily eucalyptus or pine) with nectar and water sources nearby, generally near the coast. The species' distribution is controlled by the distribution of its larval host plant (i.e., various milkweeds, genus *Asclepias*). Sexually mature monarch butterflies mate along their northern migratory route (while returning to their summer grounds) and deposit eggs on milkweed plants (USFWS 2024). Monarch butterfly has been incidentally observed within the Preserve; however, no known overwintering sites are present, and milkweed plants are not known to occur on site.

Crotch's Bumble Bee

Crotch's bumble bee is a state candidate for listing as threatened. It occurs in open grassland and scrub communities supporting suitable floral resources. Crotch's bumble bee is most commonly associated with the species from the following families, in descending order based on number of observations: Fabaceae, Apocynaceae, Asteraceae, Lamiaceae, and Boraginaceae (Richardson 2014, as cited in Xerces Society et al. 2018). Williams et al. (2014) cited the genera *Asclepias*, *Chaenactis*, *Lupinus*, *Medicago*, *Phacelia*, and *Salvia* as example food plants. The species nests primarily underground and may be reliant on small mammal burrows. Little is known about winter hibernacula, but the species is presumed to rely on microhabitats for overwintering similar to those of other bumble bees, including loose disturbed soil, leaf litter, and other debris (Xerces Society et al. 2018; CDFW 2019a). Nesting is primarily located underground in abandoned holes made by ground squirrels, mice, and rats but may be aboveground in abandoned bird nests or empty cavities (Osborne et al. 2008; Williams et al. 2014). Crotch's bumble bee was first observed on March 23, 2024, by Dr. James Maley and Melanie Schlotterbeck on the northern portion of the mesa in the Preserve. A second potential sighting occurred on February 23, 2025, on the southern portion of the mesa by Melanie Schlotterbeck and Doug Lithgow but could not be positively identified. A third sighting occurred on April 27, 2025, near the western bluff edge in the central portion of the mesa during the monthly SASAS avian survey.

Least Bell's Vireo

Least Bell's vireo (*Vireo bellii pusillus*) is a federal and state-listed endangered species that is conditionally covered under the Central–Coastal NCCP/HCP (County of Orange 1996). This species inhabits dense shrubby habitat dominated by willows and cottonwood riparian forest and can also nest in mulefat, California wild rose (*Rosa californica*), poison oak, and mugwort (*Artemisia vulgaris*). It nests from March through September in Southern California. Nests occur 1 meter above the ground, in many types of dense low shrubs affording protection and cover (CWHR 2025). Least Bell's vireo is often found adjacent to intermittent streams in arid regions.

Least Bell's vireo have been observed within the Preserve regularly since 2006. Most recently, this species was observed during monthly surveys by SASAS and CCA and surveys conducted by Dudek. During the 2024 Dudek surveys, 13 individuals were observed in riparian vegetation near the northern boundary of the Preserve and within Drainage C in the southern upland region of the Preserve (Figure 2-8). Most were indirectly observed by hearing males singling, indicating that breeding territories were being established over the course of the survey effort. Some were also observed directly. Although no nesting vireos were detected, nesting is expected to occur within riparian habitat within the Preserve.

Coastal California Gnatcatcher

Coastal California gnatcatcher is federally threatened, a CDFW SSC, and covered under the Central–Coastal NCCP/HCP. This species occurs in coastal Southern California and Baja California year-round, where it depends on a variety of arid scrub habitats. This species may occur as high as 3,000 feet AMSL, but more than 99% of the known coastal California gnatcatcher locations occur below 2,500 feet AMSL (65 FR 63680). Coastal California gnatcatcher typically occurs in or near coastal scrub vegetation that is composed of relatively low-growing, dry-season deciduous, and succulent plants. Coastal California gnatcatcher also occurs in chaparral, grassland, and riparian vegetation communities where the coastal scrub community is close (Bontrager 1991). Coastal California gnatcatcher nests usually are located in a small shrub or cactus 1 to 3 feet above the ground. During the breeding/nesting season, territories in coastal areas average 5.7 acres (Atwood et al. 1998a, 1998b).

Over 300 observations of coastal California gnatcatcher have been recorded in the upland region of the Preserve over the course of numerous surveys since 1992. Most recently, this species was observed during monthly surveys by SASAS and CCA and surveys conducted by Dudek. During the 2024 Dudek surveys, a total of 30 individuals were detected, and approximately 19 different breeding territories were identified in the upland region of the Preserve. Coastal California gnatcatchers have been observed throughout the scrub habitats on site, as shown on Figure 2-8.

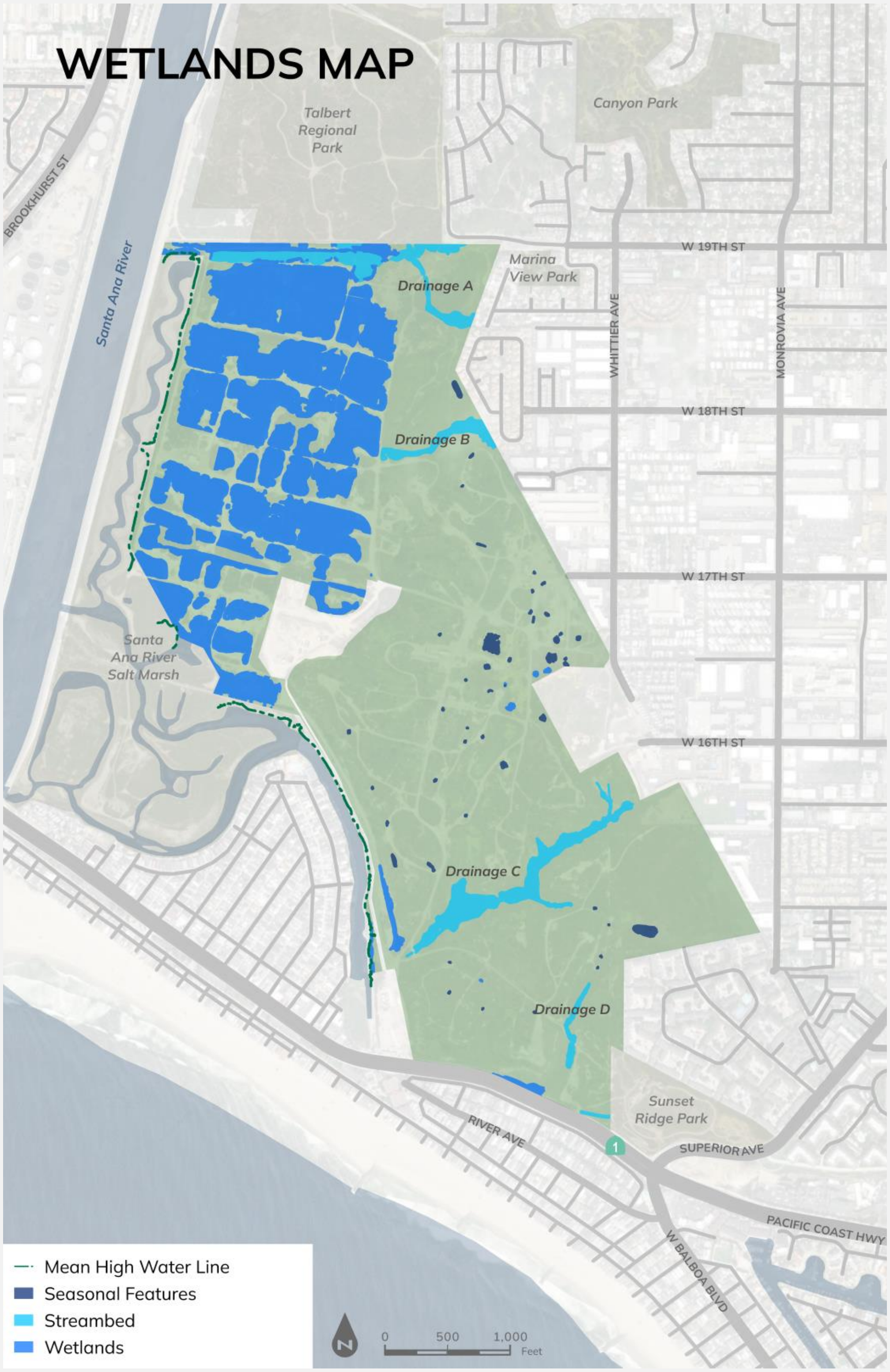
Belding's Savannah Sparrow

The Belding's subspecies of the savannah sparrow is listed as endangered by CDFW and is a federal BCC. Belding's savannah sparrow inhabits southern coastal salt marshes characterized by several species of pickleweed year-round. It breeds from April into July, commonly east of Cascade-Sierra Nevada crest and along the entire California coast. It occurs primarily in grassland, saline emergent wetland, and wet meadow habitats. Coastal breeders are restricted to saline emergent wetlands. Belding's savannah sparrow requires dense ground cover in the breeding season, when it builds a cup nest in a hollow on the ground, usually concealed by overhanging vegetation (Harrison 1978). In winter, it seeks similar cover in a variety of moist and dry grasslands, croplands, and low vegetation along beaches and shorelines. Belding's savannah sparrow has been regularly detected since 2009 within pickleweed-dominated marsh habitat in the southwestern region of the Preserve. Most recently, this species was observed during monthly bird surveys by SASAS and CCA and during surveys by Dudek, with observed locations consistent with historic observations (Figure 2-8).

2.3.5 WETLANDS

The Preserve contains a variety of wetlands that fall under the jurisdiction of USACE, the Santa Ana Regional Water Quality Control Board (RWQCB), CDFW, and CCC (Figure 2-9). A formal delineation of wetlands (jurisdictional resources) within the Preserve was completed in 2008 by Glenn Lukos Associates (GLA) to support the Newport Banning Ranch development. An additional jurisdictional delineation of seasonal features (i.e., small, topographically depressed areas capable of supporting inundation from local rain events for a short duration) within the Preserve was completed by GLA in 2012 and subsequently reviewed and updated by Dudek. The current status and condition of jurisdictional resources previously documented in the Preserve was assessed in the field by Dudek in March 2025.

Figure 2-9. Wetlands Map



UNITED STATES ARMY CORPS OF ENGINEERS

USACE's regulatory jurisdiction extends to tidally influenced waters up to the mean high water (MHW) line within the southern lowland region of the Preserve pursuant to Section 10 of the Rivers and Harbors Act. Waters that fall under Section 10 consist of wetlands formed due to brackish groundwater intrusion from the adjacent Santa Ana River and Pacific Ocean.

USACE also regulates non-tidal waters, including wetlands, that exhibit continuous surface connection to a traditional navigable water (TNW) pursuant to Section 404 of the federal Clean Water Act (CWA). Although a formal delineation has not been conducted to formally determine areas under USACE jurisdiction based on current regulations, none of the drainages in the Preserve appear to have a continuous surface connection to a TNW, and no wetlands directly abut relatively permanent waters (RPW) as defined by USACE. Drainage A, the northernmost drainage in the Preserve along the boundary with Talbert Regional Park, originates off site near 19th Street and ultimately drains to the off-site USACE tidal channel via an existing 40-foot culvert but appears to be ephemeral and conveys flows only immediately following storm events. Similarly, Drainage C in the southern portion of the Preserve is an ephemeral feature that drains runoff from the upland areas of the site into a culvert near Industrial Park Way for an undetermined distance before emptying off site into the Semeniuk Slough. Drainage D, in the southern portion of the Preserve, is also ephemeral and appears to terminate on site. In contrast to the other drainages on site, portions of Drainage B contained flows during a site visit in November 2024, but the feature terminates at an existing road near the riparian area in the lowlands of the Preserve with no surface connection to a nearby TNW. Outside of the tidally influenced wetlands under Section 10 jurisdiction, the remaining wetlands and riparian areas in the lowlands of the Preserve and the vernal pools and riparian areas in the uplands likely are not under USACE jurisdiction as Section 404 waters or wetlands.

REGIONAL WATER QUALITY CONTROL BOARD

The RWQCB jurisdictional areas include tidal areas discussed above, as well as wetlands, vernal pools, and drainages present on site.

Four drainages are present on the site, all of which are potentially under RWQCB jurisdiction as waters of the state. Drainage A and Drainage B, also known as the Middle Arroyo, are located in the northern portion of the site and originate from concrete culverts at the eastern property boundary. These drainages are dominated by willow trees, including Goodding's willow (*Salix gooddingii*) and arroyo willow. Drainage C, also known as the Large Arroyo, is located near the southern portion of the Preserve and is dominated by willow trees, mulefat, and non-native plants, including pampas grass, myoporum, black mustard, and ice plant. Drainage D is an erosional feature near the southern boundary of the site, which was created when material from the area was removed and used as fill for the widening of the Pacific Coast Highway in the 1960s. A small portion of this feature contains riparian vegetation, including arroyo willow and mulefat, and a large portion of the feature supports dense patches of ice plant. Drainages A, B, and C display a discernible Ordinary High-Water Mark (OHWM), and as such, areas of the features below this line are expected to be subject to RWQCB jurisdiction. Feature D is also expected to be subject to RWQCB jurisdiction.

Several vernal pools are present within the Preserve, which were created artificially in the 1970s when the area was graded for the establishment of a baseball field. Several berms, which were constructed along the edge of the field, made the area prone to ponding once the facility was abandoned, and the area now supports a number of vernal pool species as well as other common hydrophytic plant species. These species include pale spikerush (*Eleocharis macrostachya*), grass poly (*Lythrum hyssopifolium*), brass buttons (*Cotula coronopifolia*), and lowland cudweed (*Gnaphalium palustre*). These features exhibit indicators of wetland hydrology, hydric soils, and hydrophytic vegetation and, as such, are expected to be regulated as wetland waters by RWQCB.

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

CDFW regulates streambeds up to the top of bank line and associated riparian habitat and wetlands. Waters within the Preserve that fall under CDFW jurisdiction include Drainages A-D described above, in addition to riparian habitat associated with them. CDFW excludes marine resources or isolated wetlands from their jurisdictional reach, and as such the tidal wetlands, isolated wetlands, and vernal pools present within the Preserve are not expected to be regulated by CDFW.

CALIFORNIA COASTAL COMMISSION

The entirety of the Preserve is within the California Coastal Zone, which is subject to regulation by CCC. All wetlands, tidal areas, vernal pools, and drainages on site are within the Coastal Zone and are therefore under the jurisdiction of CCC. Because CCC uses the one-parameter indicator, the CCC jurisdiction overlaps with most other agencies in the Preserve.

2.4 Ecological Assessment

An ecological assessment of the preserve was performed to better understand the state of the ecological systems that are present on site. The historic ecology of the land provides an important reference for Preserve management decisions. However, historic land modifications as described in Section 2.1, Historic Context, have profoundly altered the historic ecology of the site to a degree that restoration of the historic ecology may not be possible. Rather, Preserve management must respond to existing conditions to address current conditions and leverage existing ecological systems to establish native vegetation communities and wildlife habitat that are sustainable under future climate change.

2.4.1 HISTORIC ECOLOGY

Historically, the interaction of the Santa Ana River and the ocean supported a coastal estuary with diverse hydrologic regimes, vegetation communities, and habitat types. Coastal estuaries are a mix of saline and freshwater habitats that are established under a dynamic equilibrium between ocean tides and freshwater discharge from one of the largest watershed areas in Southern California. Historic maps of the estuary system show the path of the Santa Ana River that hugs the coastal bluff on a southern trajectory that discharged into the present-day

Newport Bay. The remnant of this channel is seen in the Semeniuk Slough. The Preserve lowland area was likely a freshwater wetland that was connected to the Santa Ana River floodplain and sustained by overbank flood flows that could have originated as far north as Talbert Preserve North at Victoria Street and connecting through Talbert Preserve South to the Preserve lowland. Habitat types likely ranged from emergent freshwater wetlands to brackish marsh areas depending upon the course of the Santa Ana River during winter season flood events. The configuration of habitat types would have been highly complex and dynamic, creating a rich profusion of wildlife that sits on the Pacific flyway. Within, and a part of, this ecological system of channels and habitat, Native American Tribes would utilize a wide variety of resources with which to support their Tribal members. The resources used by early Tribal culture within the ecological system would range from building material, resources for clothing and basketry, items for Tribal ritual and spirituality, and food resources for sustenance. The ecology of the Santa Ana River estuary was inclusive of human habitation in equal dynamic proportion.

2.4.2 LOWLAND ECOLOGICAL ASSESSMENT

The ecological system observed within the Preserve lowlands is significantly different from the historic context. Hydrology has been profoundly altered by channelization of the Santa Ana River and urbanization of the local contributary watershed that was once tributary to the river. Saltwater influence is diminished and now regulated by managed tide gates. Tidal saltwater influence is confined to a small area at the southernmost boundary of the lowland. The lowland, once connected to the Santa Ana floodplain, is now isolated. Freshwater inputs are limited to three small canyons on site, and only one is connected to a watershed fed by urban runoff that discharges from the urban storm drain system. A second outfall is present within Talbert Preserve South that flows into the northern portion of the Preserve lowland within the City of Newport Beach water pipeline easement.

Terrain modifications are more subtle than the changes to hydrology. Numerous depressions are present within the lowland formed from encircling roadways constructed for oil extraction operations, including well construction, maintenance, and operations. These depressions fill with rainwater in winter months, creating isolated ponds that sustain native and non-native vegetation communities. The side canyon that is fed by a city storm drain outfall discharges to the lowland area, filling several of these depressions. Water infiltration is slow and results in standing water over prolonged periods that favor certain native and non-native plant species over others that would normally inhabit the lowland area.

Terrain modification and soil disturbance associated with oil extraction has altered the soil profile throughout the lowland. Soils are compacted from the construction activities, and the profile is altered through disposal of drilling spoils, road construction, and soil remediation activities where soil contamination has occurred. Likely soil stratification and grain size sorting within the soil profile that was a product of past fluvial activity is largely absent or altered.

Vegetation is an expression of the underlying ecological system of terrain, soils, and hydrology. The existing lowland vegetation demonstrates alterations to these ecological systems. Wetland areas are patchy and isolated, coinciding with low points that collect water in winter and hold water for prolonged periods. High salt marsh species are present in depressions that only receive localized rainfall with no other overland contribution. In these areas, evaporation of ponded water on an annual basis has concentrated salinity that supports halophytic vegetation and is unfavorable to freshwater plant species that typify freshwater riparian systems. Freshwater riparian species, such as willows, are present within depressions that receive freshwater inputs in addition to local, direct rainfall. However, long-term inundation favors only one species, black willow, a species that can withstand prolonged inundation and saturated soil conditions. Most other native riparian species are excluded from the lowland areas. The remaining areas of the lowland that are not in active oil field activity areas do not pond water and support a variety of native and non-native species. Mulefat is the dominant native wetland species, and pampas grass is the dominant non-native species within the non-wetland areas. Pampas grass is a highly invasive species that successfully invades and dominates vegetation through prolific wind-blown seed production, forming monotypic stands that exclude all native vegetation communities that would otherwise inhabit these areas. Pampas grass does not provide forage or nesting opportunities for native wildlife species that would normally occur within a lowland area. Due to alterations to the site ecology, vegetation community and species diversity are low as compared to intact vegetation communities that inhabit lowland areas and to the historic context of the site on a relative basis.

2.4.3 UPLAND ECOLOGICAL ASSESSMENT

The ecology of upland native vegetation communities at the Preserve is more soil dependent and less dependent upon hydrology, with the exception of vernal pools and local riparian drainages. Macrotopographic features appear to have remained relatively unchanged for decades, including the mesa tops and three localized drainages. Grading within the uplands appears to have occurred in specific locations, and many of these areas have revegetated either though natural recruitment or through active revegetation efforts.

A large borrow site is present in the southeastern portion of the Preserve. The bluffs that wrap the mesa area appear to be relatively stable with normal erosion features. Areas of unstable terrain occur where normal overland sheet flow runoff has been concentrated, and the subsequent drainage is directed at a steep bluff area. Concentration of flow is normally associated with road construction that interrupts and redirects overland sheet flow. In these cases, gullying has occurred. Unstable gullies require treatment to direct drainage away from the bluff and reestablish sheet flow with dispersed drainage. Lack of effective treatment will lead to expansion of the depth and width of erosion features over time. Except for the erosion features, the overland drainage system is generally intact and supports native and non-native vegetation communities as well as vernal pools.

Vernal pools are a unique and rare resource within the upland area of the Preserve. These shallow depressions with limited infiltration due to soil type and compaction pond rainwater that can support a unique assemblage of plant and animal species that are ecologically adapted to the ephemeral vernal pool hydrology. The key adaptations are the ability to complete a reproductive life cycle in a few weeks before the vernal pool dries up and the ability to survive a prolonged period of dormancy until the pool refills, sometime years later.

On site, vernal pool topography has been protected for many years with a plastic chain barrier. Less protected is the contributory watershed that is needed to fill pools during rain events. In many cases, shallow road cuts and fills, equipment tire ruts, and other microtopographic alterations can redirect sheet flow away from vernal pools, diminishing the pool hydrology and effectively reducing the frequence and duration of ponding. Invasive species are observed as the dominant species in most vernal pools on site.

The distribution of upland vegetation on the mesa tops has remained relatively stable over many years. Shrublands consisting mainly of coastal sage scrub and variants like maritime succulent scrub are the dominant native vegetation communities on the northern mesa. Non-native grassland with patches of native bunchgrass grasslands dominates the southern mesa area. The quality of these habitat areas ranges from intact native habitat with little representation of non-native vegetation cover to native vegetation that is interspersed with non-native vegetation that can account for up to 70% of the vegetated area. Roads are widespread and contribute to habitat fragmentation and a persistent disturbance regime that favors opportunistic non-native plant species, such as annual grasses.

Species diversity within the coastal sage scrub community is low compared to other intact coastal sage scrub communities. Existing on-site coastal sage scrub lacks representation of *Salvia* species that would normally be expected in a coastal sage scrub community, such as white sage and black sage. In addition, California sagebrush is underrepresented, and California brittlebush is overrepresented within existing coastal sage scrub vegetation. California gnatcatcher habitat typically has greater representation of California sagebrush, the preferred species for gnatcatcher nesting resources.

2.4.4 ECOLOGICAL STABILITY

A key question is the stability of the ecological system within the Preserve. Data collected for over a decade suggests that vegetation has been relatively stable over the period that data is available. However, there is likely ongoing degradation from expanding non-native plant species populations, such as pampas grass in the lowland and non-native European annual grasses in the upland. Native vegetation community distribution has remained relatively static; however, the balance of native and non-native species cover within habitat blocks has not been studied and cannot be assessed. The ongoing disturbance regime of oil field remediation actions favors opportunistic annual non-native vegetation recruitment over native recruitment. Stabilization of the site ecology will be an important goal for preserve management and an opportunity to reverse negative effects of the oil field legacy.

Our understanding of wildlife use of the Preserve is based on a dataset created through over a decade of studies on the site. However, most wildlife surveys focused on rare and sensitive species and species that are protected by state and federal laws. These species are heavily weighted to avian species that can move over and through a landscape and that encounter fewer barriers to movement. Terrestrial animals have greater barriers to movement, and for many animals, the Preserve is an island in a sea of urbanization that is difficult to discover and harder to reach. The size of the Preserve, while seemingly large, is too small for many large predator species that could occupy higher trophic levels within the ecological structure of the site. As Section 2.3.3, Wildlife, demonstrates, it is mostly species that have adapted to urbanized environments that are found within the lowland Preserve area.

The stability of wildlife populations is a key question to inform management actions. Some species, such as California gnatcatcher, have occupied the site for the entire period that data has been collected on site. The species, while somewhat insular, has successfully reproduced on site to maintain a stable population while relying on existing habitat resources. Other species that have more unique breeding habitat requirements or that are less mobile have been detected on site in some years and not in others. These local extinctions are indicative of the insular nature of the Preserve. Without sufficient area and habitat resources on site, a species may appear for brief periods, either leaving the site or perishing on site. Due to the size of the Preserve area and the limited pathways for terrestrial (non-avian) wildlife species to access the site, it is likely that species immigration and emigration are low but sufficient to maintain the populations that are present. Habitat management should focus on those species such as fairy shrimp that are confined to the site to maintain viable populations that may withstand climate change and ecological perturbations, such as drought, fire, disease, and non-native species invasions. Management may target selected species with the goal to increase suitable on-site habitat to a sufficient degree that would support a resident population if a breeding pair were to arrive on site.

2.5 Cultural Resources

Information relating to cultural resources within the Preserve is informed by archaeological studies (completed by BonTerra Consulting in 2010) and historic built environment studies (completed by Daly & Associates in 2009) that were completed for the previously proposed Newport Banning Ranch. Daly & Associates' study found no evidence of the activities of the early rancho period or when the land had been used for agricultural purposes and owned by Mary Hollister Banning and her heirs. The oil exploration and pumping operations had been done on a large scale starting in the 1960s and were not considered to have been associated with significant events relating to the oil industry on a regional or national level at this site (Daly & Associates 2009).

BonTerra's archaeological studies resulted in documentation of three historic-era archaeological sites (two refuse scatters dating to the eighteenth and early nineteenth centuries and a destroyed WWII-era gun emplacement) and eight prehistoric Indigenous sites. All 11 archaeological sites on the property were subject to evaluation efforts, resulting in the recommendation that three prehistoric resources were eligible for California Register of Historical Resources (CRHR) and National Register of Historic Places (NRHP) listing (BonTerra 2010). These resources include CA-ORA-839, CA-ORA-844B, and CA-ORA-906, of which CA-ORA-839 was considered to qualify as a unique resource under CEQA. The remaining archaeological resources were recommended not eligible for listing on the CRHR or NRHP lists.

Present Preserve plans incorporate these previous cultural resources assessments; uses will not introduce impacts to CRHR/NRHP eligible resources. Government-to-government consultation by MRCA with Tribal Governments is also informed by these findings.

3 Recommended Administration

3.1 Regulatory Setting

This section summarizes all federal, state, and local regulations that are anticipated to be relevant to the future implementation of restoration activities and public access improvements and amenities identified in the RMP.

3.1.1 FEDERAL

FEDERAL ENDANGERED SPECIES ACT

The FESA of 1973, as amended, (16 USC 1531 et seq.) serves as the enacting legislation to list, conserve, and protect threatened and endangered species, and the ecosystems on which they depend, from extinction. In addition, for those wildlife species listed as federally endangered, FESA provides for the ability to designate critical habitat, defined as that habitat considered “essential to the conservation of the species” and that “may require special management considerations or protection.” Under FESA Section 7, if a project that would potentially result in adverse impacts to threatened or endangered species includes any action that is authorized, funded, or carried out by a federal agency, that agency must consult with USFWS to ensure that any such action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat for that species. FESA Section 9(a)(1)(B) prohibits the taking, possession, sale, or transport of any endangered fish or wildlife species. “Take” is defined to mean “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (16 USC 1532 [19]). Pursuant to FESA Section 10(a)(1)(B), the USFWS may issue a permit for the take of threatened or endangered species provided that such taking is “incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.”

MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA) regulates or prohibits taking, killing, possession of, or harm to migratory bird species listed in Title 50, Section 10.13 of the Code of Federal Regulations (CFR). The MBTA is an international treaty for the conservation and management of bird species that migrate through more than one country and is enforced in the United States by the USFWS. Hunting of specific migratory game birds is permitted under the regulations listed in 50 CFR 20. The MBTA was amended in 1972 to include protection for migratory birds of prey (raptors). On December 22, 2017, the Department of Interior issued a legal opinion (M-Opinion 37050) that interpreted the above prohibitions as only applying to direct and purposeful actions of which the intent is to kill, take, or harm migratory birds; their eggs; or their active nests. Incidental take of birds, eggs, or nests that are not the purpose of such an action, even if there are direct and foreseeable results, was not prohibited. On January 7, 2021, the USFWS published a final rule (the January 7th rule) that codified the previous administration's interpretation, which after further review was determined to be inconsistent with the majority of relevant court decisions and readings of the MBTA's text, purpose, and history. On May 7, 2021, the USFWS published a proposed rule to revoke the January 7th rule, which would result in a return to implementing the statute as prohibiting incidental take. On July 19, 2021, the USFWS announced the availability of two revised economic analysis documents for public review that evaluate the potential for the proposed rule to impact small entities, including businesses, governmental jurisdictions, and other organizations. A final rule revoking the January 7th rule was published on October 4, 2021 and went into effect on December 3, 2021. In their summary of the October 4, 2021 final rule, the USFWS explained that, "the immediate effect of this final rule is to return to implementing the MBTA as prohibiting incidental take and applying enforcement discretion, consistent with judicial precedent and longstanding agency practice prior to 2017" (86 FR 54642).

CLEAN WATER ACT – SECTION 401

The State Water Resources Control Board (SWRCB) has authority over wetlands through Section 401 of the CWA, as well as the Porter–Cologne Act, California Code of Regulations Section 3831(k), and California Wetlands Conservation Policy. The CWA requires that an applicant for a Section 404 permit (to discharge dredge or fill material into waters of the United States) first obtain a water quality certification from the appropriate state agency stating that the fill is consistent with the state's water quality standards and criteria. In California, the authority to either grant certification or waive the requirement for permits is delegated by SWRCB to the nine regional boards. The Santa Ana RWQCB has authority for Section 401 compliance in the Preserve area. A request for certification is submitted to the regional board at the same time an application is filed with the USACE.

SWRCB defines a water of the state as "any surface water or groundwater, including saline waters, within the boundaries of the state" (California Water Code Section 13050[e]). The SWRCB definition of a water of the state includes the following (SWRCB 2021):

1. Natural wetlands.
2. Wetlands created by modification of the surface water of the state.
3. Artificial wetlands that meet any of the following criteria:
    a. Approved by an agency as compensatory mitigation for impacts to other waters of the state, except where the approving agency explicitly identifies the mitigation as being of limited duration;
    b. Specifically identified in a water quality control plan as a wetland or other water of the state;
    c. Resulted from historic human activity, is not subject to ongoing operation and maintenance, and has become a relatively permanent part of the natural landscape; or
    d. Greater than or equal to one acre in size unless the artificial wetland was constructed and is currently used and maintained, primarily for one or more of the following purposes: industrial or municipal wastewater

> treatment or disposal; settling of sediment; detention, retention, infiltration, or treatment of stormwater runoff and other pollutants or runoff subject to regulation under a municipal, construction, or industrial permitting program; treatment of surface waters; agricultural crop irrigation or stock watering; fire suppression; industrial processing or cooling water; active surface mining – even if the site is managed for interim wetlands functions and values; log storage; treatment, storage, or distribution of recycled water; maximizing groundwater recharge (this does not include wetlands that have incidental groundwater recharge benefits); or fields flooded for rice growing.

All waters of the United States are waters of the state. Wetlands, such as isolated seasonal wetlands, that are not generally considered waters of the United States are considered waters of the state if, "under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation" (SWRCB 2021).

Restoration activities within the Preserve may be covered under the SWRCB statewide General Order for restoration projects. Projects covered under this order include the following:

1. Improvements to stream crossings and fish passage.
2. Removal of small dams, tide gates, flood gates, and legacy structures.
3. Bioengineered bank stabilization.
4. Restoration and enhancement of off-channel and side-channel habitat.
5. Water conservation projects.
6. Floodplain restoration.
7. Removal or remediation of pilings and other in-water structures.
8. Removal of nonnative terrestrial and aquatic invasive species and revegetation with native plants.
9. Establishment, restoration, and enhancement of tidal, subtidal, and freshwater wetlands.
10. Establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites.

Discharges to RWQCB waters that are not covered by the above general order would require individual 401 certification.

CLEAN WATER ACT – SECTION 404

The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Under Section 404 of the CWA, USACE has the authority to regulate activities that could discharge fill or dredge material or otherwise adversely modify wetlands or other waters of the United States. The USACE implements the federal policy embodied in Executive Order 11990, which, when implemented, is intended to result in no net loss of wetland values or function.

The definition of waters of the United States establishes the geographic scope for authority under Section 404 of the CWA; however, the CWA does not specifically define waters of the United States, leaving the definition open to statutory interpretation and agency rulemaking. The definition of what constitutes "waters of the United States" (provided in 33 CFR Section 328.3[a]) has changed multiple times over the past few decades starting with the *United States v. Riverside Bayview Homes, Inc*. court ruling in 1985. Subsequent court proceedings, rule makings, and congressional acts in 2001 (*Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers*), 2006 (*Rapanos v. United States*), 2015 (Clean Water Rule), 2018 (suspension of the Clean Water Rule), 2019 (formal repeal of the Clean Water Rule), 2020 (Navigable Waters Protection Rule, NWPR), and 2021 (*Pasqua Tribe et al v. United States Environmental Protection Agency* resulting in remand and vacatur of the NWPR and a return to "the pre-2015 regulatory regime") have attempted to provide greater clarity to the term and its regulatory implementation. On December 30, 2022, the agencies announced the final Revised Definition of "Waters of the United States" rule (Rule) (88 CFR 3004–3144). The Rule was published in the Federal Register on January 18, 2023, and became effective on March 20, 2023, restoring federal jurisdiction over waters that were protected prior to 2015 under the CWA for traditional navigable waters, the territorial seas, interstate waters, and upstream water resources that significantly affect those waters. The Rule represents a re-expansion of federal jurisdiction over certain water bodies and wetlands previously exempt pursuant to the 2020 NWPR. The Rule also considers various subsequent court decisions including two notable Supreme Court decisions.

There are two key changes that the Rule incorporates. Firstly, the Rule reinstates the "Significant Nexus" test. The "Significant Nexus" test refers to waters that either alone, or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, or the territorial seas (86 FR 69372-69450). The "Significant Nexus" test attempts to establish a scientific connection between smaller water bodies, such as ephemeral or intermittent tributaries, and larger, more traditional navigable waters such as rivers. Significant nexus evaluations take into consideration hydrologic and ecologic factors including, but not limited to, volume, duration, and the frequency of surface water flow in the resource and its proximity to a traditional navigable water, and the functions performed by the resource on adjacent wetlands. Second, the Rule adopts the "Relatively Permanent Standard" test. To meet the "Relatively Permanent Standard" water bodies must be relatively permanent, standing, or continuously flowing and have a continuous surface connection to such waters.

On May 25, 2023, the Supreme Court issued its long-anticipated decision in Sackett v. the Environmental Protect Agency (EPA), in which it rejected the EPA's claim that "waters of the United States," as defined in the CWA, includes wetlands with an ecologically significant nexus to traditional navigable waters. The Supreme Court held that only those wetlands with a continuous surface water connection to traditional navigable waterways would be afforded federal protection under the CWA. Specifically, to assert jurisdiction over an adjacent wetland under the CWA, a party must establish that (1) the adjacent body of water constitutes water[s] of the United States (i.e., a relatively permanent body of water connected to traditional interstate navigable waters), and (2) the wetland has a continuous surface connection with that water, making it difficult to determine where the water ends and the wetland begins.

On August 29, 2023, the EPA and USACE announced the final rule amending the 2023 definition of "waters of the United States," conforming with the *Sackett v. EPA* decision. Some of the key changes include removing the significant nexus test from consideration when identifying tributaries and other waters as federally protected and revising the adjacency test when identifying federally jurisdictional wetlands. Under the EPA's new definition, a "water of the United States" is a relatively permanent, standing, or continuously flowing body of water that has an apparent surface connection to a "traditionally navigable water" to fall within federal purview. The new rule applies to wetlands and streams throughout the U.S. Although the *Sackett* opinion did not specifically reference streams, the EPA's new rule extends the "continuous surface connection" standard to streams, thereby removing non-permanent, ephemeral streams that do not meet these standards from federal jurisdiction.

The term "wetlands" (a subset of waters of the United States) is defined in 33 CFR, Section 328.3(c)(16), as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." In the absence of wetlands, the limits of USACE jurisdiction in non-tidal waters, such as intermittent streams, extend to the "ordinary high water mark," which is defined in 33 CFR 328.3(c)(7) as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

Based upon early coordination with representatives from the USACE, outside of the tidally influenced areas in the southwestern portion of the Preserve, waters and wetlands on site are not likely to fall under the regulatory jurisdiction prescribed by Section 404 of the CWA due to the lack of a continuous surface connection with traditional navigable waters. However, a formal jurisdictional delineation may be required to confirm this. Formal jurisdictional determinations approved by the USACE are valid for five years, therefore the timing of a requested AJD should be proximate to the onset of any planned impacts to aquatic resources that may fall under USACE jurisdiction.

RIVERS AND HARBORS ACT – SECTION 10

Various sections of the Rivers and Harbors Act establish permit requirements to prevent unauthorized obstruction or alteration of any navigable waterway of the United States. Section 10 covers construction, excavation, or deposition of materials in, over, or under such waters, or any work that would affect the course, location, condition, or capacity of those waters. Activities requiring Section 10 permits include structures (e.g., piers, wharfs, breakwaters, bulkheads, jetties, weirs, transmission lines) and work such as dredging or disposal of dredged material, or excavation, filling, or other modifications to the navigable waters of the United States.

Based upon early coordination with representatives from USACE, aquatic features in the southwestern portion of the Preserve are within the boundary of the MHW line and fall under USACE Section 10 jurisdiction.

3.1.2 STATE

CALIFORNIA ENDANGERED SPECIES ACT

Under CESA, the California Fish and Game Commission has the responsibility of maintaining a list of threatened and endangered species. CESA prohibits the take of state-listed threatened or endangered animals and plants unless otherwise permitted pursuant to CESA. Take under CESA is defined as any of the following: “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill” (California Fish and Game Code Section 86). Unlike the FESA, CESA does not include harassment or harm (e.g., habitat degradation) in its definition of take. Species determined by the State of California to be candidates for listing as threatened or endangered are treated as if listed as threatened or endangered and are, therefore, protected from take. Pursuant to CESA, a state agency reviewing a project within its jurisdiction must determine whether any state-listed endangered or threatened species, or candidate species, could be potentially impacted by that project.

CALIFORNIA NATIVE PLANT PROTECTION ACT

The Native Plant Protection Act of 1977 (CFGC Sections 1900–1913) directed CDFW to carry out the legislature’s intent to “preserve, protect and enhance rare and endangered plants in this State.” The Native Plant Protection Act gave the Fish and Game Commission the power to designate native plants as “endangered” or “rare,” and prohibited take, with some exceptions, of endangered and rare plants. When CESA was amended in 1984, it expanded on the original Native Plant Protection Act, enhanced legal protection for plants, and created the categories of “threatened” and “endangered” species to parallel FESA. The 1984 amendments to CESA also made the exceptions to the take prohibition set forth in Section 1913 of the Native Plant Protection Act applicable to plant species listed as threatened or endangered under CESA. CESA categorized all rare animals as threatened species under CESA, but did not do so for rare plants, which resulted in three listing categories for plants in California: rare, threatened, and endangered. The Native Plant Protection Act remains part of the California Fish and Game Code, and mitigation measures for impacts to rare plants are specified in a formal agreement between CDFW and project proponents.

CALIFORNIA FISH AND GAME CODE (SECTIONS 3503, 3503.5, 3513)

Section 3503 of the California Fish and Game Code (CFGC) states that it is unlawful to take, possess, or needlessly destroy the nests or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. Section 3503.5 protects all birds of prey (raptors) and their eggs and nests. Section 3513 states that it is unlawful to take or possess any migratory non-game bird as designated in the MBTA, except as provided by rules and regulations adopted by the United States Secretary of the Interior under the MBTA. Assembly

Bill 454 (California Migratory Bird Protection Act), amended Section 3513 to prohibit take or possession of any migratory non-game bird as designated in the MBTA prior to 2017, except as provided by rules and regulations adopted by the United States Secretary of the Interior under the MBTA before January 1, 2017, or subsequent rules or regulations adopted pursuant to the MBTA, unless those rules or regulations are inconsistent with CFGC. Assembly Bill 454 began operation on January 1, 2020, and became inoperative on January 20, 2025, when the original provisions of Section 3513 were reenacted.

CALIFORNIA FISH AND GAME CODE (SECTION 4150)

CFGC Section 4150 states a mammal occurring naturally in California that is not a game mammal, fully protected mammal, or fur-bearing mammal is a non-game mammal. A non-game mammal may not be taken or possessed under this code. All bat species occurring naturally in California are considered non-game mammals and are therefore prohibited from take as stated in CFGC Section 4150.

CALIFORNIA FISH AND GAME CODE – FULLY PROTECTED SPECIES

Sections 3511, 4700, 5050, and 5515 of the CFGC outline protection for fully protected species of mammals, birds, reptiles, amphibians, and fish. Species that are fully protected by these sections may not be taken or possessed at any time. CDFW cannot issue permits or licenses that authorize the “take” of any fully protected species, except under certain circumstances, such as scientific research and live capture and relocation of such species pursuant to a permit for the protection of livestock. On July 10, 2023, Senate Bill 147 was signed into law and amends the Fish and Game Code to allow a 10-year permitting mechanism for a defined set of projects within the renewable energy, transportation, and water infrastructure sectors.

CALIFORNIA FISH AND GAME CODE (SECTION 1600 – LAKE AND STREAMBED ALTERATION AGREEMENT)

Under Sections 1602-1616 of the CFGC, CDFW regulates activities that would substantially divert or obstruct the natural flow of or substantially change or use any material from the bed, channel, or bank of any river, stream, or lake. CDFW also regulates activities that would deposit or dispose of debris, water, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. CDFW jurisdiction includes ephemeral, intermittent, and perennial watercourses (including dry washes) and lakes characterized by the presence of (1) definable bed and banks and (2) existing fish or wildlife resources. In practice, CDFW marks its jurisdictional limit at the top of the stream or lake bank or the outer edge of the riparian vegetation, where present, and sometimes extends its jurisdiction to the edge of the 100-year floodplain. Because riparian habitats do not always support wetland hydrology or hydric soils, wetland boundaries, as defined by CWA Section 404, sometimes include only portions of the riparian habitat adjacent to a river, stream, or lake. Therefore, jurisdictional boundaries under 1602-1616 may encompass a greater area than those regulated under CWA Section 404; CDFW does not have jurisdiction over ocean or shoreline resources.

PORTER–COLOGNE WATER QUALITY CONTROL ACT

The Porter–Cologne Water Quality Control Act established SWRCB and each RWQCB as the principal state agencies responsible for the protection of water quality in California. As noted under the discussion of the CWA, the Santa Ana RWQCB has regulatory authority over the Preserve.

The Porter–Cologne Water Quality Control Act provides that "All discharges of waste into the waters of the State are privileges, not rights." Waters of the state are defined in Section 13050(e) of the Porter–Cologne Water Quality Control Act as "any surface water or groundwater, including saline waters, within the boundaries of the state." All dischargers are subject to regulation under the Porter–Cologne Water Quality Control Act, including both point and nonpoint source dischargers. The Santa Ana RWQCB has the authority to implement water quality protection standards through the issuance of waste discharge requirements (i.e., permits) for discharges to state waters. As described in Section 3.1.1, Federal, above, the General Order for restoration activities may be used to authorize discharges to waters of the state if restoration activities meet the outlined definition. Discharges to state waters not covered by the general order for restoration activities would be required to obtain an individual waste discharge requirement permit.

CALIFORNIA COASTAL ACT

CCC regulates activities found within wetlands in the coastal zone. The Coastal Act Section 30121 (California Coastal Act as of January 1, 2005) defines wetlands as "lands within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens." Subsequent Statewide Interpretive guidelines have refined the definition based upon the USFWS definition (Cowardin et al. 1979), which is as follows: "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For the 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 non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year." This definition is used as a guide for defining wetlands. CCC can also rely on other information, advice, and judgment of other experts in determining jurisdiction.

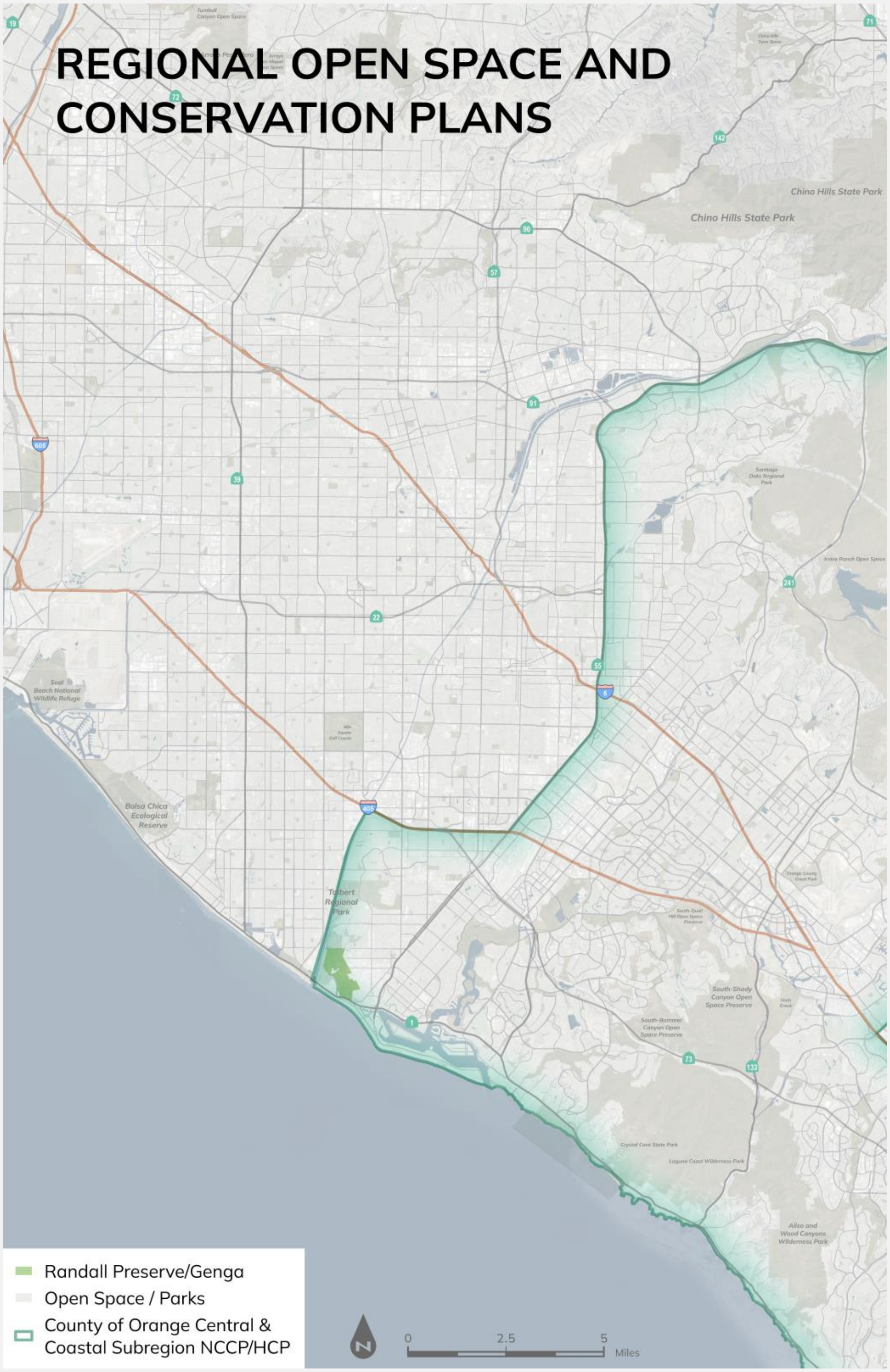
3.2 Relevant Land Use and Conservation Plans

This section summarizes local and regional land use plans and regional conservation plans relevant to the Preserve, and Figure 3-1 shows nearby open space areas in a regional context.

3.2.1 NEWPORT BANNING RANCH REMEDIAL ACTION PLAN

The Newport Banning Ranch Remedial Action Plan (RAP) outlines requirements for the decommissioning and abandonment of the Banning Ranch oil field operations intended to prepare the area for alternate public and natural uses. The initial RAP was approved by the Santa Ana RWQCB in 2015 and presented the highest impact remediation and removal of all past surface improvements (even in the absence of environmental risk) as required by the original planned development's residential component. The Preserve is now designated to remain as open space, and therefore requires a reduced remediation approach that avoids extensive disturbance of existing surface vegetation and property. This updated approach is outlined in the 2022 RAP Addendum, which outlines updated risk-based goals for remediation, additional surface soil sampling at each area of potential environmental concern (PEC), and terrestrial habitat environmental screening levels as defined by the San Francisco Bay RWQCB that guide remediation activities in vegetated areas. A separate Field Protocols document was developed in coordination with the resource agencies and describes the programmatic remediation approach for individual PECs, defines methods for documenting and delineating vegetated and non-vegetated areas, and determines appropriate field protocols for remediation activities. This remediation is ongoing, with Santa Ana RWQCB regulatory closure anticipated in 2026.

Figure 3-1. Regional Open Space and Conservation Plans



3.2.2 UNITED STATES ARMY CORPS OF ENGINEERS SANTA ANA RIVER SALT MARSH PROJECT

Between 1992 and 1996, USACE completed restoration of a 92-acre area of coastal salt marsh immediately west and southwest of the Preserve. This effort is known as the Lower Santa Ana River Marsh Restoration Project. The restoration process reconfigured many of the site's higher elevations into lower, better draining forms and constructed a Tern Island to provide habitat for the California least tern (*Sterna antillarum browni*) (USACE 2025).

The following goals of this restoration project are relevant to this RMP, given the project's immediate proximity to the Preserve:

1. Increase overall ecological productivity and diversity in the Marsh.
2. Increase the value of the Marsh as a nursery area for marine fish.
3. Improve California least tern feeding habitat and provide terns with suitably sized fish during critical periods in the breeding season.
4. Provide the Huntington Beach tern colony an additional nesting site.
5. Provide habitat for the federally endangered light-footed Ridgway's rail (*Rallus obsoletus levipes*).
6. Provide habitat for the state endangered Belding's savannah sparrow (*Passerculus sandwichensis beldingi*).

Large scale maintenance dredging efforts were completed within the Marsh in 2013 and 2017, and the USACE has an Operation, Maintenance, Repair, Replacement and Rehabilitation Manual which provides a schedule for activities associated with maintaining the restoration values of the marsh, such as water quality monitoring, non-native plant removal, trash removal, planting and seeding, and other activities (USACE 2024).

3.2.3 COUNTY OF ORANGE GENERAL PLAN

The following goal, objective, and policy from the County of Orange General Plan, Resources Element, are relevant to the project (County of Orange 2012):

Goal 1: Protect wildlife and vegetation resources and promote development that preserves these resources.

Objective 1.1: To prevent the elimination of significant wildlife and vegetation through resource inventory and management strategies.

Policy Wildlife and Vegetation: To identify and preserve the significant wildlife and vegetation habitats of the County.

3.2.4 CITY OF NEWPORT BEACH GENERAL PLAN

The following goals, objectives, and policies from the City of Newport Beach General Plan, Natural Resources Element, are relevant to any future restoration work within the Preserve (City of Newport Beach 2007):

Goal NR 10: Protection of sensitive and rare terrestrial and marine resources from urban development.

> Policy NR 10.1: Terrestrial and Marine Resource Protection. Cooperate with state and federal resource protection agencies and private organizations to protect marine and terrestrial resources.

Goal NR 13: Protection, maintenance, and enhancement of Southern California wetlands.

> Policy NR 13.1: Wetland Protection. Recognize and protect wetlands for their commercial recreational, habitat, and water quality value.

3.2.5 ORANGE COUNTY CENTRAL–COASTAL CONSERVATION PLANS

The Natural Community Conservation Act, codified at California Fish and Game Code Sections 2800–2840, authorizes the preparation of NCCPs to protect natural communities and species while allowing a reasonable amount of economic development. At the same time, FESA Section 10 provides for the preparation of HCPs to permit the taking of federally listed threatened and endangered species. Under both state and federal statutes, joint planning processes result in the preparation and adoption of an NCCP/HCP. The Preserve is within the NCCP/HCP area for the County of Orange Central and Coastal Subregion, specifically within the Central Subregion of the NCCP/HCP area (County of Orange 1996), and is therefore described in this RMP as context for the special-status species identified in the NCCP/HCP and the mitigation provisions of the NCCP/HCP.

The NCCP/HCP was reviewed and approved by USFWS and the California Department of Fish and Game (now CDFW) in 1996 to address protection and management of coastal sage scrub habitat, coastal sage scrub obligate species, and other covered habitats and species, and to mitigate anticipated impacts to those habitats and species on a programmatic, sub-regional level rather than on a project-by-project, single-species basis (County of Orange 1996).

In general, the NCCP/HCP evaluated a set of covered species and habitat (mostly focused on coastal sage scrub species including coastal California gnatcatcher and coastal cactus wren) and determined habitat impacts that could be authorized because adequate conservation would be achieved through assembly and management of a reserve as designated by the plan. Under the NCCP/HCP, a list of entities are identified as participating landowners which includes the County of Orange and The Irvine Company, amongst others. These entities were granted an acreage of specific take authorization for specific projects/activities that would result in impacts both within the Urban (take authorized) area and Reserve.

3.2.6 ORANGE COUNTY TRANSPORTATION AUTHORITY CONSERVATION PLANS

The Orange County Transit Authority Natural Communities Conservation Plan/Habitat Conservation Plan is designed to balance infrastructure development with conservation of sensitive habitats and species. The plan aims to protect native habitats and species while allowing for transportation improvements covering various freeway improvement projects and conservation efforts across Orange County. The plan was completed in 2009 and the implementing agreement ultimately signed by CDFW and USFWS in 2017. The OCTA conservation plans include mitigation for 13 freeway projects and have contributed to the establishment of seven preserve area and 13 separate restoration areas, the closest of which is Fairview Park located just over a mile to the north of the Preserve.

3.2.7 CALIFORNIA COASTAL COMMISSION SITE RESTORATION MANAGEMENT PLAN

Between 2009 and 2015, consent agreements were reached between CCC and land ownership/oil production interests in response to unpermitted development that previously took place. As a result of these agreements, habitat restoration, creation, and preservation was required and implemented in various areas of the Preserve, portions of which are still being monitored for success and will be continued to be monitored. The various consent agreements are described briefly below, and the corresponding current and former restoration sites are shown in Figure 2-2.

From 2004 to 2006, land in the southeastern corner of the Preserve was leased to a construction contractor for use as a staging area for Southern California Edison utility undergrounding work. In 2009, CCC staff became aware of the activity and determined approximately one acre had been cleared of vegetation, graded, and used for storage of mechanized construction equipment, vehicles, stacks of pipe conduits, and various other construction materials without a CDP. The activity resulted in the removal of approximately 0.83 acres of coastal sage scrub habitat that supported the federally threatened coastal California gnatcatcher and was considered ESHAs under the Coastal Act. The unpermitted development was also found to be inconsistent with sections of the Coastal Act requiring protection of water quality, scenic public views, and visual qualities and minimizing erosion within the Coastal Zone. In 2011, an agreement was reached between CCC and the involved parties, and a Consent Cease and Desist Order and Restoration Order were issued requiring removal of all unpermitted development from the impacted areas, restoring coastal sage scrub vegetation within those areas, and establishing mitigation areas on the property to create approximately 2.5 acres of new coastal sage scrub vegetation.

In 2015, a separate dispute between CCC and Newport Banning Ranch LLC, which managed planning and entitlement of the Banning Ranch surface rights, and the oil field operator, West Newport Oil, took place. The issue at the heart of the disagreement was the scope of a 1972 resolution exempting the Banning Ranch oil field operators from the new permit requirements associated with Proposition 20, the Coastal Act's predecessor. The CCC maintained that the drilling and operation of new wells, vegetation removal, extensive mowing of the site, grading, construction of structures, and other activities associated with oil field operation were taking place in ESHAs and wetlands and were inconsistent with the scope of the 1972 resolution and a previously issued CDP. An agreement was reached in which Newport Banning Ranch LLC agreed to restore, create, and enhance 18.45 acres of native habitat on the property, including coastal sage scrub, riparian, purple needlegrass grassland, transitional grassland, and vernal pools. This work is presently underway and continues in 2025.

3.3 Mountains Recreation and Conservation Authority Ordinances

The MRCA Park Ordinance, last amended in September 2022, establishes baseline operating hours, rules and regulations for areas within its jurisdiction, and penalties and administrative processes for addressing violations. Some variations of the operating restrictions may be adopted in line with the stated goals and objectives of the RMP. A summary of rules, regulations, and special considerations applicable to the Preserve will be posted in a conspicuous location, and a full Park Ordinance is available for viewing online. The Ordinance may be enforced by any duly authorized California Peace Officer or by a US Army Corps of Engineers Park Ranger as authorized by California law.

Implementation of Preserve rules and regulations will occur in a manner that aligns with the goals and objectives of the RMP (i.e., restoration and management activities). Rules and regulations will also be established in line with Tribal uses/activities described within the TAEP to ensure accessibility by tribal community members.

Standard Operating Hours

Parkland within the MRCA's jurisdiction is closed from 30 minutes after sunset to 30 minutes before sunrise, unless different hours are otherwise posted.

Rules and Regulations

Prohibited activities described in the Ordinance are summarized below.

- Smoking of any kind, including the usage of vapes (e-cigarettes) except where expressly permitted.
- Lighting of fires without a campfire or special-use permit.
- Possession of alcoholic beverages without a permit.
- Littering and dumping of any kind on parkland except in a designated receptacle.
- Injury, defacement, damage, destruction, collection, harvest, construction upon, or in any way altering the existing condition of any parkland or parkland property without a permit.
- Hunting, fishing, or taking of wildlife outside of designated fishing areas.

- Feeding or providing water to wildlife.
- Possession of weapons including firearms, bows, and arrows, or any air or spring powered device capable of firing a projectile (paintball guns, BB guns, pellet guns).
- Use or possession of fireworks without a permit.
- Letting dogs off-leash outside of designated areas, bringing aggressive dogs, failing to pick up dog excrement.
- Riding bicycles or motor bicycles outside of areas specifically designated for such usage.
- Camping without a permit.
- Filming or shooting photography when doing so would damage parkland, interfere with the public enjoyment of parkland or tribal ceremonies, block access, or necessitate the use of extraneous equipment.
- Using parkland for any commercial use without a permit (fitness instruction, dog walking, vending food).
- Nudity within the public view.
- Operation of any device which utilizes a combustive fuel motor or rocket motor.
- Operation of any aircraft, drone, or motorized/radio-controlled aircraft model without a permit.

The Ordinance also establishes guidelines for vehicle use, parking, liability, and citations within parkland.

Violations and Penalties

The Ordinance establishes the penalty for violations of any provision as a maximum fine of $1000 or imprisonment in the County jail for six months, or both. Parking violations are subject to a penalty of not more than $73. The Ordinance establishes administrative remedies including citations and a review process for appeals, which must be pursued prior to judicial action.

3.4 Management Levels

Management of the Preserve's resources are organized into three Management Levels (1, 2, 3) that consider the full range of management, planning, and restoration activities that are needed to fully realize the adopted Preserve goals and objectives. Management Levels are presented in order of escalating management intensity, planning, restoration activities, and public access amenities (see Section 3.2, Relevant Land Use and Conservation Plans). Management levels reflect the range of difficulty and cost associated with each approach. The Management Levels also recognize the level of stable funding necessary to support the varying levels of ecological functional lift that is desired and supported by consistent management activities.

Management Level 1 activities are considered a minimum level of effort and activities needed to sustain and improve the Preserve's ecological resources. While Management Level 1 activities are a minimum, these actions can still result in substantial ecological functional lift if the management actions are routinely and consistently performed over the long-term. Management Level 2 activities may be suitable to greater community involvement through community volunteer programs. Management Level 3 activities involve the greatest level of site modification including habitat restoration that may involve grading and terrain modification, manipulation of drainage features and tidal hydrology, and construction of public access amenities.

While activities associated with each Management Level present unique benefits and constraints, a high degree of effort and associated costs distinguish Management Levels 1 - 3. The separation of Management Levels is most evident when discussing the lowland area which is currently constrained by the existing tidal connection, landform, hydrology, ecology, and hydrogeomorphology of the site.

3.4.1 MANAGEMENT LEVEL 1 (LOW TOUCH)

Management Level 1 actions address basic Preserve management activities to foster ecological stability and sustainability including the need for sustainable public access, promotion of public awareness and resource stewardship, drainage and terrain stabilization, vegetation community stabilization, and promotion of desired public behavior within the Preserve (e.g., proper use of designated trails, avoidance of pioneering trails, proper trash handling and disposal, vandalism control, control of unauthorized entry and overnight camping, etc.).

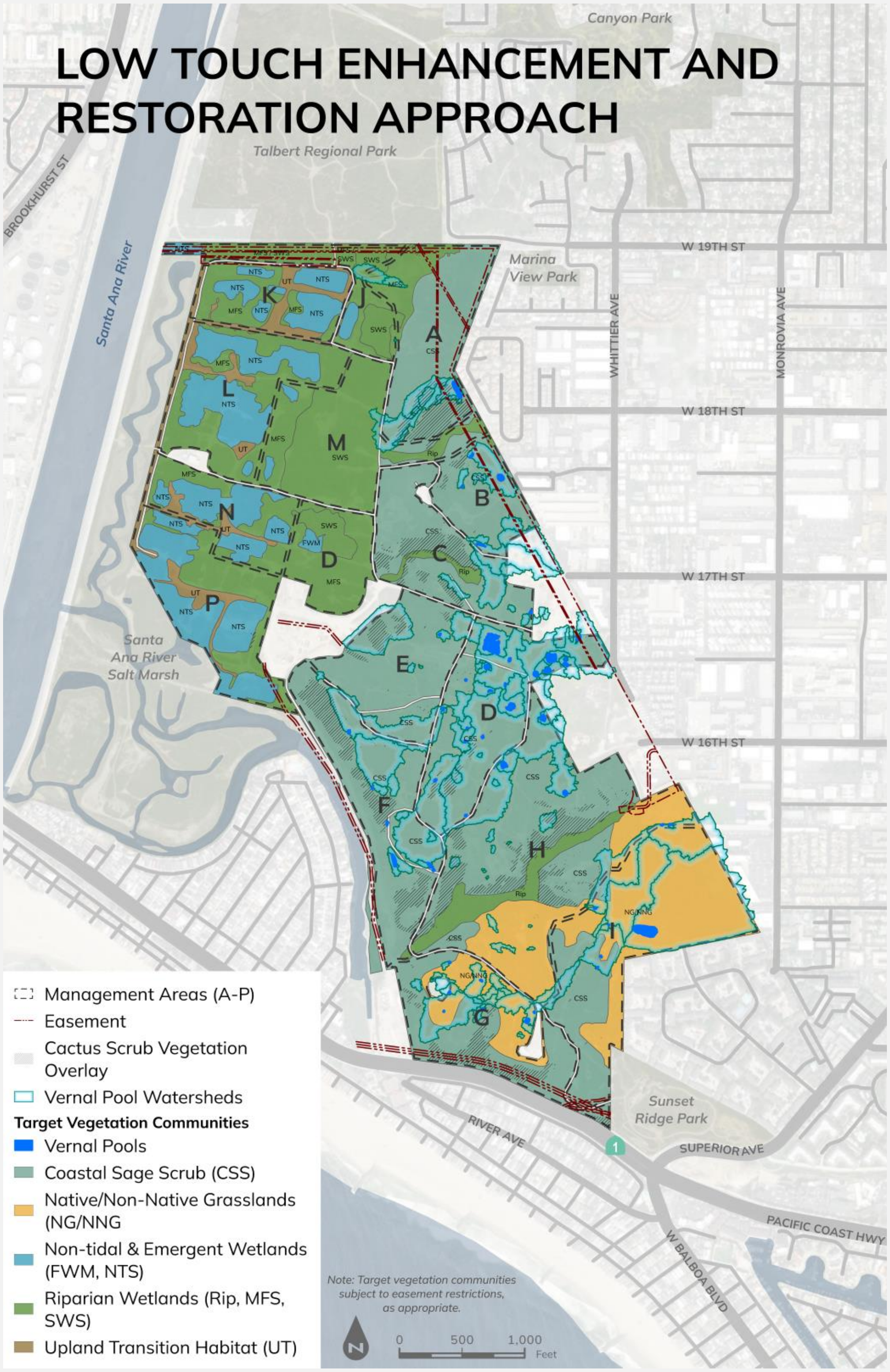
Preserve management inception would involve several activities to initiate public uses and ecological resource improvements including:

- Public safety review, identify, and barricade unsafe conditions.
- Trail designation, stabilization, and signage, paved vs. unpaved trail system.
- Limited public access within restricted access areas.
- Drainage and erosion control.
- Display/provide trail maps and Preserve information.
- Invasive vegetation control.
- Trash collection.
- Monitor the Preserve and perimeter.

Monitoring Native Vegetation Recruitment

Habitat improvements in a low-touch scenario will be directed by target native vegetation communities that are expected to recruit into disturbed areas of the Preserve as invasive and non-native species populations are diminished through an active invasive species control and suppression program (Figure 3-2). Areas throughout the Preserve will be prioritized by key factors that inform management decision making. These factors include species invasiveness, proximity to intact native habitat including previously restored habitat, proximity to sensitive wildlife species such as California gnatcatcher use areas and nesting territories, slope gradient, disposal haul route distance, and anticipated functional lift. A weighted analysis will be used to identify high priority areas that address populations of the most invasive species and an approach that generally radiates outward from existing intact habitat occurrences, especially in proximity to known sensitive wildlife use areas and sensitive wetland habitat such as vernal pools.

Figure 3-2. Low Touch Enhancement and Restoration Approach



Invasive species control is the first step to achieve native habitat sustainability. Table 3-1 summarizes the species that pose the greatest threat to the ecological stability of on-site habitat. Additional invasive non-native species are included in Section 3.5.5, Invasive and Non-Native Vegetation Management.

Table 3-1. Invasive Species Targeted for Control

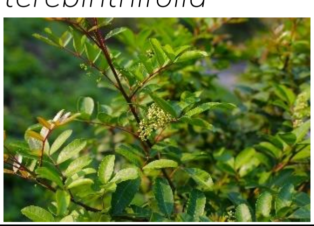
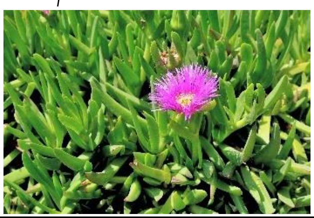
Scientific Name	Common Name	Native Habitat Affected	Level of Invasiveness
Cortaderia selloana 	Uruguayan pampas grass	Lowland wetlands	High
Cortaderia jubata 	Purple pampas grass	Lowland wetlands	High
Conium maculatum 	Poison hemlock	Lowland wetlands	High
Schinus terebinthifolia 	Brazilian pepper	Riparian canyons	Moderate
Acacia longifolia 	Sydney golden wattle	Riparian canyons	Moderate

Table 3-1. Invasive Species Targeted for Control

Scientific Name	Common Name	Native Habitat Affected	Level of Invasiveness
Arundo donax 	Giant reed	Riparian canyons	High
Carpobrotus edulis 	Ice plant	Vernal pools	High
Myoporum laetum 	Myoporum	Riparian canyons	Moderate
Foeniculum vulgare 	Fennel	Lowland wetlands	Moderate

Note: Moderate=These species have substantial and apparent (but generally not severe) ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread. High=These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate and high rates of dispersal and establishment. Most are widely distributed ecologically. (Cal IPC 2006)

3.4.2 MANAGEMENT LEVEL 2 (INTERMEDIATE TOUCH)

Management Level 2 actions are aimed at habitat and public experience improvements. Habitat improvements include decommissioning and restoring upland roads including soil decompaction, removal of fill, smoothing terrain to promote and restore upland sheet flow to reduce erosive conditions, native seed mix applications, invasive and non-native species control, monitoring, and maintenance. The overall goal of Management Level 2 actions is to expand native habitat into areas that were disturbed by oil field operations where native habitat was removed. Examples of Management Level 2 activities and projects are provided below.

- Upland road abandonment and restoration, focus on spur and loop roads.
- Upland habitat enhancement, rip and seed roads, erosion control features, enhance vernal pools, increase cactus wren habitat, increase burrowing owl habitat, develop comprehensive enhancement plans for designated areas.
- Construct public amenities, overlook platforms, trail bridges.
- Create new external access points/community connections.
- Invasive and non-native species control, seeding.

Target vegetation communities are provided for all Preserve areas in Figure 3-2. Vegetation community targets were developed using ecological factors including soil types, topography, slope gradients, and existing native and non-native vegetation communities.

3.4.3 MANAGEMENT LEVEL 3 (HIGH TOUCH)

High-touch opportunities described in Section 3.4.2, Management Level 2 (Intermediate Touch), involve transformative restoration design that modifies ecological systems and often involve habitat conversion. Within the Preserve lowlands, oil field activities and channelization of the Santa Ana River for flood control has isolated the former floodplain area from freshwater and tidal influences. The high touch scenarios present opportunities to reconfigure the lowland area to improve ecological functionality and habitat connectivity (Figures 3-3 and 3-4). Implementing a high touch approach would include mass grading to establish tidal connections to the adjacent tidal wetlands area that is managed by the USACE. Graded features would include a backbone system of subtidal channels that would provide tidal exchange to new salt marsh areas within the Preserve wetlands. The design would establish areas with site elevations that would support mid- and high-marsh vegetation communities and transitional habitat where abandoned wells are located. Vegetation establishment would involve container plant installation supported by a temporary irrigation system to maintain overall plant health, establishment, and promote plant survival and reproductive success.

The high touch opportunities are dependent on the cooperation and partnership with the USACE that operates tide gates that regulate tidal flow from the Santa Ana River channel into the USACE Santa Ana River Salt Marsh, adjacent to Preserve. Operation of the tide gates mutes the tidal prism that enters the restoration site with implications for coastal resilience.

Challenges associated with a high touch approach include construction access to the lowland areas with large grading equipment, disposal of excavated soils, points of connection to an adequate water source for irrigation, and the overall cost of project implementation to plan, design, permit, construct, monitor, and adaptively manage the restoration project long-term. However, a high touch approach is consistent with the goals and objectives of the Preserve and the creation of rare coastal tidal wetlands would greatly expand aquatic resources of regional significance.

Figure 3-3. High Touch Concept 1

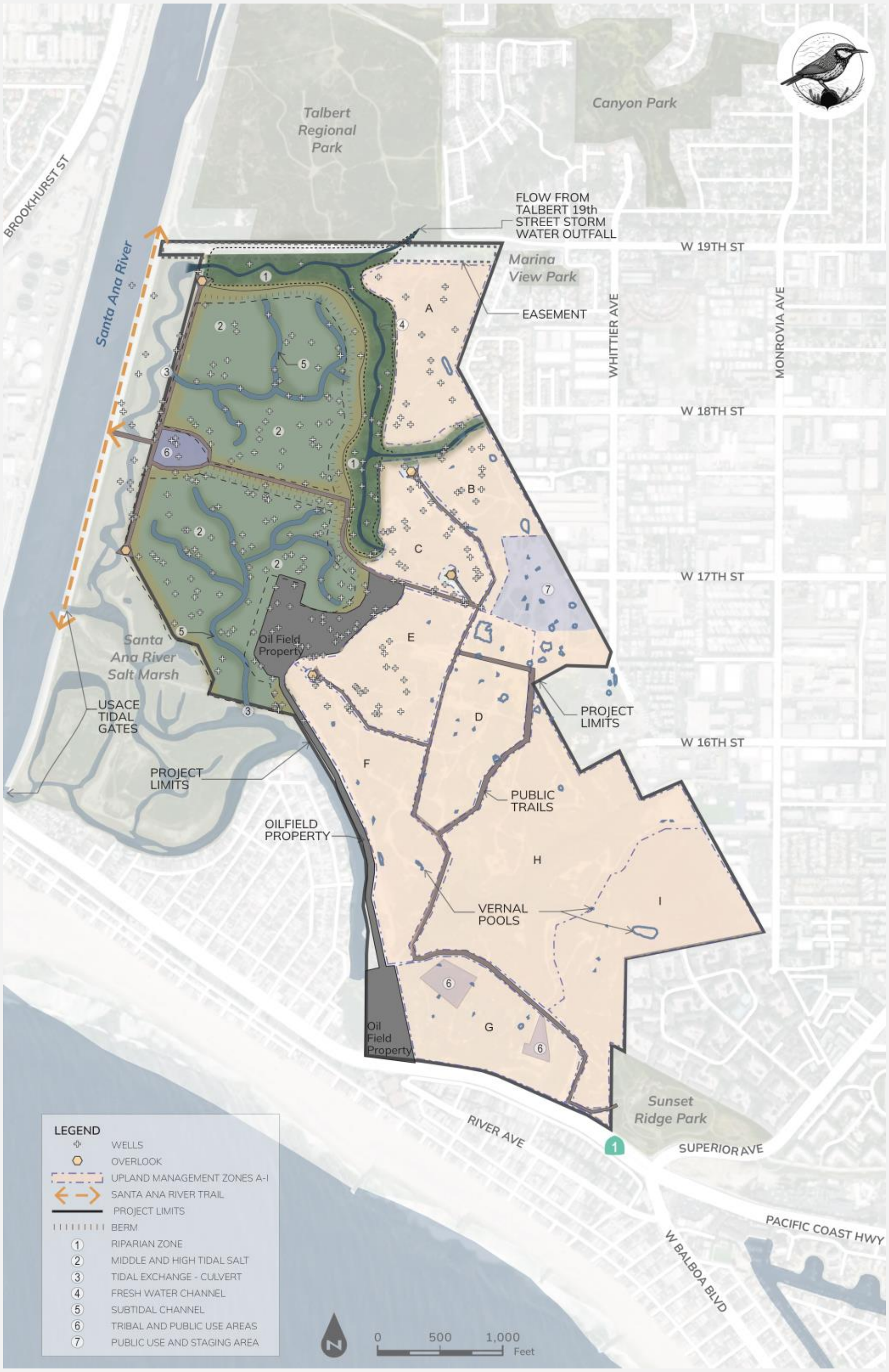
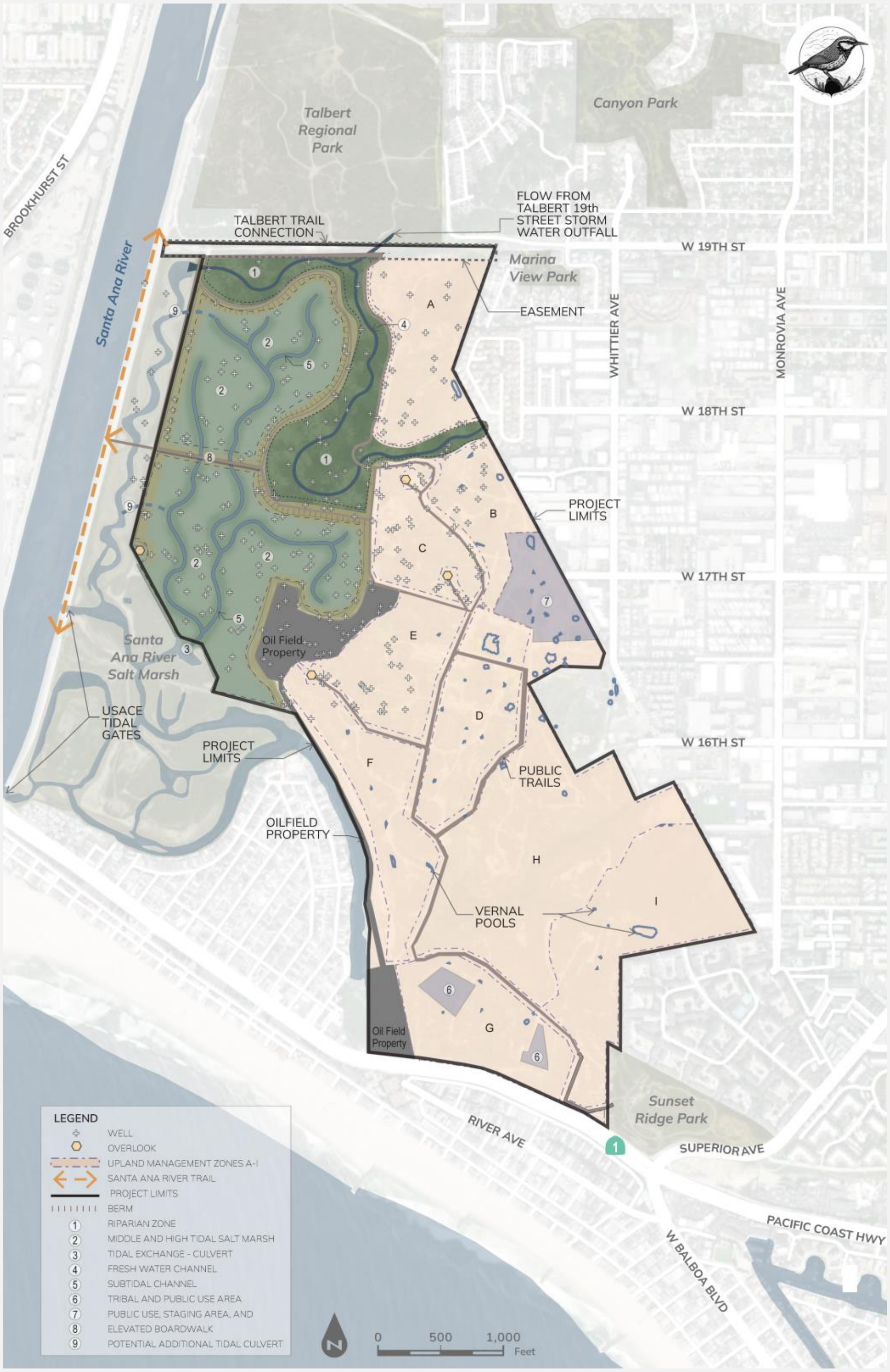


Figure 3-4. High Touch Concept 2



3.5 Habitat Restoration Guidance

3.5.1 PRESERVE HABITAT OPPORTUNITIES AND CONSTRAINTS

The overarching goal of the RMP is to integrate ecological resilience through adaptive management, Tribal co-stewardship, equitable access, and education for the protection, preservation, and restoration of the Preserve.

The size and scale of the Preserve requires a dynamic and programmatic approach to the management and restoration of the Preserve to achieve the goals of the RMP (Section 1.4, Goals and Objectives). While opportunities for restoration of vegetation communities, native habitat, and ecological function within the Preserve vary largely in scope, cost, and feasibility they share common characteristics and general areas when discussing overarching planning and implementation. However, restoration opportunities must be planned in order to address site constraints.

SITE CONSTRAINTS

Site constraints such as infrastructure features (abandoned oil wells), utility easements, ongoing habitat mitigation, and ecological resources pose limitations on the number and type of projects that can provide ecological lift within the Preserve. These constraints may limit the feasibility to enhance and restore biological resources, wildlife habitat, or to build public access facilities. The range of known site constraints are depicted in Figure 3-5. Table 3-2 summarizes the type of constraint, identifies the site management opportunities it may constrain, and the level of constraint it poses to site design and implementation. Level 1 constraints represent a low-level constraint issue that may be accommodated by site specific design. Low-level constraints may often present flexible solutions that ultimately reduce or eliminate the constraint or there may be design solutions that eliminate the effective constraint on the desired land use. Level 2 constraints require greater design modification and set greater limits on the site design. However, these constraints may be relaxed by specific stakeholders whose purview over the constraining element may be more flexible in consideration of the conservation focus of the site design. Level 3 constraints are more rigid, providing fewer options, and may present a fatal flaw for a particularly desired land use.

Table 3-2. Site Constraints Summary

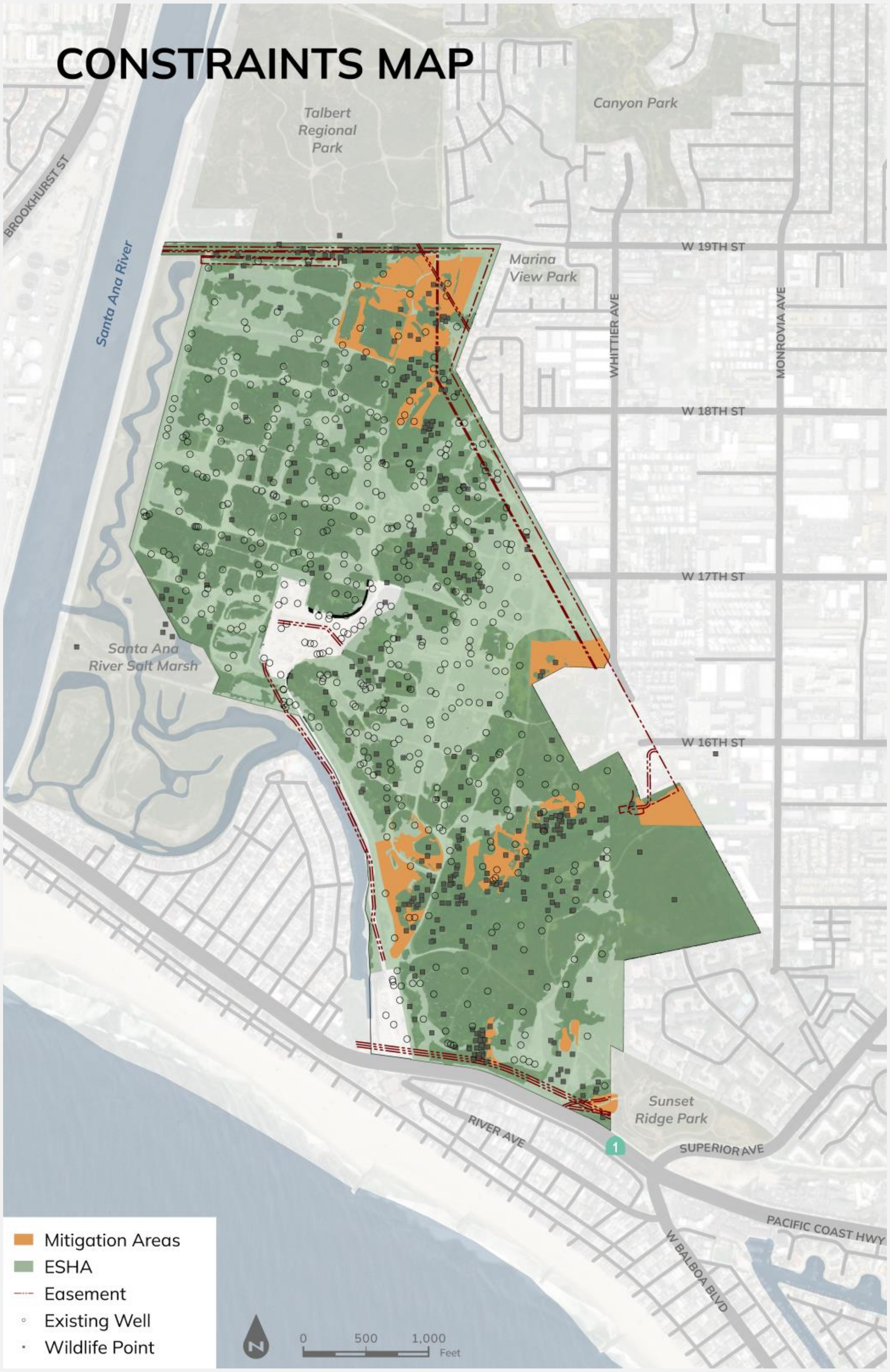
Site Constraint	Constraint Level on…			
	Public Access	Tidal Wetlands Restoration	Freshwater Wetland Restoration	Uplands Restoration
Cultural Resources	3	3	2	1

Table 3-2. Site Constraints Summary

Site Constraint	Constraint Level on…			
	Public Access	Tidal Wetlands Restoration	Freshwater Wetland Restoration	Uplands Restoration
Abandoned/Remediated Oil Wells	0	2-3	2-3	n/a
City of Newport Beach Utilities and Maintenance Road	0	2	2	0
CCC Consent Order Mitigation Sites	2	1	1	1
Vernal Pools	3	n/a	n/a	1
Listed and Sensitive Species	3	1	1	1

Notes: 0 = Represents no constraint issue. 1=Represents a low-level constraint issue that may often present flexible solutions that ultimately reduce or eliminate the constraint or there may be design solutions that eliminate the effective constraint on the desired land use. 2=Represents a mid-level constraint issue that requires greater modification and sets greater limits on the site design. These constraints may be relaxed by specific stakeholders whose purview over the constraining element may be more flexible in consideration of the conservation focus of the site design. 3=Represents a high-level constraint that are more rigid, providing fewer options, and may present a fatal flaw for a particularly desired land use.

Figure 3-5. Constraints Map



CULTURAL RESOURCES

Cultural resources are known within the Preserve. These resources are described in the Cultural Resources Report that was prepared for the former Banning Ranch development. An ethnographic study is ongoing that may identify additional sensitive cultural resources. With direct tribal involvement and oversight in Preserve management, these resources represent a significant constraint, including no public access or any soil disturbance where resources are present. This constraint will exclude public access from cultural resource areas and limit the type of habitat enhancement, restoration, and methods used to implement ecological restoration projects where resources are present.

REMEDIATED OIL WELLS

Oil wells within the lowland areas are capped at 3 feet below existing grade. It will likely not be feasible to lower the top of well elevation or to expose existing capped wells to surface conditions such as air and sea water. If further modification is possible under current regulations, the process may take a considerable amount of time to obtain permission. Further, the cost and liability to lower the elevation of existing capped wells could be prohibitive.

Moffatt & Nichol has taken the measured tide data from the USACE 2023 tidal monitoring study and used it to produce the tidal inundation frequency curve and preliminary marsh elevation ranges. Tide levels at the Preserve will be limited to (also called muted) a tidal range (difference between minimum and maximum water levels during typical tidal cycle) of approximately 2.5 feet due to the operations of the USACE tide gates. This contrasts with areas where tidal flow is unregulated by tide gates that experience a greater range of tidal water elevations. The automated tide gates limit the maximum elevation of water within the existing wetlands by the operation of these self-opening and closing water tunnels through the Santa Ana River levee. Additional analysis using hydrology models is required to determine if modifications to existing tide gates or new tide gates are required to support existing wetlands and new wetlands on the Preserve.

The potential constraint posed by existing wells on the lowland opportunities is significant. Two analyses were conducted to assess the potential constraints on tidal influence that would support salt marsh vegetation communities. The GIS analysis compared existing NAVD88 site elevations to the preliminary elevation ranges for each salt marsh community as shown in Table 3-3 (Figure 3-6). A second GIS analysis looked at surface elevations that would result if the existing land surface was lowered by 3 feet, the maximum potential cut while avoiding capped wells (Figure 3-7).

Table 3-3. Preliminary Salt Marsh Elevation Ranges

Habitat Elevation Breaks (Preliminary)				
Habitat Type	Min. El. (ft, MLLW *)	Max. El. (ft, MLLW *)	Min. El. (ft, NAVD88)	Max. El. (ft, NAVD88)
Transitional (0% inundation)	5.8	Max. El. At site	5.6	Max. El. At site
High Marsh (0% to 4% inundation)	5.7	5.8	5.5	5.6
Mid Marsh (4% to 20% inundation)	5.2	5.7	5.0	5.5
Low Marsh (20% to 40% inundation)	4.7	5.2	4.5	5.0
Mudflat (40% to 100% inundation)	3.2	4.7	3.1	4.5
Subtidal (100% inundation)	Min. El. At site	3.2	Min. El. At site	3.1

Notes: Elevations in the table are provided in both Mean Low Low Water (MLLW) datum and North American Vertical Datum of 1988 (NAVD88).
A time series of the water level plot is included for reference in Exhibit 3-1. Two tidal cycles (29.5 days) were used for analysis. The water level inside the marsh is lowest during a neap tide, e.g., 10/5 – 10/8.

Exhibit 3-1. Measured Water Levels based on MLLW at Newport Beach tide gauge (NOS Tide Station 9410580)

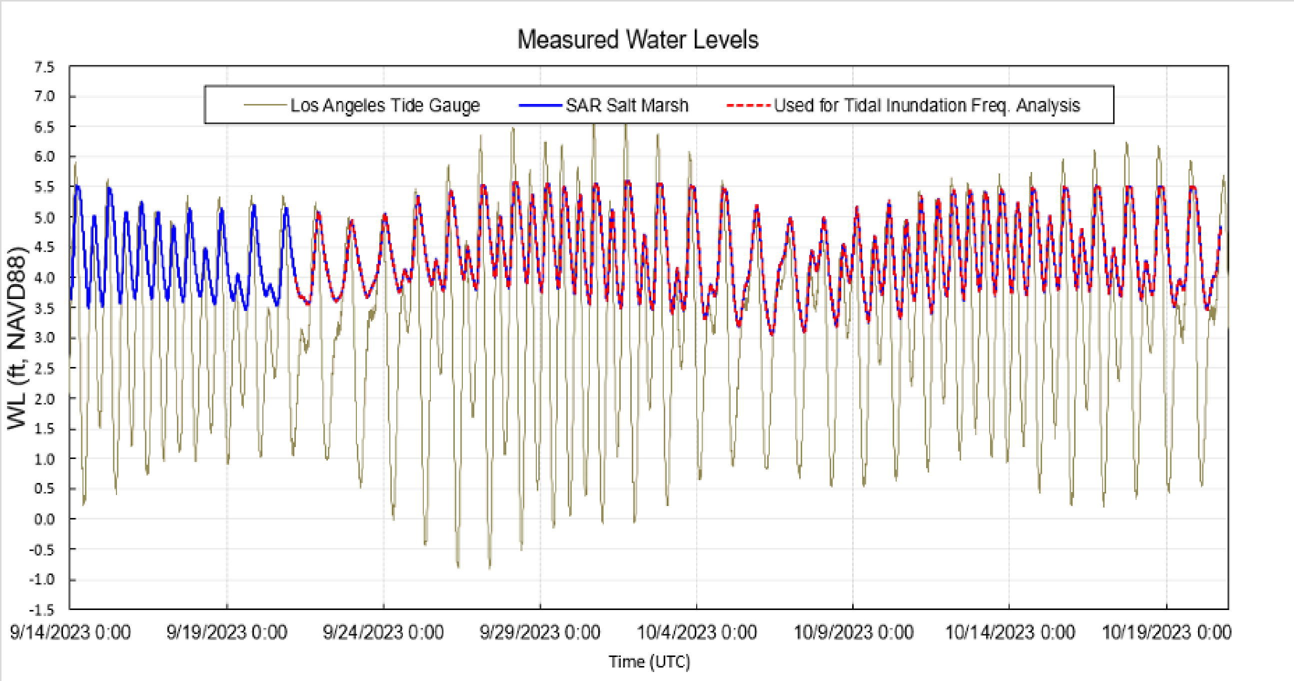


Figure 3-6. Existing Ground Level Tidal Analysis

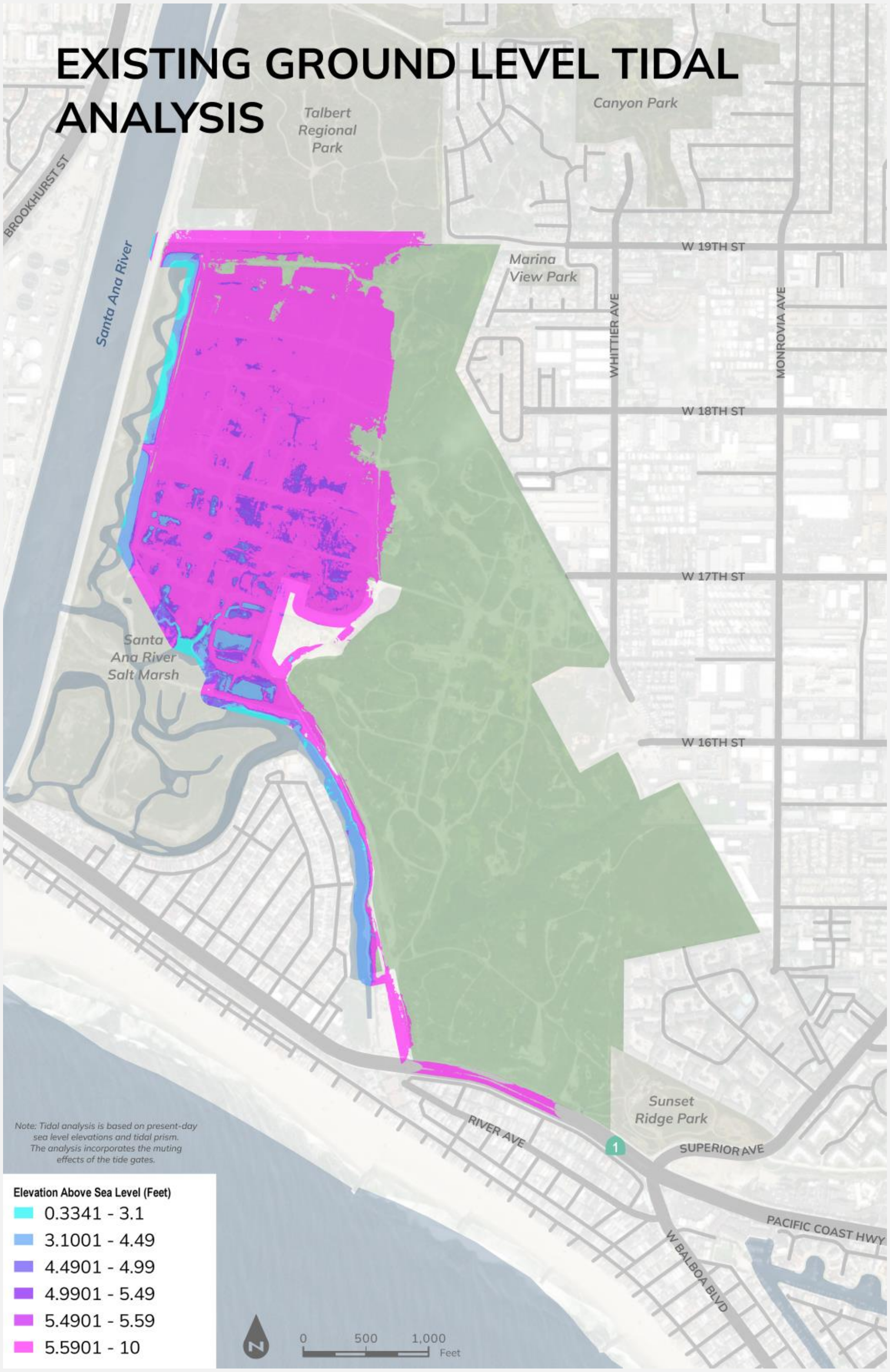
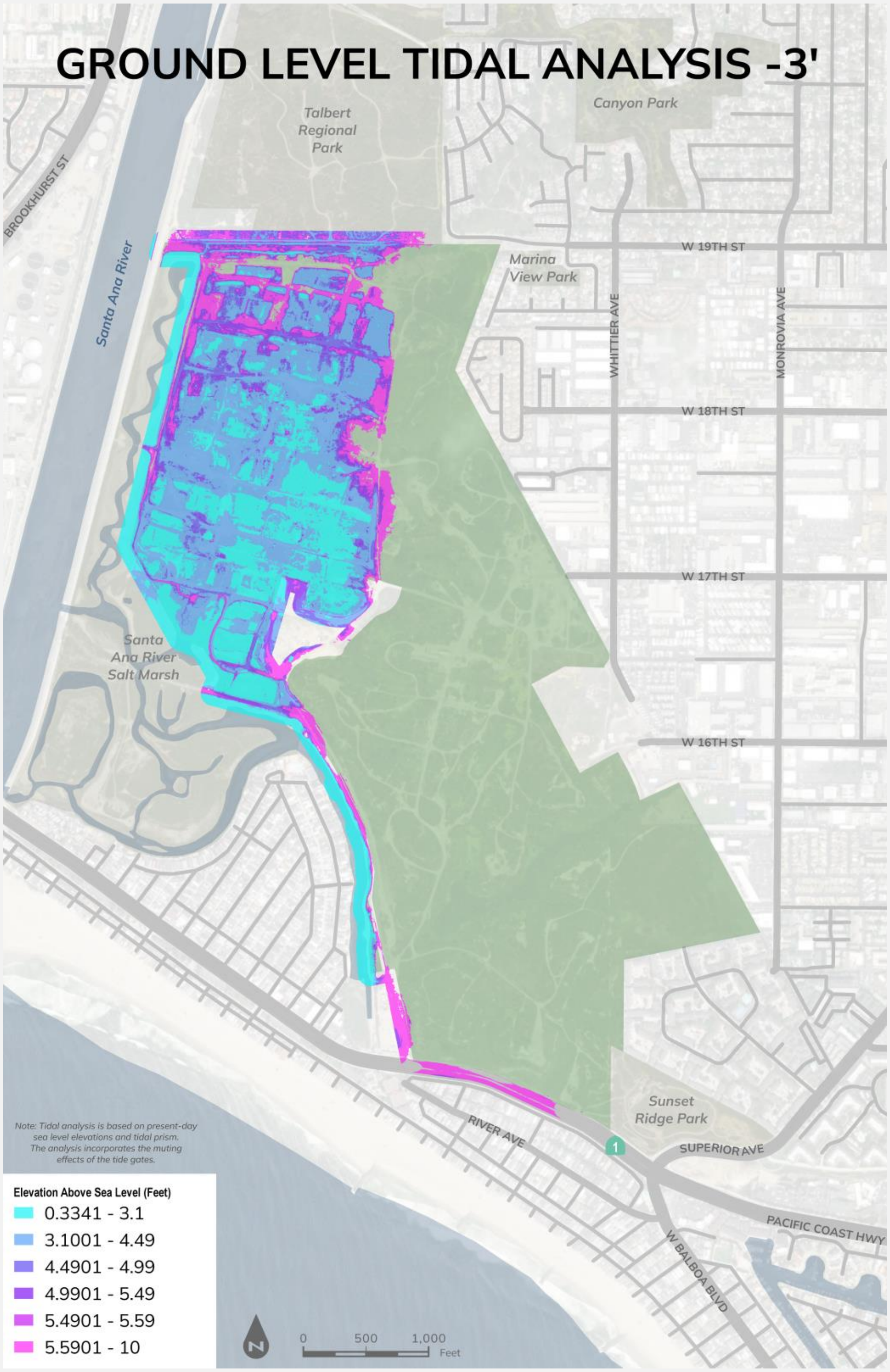


Figure 3-7. Ground Level Tidal Analysis -3'



These analyses demonstrate that salt marsh habitat elevations are extremely constrained by existing ground elevations within the lowland area. However, most salt marsh habitat elevations may be created within the top 3-foot soil profile of the site (Figures 3-6 and 3-7). In addition, it appears possible to excavate sub-tidal channels that are deeper than 3-feet below existing grade while avoiding existing well locations. Similarly, interstitial areas between wells are not elevation-restricted and may be designed to achieve lower marsh habitat areas as desired. Areas at well locations would remain at higher elevations, above the existing tidal prism. These areas would provide locations where salt marsh habitat may migrate under SLR scenarios. Remediated wells do not pose a constraint within upland areas because no significant grade alteration is necessary to enhance or restore native upland vegetation communities. All work can occur above remediated wells and no conflicts with the well features are anticipated.

SOUTHERN CALIFORNIA EDISON TRANSMISSION CORRIDOR MITIGATION AREA

In 2011, an agreement was reached between CCC and the involved parties, and a Consent Cease and Desist Order and Restoration Order were issued requiring removal of all unpermitted development from the impacted areas, restoring coastal sage scrub vegetation within those areas, and establishing mitigation areas on the property to create approximately 2.5 acres of new coastal sage scrub vegetation.

An agreement was reached in which Newport Banning Ranch, LLC agreed to restore, create, and enhance 18.45 acres of native habitat on the property, including coastal sage scrub, riparian, purple needlegrass grassland, transitional grassland, and vernal pools. This work is presently underway and continues in 2025.

CITY OF NEWPORT BEACH UTILITIES, MAINTENANCE ROAD, AND EASEMENT

The City of Newport Beach holds an easement to construct, lay, operate, maintain, and repair a 12-inch diameter water pipeline located 34 feet south of the northern Preserve property line. A maintenance access road and pipeline are located within this easement. Presently, stormwater from an outfall within Talbert Regional Park (South) flows across the property line onto the Newport Beach pipeline easement and follows a small channel that flows west and discharges into the USACE Santa Ana River Salt Marsh which is a feature of the larger Santa Ana River Mainstem Project. Although the easement may pose a barrier to the development of a larger drainage feature and riparian habitat area, current conditions suggest there may be effective infrastructure and natural resource compatibility. Restoration of the existing channel may present an opportunity to design a crossing that has greater stability than the existing unstructured flow channel. Therefore, this easement is a low to moderate constraint on habitat and restoration opportunities within this area. Further coordination with the City of Newport Beach is needed to validate this assumption.

PREVIOUS MITIGATION PROJECTS

The previous owner is required by the Remediation Plan and other regulatory agency orders to restore habitat in compensation for operational impacts to sensitive ecological resources. These mitigation sites are scattered across the Preserve. Each mitigation site has performance standards that must be achieved before acceptance by the issuing agency. Mitigation sites are protected in perpetuity from land use disturbance, and these restrictions will apply to public access (see Section 3.6, Public Access Plan). Completed mitigation sites require no further management actions other than potential adaptive management measures as determined through long-term monitoring (see Section 5, Monitoring and Management).

VERNAL POOLS

Vernal pools are ground depressions susceptible to pooling during winter storms due to impermeable layers of subsoils in the area. The water collects and remains in the depressions for an extended period of time, simultaneously supporting pockets of habitat including native vegetation and some aquatic species. Vernal pools of various qualities and resources are distributed throughout the upland areas. Vernal pools and the contributory watershed areas are linked resources that generally require protection. Human entry into vernal pools and pooled areas should be limited. Protection of the vernal pools is a high priority. Modification of watershed areas should avoid disturbances that either reduce the size of the contributory watershed or diminish water quality, especially sedimentation into the pool. Vernal pools are viewed as a high constraint to public access and a low constraint on restoration activities where San Diego Fairy Shrimp (*Branchinecta sandiegonensis*) and other aquatic species are present.

LISTED AND SENSITIVE SPECIES

The site supports a variety of sensitive and listed animal species that utilize the site for forage, cover, and breeding resources. These species present low constraints to restoration and site management. Likely constraints would be seasonal restrictions on activities for occupied habitat protection. Upland habitat for species such as the white-tailed kite, Crotch's bumblebee, California gnatcatcher, burrowing owl, cactus wren, and fairy shrimp may be enhanced and restored despite the species being present if steps are taken to avoid and minimize direct and indirect impacts to the species.

Sensitive plant species present a special challenge. Translocation of certain species is possible through salvage of whole plants, collection of cuttings and propagules, or through seed collection and topsoil/seed bank salvage and placement in appropriate receiver sites. The presence of listed and sensitive species does not affect public access so long as the public is restricted to established trails and access points.

HABITAT OPPORTUNITIES

Habitat opportunities have been identified within the upland and lowland areas of the Preserve. The range of habitat opportunities is broad. Management actions will vary in intensity over the coming years as each phase of Preserve public access and stewardship takes shape.

ECOLOGICAL MANAGEMENT UNITS

The Preserve will adopt a connectivity network to be used for Preserve management and operations and/or used by the public as trails, overlooks, and use areas. The authorized road/trail system will create habitat blocks that will create Ecological Management Units (EMU)

(Figure 3-2). Not all the existing roads and trails will be accessible to the public and, in fact, many will be decommissioned to support habitat and species goals. A systematic approach to Preserve management is necessary to prioritize and target key areas that are likely to degrade rapidly or where potential ecological functional lift (ecological improvement) is possible. EMU's provide a framework for project planning and property management to identify Preserve needs, plan for project funding, and permitting.

Adoption of EMU's will allow for an understanding of the degree to which different treatments are needed within each EMU and selection of associated levels of Preserve Management described in Section 3.4, Management Levels. In general, preservation and enhancement activities focused on invasive and non-native species control are represented by Management Level 1. Management Level 2 combines invasive and non-native species control activities with more intensive treatments including the application of native seed, installation of container plants, temporary irrigation, soil decompaction, and removal of microtopographic features that modify upland sheet flow hydrology. Management Level 3 consists of topographic manipulation (i.e., grading) to transform a system to create a new hydrology regime that supports a higher functioning tidal salt marsh system. These Management Levels 1 through 3 roughly encompass low, intermediate, and high touch opportunities.

LOWLAND LOW AND INTERMEDIATE TOUCH APPROACH

Within the lowland area, there are low-touch opportunities that address populations of invasive species through invasive and non-native species management. Low-touch opportunities include patches of dense pampas grass, poison hemlock, and other invasive species that outcompete native plant species. A low-touch program for habitat enhancement relies on effective invasive and non-native species control that suppresses invasive species seed production while allowing passive native vegetation recruitment to occur in areas not occupied by non-native vegetation (i.e., bare soil).

A low-touch approach would not address any of the existing barren areas that are disturbed by oil field operations and remediation activities. The revegetation of oil field roads may require an intermediate touch approach through soil decompaction, seeding, and planting of species that are representative of targeted native vegetation communities. Figure 3-2 presents the distribution of native habitats that would likely recruit into lowland areas in the absence of competing non-native vegetation. The map provides the distribution of targeted native vegetation communities as a guide for Management Level 1 and 2 activities to achieve ecological stability on existing lowland topography and hydrology.

LOWLAND HIGH TOUCH OPPORTUNITIES

High-touch scenarios are constrained by decommissioned oil wells in the lowlands that are capped at three feet below existing ground level. The capped well must not be compromised to avoid potential pollution and regulatory issues. Terrain analysis was used to determine if site elevations could be lowered to elevations that would fall within the tidal prism and predicted elevation ranges of low-, mid-, and high salt marsh vegetation communities. Analysis of existing site conditions shows that existing site elevations do not fall within the present-day tidal prism (Figure 3-6). However, the removal of three feet of soil establishes site elevations that fall within the predicted elevation range for low-, mid-, and high salt marsh vegetation communities (Figure 3-7). In addition, abandoned oil wells are unevenly distributed across the lowland areas. Gaps between well clusters create space for subtidal channels to be excavated to depths greater than three feet while avoiding conflicts with abandoned oil wells. This analysis demonstrates the feasibility of creating tidal wetlands within the lowland area of the Preserve.

Two high-touch opportunities are identified within the lowland area that would transform the site from a hydraulically isolated basin to a tidally connected tidal salt marsh. Each opportunity depicts different salt marsh features and public access areas. Figure 3-3 depicts two salt marsh areas that would be tidally connected through two separate connections to the USACE Santa Ana River Salt Marsh: (1) a southern connection via a new culvert under the access road on the southern boundary of the Preserve, and (2) via an opening in the berm along the northern USACE tidal channel. These tidal connections would feed subtidal channels routed between existing well locations to create tidal exchange to support the new salt marsh. The land around well groupings would remain at existing site elevations to protect the wells in place and provide higher elevations for habitat migration under future sea level rise. Areas adjacent to the subtidal channels would be graded to low and mid-marsh habitat elevations to support diverse salt marsh habitat. Public access, operations access, and City of Newport Beach easement access would be maintained between the two salt marsh units via a soil berm that connects to the Santa Ana River Trail. The advantages of a split marsh concept include the ability to implement two smaller, less costly projects that are phased and provide opportunities for separate funding mechanisms. A two-stage approach allows for lessons learned from implementation and management of the first phase project that may inform the second phase salt marsh project.

A second concept would establish one connected salt marsh with a single tidal exchange connection to the USACE Santa Ana River Salt Marsh (Figure 3-4). The connectivity of a single salt marsh area would provide greater habitat heterogeneity and micro-habitats that provide refugia to shore birds. The public walkway in this scenario would be elevated to allow for salt marsh habitat and hydrology continuity. Additional public access along the western berm would terminate at public viewpoints for wildlife viewing. The viewpoints could be screened with blinds to allow viewing with reduced disturbance to salt marsh wildlife. Subtidal channels and the layout of salt marsh habitats via elevation changes would adopt a similar strategy for oil well clusters and subtidal channel-adjacent habitat types.

RIPARIAN HABITAT OPPORTUNITIES

Freshwater resources are presently isolated within the central portion of the lowland area where freshwater from the adjacent residential development outfall meets the flat lowland area. Freshwater habitat is also found along the northern boundary with Talbert Regional Park (South) emanating from a stormwater outfall at 19th Street that flows westward to the USACE tidal channel. Riparian habitat supports least Bell's vireo and potentially light-footed Ridgway's rail if cattail emergent marsh is present. Retention and enhancement of riparian communities would maintain species diversity within the Preserve and satisfy project goals and objectives.

Two opportunities are depicted alongside the two high-touch salt marsh opportunities to demonstrate the relationship between freshwater and saltwater aquatic systems with the intent of preserving on-site freshwater habitat under sea level rise scenarios (Figures 3-2, 3-3, and 3-4). While the low-touch approach would enhance existing riparian vegetation communities in its current configuration, high touch opportunities would redirect freshwater flows from side canyons in the mesa to the north where creek flow would combine with water flowing out of Talbert Regional Park (South). Both opportunities would result in greater connectivity of regional freshwater systems, and a new riparian channel that would function at a higher level than the current pond that limits species diversity due to prolonged inundation. A channel would avoid prolonged inundation and allow for greater species diversity within the freshwater system.

One opportunity provides a narrow channel that hugs the upland transition (Figure 3-3). The narrow channel is intended to concentrate freshwater flow to support riparian vegetation along the entire channel reach up to the connection with the Talbert channel. The combined hydrology of these two drainages would support a wider riparian area along the northern Preserve boundary shared with Talbert Regional Park (South). The second riparian opportunity preserves the existing riparian lowland area and connecting flow to meet the Talbert channel (Figure 3-4). The sustainability of the freshwater habitat is dependent on regular leaching of salt from the soil that could migrate into the area from adjacent high salinity soils and brackish groundwater. In each opportunity, a perimeter berm is recommended to separate freshwater and saltwater hydrology. The berm would also serve as a road for public access, ranger patrols, and City of Newport Beach easement access.

UPLAND HABITAT OPPORTUNITIES

The upland opportunity areas shown in Figure 3-2 currently include a variety of native and non-native upland plant species. Upland areas occupy most of the Preserve on the east mesa areas of the property. These areas host a variety of sensitive and protected wildlife species as well as vernal pool areas. Opportunities for habitat enhancement and restoration will support the specific species that occupy upland habitats including California gnatcatcher, burrowing owl, cactus wren, white-tailed kite, and fairy shrimp. The general concept for upland habitat management is based on the designation of EMUs with boundaries that are defined by public access trails as described in the discussion of Habitat Opportunities in Section 3.5.1, Preserve Habitat Opportunities and Constraints. Various opportunities for habitat management, enhancement, and restoration occur within each EMU. Specific management projects will be developed to address upland resources by identifying EMUs through a process that includes the following steps:

- Site specific mapping of each EMU to identify areas of intact habitat, degraded native habitat, and disturbed areas where no vegetation is present.
- Prioritizing EMUs based on physical site factors as described in Section 3.7, Coastal Resilience Strategy, with consideration of cost and workforce availability.
- Developing site-specific management prescriptions as each unit is brought forward for treatment.

Site-specific plans are necessary to reflect the Management Level that would be applied to a specific EMU. Treatments may follow a low touch approach associated with Management Level 1 with subsequent treatments at higher Management Levels with associated higher effort and cost. Alternately, EMUs may be treated holistically as a single, complete project that simultaneously implements all Management Level actions involving enhancement and restoration actions where appropriate within each EMU. Changed site conditions would be incorporated into treatment plans at the time of implementation.

Accepted Preserve design emphasizes larger habitat blocks with fewer edge effects. Upland habitat blocks should respect and support viable breeding territories for California gnatcatcher within upland areas and create new resources that support other sensitive species such as burrowing owl and cactus wren. Opportunities exist to restore native vegetation communities that buffer wildlife from public trails.

3.5.2 MANAGEMENT LEVELS

3.5.3 PREFERRED APPROACH

[TBD]

3.5.4 ECOLOGICAL RESTORATION AND ENHANCEMENT PLAN

This ecological restoration and enhancement plan provides a guide to the general steps and approaches to habitat improvements and ecological functional lift that is needed to stabilize and improve ecological resources within the Preserve. The information presented in this plan applies to Intermediate and High Touch approaches corresponding to Management Level 2 and 3 actions to enhance and restore vegetation communities that are either degraded or fully disturbed. Key components of the plan include site-specific evaluations to develop an action plan for EMU treatments, key considerations for project planning, guidance for site preparation, seed and plant palette design, installation guidance, and performance guidance. Post-construction adaptive management is addressed in Section 5.3.

Subsequent project planning for each management unit will require additional studies and site evaluations to prepare individual management action plans that promote native vegetation community recovery and support the Preserve's goals and objectives of ecological diversity (the numbers and types of species on the Preserve), functional lift (the amount of improvement), and sustainability. Applicable Goals and Objectives are shown below for reference. Individual planned projects involving Management Level 1-3 actions should align with the goals and objectives.

GOAL: Ecological Resilience and Sustainability

Objective: Prioritize maintaining and improving species diversity and abundance.

- Elevate the protection of no longer present, sensitive, threatened or endangered biota, including the reintroduction of flora that is culturally significant to local Tribes.

- Seek to understand the existing components of ecological integrity that make the Preserve unique.
- Improve ecological contiguity between the Preserve and adjacent lands and waters.
- Revisit the Resource Management Plan regularly and update plan objectives based on adaptive management practices as needed.

Objective: Increase the ecological and climate resilience of the Preserve.

- Utilize nature-based solutions and Tribal Ecological Knowledge (TEK) to inform management activities of the Preserve, including, but not limited to, restoration of tidal wetlands, reintroduction of native species, and cultural burning.
- Apply science-based and Traditional Tribal approaches to understanding and mitigating impacts from stressors such as wildfire, invasive species, pests, and human impact.
- Maintain and enhance ESHA associated buffers where appropriate and feasible.

PROJECT PLANNING AND DESIGN GUIDANCE

Previous chapters describe a framework of Management Level activities and designated EMUs to plan project specific management actions designed to respond to existing site-specific conditions. Guidance provided in this chapter provides an overview of steps and considerations to design site-specific management action plans. However, the involvement of an experienced restoration ecologist will be critical to assess and weigh the myriad factors that inform the basic decisions integral to successful ecological restoration design.

At a preserve management level, a model to identify priority areas for ecological restoration and enhancement was created incorporating factors relevant to existing ecological resources, site accessibility, and amount of expected functional lift. The Prioritization Model is a tool to factor and weigh various characteristics contained within each EMU. Factors included in the Prioritization Model (below) are key to identifying high priorities for invasive and non-native species control activities under Management Level 1. Once invasive and non-native species populations in an EMU are properly treated, additional follow-up Management Level 2 and 3 activities may occur if desired.

- Invasive and non-native species invasiveness: The level of reproductive success (seed production and recruitment) and dispersal mechanism (wind and other dispersal agents such as avian wildlife [birds], etc.)
- Proximity to intact native habitat/previous mitigation sites: Ability to increase the size of existing, intact native habitat and completed mitigation areas.
- Proximity to sensitive wildlife habitat/use areas: Ability to increase ecological resources for cover, forage, and nest sites that directly benefit sensitive avian species and other wildlife.
- Slope Gradient/Site Access: A key safety consideration when volunteer workforce is used to perform invasive and non-native species control activities.

- Distance to the nearest vehicular haul route: Areas closer to haul routes allow for greater efficiency for the disposal of invasive and non-native species materials than areas vehicular haul route
- Functional Lift (Improvement): A cost/benefit factor that may inform priority areas.

Depending on the potential restoration activities and the ecological resources within specific areas, the planning and design process may require review or input from stakeholders, resource agencies, and other interested parties.

ENHANCEMENT AND RESTORATION APPROACH

A wide variety of native and non-native plant and wildlife species currently exist and utilize the Preserve. (See Sections 2.3.1 through 2.3.4 for a description of existing vegetation, plants, and wildlife). Enhancement and restoration approaches (Levels 2 and 3) may combine several techniques that promote the conversion of non-native, degraded vegetation communities to high functioning native habitat with little representation of exotic species. Present vegetation conditions and habitat quality in the Preserve reflect the land use legacy that created disturbances and allowed for opportunistic non-native and invasive species to flourish. Removal of the prior land use disturbance regime and implementation of an effective invasive and non-native species control program can reverse habitat degradation by suppressing invasive and non-native species population reproductive success and allow passive native regeneration to occur where invasive and non-native species have been removed. However, the conversion process can require many years or decades of invasive and non-native species control effort and requires a sustained focus to address invasive and non-native species populations to be successful.

More active habitat enhancement and restoration techniques that include seed and container plantings will accelerate the conversion process but still require invasive and non-native species control until maturing native vegetation reaches a sustainable threshold of vegetative cover. While active enhancement and restoration can accelerate habitat establishment, there is increased cost of implementation that can limit the size of treatment areas. Native plant species within higher germination rates from seed or low survival rates as container plants are generally recommended to be installed as seeds.

Management Level 1 activities address invasive and non-native species populations while leaving unstable habitat conditions (i.e., bare ground) that favors non-native vegetation recruitment over native vegetation recruitment. Preparation of systematic and holistic treatment plans, using all Management Level (1-3) activities within prioritized EMUs, are recommended to establish stable and self-sustaining native vegetation communities that require low post-treatment long-term management actions to maintain ecological functions.

Initial planning steps to plan and implement habitat improvement projects within a management unit will include site investigations to verify target vegetation communities shown in the Low Touch Preserve Plan (Figure 3-2). These investigations will examine physical site conditions such as soil type(s), terrain conditions (past modifications, instability), hydrology, solar aspect, proximity to intact native habitat, proximity to mapped wildlife use areas, proximity to public access, and native and non-native species composition. Other design considerations include opportunities for volunteer labor, project materials lead times, water source identification, and the means to deliver temporary supplemental water. Reference sites that support on-site examples of intact target native plant communities should be used as a model for habitat design. Reference sites should be considered for each management action involving seed mix design, and plant palettes when container planting is utilized. Ecological performance guidelines should be used as a guide to determine seed application rates and container plant densities where Management Level 2 and 3 actions are contemplated within a management unit. Comparative cost estimates of Management Level 1-3 actions that are applied to a specific site will allow for cost benefit analysis to determine the most cost-effective approach to meet Preserve goals and objectives.

Physical proximity to public use areas is also a key consideration in the habitat restoration design process. Treatment areas will require site protection during a three-to-five-year post-construction establishment period when vegetation cover is low, and as native vegetation establishes through passive revegetation or more active enhancement and restoration techniques are applied. Openings within vegetation may be attractive to members of the visiting public leading to unauthorized trails. Consideration of the phased public access should consider where enhancement efforts will occur in relation to new public access areas to avoid the potential for unauthorized trails. Temporary fencing and educational signage may be recommended based on public behaviors observed within the Preserve areas that are accessible to the public.

The Preserve supports a wide variety of habitat types that have persisted on site through decades of disturbance from oil field operations. A notable legacy of past land use is an overall reduction in species diversity within the existing vegetation communities. For example, as observed during the ecological site assessment (February 2, 2024), coastal sage scrub lacks Salvia species that would be expected within this vegetation community. In addition, California brittlebush appears to be overrepresented, and California sagebrush is underrepresented within the coastal sage scrub vegetation community (Section 2.4.3, Upland Ecological Assessment). To meet the Preserve species diversity goals, new species may be introduced that are not currently present. Species introductions may include plant species of significance to Native American Tribes that have traditional uses such as spiritual rituals, food sources, and materials used in everyday life.

The following vegetation community descriptions provide information on the target native vegetation communities that will be restored and enhanced within the Preserve (Figure 3-2). Due to the size and scale of the Preserve, these descriptions are intended as general guidelines for restoration and enhancement due to the unique variations of species composition and the ecology of each vegetation community.

COASTAL SAGE SCRUB

The coastal sage scrub vegetation community occurs in upland habitat and hosts a variety of wildlife species including California gnatcatcher (*Polioptila californica*) and cactus wren (*Campylorhynchus brunneicapillus*). Resilient and sustainable coastal sage scrub communities typically support 50-80% native vegetation cover and less than 10% non-native vegetation cover. The dominant native plant species typically found in coastal sage scrub vegetation communities includes, but is not limited to, California sagebrush, coyote bush, California brittlebush, California buckwheat, Menzie's goldenbush, bladderpod (*Cleome arborea*), purple needlegrass (*Stipa pulchra*), coast prickly pear, and coast cholla (*Cylindropuntia prolifera*). Variations of species within coastal sage scrub create sub-associations of dominant species that vary based on soil type, solar aspect, slope and other physical factors that create a competitive edge for one plant species over another. Projects targeting coastal sage scrub should recognize physical site-specific characteristics within a proposed treatment area and adjust the plant palette and species composition to respond to these factors. Site-specific investigations and the use of reference sites will aid in habitat design and effective implementation treatments.

Coastal Sage Scrub

Management activities for restoration and enhancement of the coastal sage scrub vegetation community may include site preparation, site protection, seed installation, container plant installation, maintenance, and monitoring depending upon the selected Management Level. Site restoration treatments are described below, but modifications to, or omission of, certain activities may be appropriate depending on the needs of each area undergoing restoration.

Site Preparation

Site preparation activities for the coastal sage scrub vegetation community may include one or more of the following activities: trash and debris removal, minor recontouring, soil decompaction, as-needed soil testing, as-needed soil amendments, provisions for temporary irrigation, and pre-project non-native treatments that may include grow-kill cycles, and/or incorporate cultural burning (see Section 4.4.3, Cultural Burning).

The implementation schedule of restoration activities will be dictated by seasonal rainfall timing (plant and seed installation), the nesting bird season for sensitive and protected wildlife, occupied habitat, and local noise restrictions limiting work hours in areas adjacent to residential communities.

Trash consists of all contemporary-manufactured materials, equipment, or debris dumped, thrown, washed, blown, or left within active restoration areas. Trash and inorganic debris washed or blown onto the site will be removed regularly from active restoration areas and throughout the Preserve as feasible. Deadwood and leaf litter of native trees and shrubs will be allowed to remain. Downed logs and leaf litter provide valuable micro-habitats for invertebrates, reptiles, small mammals, and birds. In addition, the decomposition of deadwood and leaf litter is essential for the replenishment of soil nutrients and minerals.

Minor recontouring with hand tools or small equipment may be required to reestablish proper hydrology (upland sheet flow) to activate restoration areas. Major grading of upland areas should not be needed and is not included as part of this RMP, but should it be determined that an area planned for restoration requires grading, construction documents shall be prepared to ensure these areas are safe, stable, and prepared in a way to foster native plant species.

Compacted soils lack the natural structure of native soil that absorbs and retains rainfall that supports native seed germination, seedling recruitment, and plant growth to establish mature plants. Soil decompaction should generally be conducted in areas of historic compaction (former access roads, oil well pads, oil operations building sites, etc.). Decompaction of soils involves deep ripping in two perpendicular directions to a depth of 6-12 inches and then track walk or otherwise lightly compact the soil surface to provide soil consolidation and provide a surface texture to resist erosion. Smaller areas or in areas surrounded by intact vegetation communities may be de-compacted with small equipment (i.e., walk behind rototiller). Prior to and during implementation of site preparation activities, it may be determined that soil testing is required to evaluate soils where suspected soil element imbalances appear to inhibit normal plant growth. Representative soils samples may be collected and analyzed by an agronomic lab. Depending on the results of the soil test, recommendations for soil amendments in the area should be evaluated and incorporated to promote healthy soils and native habitat.

At least one grow-kill cycle should be completed to reduce the existing non-native seed bank to potentially reduce the intensity of invasive and non-native species control efforts during the maintenance and monitoring period. Additional grow-kill cycles should be conducted as resources allow to further reduce the intensity of invasive and non-native species seed banks within restoration areas.

Site Protection

Site protection measures should be implemented prior to and during restoration implementation depending on the ecological resources present within or within the vicinity of the active restoration area. This includes the use of temporary fencing, signage, and the establishment of appropriate exclusionary work buffers if work is conducted in the avian breeding season or if other sensitive species are present.

Temporary fencing (post and rope or similar) may be appropriate to use in active restoration areas or other areas where limiting access is desired (i.e., restoration areas along trails and roads) to prevent visitors from potentially impacting restoration or natural areas. Additionally, temporary orange construction fencing may be installed along access routes and staging areas, as needed to protect existing native vegetation during restoration implementation.

Active restoration areas occurring adjacent to trails and roads should be posted with signage as appropriate along their northern, eastern, southern, and western boundaries to identify and indicate the presence of sensitive resources in the area.

Should work be conducted during avian breeding season, a nesting bird survey should be conducted prior to restoration implementation and prior to any work requiring the removal of or potential impact to native vegetation or other natural resources. If nests or nesting birds are observed appropriate exclusionary work buffers should be established and communicated to persons working in the areas. Vegetation removal or native cutting collection activities in these areas should also be accompanied by a nesting bird survey prior to work to ensure impacts to ecological resources on site are avoided.

Temporary Supplemental Irrigation

Temporary supplemental water is necessary when container plants are installed to accelerate the restoration process. Supplemental water is a technique used to minimize plant mortality, not to increase plant growth. The goal is to supplement normal rainfall to provide moisture to newly installed container plants until the plants develop a root system to support healthy mature growth and plant establishment that can withstand summer drought. In small treatment areas, supplemental irrigation may be delivered by periodic hand watering. Larger areas may require a piped irrigation system that is connected to a municipal water supply or may be connected to a water tank truck. Drip irrigation is the most water-efficient system to deliver water directly to each container plant. Drip systems are preferred over overhead spray systems that would not be effective on the windy mesa tops in the Preserve.

Container Plant Installation

Should container plants be included as part of the restoration process, container plant installation shall be conducted in early fall/winter following completion of grow-kill treatments of invasive and non-native species. All container plants will be checked for viability, general health, and Argentine ant infestation upon arrival at the Preserve and prior to being placed at planting locations. Plant materials not meeting acceptable standards should be rejected.

Standard planting procedures should be employed for the installation of the container plants. Excavate planting holes approximately twice the width of the root ball and the same depth using a posthole digger or power auger. In heavy soils, the sides of the excavated hole should be scarified to eliminate soil glazing that can impede root growth. Fill planting holes with water and allow it to drain immediately prior to planting. Situate the top of the plant root ball slightly above the adjacent undisturbed soil elevation and backfill the hole around the root ball with native soil to the top of the root ball (crown). Should root predation be a concern or observed within other on-site restoration areas, container plants may be installed with protective cages.

A 4- to 6-inch-high earthen planting basin shall be built to a diameter of 2 feet surrounding installed container plants, or 1.5 times the drip line of the plant, whichever is greater. Add a layer of organic mulch to the planting basin to retain soil moisture.

Seed Design and Installation

Seed installation should occur in fall/winter following container plant installation (if included in the restoration area) and the initial grow-kill treatment of invasive and non-native species. Seed should be sourced locally to the extent available through cooperative agreements with a seed supplier specializing in the collection of native seeds. Seed applications should be accomplished using hydroseed techniques for large application areas with uneven terrain. A seed mix applied to flat and gently sloping areas may be installed using a seed imprinter or seed drill. Both methods promote seed-soil contact for greater germination and seedling recruitment. Seed may be applied using hand broadcast methods into isolated areas to enhance degraded native habitat with existing native vegetation cover. Similarly, small treatment areas and areas where equipment access is limited may be hand broadcast.

Labels for each seed mixture should be inspected and approved prior to mixing and application. All seed mixes are to include the specified seed species at the prescribed rates per acre. Hydroseed applications will include virgin wood cellulose fiber mulch at 2,000 pounds per acre; commercial fertilizer (as appropriate), and an organic plant-based binder (guar gum or equivalent) at 80–100 pounds per acre, where applicable. Hand broadcast seeding will be done using a belly grinder or a dedicated seed broadcaster, with seed mixed with sand or inert bran to allow for even distribution. All hand seeded areas shall have surface soils scarified to a minimum 2" depth prior to seeding and soils spread evenly after application.

Recommended Plant Palettes

The recommended plant palette for coastal sage scrub restoration is presented in Table 3-4. The plant palette includes a diverse assemblage of co-dominant shrub and herbaceous layer species that are typical of the coastal sage scrub vegetation community. Recommended planting material and percent composition are provided as general guidance. The planting material recommendations also provide an opportunity for cost savings where successful establishment is possible using collected seeds or via live plant cuttings, depending on the resources available at the time of the restoration. The percent composition of each species is included as a general guide, but it is subject to adjustment based on the physical characteristics of each restoration area that may favor one species over another. Use of reference sites with similar physical characteristics as the treatment area provides a good indication of the appropriate species composition. Plant spacing and planting density is also site dependent.

However, plant spacing is normally representative of the characteristic mature spread that is typical for the species.

TEK held by local Native American Tribal members should be incorporated into plant palettes. For example, TEK may include the use of culturally significant species that shall be identified in plant palette table.

Table 3-4. Recommended Coastal Sage Scrub Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Recommended Coastal Sage Scrub Species Composition
Shrub Layer			
Artemisia California	California sagebrush	S, CP	30%
Baccharis pilularis	Coyote brush	S, CP	5%
Encelia californica	California brittlebush	S, CP	25%
Eriogonum fasciculatum	Flat-topped buckwheat	S, CP	15%
Isocoma menziesii	Menzies' goldenbush	S, CP	5%
Peritoma arborea	Bladderpod	CP	5%
Salvia apiana[1,2,3]	White sage	S, CP	5%
Salvia mellifera[2,3]	Black sage	S, CP	5%
Opuntia littoralis	Coast prickly pear	CP, P	5%
Herbaceous Layer			
Acmispon glaber	Deerweed	S, CP	TBD
Corethrogyne filaginifolia	Sand-aster	S	n/a
Deinandra fasciculata	Clustered tarweed	S	TBD
Distichlis spicata	Salt grass	CP	TBD
Lasthenia californica	Goldfields	S	TBD
Leymus condensatus	Giant wild rye	S, CP	TBD
Lupinus bicolor	Annual lupine	S	TBD
Lupinus succulentus	Arroyo lupine	S	TBD
Melica imperfecta	Coast range melic	S, CP	TBD
Plantago erecta	Dwarf plantain	S	TBD
Pseudognaphalium bicolor	Cudweed	S	TBD
Stipa pulchra	Purple needlegrass	S, CP	TBD

Note:

1 Culturally sacred plant species.

[2] Introduced species not currently present within the Preserve.
[3] Species beneficial to Crotch's Bumble Bee. Recommended planting materials are as follows: S=Seeding, CP=Container Planting, PC=Plant Cutting.

Maritime Succulent Scrub

The maritime succulent scrub vegetation community is a variant of the coastal sage scrub vegetation community, but contains several unique native plants and wildlife species. The main difference in these vegetation communities is the higher composition of cactus species and the landscape position each vegetation community occupies. Maritime succulent scrub vegetation community usually occupies rocky coastal bluffs and steep south facing, often rocky slopes where cactus can survive within harsh conditions that other species are unable to tolerate.

Maritime Succulent Scrub

Recommended restoration activities and their methods outlined above for coastal sage scrub are applicable to Maritime Succulent Scrub habitat restoration. A recommended plant palette for Maritime Succulent Scrub is presented in Table 3-5.

Table 3-5. Recommended Maritime Succulent Scrub Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Recommended Maritime Succulent Scrub Species Composition
Shrub Layer			
Artemisia California	California sagebrush	S, CP	20%
Baccharis pilularis	Coyote brush	S, CP	0%
Cylindropuntia prolifera	Coast cholla	CP, P	15%
Encelia californica	California brittlebush	S, CP	25%
Eriogonum fasciculatum	California buckwheat	S, CP	15%
Garrya flavescens	Ashy silk tassel	S	0%
Isocoma menziesii	Menzies' goldenbush	S, CP	5%
Lycium californica	California box-thorn	CP	0%
Peritoma arborea	Bladderpod	CP	5%
Salvia apiana[1,2,3]	White sage	S, CP	5%
Salvia mellifera[2,3]	Black sage	S, CP	5%
Opuntia littoralis	Coast prickly pear	CP, P	10%
Herbaceous Layer			
Acmispon glaber	Deerweed	S, CP	TBD
Corethrogyne filaginifolia	Sand-aster	S	TBD
Deinandra fasciculata	Clustered tarweed	S	TBD
Distichlis spicata	Salt grass	CP	TBD
Lasthenia californica	Goldfields	S	TBD
Leymus condensatus	Giant wild rye	S, CP	TBD
Lupinus bicolor	Annual lupine	S	TBD
Lupinus succulentus	Arroyo lupine	S	TBD
Melica imperfecta	Coast range melic	S, CP	TBD
Plantago erecta	Dwarf plantain	S	TBD

Table 3-5. Recommended Maritime Succulent Scrub Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Recommended Maritime Succulent Scrub Species Composition
Pseudognaphalium bicolor	Cudweed	S	TBD
Stipa pulchra	Purple needlegrass	S, CP	TBD

Note:
[1] Culturally sacred plant species.
[2] Introduced species not currently present within the Preserve.
[3] Species beneficial to Crotch's Bumble Bee. Recommended planting materials are as follows: S=Seeding, CP=Container Planting, P=Pads.

RIPARIAN WETLANDS

The riparian wetland vegetation community occurs in narrow canyons that convey runoff from the mesa top to the adjacent lowlands. These ephemeral drainages provide ephemeral freshwater flow within small stream features that provide hydrologic conditions to support a vegetation community that is dominated by a mix of hydrophytic tree and shrub species. Riparian vegetation also occurs within the disturbed lowland area as mule fat scrub and southern willow scrub vegetation communities. Low touch management actions within riparian areas will involve enhancement through invasive species removal and re-establishment of native riparian vegetation communities that are typical of on-site undisturbed riparian areas. Planned riparian wetland enhancement areas will be sustained by stormwater and nuisance flows that discharge from adjacent residential communities and Talbert Regional Park.

Riparian wetlands host a variety of wildlife species including least Bell's vireo. Resilient and sustainable riparian wetland vegetation communities typically support 70-100% native vegetation cover and less than 10% non-native vegetation cover. Dominant canopy and understory native plant species typically found in riparian wetland vegetation communities include, but are not limited to, mule fat, Goodding's willow, arroyo willow, mugwort (*Artemisia douglasiana*), salt grass, and ragweed. Areas of riparian wetlands containing these native plant species and coverage levels should be identified and validated through site specific investigations and use of reference sites to inform enhancement project design.

Riparian Wetlands

Riparian wetland vegetation community enhancement may include site preparation, site protection, seed installation, cutting installation, container plant installation, maintenance, and monitoring depending upon the selected Management Level. Enhancement treatments steps are described below. Many of these steps are similar to those described above for coastal sage scrub enhancement and restoration. Instances where modifications are unique to riparian enhancement are noted in each section. Modifications to or omission of certain activities may be appropriate depending on the needs of each treatment area.

Site Preparation

Site preparation activities for the riparian wetland vegetation community may include one or more of the following activities: trash and debris removal including old culverts, grading or recontouring to remove old road beds, soil decompaction, soil testing, soil amendments, provisions for temporary irrigation, and pre-project non-native treatments that may include grow-kill cycles, tree removal, and chemical treatment to prevent resprouts. Cultural burning is not recommended because fire containment is difficult in the narrow canyons.

The implementation schedule of restoration activities within the riparian wetland vegetation community will follow similar guidance provided in the coastal sage scrub vegetation community description including avoidance of breeding season to protect avian species.

Trash and inorganic debris within the riparian wetland vegetation community areas should be treated in a similar manner as described in the coastal sage scrub vegetation community description. Depending on the implementation of restoration within the riparian wetland vegetation community, structures such as culverts, bridges, and debris gates may be included in future designs and require monitoring and maintenance. These structures should be periodically monitored, especially prior to the wet season and cleared of major obstructions or build up to allow for uninterrupted flow and the prevention of upstream impacts or damage to infrastructure.

Grading of areas designated for riparian wetland restoration may be required to address incised channels that are too steep and unstable to support a sustainable riparian system. Channel restoration should establish 3:1 slopes or greater to mitigate the risk of bank cutting, dissipate flow energy, and provide additional area for native vegetation to establish and provide greater channel stability. Careful analysis of field conditions is necessary to understand flow patterns and identification of concentrated flow that can reach erosive velocities. Dissipation of energy through topographic modifications that reduce concentrated flow should be identified for corrective actions. Construction documents are not included as part of this RMP, but should it be determined that an area planned for restoration requires grading, construction documents shall be prepared to ensure these areas are safe, stable, and prepared in a way to support native plant species.

As-needed soil decompaction and as-needed soil amendment in the riparian wetland vegetation restoration areas should follow the guidance provided above for restoration activities targeting coastal sage scrub vegetation.

At least one grow-kill cycle should be completed to reduce the existing non-native seed bank to potentially reduce the intensity of invasive and non-native species control efforts during the maintenance and monitoring period. Additional grow-kill cycles should be conducted as resources allow to further reduce the intensity of invasive and non-native species seed banks within restoration areas.

Site Protection

Site protection measures should be implemented prior to and during restoration implementation depending on the ecological resources present within or within the vicinity of the active restoration area. This includes the use of temporary fencing, signage, and exclusionary work buffers as appropriate that follows the guidance provided above for restoration activities targeting coastal sage scrub vegetation.

Temporary Supplemental Irrigation

Temporary supplemental water within the riparian wetland restoration areas should follow the general guidance provided above for restoration activities targeting coastal sage scrub vegetation. If temporary irrigation is used in riparian wetland restoration areas, project level designs should focus on minimizing the need for temporary irrigation when in proximity to perennial and intermittent streams.

Container Plant Installation

Should container plants be included as part of the restoration process, container plant installation shall follow the general guidance provided above for restoration activities targeting coastal sage scrub vegetation.

Seed Design and Installation

Due to the narrow canyon topography, seed applications will use hand broadcast methods. Seed mix design would use similar considerations that are identified above for restoration activities targeting coastal sage scrub vegetation.

Cutting Installation

Cuttings should be installed in riparian enhancement areas only where sufficient hydrology is present to support plant development. Many areas that are cleared of invasive vegetation and the outer margins of riparian areas may not be supportive of cutting development. Cuttings will be installed along lower slopes and within lower terrace habitats along the margins of active channels where intermittent creek flow, or ponding and saturated soils persist into the late spring to support early development and sustain long-term survival. In addition to providing replacement habitat, cuttings are intended to provide stabilization for cleared slopes through rooting and establishment of vegetative biomass to anchor soils and resist erosion. The use of cuttings provides flexibility, may lower enhancement implementation costs, and may be used as an adaptive management response, especially in areas where native vegetation may exist, but additional coverage is desired.

Individual cuttings shall be harvested from healthy riparian plant species including, but not limited to arroyo willow, Goodding's willow, and mulefat located within or adjacent to the Preserve. Cuttings shall be harvested in the early winter following leaf drop and the start of seasonal dormancy. No more than 5% of plant mass shall be harvested from any existing plant.

Stem segments, approximately 0.75 to 1.5 inches in diameter shall be cut from live plants and stripped of tertiary branches and leaves. Salvaged stem segments shall be 24 to 36 inches in length for pole cuttings. Cuttings shall be submerged in water and soaked for 3 to 5 days to allow absorption of water, which stimulates root and latent leaf buds and prepares for sprouting.

Cuttings shall be installed in a planting pit between 18 to 24 inches deep and up to 2 times the width of the cutting. Native soil shall be backfilled into the planting pit. A 4-inch by 24-inch-diameter soil water basin should be placed around each installed pole cutting. The cuttings should be thoroughly watered immediately following planting.

Recommended Plant Palettes

The recommended plant palette for riparian wetland enhancement is presented in Table 3-6. General guidance regarding the plant palette, planting material, percent composition, reference sites, and plant spacing and density identified above for restoration activities targeting coastal sage scrub vegetation.

TEK held by local Native American Tribal members should be incorporated into plant palettes. For example, TEK may include the use of culturally significant species that shall be identified in the plant palette table.

Table 3-6. Recommended Riparian Wetland Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Recommended Species Composition
Tree/Shrub Layer			
Baccharis salicifolia	Mule fat	CP, PC	35%
Sambucus nigra spp. *caerulea*	Blue elderberry	CP	10%
Salix exigua	Sandbar willow	S	5%
Salix gooddingii	Goodding's willow	CP, PC	40%
Salix lasiolepis	Arroyo willow	CP, PC	10%
Herbaceous Layer			
Ambrosia psilostachya	Western ragweed	S	TBD
Artemisia californica	California sagebrush	S, CP	TBD
Artemisia douglasiana	Mugwort	S	TBD
Artemisia palmeri	Palmer's sagewort	S	TBD
Isocoma menziesii	Coastal goldenbush	S, CP	TBD
Leymus triticoides	Creeping wild rye	S, CP	TBD
Lupinus bicolor	Miniature lupine	S	TBD
Muhlenbergia rigens	Deer grass	S, CP	TBD
Phacelia cicutaria	Caterpillar phacelia	C	TBD
Phacelia parryi	Parry's phacelia	C	TBD

Note:
[1] Culturally sacred plant species
[2] Introduced species not currently present within the Preserve

[3] Species beneficial to Crotch's Bumble Bee. Recommended planting materials are as follows: S=Seeding, CP=Container Planting, PC=Plant Cutting.

SALT MARSH

Enhancement and restoration of salt marsh vegetation communities within the Preserve lowlands is addressed in the low and intermediate touch concepts (Sections 3.4.1 and Section 3.4.2). Existing salt marsh habitat occupying depressions is non-tidal and persists in these locations because of the net evaporative conditions that concentrate salinity at these locations, favoring halophytic vegetation. Low and Intermediate touch concepts would enhance the salt marsh vegetation through invasive removal and replanting without expanding the area or distribution of this community due to the lack of regular tidal influence within the lowland area.

The high touch concepts described in Section 3.4.3 present a transformation of the existing non-tidal lowland to a tidal condition that would create salt marsh vegetation communities. The tidal salt marsh vegetation community occurs in areas subject to varying periods of tidal inundation. Tidal wetlands contain hydric soils and halophytic plant species specially adapted to varying levels of tidal inundation duration and frequency based on elevations relative to the tides. Tidal wetlands host a variety of wildlife species including Belding's savannah sparrow. Resilient and sustainable tidal wetland vegetation communities typically support 60-100% native vegetation cover and less than 10% non-native vegetation cover. Native plant species typically found in tidal wetland vegetation communities include, but are not limited to, salt grass, Parish's glasswort, alkali weed), Pacific swampfire, woolly seablite, spiny rush, and turtleweed. Areas of tidal wetlands containing these native plant species and coverage levels should be identified and validated through site specific investigations for use as reference sites for comparison to active restoration areas within the Preserve.

Salt Marsh

Due to the existing land elevations and lack of tidal connection within the Preserve, large portions of historic tidal wetlands in the western portion of the Preserve have become degraded and will require restoration activities to restore full ecological functions of tidally influenced salt marsh habitat. For the purposes of this RMP, this vegetation community is divided into middle salt marsh and high/transitional salt marsh in anticipation of sea level rise. Adoption of the higher elevation salt marsh communities will reduce the effects of sea level rise in conjunction with the tidal muting effect of the USACE tide gate operations. It is acknowledged that other areas of tidal wetlands (i.e., mudflats, low marsh, shallow subtidal, etc.) exist, but are not currently included in this RMPs vegetation community restoration guidance due to constraints present within and adjacent to the Preserve. Should these additional habitat areas be included in future restoration planning efforts, native plant species representative of these vegetation communities should be included in restoration plant palettes.

Restoration of the tidal wetland vegetation community within the Preserve will involve activities that may include site preparation, site protection, seed installation, local block salvage and transplant installation, container plant installation, maintenance, and monitoring depending upon the selected Management Level. Site restoration treatments are provided below that include references to details described above for enhancement and restoration of coastal sage scrub and riparian wetlands with differences in treatments specific to this vegetation community described in detail. Modifications to or omission of certain activities may be appropriate depending on the needs of each area undergoing restoration.

Site Preparation

Site preparation activities for the tidal wetland vegetation community may include one or more of the following activities: trash and debris removal, grading or recontouring, soil decompaction, soil testing, soil amendments, tidal connection improvements, provisions for temporary irrigation, and pre-project non-native treatments that may include grow-kill cycles.

The implementation schedule of restoration activities within the tidal wetland vegetation community will follow similar guidance provided in the coastal sage scrub vegetation community description. An additional scheduling consideration specific to tidal wetland restoration includes tidal levels that may restrict restoration implementation, maintenance, and monitoring activities. Project implementation phasing may be employed to facilitate grading within the restoration site prior to making tidal connections.

Trash and inorganic debris within treatment areas should be addressed in a similar manner as described in the coastal sage scrub vegetation community description, though regular removal of trash and debris may be restricted due to tides, saturated soils, or presence of sensitive species. Depending on the implementation of restoration within the tidal wetland vegetation community, structures such as culverts, tide gates, and bridges may be included in future designs and require monitoring and maintenance. These structures should be periodically checked for blockages, especially following high tide events (i.e., king tides) and cleared of major obstructions or build up to allow for uninterrupted flow and the prevention of upstream impacts or damage to infrastructure.

Grading of areas designated for tidal wetland restoration will be required to reestablish proper tidal hydrology to the active restoration areas. Restored perimeter slopes within these areas should generally consist of 3:1 slopes or greater to provide additional areas for native vegetation to migrate up in elevation over time in response to conditions caused by sea level rise. Additional information regarding sea level rise projections and its potential impact on ecological resources within the Preserve is provided in Section 3.7. Construction documents are not included as part of this RMP, but should it be determined that an area planned for restoration requires grading, construction documents shall be prepared to ensure these areas are safe, stable, and establishing site elevations that are consistent with the requirements of tidal wetland species to foster native plant species. Any area where minor contouring is adequate to reestablish proper hydrology to the active restoration areas should follow the guidance provided above for restoration activities targeting coastal sage scrub vegetation.

As-need soil decompaction and as-needed soil amendment in the tidal wetland vegetation restoration areas should follow the guidance provided in the coastal sage scrub section.

Within low touch treatment areas at least one grow-kill cycle should be completed to reduce the existing non-native seed bank and reduce the intensity of invasive and non-native species control efforts during the maintenance and monitoring period. Additional grow-kill cycles should be conducted as resources allow to further reduce the intensity of invasive and non-native species seed banks within low touch enhancement areas.

Site Protection

Site protection measures should be implemented prior to and during restoration implementation depending upon the proximity to public access trails. This includes the use of temporary fencing, signage, and exclusionary work buffers as appropriate that follows the guidance identified above for restoration activities targeting coastal sage scrub vegetation.

Tidal Connection Improvements

Tidal connection improvements in the form of additional tidal culverts may be included as part of the re-establishment of tidal exchange and restoration of the salt marsh vegetation communities with the Preserve lowlands. If these connections are incorporated into project level designs, plant species and composition should be evaluated in response to introduced tidal action and the potential for muted or delayed tides within the Preserve. Additional studies will be required to model tidal exchange through the existing tide gate based on detailed grading plans to determine adequate flow volume is present within annual tide cycles. Analysis should address and eliminate the possibility for potential adverse effects on the existing USACE Santa Ana River Wetlands Salt Marsh Project.

Temporary Supplemental Irrigation

Temporary supplemental water within the tidal wetland restoration areas is likely needed in the higher transitional fringe areas of the salt marsh restoration site where tidal inundation is infrequent. Project level irrigation system design should focus on minimizing the need for temporary irrigation in tidally influenced areas as appropriate. Overhead spray irrigation systems are recommended due to the small size of installed plant material associated with salt marsh species. Within enhancement areas, a drip system for temporary irrigation may be desired as an alternative to hand watering, especially within large treatment areas.

Container Plant Installation

Should container plants be included as part of the restoration process, container plant installation should use similar considerations identified above for restoration activities targeting coastal sage scrub vegetation. Additional container plant installation guidance specific to tidal wetland areas includes the exclusion of earthen planting basins to avoid the trapping saltwater following a high tide, potentially resulting in accumulations of salt near container plants. The use of mulch is also not generally recommended in these areas due to the potential for tidal inundation floating away materials from their intended location. Use of earthen berms and mulch may be considered in transitional and high marsh areas or in areas excluded from tidal influence.

Seed Design and Installation

Commercially available seed in high volumes of many salt marsh species are not available. Due to the prostrate, spreading nature of salt marsh species, small container plants and cuttings are more often used in enhancement and restoration projects. Seed mixes should include a diversity of species that are typical of the target salt marsh vegetation community. Seed applications using the hand broadcast method is generally recommended in the tidal wetland restoration areas and should follow the same guidance as described above for restoration activities targeting coastal sage scrub vegetation.

Local Transplant Installation

The use and installation of direct transplants of local native wetland species can provide flexibility and provide additional species diversity during restoration implementation using plants that are salvaged from an area prior to anticipated impacts. Vegetation used for transplants should be healthy and dominate in an area prior to sourcing from these locations to avoid negatively impacting existing vegetation as much as possible. No more than 10-20% of plant mass should be harvested from any existing plant depending on the health and size of each individual source plant. Any soils that are removed should be replaced with clean native soil to maintain a uniform soil surface that promotes native vegetation regrowth into salvaged areas. Transplanted vegetation should be installed in a similar manner as container plants following guidance provided. If transplanted material is not able to be installed immediately after sourcing, any plugs or transplanted block material should be watered and securely stored until ready to be installed.

Recommended Plant Palettes

The recommended plant palette for tidal wetland restoration and non-tidal salt marsh enhancement is presented in Table 3-7. Guidance regarding the plant palette, planting material, reference sites, and plant spacing and density should use similar considerations as identified above for restoration activities targeting coastal sage scrub vegetation. Additionally, Table 3-7 shows ecological position for each plant species, but does not provide species composition due to the variable nature of salt marsh areas. Composition should be determined during the project level planning and design phases.

TEK held by local Native American Tribal members should be incorporated into plant palettes. For example, TEK may include the use of culturally significant species that shall be identified in the plant palette table.

Table 3-7. Recommended Tidal Wetland Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Ecological Position	
			Mid-Marsh	High Marsh/ Transition
Arthrocnemum subterminale	Parish's glasswort	CP		■

Table 3-7. Recommended Tidal Wetland Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Ecological Position	
			Mid-Marsh	High Marsh/ Transition
Batis maritima	Turtleweed	CP	■	
Cressa truxillensis	Alkali weed	S		■
Distichlis spicata	Salt grass	CP		■
Frankenia salina	Alkali heath	CP	■	■
Jaumea carnosa	Fleshy jaumea	CP	■	
Juncus acutus	Spiny rush	CP	■	■
Malvella leprosa	Alkali mallow	S	■	
Distichlis littoralis	Salt-flat grass	CP		■
Salicornia pacifica	Pacific swampfire	S	■	
Sueda taxifolia	Woolly seablite	CP, TP		■

Note:
1 Culturally sacred plant species
2 Introduced species not currently present within the Preserve
3 Species beneficial to Crotch's Bumble Bee. Recommended planting materials are as follows: S=Seeding, CP=Container Plants, TP=Transplanted Plugs.

VERNAL POOLS

The vernal pools of various levels of degradation are scattered across the upper mesa where soil conditions cause rainwater to pool in shallow ephemeral basins. These aquatic features often support unique vegetation and wildlife that are adapted to utilize the ephemeral hydrology to complete a species' life cycle within a short period before the pond dries up. Vernal pools host a variety of wildlife species including San Diego fairy shrimp, a federally listed endangered species.

A key goal of vernal pool restoration is to create and enhance connectivity between existing San Diego fairy shrimp-occupied vernal pools to increase the resilience of the San Diego fairy shrimp population through genetic flow improvements, greater habitat area, and greater geographic distribution. Connectivity may be achieved either through minor topographic modifications between existing adjacent pools to promote hydraulic connectivity once pools fill to maximum capacity and outflow into the adjacent pools. Alternatively, new pools may be created to facilitate a hydrological connection between more isolated pools and provide better capture of the available watershed supporting the pools. Resilient and sustainable vernal pool vegetation communities typically support 50-75% native vegetation cover and less than 5% non-native vegetation cover. Native plant species typically found in vernal pool vegetation communities include, but are not limited to, alkali weed, toad rush (*Juncus bufonius*), alkali plantain (*Plantago elongate*), woolly marbles (*Psilocarphus brevissimus*), water pygmyweed (*Crassula aquatica*), pale spikerush, smooth boisduvalia (*Epilobium campestris*), flowering quillwort (*Triglochin scilloides*), and alkali mallow (*Malvella leprosa*).

Vernal Pool

Restoration of the vernal pools will include site preparation, site protection, seed installation or placement of salvaged vernal pool inoculum, container plant installation, maintenance, and monitoring depending upon the selected Management Level. Due to the level of restoration activities required to restore or create vernal pools, a minimum of Management Level 2 actions are needed to facilitate the topographic changes required to establish an appropriate pool water depth that sustains vernal pool plant species and fairy shrimp. Typically, San Diego fairy shrimp are found in pools that impound a maximum water depth of 6 inches to 8 inches when filled. Degraded pools often contain soil materials that have washed into the pool over many years. This sedimentation decreases pool water depth and the period of inundation. In addition, soil deposition creates a thicker than normal layer of loose soil on the pool surface that soaks up rainwater and delays the accumulation of standing water. Too shallow pools do not hold water for sufficient ponding periods (two or more weeks) to support vernal pool species.

Restoration involves removal of sediment and built-up organic debris to re-establish the pool shape and water holding capacity to optimize typical vernal pool hydrology including frequency of pool inundation and speed of drawdown through evaporation. Native upland vegetation consisting mainly of coastal sage scrub species and native grasses should be established within the vernal pool contributory watershed area to act as a protective buffer, reduce non-native plant species invasion, and stabilize the soil surface to reduce sedimentation within the enhanced/restored vernal pool. The range of enhancement and restoration treatment steps are described below.

Site Preparation

Site preparation activities for the vernal pool vegetation community may include one or more of the following activities: trash and debris removal, mechanical removal of non-native vegetation, including annual grasses and invasive species, such as ice plant, vernal pool inoculum salvage, connectivity improvements between vernal pools, and minor recontouring or grading.

The implementation schedule of restoration activities within the vernal pool vegetation community will follow similar guidance provided in the coastal sage scrub vegetation community description. An additional scheduling consideration specific to vernal pool restoration includes working around the typical periods of inundation and ponding, which typically occurs from January to May when the seasonal rainfall fills the vernal pools. All work within and around existing vernal pools should occur in the dry season (August through October) when vernal pool plants and fairy shrimp are in dry season dormancy.

Trash and inorganic debris within vernal pool vegetation community areas should be removed prior to grading. Vernal pool sites should be cleared of all non-native vegetation. If there is evidence of vernal pool species or the presence of San Diego fairy shrimp, dry season inoculum should be salvaged for the top 1-inch of soil. Inoculum should be stored in breathable containers and stored in a cool, dry location until placement out in restored vernal pools.

Improved connectivity between vernal pools should be considered when restoring vernal pools that are in relative proximity. Establishment of connectivity between vernal pools should be considered during project level planning especially if the vernal pools contain existing populations of San Diego fairy shrimp. To facilitate the enhancement and restoration of vernal pool habitat, minor recontouring or grading may be appropriate depending on the pool bottom profile and input and output elevations to create depths adequate to support San Diego fairy shrimp and native vernal pool plant species. For San Diego fairy shrimp this typically occurs to depths ranging from approximately 6 to 8 inches. Recontouring or grading should create microtopographic heterogeneity using variable pool shapes, rocks, and other microtopographic features that may benefit plant and invertebrate species.

Site Protection

Site protection measures should be implemented prior to and during restoration implementation depending on the proximity of the retreatment area to active public trails and use areas. Site protection may include temporary fencing, signage, and exclusionary work buffers as appropriate. As previously mentioned, restoration activities should generally occur during the dry season when fairy shrimp and vernal pool plants are in the cyst stage.

Temporary Supplemental Irrigation

Temporary supplemental water within the vernal pool restoration areas should avoid spraying into vernal pools. Irrigation should only be used to establish native upland vegetation within the vernal pool contributory watershed. Project level irrigation design should focus on irrigating vegetation surrounding the vernal pool.

Container Plant Installation

As part of the restoration process, if container plant are used, installation should follow similar considerations as identified above for restoration activities targeting coastal sage scrub vegetation.

Seed Design and Installation

Seed applications using the hand broadcast method is generally recommended in vernal pool restoration areas as described above for restoration activities targeting coastal sage scrub vegetation in the Coastal Sage Scrub Section.

Recommended Plant Palettes

The recommended plant palette for vernal pool restoration is presented in Table 3-8. General guidance regarding the plant palette, planting material, percent composition, reference sites, and plant spacing and density should use similar considerations as identified as above for restoration activities targeting coastal sage scrub vegetation.

TEK held by local Native American Tribal members should be incorporated into plant palettes. For example, TEK may include the use of culturally significant species that shall be identified in the plant palette table.

Table 3-8. Recommended Vernal Pool Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Composition
Crassula aquatica[2]	Water pygmyweed	S	TBD
Cressa truxillensis	Alkali weed	S	25%
Deschampsia danthonoides[2]	Annual hairgrass	S	TBD
Eleocharis macrostachya	Creeping spikerush	S	15%
Epilobium campestris[2]	Smooth boisduvalia	S	TBD
Eryngium aristulatum ssp. parishii	San Diego button-celery	S	TBD
Psilocarphus brevissimus	Woolly marbles	---	10%

Table 3-8. Recommended Vernal Pool Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Composition
Juncus bufonius	Toad rush	---	10%
Lasthenia californica	Goldfields	S	5%
Malvella leprosa	Alkali mallow	---	5%
Plagiobothrys acanthocarpus[2]	Adobe popcornflower	S	TBD
Plantago elongata	Prairie plantain	S	10%
Triglochin scilliodes[2]	Flowering-quillwort	S	TBD

Note:
1 Culturally sacred plant species
2 Introduced species not currently present within the Preserve
3 Species beneficial to Crotch's Bumble Bee. Recommended planting materials are as follows: S=Seeding, CP=Container Plants, TP=Transplanted Plugs.

GRASSLANDS

Grassland habitat occurs in open upland areas within the Preserve and contains a mix of native and non-native plant species. Due to the long process and uncertain outcome of converting non-native grasslands to native grasslands, the establishment and restoration of the grassland vegetation community should increase species diversity within the grasslands rather than conversion to wholly native bunchgrass grasslands. This is largely due to the cost-benefit of attempting grassland conversion efforts and the similar ecological functions native and non-native grasslands provide in terms of wildlife forage, nesting resources, and cover for avoidance of predation. If resources are available to support full conversion of grassland areas, then non-native grass species performance standards and control should be considered.

Grassland vegetation communities host a variety of passerine wildlife species (perching birds) including Belding's savannah sparrow and burrowing owl. Resilient and sustainable grassland vegetation communities typically support 50%-100% native vegetation cover. Native plant species typically found in grassland vegetation communities include, but are not limited to, purple needle grass, foothill needlegrass (*Stipa lepida*), coast range melica (*Melica imperfecta*), California goldfields (*Lasthenia californica*), purple owl's clover (*Castilleja exserta*), annual lupine (*Lupinus bicolor*), as well as various non-native grasses species. Areas of grassland habitat containing these native plant species and coverage levels should be identified and validated through site specific investigations for use as reference sites for comparison to active restoration areas within the Preserve.

Grasslands

Grassland plant and seed palettes will include perennial and annual species that are important to pollinators and other insects, including the Crotch's bumble bee and the monarch butterfly. Grassland species will include wild heliotrope (*Phacelia distans*), blue dick (*Dichelostemma capitatum*), and deerweed, all known to be preferred nectar sources for the bumble bee. Narrow-leaf milkweed (*Asclepias fascicularis*), a known larval host plant for the monarch butterfly, will also be included to help benefit this butterfly.

Enhancement of the grassland vegetation community includes management activities such as site preparation, site protection, seed installation, maintenance, and monitoring depending upon the selected Management Level. Enhancement treatments steps are described below. Many of these steps are similar to those described above for restoration activities targeting coastal sage scrub vegetation. Instances where modifications are unique to grassland enhancement are noted in each section. Modifications to or omission of certain activities may be appropriate depending on the needs of each enhancement area.

Site Preparation

Site preparation activities for the grassland vegetation community may include one or more of the following activities: trash and debris removal, minor recontouring, soil decompaction, soil testing, soil amendments, provisions for temporary irrigation, and pre-project non-native treatments that may include grow-kill cycles, and/or incorporate cultural burning (see Section 4.4.3).

The implementation schedule of enhancement activities within the grassland vegetation community should use similar considerations that are identified above for restoration activities targeting coastal sage scrub vegetation.

Trash and inorganic debris within the grassland vegetation community areas should use similar considerations that are identified above for restoration activities targeting coastal sage scrub vegetation.

In areas where existing grassland occurs within the contributory watershed of an existing vernal pool, guidance provided in the vernal pool section should be referenced. Grading of grassland enhancement areas will likely not be required. Should grading be determined to be necessary, construction documents should be prepared to ensure these areas are safe, stable, and prepared in a way to foster native plant species.

As-need soil decompaction and as-needed soil amendment in the grassland enhancement areas should follow the guidance provided above for restoration activities targeting coastal sage scrub vegetation. If soil decompaction or soil amendment activities are required in grassland vegetation communities that occur in the vicinity of vernal pools, guidance in the vernal pool section should be referenced.

At least one grow-kill cycle or cultural burn event should be completed to reduce the existing non-native seed bank to potentially reduce the intensity of invasive and non-native species control efforts during the maintenance and monitoring period. Additional grow-kill/cultural burn cycles should be conducted as resources allow to further reduce the intensity of invasive and non-native species seed banks within enhancement areas. If full conversion of non-native grassland to native grassland is included in project level planning and implementation, repeated grow-kill/cultural burn events are recommended for one to two years prior to the installation of a native grass seed mix.

Site Protection

Site protection measures should be implemented prior to and during enhancement treatment depending on the proximity to public access and public activities. Site protection may include the use of temporary fencing, signage, and exclusionary work buffers as appropriate that follows the guidance provided in the coastal sage scrub section. If grassland restoration areas occur within the vicinity of vernal pools then site protection guidance provided in the vernal pool section should be referenced including fencing of the vernal pool watershed boundary. Additionally, due to the potential for burrowing owl occurrences, surveys for burrows and burrowing owls should be conducted prior to enhancement activities, as appropriate.

Temporary Supplemental Irrigation

Temporary supplemental water within the grassland restoration areas should use similar considerations that are identified above for restoration activities targeting coastal sage scrub vegetation.

Container Plant Installation

Should container plants be included as part of the restoration process, container plant installation should use similar considerations that are identified above for restoration activities targeting coastal sage scrub vegetation.

Seed Design and Installation

Seed applications using the hand broadcast seeding or hydroseed method is generally recommended in grassland restoration areas as described above for restoration activities targeting coastal sage scrub vegetation.

Recommended Plant Palettes

The recommended plant palette for grassland restoration is presented in Table 3-9. Guidance regarding the plant palette, planting material, percent composition, reference sites, and plant spacing and density should use similar considerations that are identified above for restoration activities targeting coastal sage scrub vegetation.

TEK held by local Native American Tribal members should be incorporated into plant palettes. For example, TEK may include the use of culturally significant species that shall be identified in the plant palette table.

Table 3-9. Recommended Grassland Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Recommended Species Composition
Acmispon glaber	Deerweed	S	TBD
Amsinckia menziesii	Fiddleneck	S	TBD
Asclepias fascicularis[2,4]	Narrowleaf milkweed	S	TBD
Calochortus splendens	Splendid mariposa lily	S	TBD
Calystegia macrostegia ssp. *Cyclostegia*	Coast morning glory	S	TBD
Camissonia bistorta	California suncup	S	TBD
Castilleja exserta	Purple owl's clover	S	2%
Dipterostemon capitatus	Blue dicks	S	TBD
Lasthenia californica	Goldfields	S	15%
Lupinus bicolor	Annual lupine	S	15%
Melica imperfecta	Coast range melic	S, CP	15%
Phacelia cicutaria[2,3]	Caterpillar phacelia	S	TBD
Plantago erecta[2,3]	California plantain	S	TBD
Stipa lepida	Foothill needlegrass	S, CP	15%
Stipa pulchra	Purple needlegrass	S, CP	30%

Table 3-9. Recommended Grassland Plant Palette

Botanical Name	Common Name	Recommended Planting Material	Recommended Species Composition
Verbena lasiostachys	Western verbena	S	8%

Note:
1 Culturally sacred plant species.
2 Introduced species not currently present within the Preserve.
3 Species beneficial to Crotch's Bumble Bee
4 Species beneficial for monarch butterfly. Recommended planting materials are as follows: S=Seeding, CP=Container Planting.

3.5.5 INVASIVE AND NON-NATIVE VEGETATION MANAGEMENT

Invasive and non-native vegetation management will be implemented to achieve the Preserve's goals and objectives outlined in Section 1.4. Invasive and non-native vegetation proximity to existing native vegetation and sensitive wildlife species was included as a primary factor to identify EMUs where restoration should be prioritized (Figure 3-2). Treatment of invasive and non-native vegetation within the Preserve will occur in designated areas undergoing active restoration following the guidance provided in the following sections. Effective invasive and non-native vegetation treatment shall suppress invasive and non-native species seed production and allow for native vegetation recruitment in areas not occupied by non-native vegetation. Should progress towards managing and treating invasive and non-native species using the guidance provided in this RMP be determined to be inadequate, a dedicated Integrated Pest Management Plan may be necessary to develop and implement.

INVASIVE PLANT SPECIES

Invasive plant species that thrive in habitat preserves and edge habitats are a well-documented problem in Southern California and throughout the United States. There are numerous adverse effects of invasive non-native species in natural open areas, including, but not limited to, exotic plant competition for light, water, and nutrients, and the formation of thatches that block sunlight from reaching smaller native plants. Exotic plant species may alter habitats and displace native species over time, leading to extirpation of native plant species and unique vegetation communities (Bossard et al. 2000).

Of the 70 non-native plant species identified within the Preserve, 5 have been rated as highly invasive and 23 have been rated as moderately invasive by the California Invasive Plant Council (Cal-IPC). Table 3-10 provides a list of invasive species observed within the Preserve and their associated Cal-IPC rating.

Table 3-10. Non-Native and Invasive Plant Ratings Summary

Non-Native and Invasive Plants Ratings Summary*		
Scientific Name	Common Name	Cal-IPC Rating
Carpobrotus edulis	Ice plant	High
Tamarix ramosissima	Tamarisk	High
Arundo donax	Giant reed	High
Cortaderia jubata	Purple pampas grass	High
Cortaderia selloana	Uruguayan pampas grass	High
Carpobrotus chilensis	Sea fig	Moderate
Mesembryanthemum crystallinum	Common ice plant	Moderate
Schinus terebinthifolia	Brazilian peppertree	Moderate
Conium maculatum	Poison hemlock	Moderate
Foeniculum vulgare	Fennel	Moderate
Carduus pycnocephalus	Italian plumeless thistle	Moderate
Centaurea melitensis	Maltese star-thistle	Moderate
Cirsium vulgare	Bull thistle	Moderate
Cynara cardunculus	Cardoon	Moderate
Brassica nigra	Black mustard	Moderate
Hirschfeldia incana	Shortpod mustard	Moderate
Lythrum hyssopifolia	Hyssop loosestrife	Moderate
Myoporum laetum	Myoporum	Moderate
Nicotiana glauca	Tree tobacco	Moderate
Washingtonia robusta	Washington fan palm	Moderate
Avena barbata	Slender oat	Moderate
Avena fatua	Wild oat	Moderate
Brachypodium distachyon	Purple false brome	Moderate
Bromus diandrus	Ripgut brome	Moderate
Cynodon dactylon	Bermudagrass	Moderate
Festuca myuros	Rat-tail fescue	Moderate
Festuca perennis	Perennial rye grass	Moderate
Hordeum murinum	Mouse barley	Moderate
Mesembryanthemum nodiflorum	Slenderleaf ice plant	Limited
Schinus molle	Peruvian peppertree	Limited
Carduus tenuiflorus	Winged plumeless thistle	Limited

Table 3-10. Non-Native and Invasive Plant Ratings Summary

Non-Native and Invasive Plants Ratings Summary*		
Cotula coronopifolia	Brass buttons	Limited
Glebionis coronaria	Crowndaisy	Limited
Helminthotheca echioides	Bristly oxtongue	Limited
Silybum marianum	Blessed milkthistle	Limited
Brassica rapa	Field mustard	Limited
Sisymbrium irio	London rocket	Limited
Bassia hyssopifolia	Fivehorn smotherweed	Limited
Salsola tragus	Prickly Russian thistle	Limited
Ricinus communis	Castor bean	Limited
Medicago polymorpha	Burclover	Limited
Marrubium vulgare	Horehound	Limited
Eucalyptus camaldulensis	River redgum	Limited
Eucalyptus globulus	Tasmanian bluegum	Limited
Olea europaea	Olive	Limited
Rumex crispus	Curly dock	Limited
Bromus hordeaceus	Soft brome	Limited
Polypogon monspeliensis	Annual rabbitsfoot grass	Limited
Raphanus sativus	Cultivated radish	Limited
Acacia longifolia	Sydney golden wattle	Watch
Acacia pycnantha	Golden wattle	Watch

Note: Non-rated plant species were omitted from table

Herbicide Compliance

When performing pest control, all applicable laws, regulations, safety precautions, and label directions must be followed. State laws and regulations regarding pest control and pesticides (i.e., vector or invasive and non-native species control, pest eradication, or fishery management) are contained in the Food and Agriculture Code and the California Code of Regulations.

In accordance with state law, possible treatment options for prevalent invasive non-native plant species are provided, but this does not dictate the specific methods or materials that must be used to control invasive exotic plant pest species at specific sites within the Preserve. Actual methods and materials will depend on the specific environmental conditions present at the active restoration areas at the time when control measures are undertaken. At the time of treatment, the contractor or entity performing the control work will obtain a written recommendation from a licensed Pest Control Adviser (PCA). Depending on the circumstances and pesticide used, a written recommendation may not be required, and a Qualified Applicator

License or Qualified Applicator Certificate may make the decisions required for specific pesticide applications under the terms of their license or certificate.

In accordance with the California Food and Agriculture Code, Section 12003, a written recommendation must be signed and dated and shall be furnished to the operator of the property, the dealer, and the applicator prior to the application. Each recommendation must include the following:

(a) the name and dosage of each pesticide to be used or description of the method recommended;

(b) the identity of each pest to be controlled;

(c) the owner or operator, location of, and acreage to be treated;

(d) the commodity, crop, or site to be treated;

(e) suggested schedule, time, or conditions for the pesticide application or other control method;

(f) a warning of the possibility of damages by the pesticide application that reasonably should have been known to exist by the pest control adviser;

(g) signature and address of the person making the recommendation, the date, and the name of the business the person represents; and,

(h) any other information the director may require.

In accordance with the California Food and Agriculture Code, Section 12004, Agricultural PCAs and agricultural pest control operators shall retain one copy of each written recommendation for one year following the date of each recommendation. A copy of the recommendation must be immediately provided to the Agricultural Commissioner upon request. A PCA recommendation is valid for a maximum of 1 year.

In addition to the requirements for Section 12003, the standards for recommendations are established in the Food and Agricultural Code Section 6556 and include the following:

(a) total acreage or units to be treated;

(b) concentration and volume per acre or other units;

(c) worker re-entry interval, if one has been established; preharvest or preslaughter interval, and label restrictions on use or disposition of the treated commodity, byproducts or treated area;

(d) criteria used for determining the need for the recommended treatment; and

(e) certification that alternatives and mitigation measures that would substantially lessen any significant adverse impact on the environment have been considered and, if feasible, adopted.

Pesticide registrations, laws, regulations, and label directions change regularly, so this RMP presents general information only. Refer to the specific herbicide label for information about approved methods, proper timing, and application rates. The contractor must follow all applicable label directions, laws, regulations, and safety precautions when performing pest control. It is up to the pesticide applicator to abide by the most current pesticide laws and regulations.

To apply pesticides for hire, state law requires that the contractor performing pest control have a valid Qualified Applicator Certificate or Qualified Applicator License from the State of California, as appropriate to the contractor's situation. If a contractor is performing the work, the contractor must also have a valid Pest Control Business License. If the contractor performing the pest control work needs specific pest control recommendations for any particular pest-control effort, the contractor should consult a licensed PCA for a written recommendation.

A National Pollutant Discharge Elimination System (NPDES) permit is required if any pesticides are applied to or come in contact with waters of the United States. If herbicides are applied to or contact with water, enrollment under Water Quality Order No. 2013-0002-DWQ, General Permit No. CAG990005, Statewide General NPDES Permit for the Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications, or any subsequent permit, will be required prior to applying pesticides to the water.

Herbicides may be legally applied to any portion of the management area without an NPDES permit, so long as herbicides are not applied to or do not contact with open water, and all other legal requirements are met. Aquatic herbicides are not legally required for use in wetland areas unless the herbicide will directly contact open water, or unless label directions prohibit their use (some pesticides have restrictions in tidal zones or where saturated soil is present).

AVAILABLE INVASIVE SPECIES CONTROL RESOURCES

Cal-IPC maintains invasive plant management information on its website at http://www.cal-ipc.org/ip/management/index.php. Information available includes invasive plant profiles, invasive plant alerts, and a list of current references. The 2025 Cal-IPC Invasive Species Inventory and any updates to it, can be found at https://www.cal-ipc.org/plants/inventory/ (Cal-IPC 2025).

The University of California Statewide Integrated Pest Management Program maintains a website with extensive information about pest identification and management at http://www.ipm.ucdavis.edu/default.html (UCIPM 2025).

Up-to-date specimen labels and material safety data sheets for most currently registered agrochemicals can be found in a database maintained on the Crop Data Management Systems Inc. website at http://www.cdms.net/LabelsMsds/LMDefault.aspx (CDMS 2025). Pesticides can be searched for by either manufacturer or product name. Current pesticide labels and material safety data sheets can also be obtained from the manufacturer and product suppliers.

Other useful published resources include Weeds of California and other Western States, Volume 1, Aizoaceae–Fabaceae (DiTomaso and Healy 2007a) and Weeds of California and other Western States, Volume 2, *Geraniaceae–Zygophyllaceae* (DiTomaso and Healy 2007b); Aquatic and Riparian Weeds of the West (DiTomaso and Healy 2003); Invasive Plants of California's

Wildlands (Bossard et al. 2000); Pests of Landscape Trees and Shrubs: An Integrated Pest Management Guide (Dreistadt 1994); and Natural Enemies Handbook: The Illustrated Guide to Biological Pest Control (Flint and Dreistadt 1998).

INVASIVE AND NON-NATIVE VEGETATION TREATMENT

All non-native vegetation including perennial and annual non-native species will be removed from active restoration areas within the Preserve prior to planting and seeding, as applicable. Following irrigation installation at least one grow-kill cycle should be completed to reduce the existing non-native seed bank and to potentially reduce the intensity of invasive and non-native species control efforts during the maintenance and monitoring period.

Invasive perennial species anticipated for removal and follow up control include, but are not limited to, Uruguayan pampas grass, purple pampas grass, poison hemlock, Brazilian pepper, giant reed, and ice plant. Annual and biennial non-native 'weedy' species anticipated for removal and follow up control include, but are not limited to, bull thistle (Cirsium vulgare), blessed milkthistle (*Silybum marianum*), short-pod mustard, Maltese star-thistle (*Centaurea melitensis*), and annual grasses and other nuisance forbs.

Herbaceous Non-Native Vegetation Treatment

Physical removal is the best method for non-native herbaceous species for which the root ball can readily be pulled out with the above ground portions of the plant. These species will be physically removed before seed-set. If hand removal is only possible after seed-set, then seed heads should be cut off, bagged, and removed from the site prior to the removal activity. Physical removal may be used in combination with mechanical removal (string trimming), but only in areas where there is no threat of impacts to adjacent natives and only if preapproved by the land manager in each case.

Herbicide control will be used when roots cannot be completely removed and for invasive perennial species, or for non-natives that have root systems that are impractical to remove by hand. The land manager will coordinate with the restoration contractor/pesticide applicator to identify specific locations where herbicides are required and identify any restrictions. Chemical treatment may follow hand and mechanical removal activities to increase the effectiveness of subsequent herbicide treatments.

Grow-kill cycles will consist of allowing time for non-natives to grow after the initial removal/treatment and ideally after the first fall seasonal rain and then controlling them (typically with a broad-spectrum herbicide) prior to revegetation activities. The amount of time to allow the non-natives to grow will depend on weather conditions and any potential active watering. If there has been adequate natural and supplemental watering, non-natives should begin to grow within one to two weeks and could be controlled within two to four weeks afterward. The timing of grow-kill cycles will be evaluated by the land manager to ensure that the treatments are timed appropriately and that native seedlings are recognized by the restoration contractor and avoided during implementation.

Large Woody Non-Native Vegetation Treatment

This category of non-natives includes non-native perennial woody trees and shrub species, and other naturalized woody species identified on site during restoration implementation. Non-native trees will be cut to grade, stump treated with herbicide, and all biomass removed from the site. If removal may impact native vegetation, then treatment will include girdling, treating with an appropriate herbicide to affect kill, then leaving standing. Woody non-native trees will be selectively removed from the Preserve, treated and disposed of off site in a legal manner or be used on site in an appropriate manner.

Access to woody non-native trees will be from a route flagged in the field by the land manager to minimize impacts to adjacent native vegetation, with processing in designated staging areas in adjacent disturbed or developed upland habitat within the Preserve. Felled trees shall be sectioned and hauled to the designated staging areas where it will either be chipped and removed from the site and disposed of at an approved green waste facility or used on site in an appropriate manner. Cut stumps will be treated with an appropriate herbicide based on PCA recommendations. Larger trees may be girdled or treated by injection and left standing (to leave structures called “snags” for wildlife). Typically trees over 16” DBH (Diameter Breast Height) will be left standing (to leave high canopy and nest cavities for wildlife). Rubber-tired skidders will be used to haul felled trees to a staging area for chipping. No material will be stockpiled in native habitat or jurisdictional areas.

It is expected that follow-up herbicide applications will be necessary for highly aggressive species that cannot be killed with one herbicide application. Follow-up herbicide treatment shall be conducted at the biologically appropriate time when the recovering plants are still relatively small and before they have time to regain strength and vigor. Follow up treatment may be required for many invasive perennial species during active restoration.

Invasive Non-Native Plant Treatment Methods

Treatment of aggressive, rapidly colonizing non-native plant species that compromise the quality and functions of natural habitats will be the focus of regular control. Species include those listed on the Cal-IPC California Invasive Plant Inventory Database (Cal-IPC 2025) throughout the southwestern region of the California Floristic Province as a moderate to high threat of ecological impact to wetland/riparian and upland vegetation communities.

Treatment may involve hand pulling prior to seed-set (for species where the entire root mass may be removed), herbicide application, cutting, physical removal, or a combination thereof. Mechanical or hand control methods will be used where herbicide cannot be used, or the level of invasive species does not warrant the use of herbicides. Should mechanical or hand control methods be used, invasive species will be pulled and/or cut when plants are 6–12 inches tall or when they can be positively identified, and prior to the formation of seed heads.

Biomass from non-native vegetation shall be removed from the site and disposed of in a legal and appropriate manner. Care should be taken to avoid spreading root, shoot, or seed material from non-native plant species around the management area which may provide opportunity for dissemination and subsequent colonization. No slash shall be stored on the project site.

Invasive species control will be implemented on an as-needed basis and, as such, may be implemented year-round depending on invasive species populations and growth status. If invasive species control is conducted during the breeding season, avian surveys will be conducted and any identified nest will be flagged and avoided. Should treatment be required during the breeding season (generally February 15 through September 15), a qualified biologist will conduct nesting bird surveys prior to control efforts.

Pesticide label directions change with some frequency, and occasionally new products are introduced, or old ones are withdrawn. Currently registered herbicides that may be used for invasive species control in the Preserve should be approved by the land manager and PCA prior to use. Specific herbicide application rates and methods will be based on manufacturer specifications, and will adhere to the following general guidelines:

Herbicide treatments must be pre-approved by the land manager. Herbicides that have the potential to come in contact with open water must be approved for use within wetland areas. Application methods will follow manufacturer specifications regarding application and safety procedures. Herbicide application will comply with state and local regulations. All application tasks will be performed by or under supervision of a licensed applicator with the Pest Control Business License issued by the State of California Department of Pesticide Regulation and registered with the Orange County Agricultural Commissioner. Herbicide application will consist of spot applications to individual plants where invasive species coverage is sparse and broadcast applications to dense patches of invasive species where native species are not establishing. Applications will be uniform and complete. Contact with native species must be avoided. In the event of gusty winds or winds in excess of 10 miles per hour, application work will be temporarily discontinued to protect applicators and adjacent natural resources from herbicide drift. Treatment will not occur if rainfall is predicted within the next 72 hours and will be temporarily discontinued in the event of rainfall since that reduces the effectiveness of the herbicide. Sprayed vegetation will be left undisturbed for 7 days to allow the herbicide to be distributed throughout the entire plant. Visible effects of herbicide application consist of wilted foliage, brown foliage, and disintegrated root material. Excessive dead invasive species materials will be removed from the soil surface and disposed of off site.

The need for follow-up invasive species control measures will depend on the species being controlled, how successful the initial efforts were, and whether new invasive propagules are becoming established in the management area. Some invasive species require 2 to 3 years of properly timed treatment to kill the plants (Bossard et al. 2000; Di Tomaso and Healy 2003; Tu et al. 2001). Follow-up herbicide treatment should be done at the biologically appropriate time when the recovering plants are still relatively small and before they have time to regain strength and vigor.

Provided below are treatment recommendations for seven of the most prevalent and highly rated invasive and non-native plant species found throughout the Preserve at the time of the preparation of this RMP. If other non-native and invasive species are present that are not included within this list, methods for effective control can be found through resources discussed in Section 4.3.1, Invasive Non-Native Plants, and by consulting with a PCA.

Pampas Grass – *Cortaderia selloana* – Cal-IPC Rating: High

Pampas grass was observed within the Preserve during biological site surveys. This species is spread by wind-blown seed. Pampas grass will likely require ongoing control of new plants. If the plants begin blooming before control measures are undertaken, the flower stalks should be carefully cut off and bagged to prevent seed dispersal. Small plants can be pulled, and larger plants will either need to be cut down and/or sprayed with herbicide. Pampas grass can be effectively treated with herbicide year-round. Repeated treatments may be necessary for established plants (DiTomaso et al. 2013).

Brazilian and Peruvian Pepper Tree – *Schinus terebinthifolia* and *Schinus molle* – Cal-IPC Rating: Moderate and Limited

Pepper tree was observed within the Preserve during biological site surveys. Pepper tree is a common ornamental tree species from South America that volunteers into upland and wetland areas. The trees should be cut down and stump treated with an herbicide such as glyphosate (Aquamaster, Roundup Pro, etc.) or triclopyr (Garlon 3A, Garlon4 Ultra, Pathfinder II), following label directions. Sprouting stumps can then be sprayed with a dilute herbicide solution, following label directions (DiTomaso et al. 2013).

Giant Reed – *Arundo donax* – Cal-IPC Rating: High

Giant reed was observed within the Preserve during biological site surveys. Giant reed can be removed by hand if the new plants are discovered early enough. It should be physically removed as soon as discovered. Giant reed can spread when fragments of stems and rhizomes break off and are carried downstream. All material should be removed and disposed of off site. If giant reed plants are not treated before they become well-established, a combination of cutting and immediate application of an herbicide such as glyphosate (Aquamaster, Roundup Pro, etc.) work well with this species. Repeat herbicide treatment will be required to manage and eradicate the species. For this species, herbicide treatments are most effective in the fall months when this species has the highest rate of growth. If a frost occurs, the herbicide will not effectively translocate down to the rhizomes and roots in this species, so herbicide treatments should be suspended until frost conditions have ended (DiTomaso et al. 2013)

Ice plant – *Carpobrotus edulis* – Cal IPC Rating: High

Ice plant was observed within the Preserve during biological site surveys. This species reproduces both vegetatively by stem fragments and by seed. Hand pulling and mechanical removal of ice plant is effective at any time of year. All live plant and stem fragments must be removed from contact with the soil to prevent resprouting, due to its ability to grow roots and shoots from any node. At least one follow up visit is recommended to remove resprouts. Hand pulling is labor intensive, but can be aided by the use of heavy equipment (skid-steer, bobcat, etc.). Chemical treatment (Glyphosate) is also an effective method of control with applications most effective when applied to plants from the plant is rapidly growing (DiTomaso et al. 2013).

Poison Hemlock and Sweet Fennel – *Conium maculatum* and *Foeniculum vulgare* – Cal IPC Rating: High and Moderate

Poison hemlock and sweet fennel were observed within the Preserve during biological site surveys. Poison hemlock is highly toxic to humans and animals and reproduces by seed only. Sweet fennel is an aromatic perennial that is not toxic, and it reproduces by seed and sometimes vegetatively from root or crown fragments.

Hand removal is recommended for small infestations of both poison hemlock, making sure to dig down and remove the entire taproot. Cutting is not effective for poison hemlock and germination of seed is not uncommon following removal of individuals. It is recommended to wear gloves and wash hands after working with poison hemlock. A wide variety of chemical treatments options are available and include but not limited to Glyphosate, Imazapyr, Triclopyr and are available and effective as pre-emergent and post-emergent applications. (DiTomaso et al. 2013).

Cutting (hand chopping) of small infestations of sweet fennel can be effective but labor intensive. Larger individuals have substantial roots that will need to be removed. Slashing should be conducted prior to flowering with repeat slashings of regrowth needed to be effective. Chemical treatment options include Glyphosate, Triclopyr, and 2,4-D. All chemical treatment options are effective as post-emergent applications. (DiTomaso et al. 2013).

Salt cedar – *Tamarix ramosissima* – Cal-IPC Rating: High

Salt cedar was observed in the Preserve during biological site surveys and is a bushy tree that can be difficult to control and will likely require repeated herbicide treatments. Mechanical methods such as cutting the plants down without the use of herbicides are ineffective because the plants have extensive root systems that will sprout new growth. Salt cedar is best controlled by cutting and immediately treating the cut areas with an herbicide treatment, the stump and root sprouts will need to be repeatedly cut and sprayed several times a year until there is no regrowth and the plants are dead. Timing depends on the herbicide material used. Triclopyr with the trade names Garlon 4 Ultra and Pathfinder II can be used year-round, while Garlon 3A should only be used during the growing season. For glyphosate, various Roundup formulations and similar products, treatment should only be done during late spring to early fall during active growth (Bossard et al. 2000). Imazapyr (Arsenal AC, Habitat, Stalker, Chopper, Polaris) can be used in late summer or early fall when plants are fully expanded (DiTomaso et al. 2013).

3.5.6 ECOLOGICAL PERFORMANCE GUIDELINES

The following ecological performance guidelines are intended to provide target values to achieve the Preserve's goals and objectives previously described in Section 1.4. Performance guidelines are intended to inform and provide flexibility during site specific implementation design that will direct implementation of restoration areas for each vegetation community, as appropriate. Ecological performance guidelines will inform adaptive management decisions during post-construction maintenance and monitoring periods to assess and determine the trajectory of native vegetation community development. Deviations from performance guidelines would provide an indication of the need for remedial actions to bring underperforming enhancement and restoration back to an appropriate developmental trajectory to ultimately meet performance guideline standards.

The vegetation-based performance guidelines are presented as ranges of vegetative coverage for invasive and non-native vegetation and native vegetation within each of the target vegetation communities previously discussed. Non-native vegetation guidance is provided at a level to promote habitat sustainability with low management effort. Coastal sage scrub vegetation communities should achieve native vegetation coverage of 50-80%, non-native vegetation coverage of ≤10%, and ≤1% of invasive non-native vegetation coverage. Maritime scrub vegetation communities should achieve native vegetation coverage of 50-80%, non-native vegetation coverage of ≤10%, and ≤1% of invasive non-native vegetation coverage. Riparian Wetland vegetation communities should achieve native vegetation coverage of 50-100%, non-native vegetation coverage of ≤10%, and ≤1% of invasive non-native vegetation coverage. Tidal wetland vegetation communities should achieve native vegetation coverage of 60-100%, non-native vegetation coverage of less than 10%, and 1% or less of invasive non-native vegetation coverage. Vernal pool vegetation communities should achieve native vegetation coverage of 50-75%, non-native vegetation coverage of less than 5%, and 1% or less of invasive non-native vegetation coverage. Grassland vegetation communities should achieve native vegetation coverage of 50-100% and 1% or less invasive non-native vegetation coverage. No non-native cover standard is provided for grassland vegetation community because of the dominance of annual European grasses. Coverage range guidelines are summarized in Table 3-11. Fulfillment of these criteria will indicate that the Preserve is progressing toward the conditions described in the long-term goals and objectives.

If a restoration area fails to meet any performance guidelines listed in Table 3-11, one year following initiation of restoration within specified area, a restoration ecologist should recommend additional remedial actions using available resources (e.g., supplemental planting, seeding, transplanting, changes to cultural practices, etc.) to bring the restoration area to a level in conformance with a trajectory toward meeting the performance guidelines.

Table 3-11. Summary of Ecological Performance Guidelines

Vegetation Community	Native Vegetation Coverage**	Non-native Vegetation Coverage	Invasive Non-native Coverage
Coastal Sage Scrub	50-80%	≤10%	≤1%
Maritime Scrub	50-80%	≤10%	≤1%
Riparian Wetland	70-100%	≤10%	≤1%
Tidal Wetland	60-100%	≤10%	≤1%

Table 3-11. Summary of Ecological Performance Guidelines

Vegetation Community	Native Vegetation Coverage**	Non-native Vegetation Coverage	Invasive Non-native Coverage
Vernal Pools	50-75%	≤5%	≤1%
Grasslands	50-100%	*	≤1%

Note:
*Non-native vegetation coverage will be adjusted based on the Management Level selected.
**Coverage ranges are intended to inform and provide flexibility during site specific implementation plan design for each vegetation community, as appropriate.

3.6 Public Access Plan

The Randall Preserve is a rare undeveloped coastal parcel south of the Ventura County line. Now protected, its 387 acres are mandated to fulfill twin policy goals. First, it should preserve and protect rapidly disappearing coastal habitats. Second, it should serve as a regional community asset for the public to responsibly learn, experience, view, and protect coastal habitats. The second goal is implemented via the Preserve's Public Access Plan (PAP).

The development of the PAP is shaped by technical analyses and informed by public input. It will emerge in final form once public consultation is complete, ideas have been vetted and shared, and an overall agreement is reached on appropriate circulation networks, access locations, and programmatic elements.

The PAP is developed to be consistent with the all overarching goals PAP-1 and PAP-2 and prioritizes the following:

- PAP-1.1 Limit hours of operation and use of the property to minimize human impacts.
- PAP-1.4 Incorporate multi-lingual educational signage that details site history and context.
- PAP-2.1 Identify barriers and engage in developing solutions to address historical spatial inequities for neighboring communities.
- PAP-2.5 Provide basic facilities on site such as accessible restrooms, parking, seating areas, and recreational paths.

Developing the PAP is a four-step process identified below and detailed in the sections that follow:

- Understanding the profile of potential visitors
- Assessing the barriers to access
- Identifying circulation and access opportunities
- Programming opportunities for public use

3.6.1 POTENTIAL VISITORS

WHO MIGHT VISIT THE RANDALL PRESERVE?

Prioritizing equity in public access to the Preserve requires an assessment of the demographic profiles of potential visitors. This analysis aims to understand typical profiles of future visitors based on their proximity to the Preserve.

- Immediate Neighbor: Residents who live within about a half-mile of the Preserve and can potentially walk to it.
- Local Visitor: Residents who live within five miles of the Preserve and would likely drive, jog, or bike to the Preserve.
- Regional Visitor: A broad group of residents who live within five to 15 miles of the Preserve and would have to drive or take public transit to access the Preserve.

Each visitor profile is composed of these key attributes and indicators:

- Demographics: Income, race, ethnicity, age, and related data.
- Park Access Metrics: park acres per resident.
- Environmental Justice: Census tract level scoring for CalEnviroScreen 4.0 and California's Tax Credit Allocation Committee Housing/Community Development Department high/low resource neighborhoods.

POTENTIAL VISITORS | 15-MILE RADIUS

About 2,104,606 people live within 15 miles of the Preserve in 407 census tracts. (Exhibit 3-2) This radius captures most of the population living in Orange County (3,135,755 people), including many residents of Orange County's most populous cities: Anaheim, Santa Ana, and Irvine. There are 737,962 housing units within this boundary.

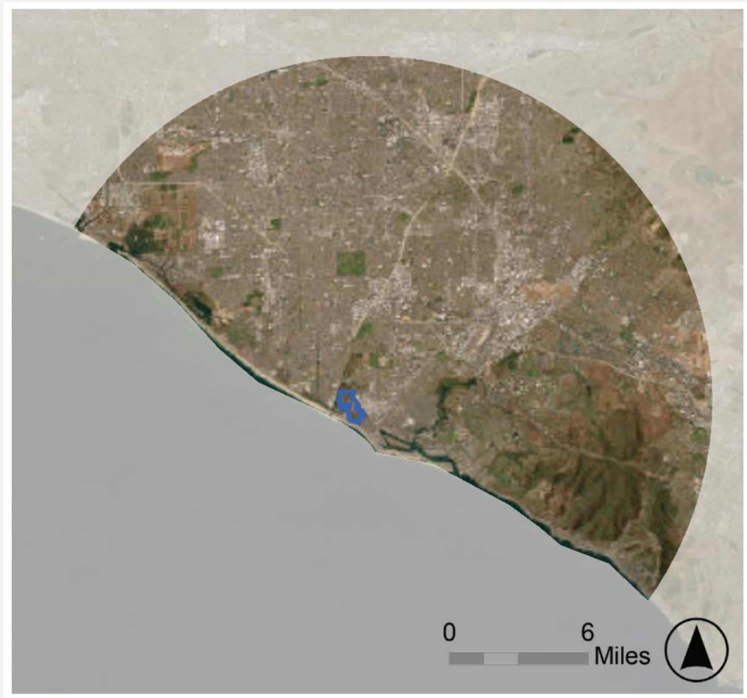
People of Hispanic origin represent 37.5 percent of residents. (Exhibit 3-3) People that self-identify as non-Hispanic constitute the following percentages of the total population: 33.4 percent identify as White, and 23.1 percent identify as Asian.

Additionally, 3.5 percent identify as two or more races, 1.5 percent identify as Black, 0.4 percent identify as Hawaiian or Pacific Islander, 0.4 percent identify as other race, and 0.15 percent identify as Native American. 32.3 percent were born in a foreign country.

Residents aged 65 or older constitute 14.9 percent of the population. Residents aged under 18 years old constitute 21 percent of the population. The median age in these census tracts ranges from 19.6 to 76.3.

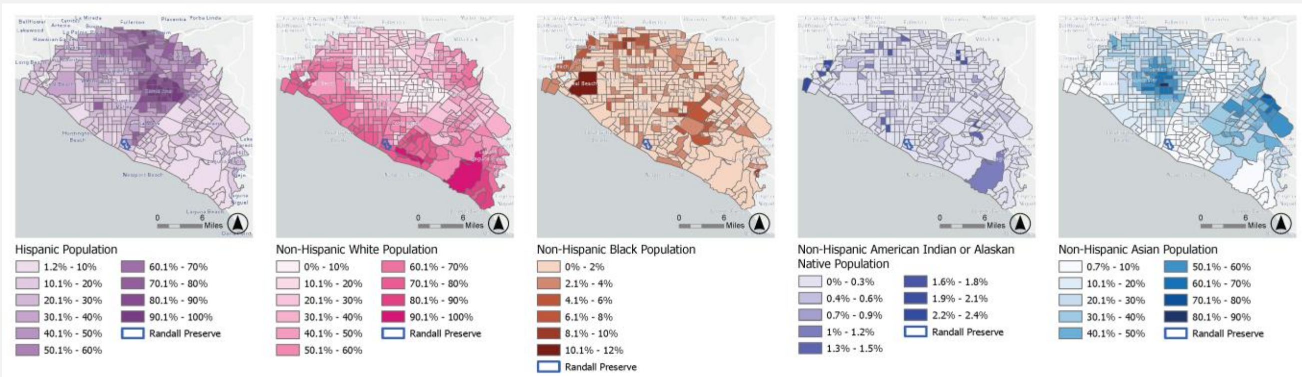
The median household income in these census tracts ranges from $36,441 to $250,001. Often, the census tracts with younger median ages also have a lower median household income and additional indicators of adversity. About 18.7 percent of households earn more than $200,000 annually.

Exhibit 3-2



In terms of housing, 51.7 percent rent and 48.3 percent own their homes. The average household size for census tracts within the 15-mile radius ranges from 1.3 to 5.3. About eight percent of all people are experiencing poverty.

Exhibit 3-3

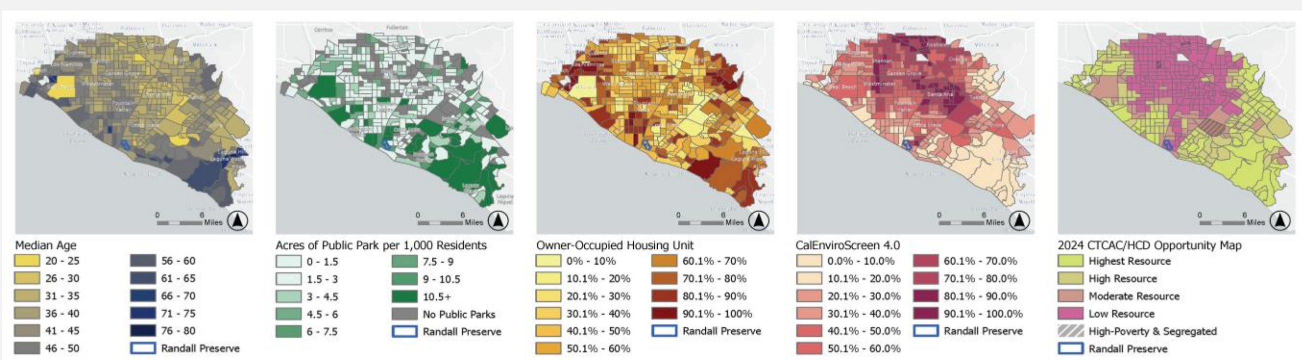


Across all of Orange County, four census tracts out of 580 are in the highest 95 percentile for environmental justice vulnerability per CalEnviroScreen 4.0. (Exhibit 3-4) Three of those tracts are in this radius, reflecting 0.9 percent of residents, about 18,941 people, that are living with very high vulnerability.

Further, 59 percent of residents live in census tracts that are low opportunity and 15.7 percent in the highest opportunity.

Within the 15-mile radius, there are 8.6 acres of parkland per 1,000 residents.

Exhibit 3-4



NEIGHBORS | HALF-MILE RADIUS

About 24,929 people live within one half-mile of the Preserve in 5 census tracts. (Exhibit 3-5) They live in 12,538 homes in the coastal neighborhoods of Costa Mesa, Huntington Beach, and Newport Beach. In this radius, 22.5 percent of people are of Hispanic Origin. (Exhibit 3-6) People that self-identify as non-Hispanic constitute the following percentages of the total population: 67.1 percent identify as White, and 4.7 percent identify as Asian.

Exhibit 3-5

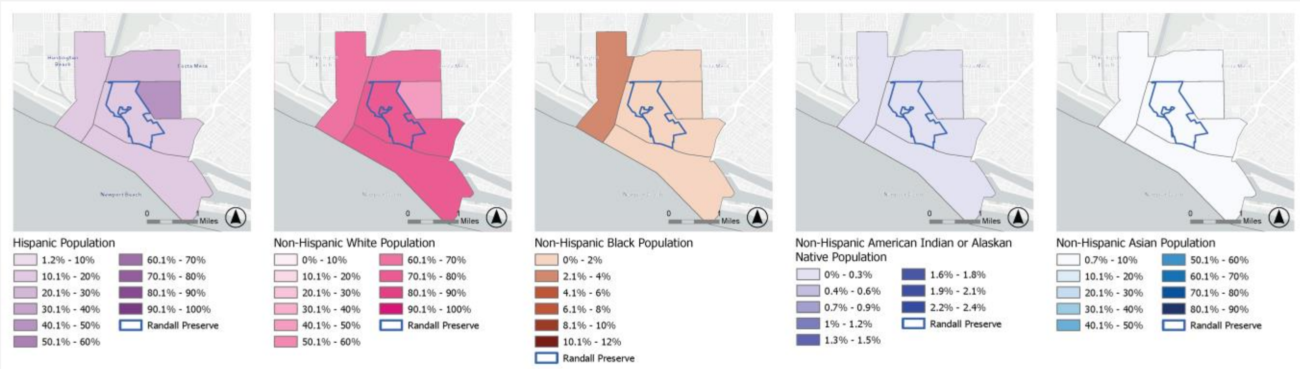
3.9 percent identify as two or more races, 0.8 percent identify as Black, 0.4 percent identify as Hawaiian or Pacific Islander, and none identify as Native American. These percentages are typical of the wider region. Within this geography, 12.8 percent were born in a foreign country.

Residents aged 65 or older constitute 19 percent of the population. Residents aged under 18 years old constitute 13.5 percent of the population. The median age in these census tracts ranges from 37.2 to 48.3. The median household income in these census tracts ranges from $78,698 to $140,889.

About 22.4 percent of households earn more $200,000 annually. And, 57.5 percent rent, while 42.5 percent own their homes. The average household size in these tracts ranges from 1.8 to 2.6, significantly lower than the wider region.

About 1.5 percent of all people are experiencing poverty, significantly lower than the regional average of 8 percent.

Exhibit 3-6

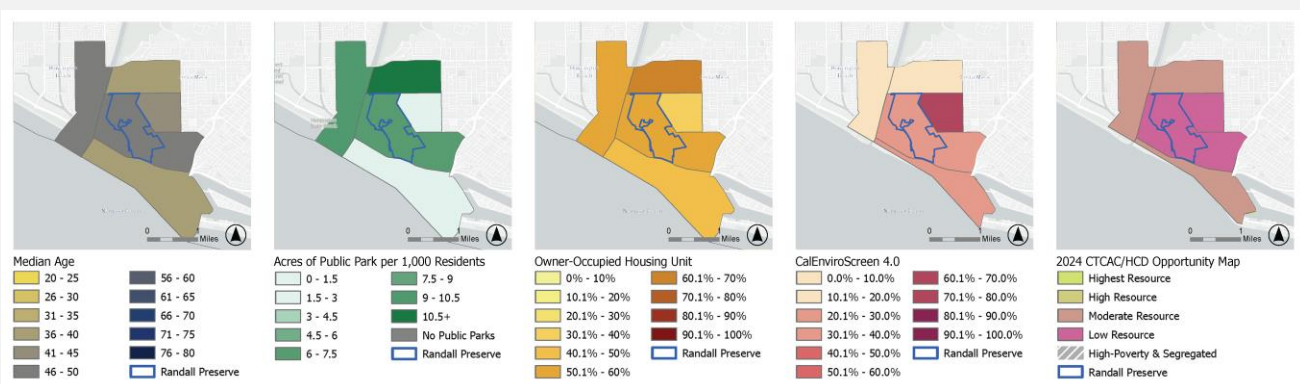


The census tracts in this immediate vicinity have moderate and low environmental justice vulnerability scores per CalEnviroScreen 4.0. The single tract with the highest score is in the 65th percentile of all tracts. (Exhibit 3-7)

About 35.7 percent of residents live in census tracts that are considered low resource, and the remainder live in tracts that are moderately resourced. None live in the highest resource areas.

There are currently 9.6 acres of park per 1,000 residents. While this percentage is already high considering access to public beaches, the addition of the Randall Preserve will result in 25 acres of park per 1,000 residents.

Exhibit 3-7



LOCAL VISITORS | HALF- TO FIVE-MILE RADIUS

About 278,065 people live within the half-mile to five-mile zone of the Preserve in 64 census tracts. (Exhibit 3-8) They live in the coastal and immediately inland neighborhoods of Costa Mesa, Huntington Beach, Newport Beach, Fountain Valley, and Santa Ana. They live in 116,905 housing units.

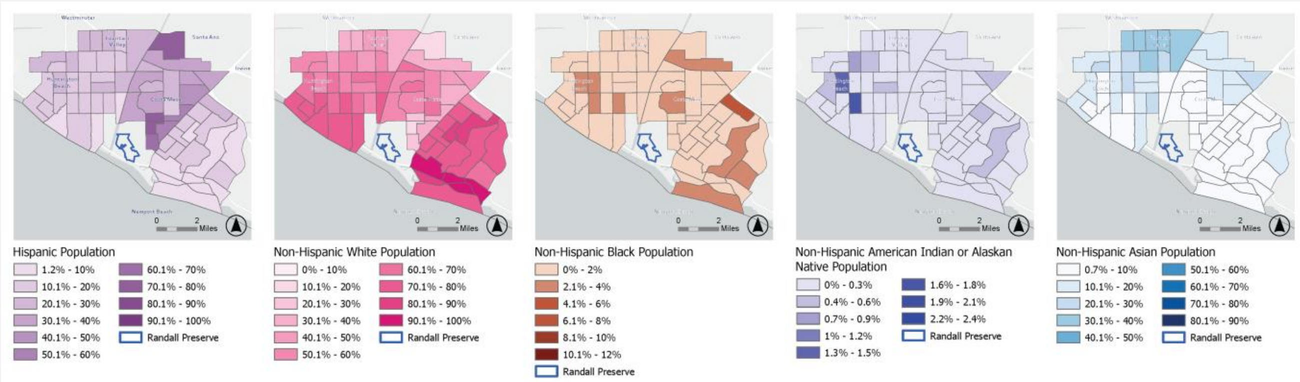
Exhibit 3-8

In this radius, 23.7 percent are of Hispanic Origin. (Exhibit 3-9) People that self-identify as non-Hispanic constitute the following percentages of the total population: 57.1 percent identify as White, and 12.3 percent identify as Asian. The larger White population is typical of affluent, coastal communities in Orange County.

4.9 percent identify as two or more races, 0.9 percent identify as Black, 0.6 percent identify as other race, 0.4 percent identify as Hawaiian or Pacific Islander, and 0.2 percent identify as Native American.

Within this geography, 19.4 percent were born in a foreign country.

Exhibit 3-9



Residents aged 65 or older constitute 18 percent of the population. Residents aged under 18 years old constitute 18.6 percent of the population. (Exhibit 3-10) The median age in these census tracts ranges from 29.8 to 65.1.

The median household income in these census tracts ranges from $57,058 to $245,250. This reflects a gap in resources between coastal and inland communities. About 23.1 percent of households earn more than $200,000 annually. In terms of housing, 51.4 percent rent and 48.6 percent own their homes. The average household size in these tracts ranges from 1.8 to 3.7.

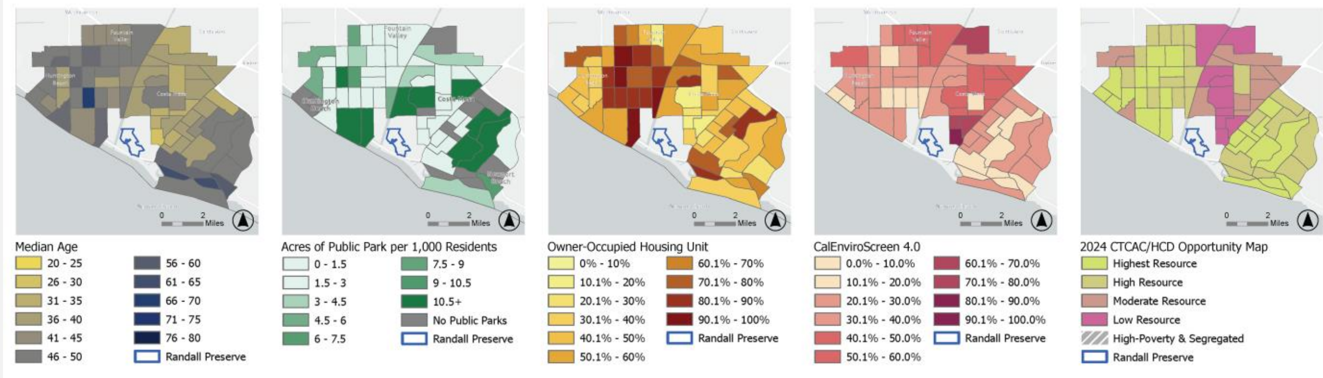
About 4.9 percent of all people are experiencing poverty.

The census tract in this vicinity with the highest environmental justice vulnerability score per CalEnviroScreen 4.0 is in the 82nd percentile of all tracts, and it is among the nearest to the Randall Preserve.

About 16.8 percent of residents live in census tracts that are low resource. Some of the low resource tracts in this radius have a large manufacturing presence or highway-commercial building typologies, while 31.1 percent are in the highest opportunity.

Within the five mile geography, there are 5.6 acres of park per 1,000 residents.

Exhibit 3-10



REGIONAL VISITORS | FIVE- TO 15-MILE RADIUS

About 1,801,612 people live within the 5-mile to 15-mile zone of the Preserve in 338 census tracts. (Exhibit 3-11) They live in the previously named cities as well as Long Beach, Seal Beach, Laguna Beach, Laguna Woods, Aliso Viejo, Irvine, Tustin, Orange, Anaheim, Garden Grove, Westminster, Stanton, Buena Park, Cypress, and Los Alamitos. They live in 608,519 housing units.

Trends are more visible at this scale. In this radius, 42.3 percent are of Hispanic Origin, with a notable concentration near Santa Ana. (Exhibit 3-12), while 29.3 percent identify as Non-

Hispanic White, with higher concentrations along the coastline. Additionally, 25.1 percent identify as Asian, including a notable cluster near Westminster's Little Saigon and Garden Grove's Koreatown.

3.3 percent identify as two or more races. 1.7 percent identify as Black, with an outlier tract in Seal Beach that captures the Naval Weapons Station. 0.4 percent identify as Hawaiian or Pacific Islander, 0.3 percent identify as other race, and 0.2 percent identify as Native American.

Exhibit 3-11

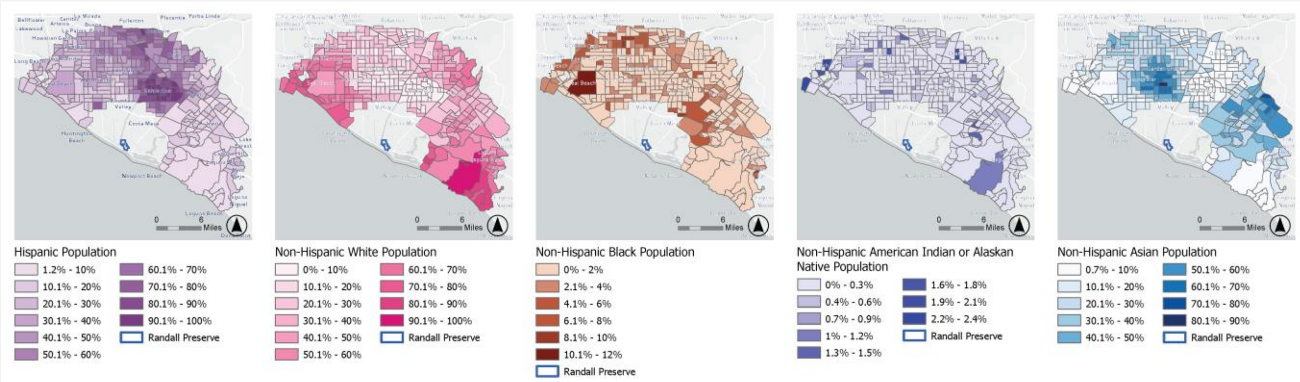
Within this geography, 34.6 percent were born in a foreign country.

Residents aged 65 or older constitute 14.4 percent of the population. Residents aged under 18 years old constitute 21.6 percent of the population. The median age in these census tracts ranges from 19.6 to 76.3.

The median household income in these census tracts ranges from $36,441 to $250,001. This reflects a gap in resources between coastal and inland communities.

About 17.8 percent of households earn more $200,000 annually. In terms of housing, 51.6 percent rent, while 48.4 percent own their homes. The tract with the Naval Weapons Station in Seal Beach has no home ownership. The average household size in these tracts ranges from 1.3 to 5.3.

Exhibit 3-12



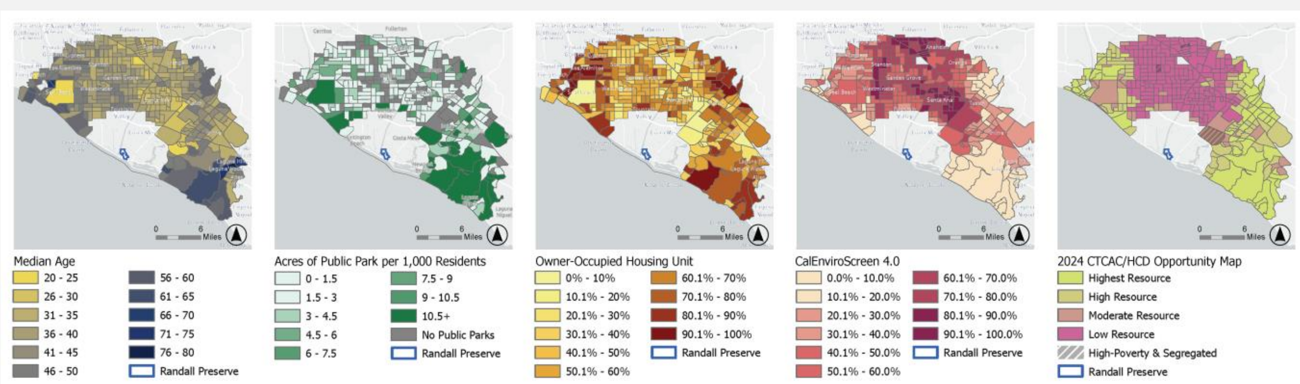
About 8.5 percent of all people are experiencing poverty, just above the total regional percentage.

Across all of Orange County, four census tracts are in the highest 95 percentile for environmental justice vulnerability per CalEnviroScreen 4.0. (Exhibit 3-13) Three of those tracts are in this radius, reflecting 0.9 percent of residents, about 18,941 people, that are living with very high vulnerability

59 percent of residents live in census tracts that are low opportunity, and 15.7 percent in highest opportunity.

Within this geography, there are 7.8 acres of park per 1,000 residents.

Exhibit 3-13



3.6.2 BARRIERS TO ACCESS

The Preserve has great potential to serve as a local and regional amenity and draw visitors that are immediate neighbors as well as residents from across the region. Visitors will use a variety of modes of transportation, depending on their origin location. Typically, the following four modes and their noted characteristics will cover the entirety of access options:

- By foot: Sidewalk conditions, shade trees, crosswalks, and controlled intersections
- Bicycle: Bike lane and trail network, level of protection, on-site bike parking
- Drive: On-site parking, bus parking for groups/schools, traffic impact on surrounding neighborhoods
- Transit: Walkable access to bus stops, potential for dedicated shuttle service

WHAT ARE TYPICAL BARRIERS TO ACCESS?

Common barriers to access include infrastructural deficiencies such as poor-quality sidewalks, missing streetlights, and infrequent or absent transit service. While freeways and main arterial roads might serve the regional visitor, they might also be physical barriers for local, pedestrian visitors.

This study reviews local connections, physical infrastructure, and the quality of the neighboring streets to assess potential barriers for visitors at each of the three scales.

BARRIERS TO ACCESS WITHIN A HALF-MILE RADIUS

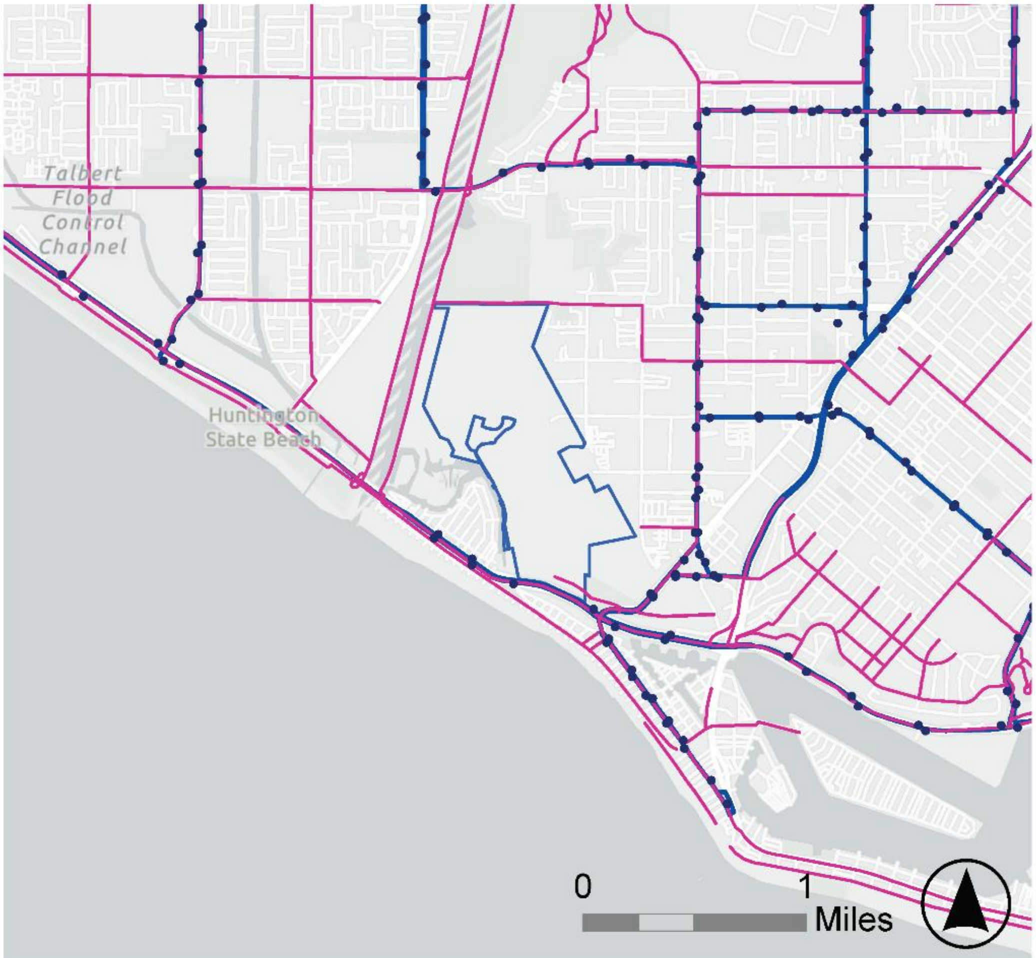
At the neighborhood scale, access for pedestrians and cyclists is the highest priority. The Randall Preserve sits at the intersection of three cities, Costa Mesa, Newport Beach, and Huntington Beach. These cities maintain their public right-of-way to a very high standard, providing Americans with Disabilities Act (ADA) compliant sidewalks and curb cuts on neighborhood streets, as well as primary commercial streets in the immediate vicinity of the site.

Streets with capacity for bike infrastructure have implemented lanes and signage, including on several streets with potential access points to the Preserve. (Exhibit 3-14) The presence of a primary school and higher educational institutions contributes to the high quality of bike infrastructure and crosswalks.

Three Orange County Transportation Authority (OCTA) bus routes have stops within a half-mile from the Preserve. Routes 47 and 55 provide potentially valuable connections to various Regional Transportation Centers, where additional connections can be made, and route 1 follows Pacific Coast Highway, making connections across the beach cities.

The region is very well served by auto access, and this applies equally to the immediate neighbors. The road network nearest to the Preserve is well maintained, all intersections are controlled, and pedestrian crosswalks are marked.

Exhibit 3-14



Transit & Cyclist Access

- OCTA Bus Stops
- OCTA Bus Routes
- Bike Routes
- Randall Preserve Boundary

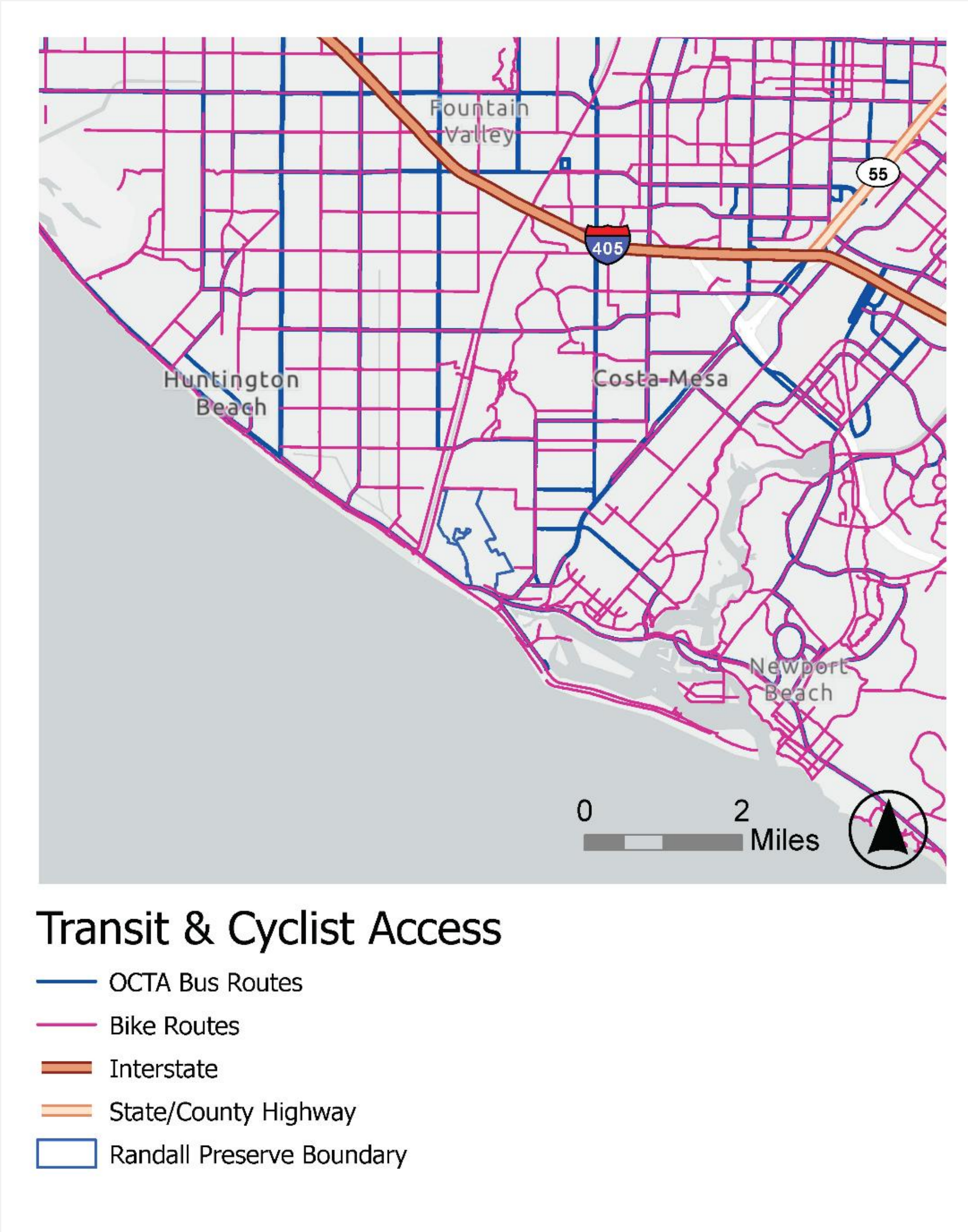
BARRIERS TO ACCESS WITHIN HALF- TO FIVE-MILE RADIUS

At a local scale, the dominance of the vehicle network is visible. Residents or visitors with access to a car in this region should be able to reach the Randall Preserve within 30 minutes at most times of the day. Several prominent regional highways become visible at this scale: the Interstate 405 and State Route 55. (Exhibit 3-15) While neither provide direct access to the Preserve, they place visitors within 15 minutes of the Preserve by car.

Cyclists living in this radius seeking to access the Randall Preserve may be long distance or weekend riders, and use the Santa Ana River Trail or Banning Channel Bikeway to directly access the Preserve. The bike network at this scale appears extensive, though much of the network is a Class II or Class III Bike Lane, which does not provide the utmost security to riders.

Within this radius, Orange County Transportation Authority remains the only public transit option.

Exhibit 3-15

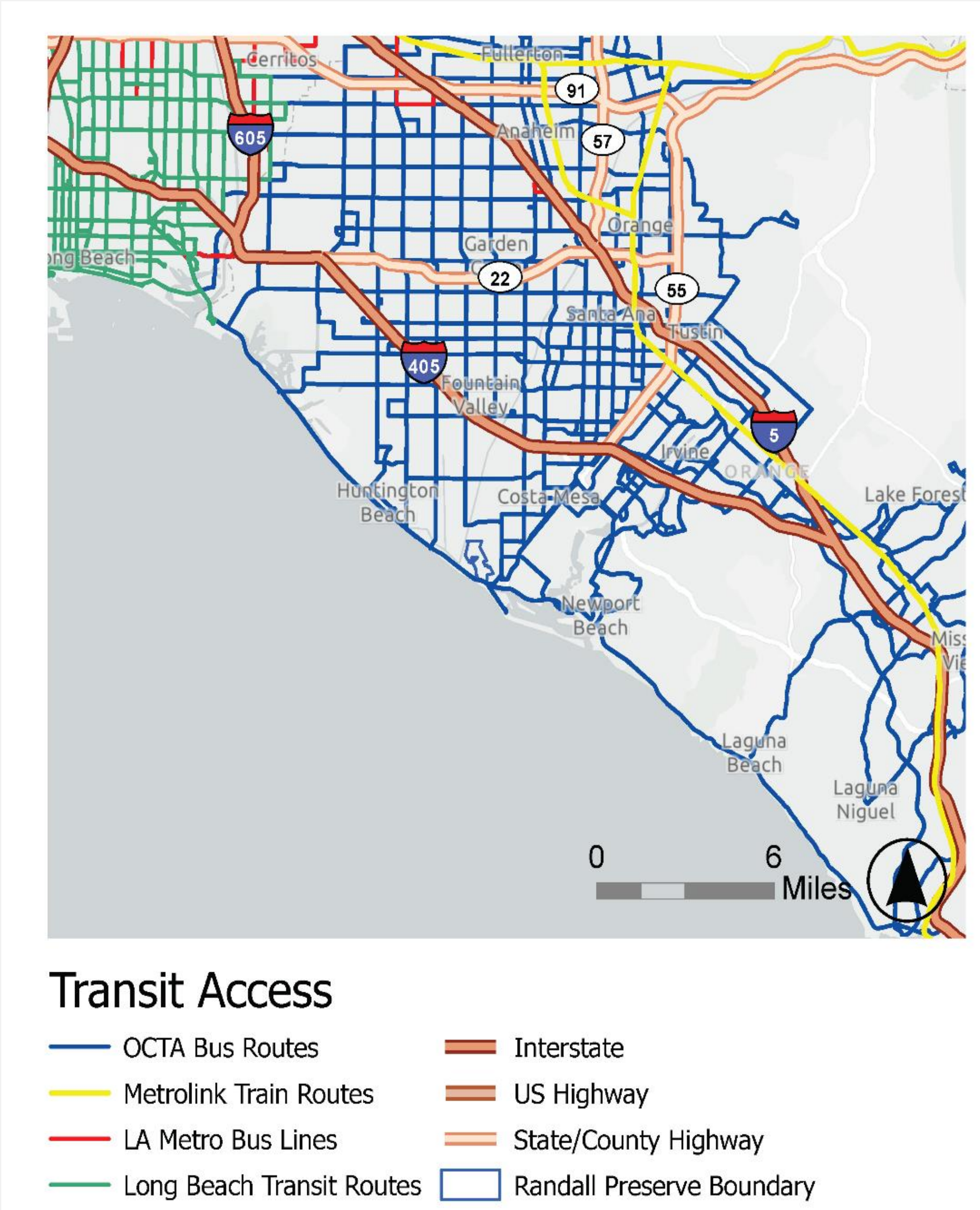

Fountain Valley
55
405
Huntington Beach
Costa Mesa
Newport Beach
0
2
Miles
Transit & Cyclist Access
OCTA Bus Routes
Bike Routes
Interstate
State/County Highway
Randall Preserve Boundary

BARRIERS TO ACCESS WITHIN FIVE- TO 15-MILE RADIUS

At the regional scale, additional transit networks become visible. (Exhibit 3-16) Amtrak and Metrolink connections can be made at the Anaheim and Fullerton Transportation Centers, easily accessible by the nearest OCTA bus to the Preserve. From this connection point, transit services in Los Angeles and Long Beach appear within reach. That said, the bus ride to either transportation center averages nearly two hours long, while a similar drive would take less than an hour.

Regionally, there are no barriers to accessing the Preserve by car.

Exhibit 3-16


Cerritos
Fullerton
Anaheim
Orange
Garden
Santa Ana
Tustin
Fountain Valley
Irvine
Huntington Beach
Costa Mesa
Lake Forest
Newport Beach
Laguna Beach
Laguna Niguel
605
91
57
22
55
405
5
0
6
Miles
Transit Access
OCTA Bus Routes
Metrolink Train Routes
LA Metro Bus Lines
Long Beach Transit Routes
Interstate
US Highway
State/County Highway
Randall Preserve Boundary

3.6.3 CIRCULATION AND ACCESS OPPORTUNITIES

The internal circulation network on the Randall Preserve is a critical element of public access, connecting visitors from proposed entry points to designated areas for recreation within nature. The methodology driving public access on the Randall Preserve maintains that the site is foremost a nature preserve, and all public access must align with initiatives to maximize the restoration and protection of sensitive ecological habitats on-site while also providing critical access for service and emergency vehicles, and for cultural and Tribal uses.

The current landscape has been highly disturbed by the oil operations' vehicular network, and future public access will rely on that already-disturbed network to create trails and public use areas that provide a variety of experiences within the Preserve. Within these factors, the future public access network emerges as a reduced version of existing corridors, allowing for the expansion and coalescence of habitat areas across formerly driven roads while still connecting visitors from the edges of the Preserve to points of interest, use areas, and potentially to additional access points.

Public access on the Randall Preserve intends to connect visitors with the wide range of habitats on-site, from the brackish lowlands to the grassy highlands. There are several opportunities to leverage existing networks to access notable, low-impact public use areas. Along the bluffs in the upper mesa are several overlooks with sweeping views of the Pacific Ocean, Palos Verdes Peninsula, Catalina Island, and of the Preserve's lowlands. Looking north up the Santa Ana River watershed the San Gabriel Mountains can be viewed. The overlooks, trails, public use areas, and potential access points described in this chapter fall within the methodology to reduce potential future degradation or disruption to the landscape.

As the Randall Preserve has never been open to public use, public access across the site will be developed and opened in phases, depending on the managing agencies' abilities to safely oversee a public program in each considered area. The goal is that public access in the Randall Preserve will provide visitors with an intimate connection to an ecosystem that was once abundant in this region and fill an important connection between the abutting open space amenities and areas.

ACCESS POINTS

The Preserve sits between numerous open space amenities at the edge of Costa Mesa, Newport Beach, and Huntington Beach. Its placement suggests that certain visitors may enter and exit the site from the same access point, and others may prefer to use the site as an alternate pathway between their neighborhood and the coast. Given the broad appeal to spend time in the Preserve, as well as interest in passing through it, the maximum number of access points are considered here. As public access will be phased across the site and across time, the first area expected to open to the public will be where the eastern edge of the Preserve meets 17th Street. Access points for utilities, maintenance, and safety have potential to become public access points at a later date.

While we've identified the following locations as potential access points, they would require agreements with the adjacent land managers and other entities before access can be granted.

17th Street - Main Entrance (Figure 3-6): The main entrance is currently the primary access point for the oil remediation team and will be the primary access point for all future public, service, and utility uses. The entrance is at the end of a two-lane street with mixed residential and light industrial uses. (Exhibit 3-17) Upon entering the site, about seven acres of land signal the convergence of all roads leading into the Preserve. This area is highly disturbed, having been used for parking and staging of materials and machinery, and will likely be used as a future parking area as well as for other public programming uses as determined through the outreach engagement process.

Exhibit 3-17

Sunset Ridge Park (Figure 3-6): At the end of the proposed trail network, Sunset Ridge Park is a public amenity with restrooms, outdoor facilities like benches and playgrounds and public parking. This southerly access point would connect visitors to the whole trail network, with nearby access to a viewpoint spur trail.

Pacific Coast Highway (Figure 3-6): The Pacific Coast Highway gate is adjacent to OCTA bus stops, providing a critical access point for the transit-dependent visitors. The extended frontage of the Preserve along PCH might also draw public interest and future visitors. It is anticipated this will be a pedestrian only access with vehicular access reserved for ranger patrols and Tribal elders.

Banning Channel Bikeway (Figure 3-6): At the water's edge, a bridge connects the Banning Channel Bikeway to the Randall Preserve. This access point would be convenient for regional cyclists, joggers, and hikers. It is adjacent to a potential joint Tribal and public use area.

Talbert Regional Park (Figure 3-6): Talbert Regional Park is located at the northern edge of the Preserve, and through access would potentially connect visitors with a much larger trail network.


Talbert Regional Park
Canyon Park
BROOKHURST ST
Santa Ana River
Talbert Regional Park
W 19TH ST
Marina View Park
Banning Channel Bikeway
W 18TH ST
WHITTIER AVE
MONROVIA AVE
First Loop*
17th Street*
Main entrance
W 17TH ST
Santa Ana River Salt Marsh
W 16TH ST
SUPERIOR AVE
Sunset Ridge Park
Sunset Ridge Park
Pacific Coast Highway
1
RIVER AVE
PACIFIC COAST HWY
W BALBOA BLVD
First Loop* - 2/3 Mile
Viewpoint Spur*
Possible alignment of future trails
Patrol Route
Utility Access Road
Main Entrance Area*
Service Vehicle Access
Possible Service Entrance
* Anticipated to be available for public use at time of opening.
NORTH
0
500
1,000
Feet

TRAIL NETWORK

The proposed public circulation diagram embodies the key principles described above, most notably, to connect visitors to nature without further disrupting the landscape (Figure 3-7). The intent of the proposed future trail system is to provide a variety of experiences for visitors, depending on their interests and available time to spend exploring the Preserve – while making use of the already-disturbed oil operations roads on site. Several loop trails of differing lengths and elevations depart and return to the main entrance area. Viewpoint spurs along the trails offer rewarding and out-and-back experiences. Each access point to the Preserve is a connection point to the entire proposed trail network, allowing visitors to explore the site widely within the bounds of the trail system.

Loop 1 – 2/3 mile

Departing from the 17th Street/Main Entrance Area, the First Loop is a trail that touches both the mesa and lowlands, providing a great variety of experiences in a 30-minute walk. This trail accesses two potential overlooks that provide dramatic views across the property and beyond. The First Loop is expected to be available for use when the Preserve first opens to the public.

Upland Loop 1 – 3/4 mile

Just south of the First Loop and 17th Street/Main Entrance Area, the Upland Loop wanders near native grasslands while keeping a safe distance for native habitat to thrive. This trail may be of interest to users that want a longer walk departing from the main staging area.

Lowlands Loop 1a – 1.5 miles

Using the existing oil operations road network, the Lowlands Loop descends from the mesa toward the Santa Ana River, providing a firsthand connection with the salt marsh ecosystem. Named for the approach to resource management that it most closely aligns with, this trail would be the remaining functional road after other roads in the area become grown in with acceptable plant species.

Lowland Loop 1b – 1.75 miles

Named for a more dramatic approach to resource management, the High Touch Loop follows the path that would be created by the significant land movement operations to sculpt new pathways for the freshwater to meet the brackish waters in the salt marsh. This trail is an exception to the methodology that prevents new trails from being built with good reason, considering it would be the result of a dramatic change in the lowlands to contribute to the health of the ecosystem.

North – South Connection – 1 mile

For neighbors and visitors alike, a connection between the Main Entrance Area and the southern edge of the site may be a valuable resource for recreation. The North – South Connection would enable access from two southern points, Sunset Ridge Park and Pacific Coast Highway, as well as opening access to three potential viewpoints with sweeping views of the California coastline.


Talbert Regional Park
Canyon Park
BROOKHURST ST
Santa Ana River
Talbert Regional Park
W 19TH ST
Marina View Park
Banning Channel Bikeway
High Touch Loop
Low Touch Loop
W 18TH ST
WHITTIER AVE
MONROVIA AVE
First Loop*
17th Street*
Main pedestrian & vehicle entrance
W 17TH ST
Santa Ana River Salt Marsh
Upland Loop
W 16TH ST
North - South Connection
SUPERIOR AVE
Sunset Ridge Park
Sunset Ridge Park
Pacific Coast Highway
Pedestrian & emergency vehicle access
RIVER AVE
PACIFIC COAST HWY
W BALBOA BLVD
Bike Routes
OCTA Bus Routes
OCTA Bus Stops
Main Entrance Area*
17th Street Entrance*
Possible Public Entrance
Joint Tribal & Public Use Area**
First Loop* - 2/3 Mile
Upland Loop - 3/4 Mile
Low Touch Loop - 1.5 Miles
High Touch Loop - 1.75 Miles
North - South Connection - 1 Mile
Viewpoint Spur - Varying lengths
* Anticipated to be available for public use at time of opening.
** Additional Tribal Use Areas not shown.
NORTH
0 500 1,000
Feet

3.6.4 PROGRAMMATIC OPPORTUNITIES

The Public Access Plan considers opportunities for access and use by the public visitors. Operating within the greater framework of this land conservation effort, the plan establishes goals and principles that minimize public impacts on habitat and wildlife, while providing opportunities for open space, recreation, education, interpretation, Tribal knowledge, and habitat revitalization. The opportunities for visitor-oriented programs and facilities presented here intend to enhance visitor experience and education.

Nature Walks

Nature walks, bird watching, and admiring coastal views are low impact activities that may take place on the Preserve.

Gathering Spaces

Benches along trails and in public use areas can serve as a rest stop and as a meeting point. This may be accompanied by informational signage.

Scenic Overlooks

The Randall Preserve has several natural vista points (Exhibit 3-18) that provide views of the wetlands, Santa Ana River, and coastline. Improving select overlooks to become ADA accessible destinations along the trails will broaden access and improve safety and inclusivity for all visitors.

Exhibit 3-18

Tribal Cultural Significance

California Native American Tribes who are culturally and ancestrally affiliated with the Preserve will be able to once again perform cultural practices on this land. These cultural practices are based on a value system rooted in reciprocity with the land. Implementation of traditional ecological knowledge during ecological restoration activities will increase the overall health of the preserve and these Tribal Communities.

Tribal Use Areas will also exist at the Preserve to be used by multiple or individual California Native American Tribes. When these areas are in use, the Tribe currently using the area will be able to keep their activities private or open to the public at their own discretion.

Multi Use Trails

Multi-use trails could connect to the existing network of trails in the area, including the Banning Channel Trail, Sunset Ridge Park, Talbert Regional Park, Santa Ana River Trail, and Huntington Beach Bike Trail.

Outdoor Classroom

An amphitheater or similar space is an opportunity to learn and collaborate with schools and higher education institutions in the vicinity and regionally.

Low Impact Camping

A small number of campsites in the entrance area, by reservation only, could become a regional attraction. Campsites require supporting facilities, like picnic areas and restrooms. Any facility built would be cold-camping without the use of flames, including stoves, barbecues, or campfires.

Visitor Center

A visitor center could serve as a permanent home for cultural and ecological exhibits, a classroom for group visits, an operational center for the land management team, and supporting facilities like restrooms and a store with interpretive items.

COMPARABLE SITES

Nearby State Parks and Ecological Preserves may provide programmatic insights in terms of the types of outdoor recreational spaces that are abundant or potentially lacking. This list of sites spans from Santa Barbara County to San Diego County, and intends to highlight a range of priorities in placemaking - from visitor centered experiences and active recreation to ecological preservation.

Some of the activities, spaces, and amenities reviewed in this study include:

- Playgrounds
- Campsites
- Restrooms
- Picnic Areas / Scenic Overlooks
- Multi-modal trails (Hiking, cycling, equestrian)
- Auto-Tourism
- Dog Parks
- Interpretive Centers

Talbert Regional Park & Fairview Park: Talbert Regional Park (South) is the Preserve's neighbor to the north. The park is 88.5 acres of unprogrammed landscape, which invites off-road dirt biking and has direct connection to the Banning Channel Trail, serving cyclists from great distances. Above Victoria, Talbert (North) has an additional 91-acres of similar parkland along the Santa Ana River.

Adjacent to Talbert (North) is Costa Mesa's Fairview Park. These 208 acres of open space include several programmed park areas with restrooms, picnic areas, and scenic overlooks. Dogs are permitted on leashes in the park. Fairview Park has over 100 parking spaces near trailheads, and additional parking in the model train area.

Franklin Canyon Park: Nestled between Los Angeles and Beverly Hills in the Santa Monica Mountains, Franklin Canyon Park is 605 acres of conservation, recreational, and educational space. The Park features ADA compliant trails, an outdoor classroom, amphitheater, and interpretive center. Among the exhibits, a replica Tongva hut exists for the public's cultural discovery of the region's Native People. The multiple recreation and interpretive areas have dedicated parking nearby, as well as parallel parking along portions of the park road. The Park is open from sunrise to sunset.

San Elijo Lagoon Ecological Reserve: San Elijo Lagoon has seven miles of pedestrian trails over its 979 acres in Encinitas, San Diego County. This trail system features a nature center with interactive exhibits and live animals, along with restrooms and picnic areas nearby the main parking lot. Several pedestrian bridges provide valuable connections within the Reserve as well as to adjacent neighborhoods and ultimately to the ocean under Amtrak-serving train tracks. The Ecological Reserve is a San Diego County park, but was an effort across multiple agencies, including the U.S. Fish and Wildlife Service and California Department of Fish and Wildlife. The Nature Center is open from 9 am - 5 pm daily, and the trails are open from sunrise to sunset.

Crystal Cove State Park: Crystal Cove State Park spans nearly 4,000 acres from the inland chaparral canyons to the sea, and is the nearest public campground to coastal Orange County. Amenities on site include: campsites as well as the option for primitive camping, and restrooms with showers. There is plenty of parking and access to the Pacific Ocean underneath Pacific Coast Highway. It is part of the Natural Communities Coalition and has higher standards for protection than most State Parks. It also boasts one of Orange County's protected marine reserves, called a State Marine Conservation Area.

Carpinteria Salt Marsh Nature Park: The Salt Marsh is a 230-acre tidal preserve, including 36-acres of previously graded land that have been re-naturalized and open for public use since 1991. The trail system does not venture into the tidal lowlands, but remains in the upland to provide views across the salt marsh. The Nature Park offers informational signage and prohibits dogs and bikes from using the trails to maintain protection of the sensitive habitat. Nearby public restrooms are available at the beach.

Entrance Area Scale Comparisons

Welcome facilities at regional parks often offer parking, restrooms, and directions toward designated trails. They may also be the site of additional services and amenities, such as a welcome or education center. The Randall Preserve has about seven acres of possible entrance area where such amenities may go. (Exhibit 3-19)

The facilities at similar regional parks shown at the same scale as the approximate possible entrance area at the Randall Preserve illustrate the capacity and ability of the 17th Street Main Entrance Area to accommodate a range of programs. (Exhibit 3-20)

Exhibit 3-19


Randall Preserve
Approximate possible entrance area
0
250
500
1,000 Feet

Exhibit 3-20

San Joaquin Marsh & Wildlife Sanctuary
70 parking spots, bus parking & Visitor Center

Fairview Park, Costa Mesa
100 day use parking spaces

San Elijo Lagoon, San Diego County
50 day use parking spaces & Visitor Center

Trestles Beach, San Diego County
110 day use parking spaces

Doheny State Beach, Dana Point
480 day use parking spaces

Moro Campground, Crystal Cove State Park
60 RV campsites & restrooms

3.7 Coastal Resilience Strategy

The Coastal Resilience Strategy (CRS) is a separate document which analyzes and recommends a set of actions designed to provide protection to the low-lying areas (lowlands) of the Preserve from the impacts of rising sea levels, and inundation from coastal storms and flooding. This section is a summary of the CRS. The complete CRS is included as Appendix C of this RMP.

Resilience is the property's ability to withstand impacts and recover quickly from them. Resiliency is accomplished by identifying and assessing the risks from sea level rise (SLR), developing adaptation measures to increase resilience, prioritizing and implementing adaptive measures, and monitoring the effectiveness of those measures under real-world conditions.

Following guidance in the California Coastal Commission (CCC) Sea Level Rise Policy Guidance Document (CCC Guidance), the objective of a CRS is to identify coastal resilience strategies intended to reduce negative impacts and improve the Preserve's ability to prepare for, withstand, and recover from extreme coastal events and rising sea levels. Strategies focus on improving resilience of the natural and built environments and include implementing solutions that are nature-based, engineered structures, or a hybrid solution.

Building on these guidelines, this CRS outlines potential adaptation strategies to mitigate or reduce the potential impacts of SLR to vulnerable locations across the Preserve. This adaptation plan does not dictate a specific set of actions the Preserve must take but rather offers a range of options for further evaluation through a cost-benefit analysis for potential future deployment. The CRS is a flexible planning document and amenable to revisions as new information emerges, climate science advances, and community preferences evolve.

The initial phase of the CRS evaluated the vulnerability of different resources within and adjacent to the Preserve under various SLR scenarios. These findings are presented in the Sea Level Rise Vulnerability Assessment (SLRVA) which provides a science-based understanding of how coastal flooding, tidal backflow, and groundwater rise may affect the Preserve's ecosystems, infrastructure, and public access areas over time (Appendix C: Coastal Resilience Study). The SLRVA analyzes Preserve features that are important in the RMP, including Tribal use areas, future public access and maintenance points, and specific infrastructure.

CCA and MRCA developed explicit objectives for the lowlands that coincide with the development of a CRS for the Preserve:

GOAL #1: Restore coastal processes and functions to the maximum extent possible for ecological benefit.

Objectives:

1. Increase estuarine habitat with a mix of tidal channels, mudflat, salt marsh, and brackish/freshwater marsh.
2. Enhance and maintain wetland-upland ecotone and upland habitat to support habitat resiliency and species diversity.
3. Restore and maintain coastal habitat that supports special status species, essential fish habitat, and migratory birds.
4. Maintain hydrological integrity for the benefit of habitats

GOAL #2: Plan for changing environments and design for ecological resilience.

Objectives:

1. Design habitats to accommodate climate change related sea level rise and other coastal impacts (e.g., incorporate topographic and salinity gradients, habitat diversity and natural buffers, and transition zones to accommodate migration of wetlands with rising sea levels).
2. Prioritize nature-based solutions.

3. Develop and implement a comprehensive sediment-management plan.
4. Work toward increased unification and collaboration of management with appropriate entities, such as OC Parks, Orange County Vector Control, and Army Corps of Engineers.

GOAL #3: Identify opportunities for contiguous coastal habitat areas and increase the buffer between sensitive habitat and sources of human activities.

Objectives:

1. Bridge wildlife connectivity between the Preserve and adjacent natural areas.
2. Balance ecological sustainability with an appropriate level of public access and Tribal cultural uses.
3. Increase habitat buffer zones by limiting or reducing impacts from urban infrastructure and intrusions (e.g. stormwater pipelines, powerlines, lighting, excessive noise).
4. Basis for Coastal Resiliency Strategies

The initial phase of CRS development involved determining the vulnerability of different locations and resources within the Preserve to SLR. These findings are presented in the SLRVA (included in Appendix C). The SLRVA examines the vulnerability of Preserve's assets and coastal resources under SLR scenarios ranging from 1.6 feet (0.25 meters) to 4.9 feet (1.5 meters), covering projected SLR from year 2065 to year 2140 as shown in Table 1 below.

A total of seven (7) SLR and storm scenarios were mapped for the vulnerability assessment:

1. Existing conditions (no SLR)
   - Non-Storm – Annual High Tide (AHT) of +6.79 ft NAVD88
   - 100-Year Storm – Highest Observed Tide (HOT) of +7.72 ft NAVD88
2. 1.6 ft SLR conditions
   - Non-Storm – AHT of +6.79 ft NAVD88
   - 100-Year Storm – HOT of +7.72 ft NAVD88
3. 4.9 ft SLR conditions
   - Non-Storm – AHT of +6.79 ft NAVD88
   - 100-Year Storm – HOT of +7.72 ft NAVD88
   - 100-Year Storm (*Unprotected*) – HOT of +7.72 ft NAVD88

Evidence in the updated 2024 report suggests that it is reasonable to view the *Intermediate* scenario as the most representative of the SLR expected to occur in the near term and provides a reasonable upper bound for the most likely range of SLR by the year 2100.

Table 1 - Probable Timing Associated with Selected SLR Scenarios for the Los Angeles Region (OPC, 2024)

SLR Scenarios, ft (cm)	Probable Timing Associated with SLR Projections (2024 Draft Guidance Update)				
	Low	Int-Low	Intermediate	Int-High	High
1.6 (50)	2150+	2120	2080	2065	2055
4.9 (150)	2150+	2150+	2140	2105	2090

Key Findings

COSMOS Modeling results indicate that the Preserve is highly protected. However, localized flood hazards could impact the Preserve and surrounding areas under long-term SLR projections—particularly during extreme storm events and if existing infrastructure is not maintained or upgraded. The key conclusions are as follows:

1. The vulnerability of coastal resources at the Preserve varies significantly depending on the presence or absence of infrastructure and protection provided by the Santa Ana River East Levee and existing tide gates that provide a hydraulic connection to the Santa Ana River.
2. Flood exposure remains minimal under all *protected scenarios* (assumes existing hydraulic infrastructure will continue to function properly and/or be retrofitted to adequately accommodate hazards associated with SLR overtime). However, under higher SLR scenarios, the site's resilience is highly dependent on the continued operability of this infrastructure to prevent significant inundation.
3. Groundwater emergence is expected to increase significantly under higher SLR scenarios, particularly in the low-lying freshwater marshes and riparian areas of the Preserve. Under existing conditions, groundwater remains below the surface in most areas. However, as SLR reaches 1.6 feet, isolated areas—especially in the southern and central lowlands—may begin to experience shallow groundwater close to the surface, potentially causing soil saturation, changes in plant community composition, and infrastructure degradation. Under the 4.9-foot SLR scenario, groundwater is projected to emerge at the surface in many low-lying areas, even without direct coastal flooding. This includes areas that are otherwise protected from surface water inundation by tide gates or levees.
4. Under a 4.9 ft SLR scenario combined with a 100-year storm event, the site is projected to experience widespread flooding in an *unprotected scenario* (i.e., without

agency-led improvements to infrastructure along the Santa Ana River (SAR), Newport Bay, or Pacific Coast Highway (PCH)). This includes inundation of wetlands, floodplains, and nearby infrastructure, as well as backflow through storm drains and utilities, which could compromise drainage systems and lead to localized flooding.

5. Within the Preserve, lowland areas are projected to be more at risk of widespread inundation under scenarios in which the existing infrastructure fails and little to no agency intervention occurs, which is unlikely.
6. Rising sea levels are projected to significantly increase regional vulnerability, particularly for critical infrastructure like Pacific Coast Highway (PCH).Without proactive adaptation, frequent tidal and storm-driven flooding could disrupt transportation, emergency services, and coastal access. A more regional adaptation approach will need to be adopted as part of a broader adaptation framework.
7. Under the *Protected* scenario, most resources exhibit low to moderate overall vulnerability, due to reduced hazard exposure from tidal inundation and storm surge. This includes critical infrastructure such as storm drains, utilities, and natural vegetation, which benefit from the function of the tide gates and structural protections. In contrast, the Unprotected scenario shows a marked increase in vulnerability across nearly all asset categories. Lowland development, stormwater infrastructure, and recreation amenities show high overall risk, driven by increased hazard exposure and limited adaptive capacity.
8. This distinction reflects the differing levels of exposure to SLR-related hazards such as tidal inundation, storm-driven flooding, and groundwater emergence, and allows for a more accurate evaluation of risk based on site-specific conditions and infrastructure performance.

The following tables summarize the overall vulnerability of coastal assets identified in the SLRVA, organized by this protection status.

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Vulnerability of Coastal Resources at the Preserve under *Protected* Scenarios

Resource Category	Resource	Specific Assets	Within Preserve Boundary	Hazard Exposure	Hazard Sensitivity	Adaptive Capacity	Vulnerability (Overall Risk)
Existing Vegetation & Habitat	*Preserve Vegetation*	Open Space Vegetation	Yes	Low	Moderate	Moderate	Low
	Submerged Waterways	Semeniuk Slough	No	Low	Low	High	
		SAR	No	Moderate	Low	Moderate	
	Uplands	Coastal Bluffs & Arroyos	Yes	N/A	Moderate	High	
	USACE Salt Marshes	North Marsh (USACE Project)	No	Moderate	Low	High	
		South Marsh (USACE Project)	No	Moderate	Low	High	
Critical Infrastructure & Development	Hydraulic Infrastructure	Levee	No	Moderate	Low	Low	Low
		Tide Gate Facilities	No	Moderate	Low	Moderate	
		Culverts	Yes	Moderate	Low	Moderate	
		Outlet Drains / Gates	No	Moderate	Low	Moderate	
		Easements	Yes	N/A	Moderate	Moderate	
	Lowlands Development	Bulkhead Walls	Yes	Low	Moderate	Moderate	
		Oil Operator Facilities	Yes	Low	Moderate	Moderate	
		Staging / Laydown & Other Development Areas	Yes	N/A	Moderate	Low	
		Fencing	Yes	Low	Moderate	Low	
	Upland Development	Site Access Area / Parking	Yes	N/A	Moderate	Moderate	
	Major Roadways	Pacific Coast Highway	No	High	High	Low	
	Service Roads	Industrial Way	Yes	Low	Moderate	Moderate	
		Oil Operator Service Dirt Roads	Yes	Moderate	Moderate	Moderate	
		Access Bridge (at North Marsh)	No	Low	Moderate	Moderate	
	Residential Areas	Newport Bay Residential Area	No	High	High	Low	
Utilities	Existing Site Utilities	Storm Drains	Yes	Moderate	Low	Moderate	Low

Vulnerability of Coastal Resources at the Preserve under *Protected* Scenarios

Resource Category	Resource	Specific Assets	Within Preserve Boundary	Hazard Exposure	Hazard Sensitivity	Adaptive Capacity	Vulnerability (Overall Risk)
		Electrical (Overhead Power)	Yes	Low	High	Moderate	
		Exist Oil Piping	Yes	Low	Moderate	Low	
Recreation & Public Access	Recreation & Public Access	Future Access Trails & Amenities1	Yes	N/A	Low	Low	Low
		SART Pedestrian Trail	Yes	N/A	Low	Low	

Vulnerability of Coastal Resources at the Preserve under *Unprotected* Scenarios

Resource Category	Resource	Specific Assets	Within Preserve Boundary	Hazard Exposure	Hazard Sensitivity	Adaptive Capacity	Vulnerability (Overall Risk)
Existing Vegetation & Habitat	Preserve Vegetation	Open Space Vegetation	Yes	Low	Moderate	Moderate	Low
	Submerged Waterways	Semeniuk Slough	No	Low	Low	High	
		SAR	No	Moderate	Low	Moderate	
	Uplands	Coastal Bluffs & Arroyos	Yes	N/A	Moderate	High	
	USACE Salt Marshes	North Marsh (USACE Project)	No	Moderate	Low	High	
		South Marsh (USACE Project)	No	Moderate	Low	High	
Critical Infrastructure & Development	Hydraulic Infrastructure	Levee	No	Moderate	Low	Low	Low
		Tide Gate Facilities	No	Moderate	Low	Moderate	
		Culverts	Yes	Moderate	Low	Moderate	
		Outlet Drains / Gates	No	Moderate	Low	Moderate	
		Easements	Yes	N/A	Moderate	Moderate	
	Lowlands Development	Bulkhead Walls	Yes	Low	Moderate	Moderate	
		Oil Operator Facilities	Yes	Low	Moderate	Moderate	
		Staging / Laydown & Other Development Areas	Yes	N/A	Moderate	Low	

Vulnerability of Coastal Resources at the Preserve under *Unprotected* Scenarios

Resource Category	Resource	Specific Assets	Within Preserve Boundary	Hazard Exposure	Hazard Sensitivity	Adaptive Capacity	Vulnerability (Overall Risk)
		Fencing	Yes	Low	Moderate	Low	
	Upland Development	Site Access Area / Parking	Yes	N/A	Moderate	Moderate	
	Major Roadways	Pacific Coast Highway	No	High	High	Low	
	Service Roads	Industrial Way	Yes	Low	Moderate	Moderate	
		Oil Operator Service Dirt Roads	Yes	Moderate	Moderate	Moderate	
		Access Bridge (at North Marsh)	No	Low	Moderate	Moderate	
	Residential Areas	Newport Bay Residential Area	No	High	High	Low	
Utilities	Existing Site Utilities	Storm Drains	Yes	Moderate	Low	Moderate	Low
		Electrical (Overhead Power)	Yes	Low	High	Moderate	
		Existing Oil Piping	Yes	Low	Moderate	Low	
Recreation & Public Access	Recreation & Public Access	Future Access Trails & Amenities	Yes	N/A	Low	Low	Low
		SART Pedestrian Trail	Yes	N/A	Low	Low	

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The following is a preliminary list of assets that have been indicated as being potentially impacted by 1.6 ft and/or 4.9 ft SLR at the Preserve:

Inside Preserve Boundary

1. Existing Habitat/Open Space/Vegetation communities
2. Oil Remainder Property/Operator Facilities
3. Perimeter Fencing
4. Culverts at southern area of the Preserve
5. Storm Drains
6. Industrial Way
7. Electrical Utilities (w/ Overhead Power Transmission Lines)
8. Vector Control routes
9. Public access paths
10. Vehicular access roads
11. Service access road that connects PCH to SAR East levee

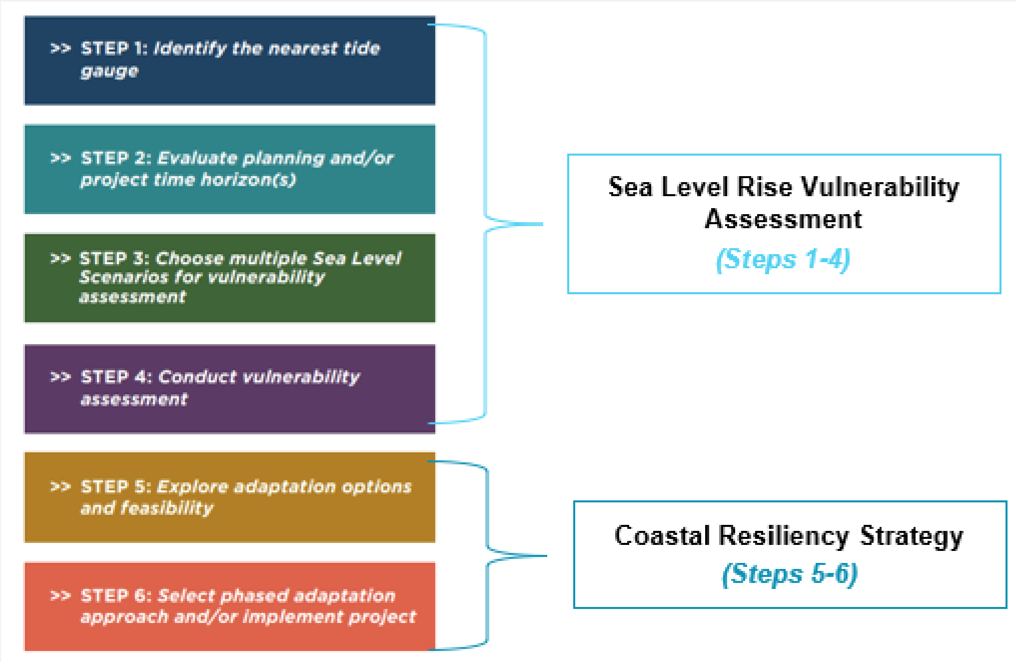
Outside Preserve boundary, but still pertinent:

1. Santa Ana River (SAR) East Levee
2. Outlet Drains / Gates (SAR East Levee)
3. North Marsh (USACE)
4. South Marsh (USACE) / Semeniuk Slough
5. Tide Gates at USACE North Marsh and South Marsh
6. Culverts at North Marsh and South Marsh that connect to the Preserve
7. PCH

California Ocean Protection Council's (OPC's) updated 2024 Sea-Level Rise Guidance provides guidance on selecting SLR projections, which helps to standardize the process across the state. It points planners and engineers toward the best available SLR science and helps them understand how to practically consider and design for those risks. Exhibit 3-21 summarizes the major steps.

This State guidance provides the framework for the Preserve's SLR Vulnerability Assessment including the selection of the modeling scenarios. While these are not formal design guidelines, they included information on SLR projections and risk tolerance could form the foundation of future Preserve design guidelines. The CRS draws upon the analyses and findings from the SLRVA (Steps 1-4) and explores the decision-making process as it pertains to various adaptation approaches (steps 5-6).

Exhibit 3-21 – OPC's Updated 2024 SLR Guidance Decision Framework



(Source: OPC's 2024 Updated SLR Guidance)

Several distinct levels of management that involve increasing levels of land alteration or "touch" approaches were developed for the RMP and are presented in the table below. Each level informs the CRS adaptation solutions. The term "adaptation" is defined as those actions that are retrofitted to increase the resilience of the existing condition and actions taken under the Low Touch and Intermediate Touch Management Levels 1 and 2. The term "*resilience*" is used for any solution added as part of future mitigation actions ascribed to the High-Touch Management Level 3.

The SLVRA analyzes the lower levels of management (Level 1: Low-Touch and Level 2: Intermediate-Touch) scenarios. The CRS focuses primarily on higher Level 3 management approaches that would transform existing conditions into an entirely new tidally-influenced ecosystem. The following section presents high-level concept summaries and evaluations of each resilience and adaptation solution. These evaluations are intended to narrow the range of options to those most suitable for potential implementation at the Preserve.

Table 5. Summary of Management Levels as they Relate to Coastal Resiliency & Adaptation Solutions

Management Level	Focus	Key Actions	Outcomes / Goals
Level 1 – Low Touch	Basic preserve management and ecological stabilization	- Trail designation, signage, and safety reviews - Erosion and drainage control - Trash collection and perimeter patrols - Invasive species suppression - Public behavior guidance (e.g., trail use, camping, vandalism)	Establish safe, sustainable public access and promote natural native vegetation recovery through weed suppression.
Level 2 – Intermediate Touch	Habitat enhancement and public experience improvements	All of Level 1 - Low Touch, plus: - Upland road decommissioning, soil decompaction and regrading - Native seeding and erosion control - Vernal pool and species habitat improvements - Construct amenities (e.g., viewing platforms, trail bridges, etc.) - Establish nursery and community access points	All of Level 1 and Restore habitat in previously disturbed upland areas, enhance biodiversity, and support educational and recreational use.
Level 3 – High Touch	Transformative ecological restoration and tidal reconnection	All of Level 2 - Intermediate Touch, plus: - Mass grading and tidal channel excavation - Salt marsh and transitional habitat creation - Planting with temporary irrigation systems	All of Level 2 and Reestablish tidal influence in lowlands, enhance coastal wetland habitat, and achieve regional-scale ecological benefits.

Table 5. Summary of Management Levels as they Relate to Coastal Resiliency & Adaptation Solutions

Management Level	Focus	Key Actions	Outcomes / Goals
		- Coordination with USACE on tide gate and/or culvert management	

Coastal Resilience Solutions

A range of CRS solutions were selected for analysis that include:

1. Engaging the communities who enjoy open space environments will be brought into the planning process to inform them of the potential risks and discuss resiliency options for the Preserve. Specific tools will be made available to the communities and the public to help keep them informed of the latest science, planning documents, and land management decisions.
2. Developing Strategic Partnerships and formalizing agreements.
3. Identifying funding opportunities for implementation of various strategies.
4. Gathering and sharing information with stakeholders and the public.
5. Implementing nature-based solutions.
6. Utilizing engineered solutions.
7. Adopting hybrid solutions.
8. Planning phased solutions.

To further support decision-making and comparative evaluation of the proposed solutions, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was conducted. This qualitative assessment summarizes the internal advantages and limitations (strengths and weaknesses), as well as the external factors that may present favorable conditions or pose potential challenges (opportunities and threats).

There is broad scientific consensus and greater certainty in SLR projections for the next 30 years. Beyond the year 2050, however, there is scientific uncertainty associated with the rate of SLR. The severity of future SLR largely depends on global efforts to decrease greenhouse gas (GHG) emissions and slow the effects of climate change. Because the adaptation planning timeline is looking forward 30 to 80 years and beyond, it is likely that the projections and science will change and that global policies will advance. For this reason, adaptation strategies are tied to “triggers,” or observable sea level rise points, so that stakeholders, and Randall Preserve Managers may consider appropriate implementation actions once the sea rises, not solely based on projected timelines.

4 Future Stewardship

The following sections relate to the stewardship activities required to maintain the Preserve areas that are not actively being restored. Management related to active restoration areas is outlined in Section 3.5, Habitat Restoration Guidance.

4.1 Vegetation Management

4.1.1 VEGETATION MANAGEMENT ALONG ACCESS ROADS AND TRAILS

Vegetation that occurs along the access roads and trails will be managed to allow for safe and appropriate access to operators and visitors of the Preserve. Generally, access roads and trails within the Preserve will be kept free of vegetation, but specific management guidance for native species, non-native and invasive species, sensitive and special status species growing in or residing near these areas is provided below. More specific treatment methods for non-native and invasive plant species are provided in Section 3.5.5.

Native Vegetation

Native vegetation growing on or onto access roads and trails will be treated to a level that allows safe and adequate access for users and visitors while limiting detrimental effects to the native vegetation as much as possible. Herbaceous species and germinating shrubs or trees growing on access roads and trails should be removed or treated to prevent access issues. Biomass of removed native plant species along access roads and trails can be placed in adjacent or other areas of the Preserve. Herbaceous species growing along the edge of access roads and trails should be left in place. Shrub and tree species growing onto access roads and trails should be trimmed back adequately to allow access. Cuttings from shrubs and trees as a result of vegetation management can be used to propagate container plants or be installed within the Preserve if appropriate for that plant species. If appropriate and approved by the land manager, shrubs and trees impeding access roads and trails can be trimmed, removed or treated by other methods.

Non-Native and Invasive Vegetation

Non-native and invasive vegetation growing on or onto access roads and trails should be removed or treated to allow safe and adequate access by users and visitors, as well as to reduce non-native vegetation coverage and seed banks. Treatment methods are outlined in Section 3.5.5.

Sensitive and Special-Status Vegetation

Four special-status plant species known to occur within the Preserve. These species include southern tarplant (*Centromadia parryi* ssp. *australis*), southwestern spiny rush (*Juncus acutus* ssp. *leopoldii*), woolly seablite, and California box-thorn. Should one of these or another sensitive or special status plant species occur on an access road or trail it shall be left in place, flagged, and protected in situ. Depending on the biology of the plant species and if appropriate, individual plants can be transplanted to other areas of the Preserve or once they have senesced, seed can be collected and used in other appropriate areas of the Preserve.

4.1.2 MAINTENANCE

Maintenance of vegetation within the Preserve should generally be limited to areas where public access or maintenance access is required. Other natural areas that are not actively being restored should be allowed to function without additional intervention. Should issues be identified within natural habitat areas that pose a potential threat to the rest of the ecological resources within the Preserve, on-site facilities, or human health and safety (i.e., fire ladders, fuel modification zones) remedial actions should be proposed and implemented to reduce the risk of detrimental impacts to resources on site.

Facilities should be regularly maintained to an adequate level to allow proper functioning throughout the Preserve. Facilities may include, but are not limited to, access roads, trails, fencing, gates, locks, signage, storage areas, temporary offices, stewardship materials, culverts, tide gates, and any other man-made structures or areas not designated as habitat.

4.2 Property Stewardship

4.2.1 TRASH AND DEBRIS

Trash consists of all human-made materials, equipment, or debris dumped, thrown, washed, blown, or left within the Preserve. Trash and inorganic debris washed or blown onto the site will be removed regularly from active restoration areas and throughout the Preserve as feasible by staff and/or volunteers under land manager’s guidance. Deadwood and leaf litter of native trees and shrubs will be allowed to remain and will not be removed. Downed logs and leaf litter provide valuable micro-habitats for invertebrates, reptiles, small mammals, and birds. In addition, the decomposition of deadwood and leaf litter is essential for the replenishment of soil nutrients and minerals.

Trash and debris generated from stewardship events will be disposed of regularly in a legal manner. Should human health hazards (i.e., needles or other similar materials) be encountered on site, they should be safely removed or flagged for removal as soon as possible. To aid in this containment, a sharps container should be kept on site and stored in a secure location. Large items or dumped materials will be assessed for removal and should be removed within 90 days of assessment. If hazardous items are dumped on site, these items should be assessed and removed as soon as feasible by an appropriate entity trained to safely remove that hazard.

4.2.2 FENCING

Due to the Preserve's proximity to urbanized areas, perimeter fencing shall be installed, replaced and maintained to an adequate level to provide protection to the ecological resources contained within the Preserve. Fencing shall comply with local regulations and to the extent possible not prevent wildlife from accessing the Preserve. Fencing along shared boundaries (i.e., oil operators) will be maintained by agreed upon responsible parties.

Temporary fencing (post and rope or similar) may be used in active restoration areas or other areas where limiting access is desired (i.e., flooded trails) to prevent visitors from potentially impacting restoration or natural areas. Additionally temporary orange construction fencing may be installed along access routes and staging areas, as needed to protect existing native vegetation during restoration implementation. Given the high degree of sensitive habitat at the Preserve, physical delineation of authorized trails for public use is recommended to ensure balanced recreational and ecological use of the site. Physical delineation methods can include the use of agency fencing, temporary delineators, signage, and other markers to provide clear indications to visitors of the authorized paths of travel.

4.2.3 SIGNAGE

Various forms of regulatory, informational, directional signage shall be used through the Preserve, in keeping with existing MRCA Signage Standards. Signage placement shall be coordinated to provide information regarding the Preserve, identify locations of active restoration, and deter unauthorized access of the Preserve and allow for legal enforcement of the removal of unauthorized users if necessary. Signage indicating the name of the Preserve and additional applicable information shall be installed at public access points. Signage fulfilling grant funding signage requirements will also be included at the Preserve as necessary.

Additionally, appropriate signage will be installed at intervals along perimeter fencing to allow for the legal enforcement and removal of unauthorized users within the Preserve. Active restoration areas will be posted with signage as appropriate along its northern, eastern, southern, and western boundaries to identify and indicate the presence of sensitive resource areas. Educational and interpretive signage may be installed throughout the Preserve and follow a consistent design standard if deviating from MRCA Signage Standards. Installation, maintenance, and replacement of interpretive signage will be commensurate of the level of resources available. Incorporation of multi-lingual educational signage is a priority.

4.2.4 NOISE AND LIGHT

Excessive noise (beyond local ambient levels) as a result of restoration implementation or other stewardship activities within the Preserve will be limited to occur during daylight hours to reduce impacts to wildlife within the Preserve.

Artificial lighting and light pollution can have a negative impact to wildlife at or around the Preserve. Any future designs or implementation of permanent or temporary lighting infrastructure will aim to adhere to the following design principles:

1. Use of Lighting Only When Necessary. All lighting should have a clear purpose with thoughtful consideration going to impacts to habitat and wildlife. Timers and motion sensor detectors could be used to ensure lights are only activated when needed and dimmed or turned off when not in use.
2. Use of Minimum Light Requirements. Lights will be set to the level of minimum illumination required for the task, while also being careful of surface reflections.
3. Use Shields and Targeted Lights. All lighting shall be directed downward and avoid spilling onto habitat areas of the Preserve. This includes the use of cutoff fixtures and positioning.
4. Limit Blue Light. Wildlife find blue light particularly disruptive. Therefore, using warmer-colored lights (2,700 Kelvin) or amber lights will be prioritized. Efforts will be made to limit the amount of shorter wavelength (blue-violet) light to the least amount needed (Longcore et al. 2018).

Any temporary lighting used within the Preserve as part of restoration implementation or normal stewardship activities will require prior approval by land manager.

4.2.5 HYDROLOGY, STORMWATER, AND EROSION CONTROL

Erosion control and best management practices (BMPs) should be installed as needed to maintain healthy and functioning habitats within the Preserve. The use of erosion control BMPs should be employed as determined by the land manager, to minimize loss of soils and vegetation from the Preserve. BMPs that can be used on a localized basis include silt fence, fiber rolls, and erosion control blanket to be incorporated as needed within the Preserve. BMPs used will preferably utilize only biodegradable materials (excluding silt fencing) and must be certified as weed free.

Native revegetation of areas experiencing erosion should be considered to provide longer term soil stability and erosion control. Over time, as native vegetation provides increased soil stability and erosion control, BMPs may be removed or reduced. Biodegradable BMP may be allowed to naturally degrade on site, but all non-biodegradable materials must be removed. If concentrated flows cause erosion to persist in areas, temporary BMPs (e.g., fiber rolls and gravel bags) or long-term protection (e.g., living mulefat or willow wattles) shall be considered for installation.

4.2.6 PEST AND VECTOR CONTROL

General Pest Control Within the Preserve

Pest control may be required within the Preserve should infestations from invertebrates (i.e., snails, slugs, insects, mites, bores, etc.) or small vertebrates (gophers, ground squirrels, rabbits, rates, voles, etc.) cause major damage to and pose a threat to the long-term health of native habitats. Any pest control that is performed shall be conducted following all applicable laws, regulations, and safety precautions. Should a pest control contractor require specific pest control recommendations, they shall consult a licensed PCA. The pest control contractor shall provide reports of all pest control measures implemented within the Preserve. Copies of any written recommendations shall also be provided.

Vector Control

Due to the size of the Preserve regular vector control will be needed over the long-term. Vector control should generally be handled by Orange County Vector Control (OCVC) field specialists who are well versed in treating vector control issues in habitat areas. Access should be coordinated and provided to vector control field specialists to allow for timely assessments and treatments within the Preserve. Annual check-in meetings and coordination with OCVC should be conducted at a minimum to ensure updated access information, routes, any restrictions, and projected treatment schedules are shared. Additionally, vector breeding areas (new or existing) that require minor alterations to vegetation or hydrology to aid in reducing vector breeding should be discussed and evaluated during annual check-in meetings between OCVC and the land manager.

Due to the evolving nature of vector control technology (i.e., drone applicators), new technologies should be evaluated on a cost/benefit basis prior to being used on site. Generally, any new technology being considered for use on site should be evaluated for ecological safety and the absence of any lasting detrimental effect on non-target species and habitat communities within the Preserve.

Additionally, to aid in the prevention of vector breeding within the Preserve, any operations, facilities, or stored materials should be implemented in a manner that reduces vector breeding locations, as feasible. Methods to reduce vector breeding in these areas should be discussed with the OCVC.

4.2.7 SECURITY AND PATROLLING

Regular patrols and security protocols are required to maintain the natural resources found within the Preserve. Due to the Preserve's proximity to residential, commercial, and other natural resources a minimum of monthly patrols are recommended to maintain security and safety while the site undergoes remediation. More frequent patrols will be needed as the increase in public use occurs. Patrols should check for evidence of human disturbance, including vandalism, pedestrian access, and encampments. Should human disturbance have detrimental effects on vegetation, wildlife, soils, etc. or on-site facilities, appropriate remedial measures shall be implemented as necessary to correct any problems detected. Additional items to be checked during patrols include, but are not limited to, fencing, gates, locks, trash and debris, access road conditions, fire hazards, potential vector issues, erosion, security and wildlife cameras (as needed) and qualitative habitat observations as relevant.

As part of a regularly assessed and updated security protocol, a list of active and approved individuals or groups allowed access to the Preserve and their contract information shall be kept and updated annually at a minimum. This may include, but is not limited to, OCVC, oil operator staff (on site and managers), local fire agency contacts, public works, waste management services, Tribal entities, contractors, delivery persons, and any approved researchers or naturalist groups.

Based on the final implementation of facilities on site, a map identifying the locations of shared facilities and resources shall be created, updated, and provided to approved individuals and groups as appropriate. This map shall identify facilities (restrooms, buildings, storage/staging areas), First-aid material locations, trash receptacles, and any other items relevant and appropriate to site users.

In the event an encampment or person experiencing homelessness is identified within the Preserve, the location and relevant details shall be recorded and provided to the land manager. Immediate action will be taken to resolve the encampment and remove individuals with the assistance of local law enforcement and homeless liaison teams. It is recommended that if a person experiencing homelessness is encountered on site, outreach and support services (by trained individuals) should be provided prior to involvement from local authorities. To ensure the safety of Preserve staff that may encounter persons experiencing homelessness it is recommended that they not take direct action towards the persons when encountered. Should a person experiencing homelessness exhibit hostility toward staff, Preserve staff should leave the area and get to a safe location immediately, and then contact local authorities as soon as it is safe to do so. Additional guidance and protocols should be developed based on local resources available in the area.

4.2.8 WILDFIRE CONTROL

Management and restoration within the Preserve should be conducted in a manner that reduces the risk of wildfire as much as feasible. This includes choice of species included in restoration area plant palettes, thinning or removal of fuel in areas that may create fuel ladders, management and maintenance of fuel modifications zones, and regular coordination with the local fire authority to ensure compliance with local regulations and access to the Preserve in the event of wildfire.

The land manager will make a concerted effort to work with restoration or volunteer teams to remove invasive species from the Preserve's edge and coordinate such removal before plants go to seed to further reduce the amount of invasive plants on the property. Low growing, drought tolerant, and/or fire-resistant plants, such as prickly pear cactus, should be considered along the Preserve's edge. This can help serve as both a fire break and meet fuel modification standards according to Orange County Fire Authority guidelines.

Plant species selection as part of restoration area plant palettes should take into consideration the amount of biomass and fuel created within an area. This is especially important when restoration areas or other managed areas are located adjacent to or within the vicinity of residential and commercial areas.

During regular property patrols and monitoring any areas where fuel ladders are present or are likely to form should be noted. If fuel ladders form, thinning of available fuels within these areas should be planned and implemented. Thinning of available fuels may include physical removal or biomass or treatment of vegetation. Thinning of fuels may occur anywhere in the Preserve, but should ideally occur outside of nesting bird season. Fuel modification zones should also be periodically assessed and thinning of available fuels within these areas should be planned and implemented as appropriate. Coordination with the local fire authority ensures compliance with fuel modification zone setbacks especially in areas where the Fire Code requires clearance, such as residential areas. Though MRCA Rangers are trained in wildland firefighting, as part of this coordination, access to the Preserve should be granted to local fire departments in the event a fire occurs within the Preserve and assistance is needed.

Based on the maps issued by the California Department of Forestry and Fire Protection (CAL FIRE) in March 2025, there is only a small area of the Preserve near Talbert Regional Park that has been classified as a “Moderate Fire Hazard Severity Zone.” This classification is based on the average hazard across a minimum of 200 acres. The remainder of the property is not classified as having any hazard risk. Based on the CAL FIRE Historical Wildland Fire Map, the Preserve has not had a recorded wildfire perimeter since data was tracked beginning in 1914. CAL FIRE typically only records fires above five acres in size.

In the event that the Preserve burns in a wildfire a prompt review of the site and potential remedial actions should be determined, if any, should be taken. The primary anticipated post-fire management activity involves monitoring the site and controlling annual invasive and non-native species that may invade burned areas following a fire event, especially when such invasive and non-native species were not previously present or were present in lower densities. If fire control lines or other forms of bulldozer damage occur in the Preserve, these areas would be repaired and revegetated to pre-burn conditions or better. In general, a burned area will be left to recover naturally from wildfire events but should follow the adaptive management guidance provided in Section 5.3.

4.3 Invasive Species Control

4.3.1 INVASIVE NON-NATIVE PLANTS

Invasive non-native plant species control within the Preserve is expected to be an ongoing effort. Preserve management and restoration and enhancement opportunities prioritize and include control of invasive non-native plant species as part of restoration implementation efforts. Control of invasive non-native plant species prior to and after active restoration is important, and aids in preventing new populations or new species from being introduced throughout the Preserve.

Invasive non-native plant species populations and occurrences should be observed during regular property patrols, monitoring efforts, and stewardship events. Early identification and treatment of new invasive non-native plant species within the Preserve is critical to reducing its potential spread to other areas.

Measures should be implemented to reduce the risk of biological contamination in the form of seed spread from areas within the Preserve. This is especially important if contractors working within the Preserve have recently worked in other watersheds or areas containing invasive non-native vegetation. Prior to working on site, visitors and contractors should ensure their footwear and clothing is free of non-native seed and as feasible follow USFWS's guidance regarding Recommended Equipment Decontamination Procedures and Aquatic Invasive Species Decontamination Protocols. If similar guidance is available and preferred, then this should be assessed and used on site to prevent the spread of invasive non-native species and other pathogens.

All herbicide treatments must be specified by a licensed PCA and applied under the supervision of someone holding a Qualified Applicators License or Qualified Applicator Certificate. Any chemical use shall be conducted using methods that minimize effects to adjacent/desirable native species, such as brush application or spot-spraying as directed by the PCA. Only herbicides approved for use in wetland areas will be used in or near flowing waters, as approved by the California Department of Pesticide Regulation. Additional guidance on the treatment of invasive non-native plant species within the Preserve is provided in Section 3.5.5.

4.3.2 FERAL AND DOMESTICATED ANIMALS

Due to the Preserve's proximity to urbanized areas, feral and domesticated animals are expected to occasionally occur on site. While occasional visitation from feral and domesticated animals is tolerable, regular and repeated visitation can impose higher amounts of stress on wildlife populations within the Preserve. Should feral or domesticated animals be observed on site, they should be assessed for potential aggressive/defensive behavior, documented, and removed from the Preserve. Preserve staff should coordinate with local animal control to ensure safe and humane capture and removal of any feral and domesticated animals observed within the Preserve, including feral honey bee colonies.

4.4 Tribal Stewardship

The full extent of Tribal access and stewardship of the Preserve is still being determined and will ultimately be described within the TAEP. The TAEP is currently being developed in a parallel planning process involving direct engagement between MRCA and the Tribes. This section will ultimately describe the ways in which elements of the TAEP are expected to interact with the core public access, restoration, and stewardship described in the RMP.

4.4.1 CO-STEWARDSHIP ARRANGEMENT

Although the specific terms and conditions surrounding the cooperative stewardship of the Preserve by MRCA and the Tribes have yet to be formalized, the desired outcome of the arrangement is to afford the Tribes an opportunity to restore a broken connection with the land. In this context, Tribal co-stewardship of the Preserve may take many forms and cover a wide spectrum of possibilities. Tribal co-stewardship on the Preserve is expected to evolve over time.

One of the first steps in restoring this connection is the commissioning of an ethnographic study by the MRCA to document the Tribal connection to the Preserve as recorded by the oral and written history of the Tribal communities that historically inhabited the coastal lands in and around the Preserve.

Although development of the TAEP is ongoing, initial Tribal engagement during preparation of the RMP identified the following key areas in which Tribal access and co-stewardship initiatives are likely to be relevant to the public access and ecological stewardship described in the RMP:

- Tribal Use: Traditional Plant Palettes and Traditional Structures
- Cultural Burning

Additional details regarding cooperative stewardship of the Preserve by the Tribes and activities and programs relevant to the implementation of this RMP, will be incorporated into a future version of the plan upon completion of the TAEP.

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5 Monitoring and Management

5.1 Ecological Health Monitoring and Management

The ecological monitoring and management program is designed to support the broad goal of establishing an ecologically resilient and sustainable preserve. As listed in Section 1.4, the ecological resilience and sustainability goal of the RMP is further defined by the following specific goals and objectives.

Prioritize maintaining and improving species diversity and abundance.

- Elevate the protection of no longer present, sensitive, threatened and/or endangered flora and fauna, including the reintroduction of flora that is culturally significant to local Tribes.
- Seek to understand the existing components of ecological integrity that make the Preserve unique.
- Improve ecological contiguity between the Preserve and adjacent lands and waters.
- Revisit the Resource Management Plan regularly and update plan goals based on adaptive management practices as needed.

Increase the ecological and climate resilience of the Preserve.

- Utilize nature-based solutions and Tribal Ecological Knowledge (TEK) to inform management activities of the Preserve, including, but not limited to, restoration of tidal wetlands, reintroduction of native species, and cultural burning.
- Apply science-based and Traditional Tribal approaches to understanding and mitigating impacts from stressors such as wildfire, invasive species, pests, and human impact.
- Maintain and enhance ESHA associated buffers where appropriate.

5.1.1 MANAGEMENT FRAMEWORK

Adaptive Management

Long-term ecological monitoring within the Preserve will be conducted within an adaptive management framework. Adaptive management is an iterative process established to refine management practices over time as new and better information and knowledge are gathered. This flexibility is essential for allowing management responses to adapt to uncertainties and changing circumstances. The framework structures the process by which ecological management and monitoring activities in the Preserve are adapted over time. This adaptive management approach generally follows USFWS and CDFW standards and guidance (e.g., Williams and Brown 2012; Williams et al. 2009; Atkinson et al. 2004).

Iterative Feedback

The ecological monitoring program is designed to provide the data and information necessary to inform an iterative feedback process for adjusting management and monitoring activities over time. The monitoring program is designed to track progress towards achieving ecological goals and objectives and is based on the current state of knowledge regarding stressors known or hypothesized to influence species and habitat in a public use context (e.g., recreational use). As greater knowledge about the Preserve's ecology is gathered over time through monitoring, the management program can be adapted to prioritize management activities and target specific issues. The adaptive management framework also allows for prioritizing monitoring activities, as necessary, to focus on highlighted management questions or uncertainties. In addition, monitoring and management activities in the Preserve may be modified, within this adaptive management framework, based on new information available from regional monitoring efforts, relevant scientific literature, and through Tribal coordination.

Management Objectives and Monitoring Approach

Articulating defined management objectives is a critical step in the adaptive management process. Effective management objectives should be specific, measurable, achievable, results-oriented and time-fixed. Although the range of possible ecological monitoring activities is vast, effective monitoring in a management context should be confined to evaluating measurable ecological outcomes that can be linked directly to feasible management actions. Furthermore, an effective monitoring design will reflect the desired domain of interest and its key stressors, available funding, legal requirements, and organizational goals (Beever 2006). Table 5-1 lists recommended management objectives and corresponding monitoring approaches developed based on the broad RMP goals and objectives listed under Ecological Resilience and Sustainability in Section 1.4

Table 5-1. Recommended Management Objectives and Monitoring Approach for RMP Goals and Objectives

RMP Goals and Objectives	Management Objectives	Monitoring Approach
Ecological Resilience and Sustainability Goal 1: Prioritize maintaining and improving species diversity and abundance.		
Elevate the protection of no longer present, sensitive, threatened and/or endangered flora and fauna, including the reintroduction of flora that is culturally significant to local Tribes.	▪ Maintain the extent of native habitats in the Preserve within 10% of the acreages documented in the baseline vegetation map in this RMP after the first 10 years operation. ▪ Maintain or increase existing sensitive plant and wildlife species populations in the Preserve during the first 10 years of operation. ▪ Within the first 3 years of operation, determine the status of sensitive species that have not been recorded on the Preserve in the last 10 years. ▪ Integrate the use of Traditional plant palettes to establish culturally significant plant species in the Preserve within the first 3 years of implementing active habitat restoration activities.	▪ Update the vegetation map for the Preserve once every 10 years. ▪ Conduct monthly bird surveys to track annual avian species diversity in the Preserve. ▪ Conduct focused surveys for sensitive wildlife species at least once every 3 years. ▪ Conduct surveys for known rare plant species at least once every 5 years. ▪ Document the status of culturally significant plant species within habitat restoration areas at least once every 3 years.

Table 5-1. Recommended Management Objectives and Monitoring Approach for RMP Goals and Objectives

RMP Goals and Objectives	Management Objectives	Monitoring Approach
Seek to understand the existing components of ecological integrity that make the Preserve unique.	▪ Identify at least one ecological study to be completed prior to or within the first year of operation to evaluate the ecological integrity of the Preserve.	▪ Include an abstract of the completed study in the annual work plan for the Preserve.
Improve ecological contiguity between the Preserve and adjacent lands and waters.	▪ Prioritize habitat restoration activities along Preserve interface with adjacent open space within the first 5 years of operation.	▪ Track the size, type and status of habitat restoration activities located within 150 feet of any interface with adjacent open space.
Revisit the Resource Management Plan regularly and update plan goals based on adaptive management practices as needed.	▪ Review the RMP and update management objectives as needed at least every 5 years.	▪ Document any changes to the RMP and management objectives in the annual work plans.
Ecological Resilience and Sustainability Goal 2: Increase the ecological and climate resilience of the Preserve		
Utilize nature-based solutions and Tribal Ecological Knowledge (TEK) to inform management activities of the Preserve, including, but not limited to, restoration of tidal wetlands, reintroduction of native species, and cultural burning.	▪ Develop a list of potential management activities that could be implemented using nature-based solutions and TEK applications led by Tribal partners within the first 5 years of operation.	▪ Include a list of management activities implemented using nature-based solutions and TEK, recommended by Tribal members, in annual reporting prepared for the Preserve.

Table 5-1. Recommended Management Objectives and Monitoring Approach for RMP Goals and Objectives

RMP Goals and Objectives	Management Objectives	Monitoring Approach
Apply science-based and Traditional Tribal approaches to understanding and mitigating impacts from stressors such as wildfire, invasive species, pests, and human impact.	▪ Include references from scientific literature and TEK sources when identifying management activities to address stressors within the Preserve in annual work plans.	▪ Include references from scientific literature and TEK sources when documenting the status of stressors and related management activities in annual reporting for the Preserve.
Maintain and enhance ESHA associated buffers where appropriate.	▪ Incorporate ESHA buffers into the siting and design of public access amenities and structures planned within the Preserve. ▪ Prioritize implementing habitat restoration activities within ESHA buffers within the first 5 years of operation.	▪ Conduct qualitative monitoring of ESHA buffers annually or as seasonally-appropriate based on the type of ESHA.

5.1.2 ADAPTIVE MANAGEMENT STRATEGIES

Effective adaptive management strategies should be related to the specific management objectives and, importantly, must be practical and feasible to implement considering existing ecological conditions, available funding and associated restrictions, and community and Tribal input. While many of the stressors identified in the Preserve are well-established (i.e., invasive species, disrupted tidal processes) and have contributed to present-day ecological conditions, the introduction of public use will bring a novel list of stressors associated with human disturbance with the potential to adversely affect existing resources. To the extent that public access within the Preserve is likely to include some level of passive recreational use, it is important to acknowledge, as noted in Mitrovich et al. (2020), that researchers have found evidence of detrimental impacts on wildlife from a variety of recreation activities and intensities (Geffory et al. 2015; Larson et al. 2016; Samia et al. 2017). Documented effects of recreational activities on wildlife include detrimental changes to behavior, reproduction, growth, immune system function, levels of stress hormones, and other physiological effects (Lucas 2020). In addition to the potential for detrimental effects on wildlife, recreational activities can also impact sensitive plants and vegetation through collection, trampling, dust and erosion.

Human Disturbance

Human disturbance associated with public access can include soil erosion, vegetation damage, and wildlife disturbance. Issues related to soil erosion and/or vegetation damage would be addressed through stewardship activities described in Section 4. Adaptive management strategies addressing public access itself as a source of stressors on the habitats and species in the Preserve include time-of-access restrictions (e.g., seasonal or diurnal/nocturnal restrictions), use or disturbance thresholds (e.g., distance between trails and nesting sites, density of active trails, number of visitors), and/or access closures or modifications.

Invasive Species

Invasive species control is a primary goal of the habitat restoration opportunities identified for the Preserve. As described in Section 3.4, stands of non-native vegetation are targeted for restoration to native vegetation communities, and existing native communities distressed by invasive species are targeted for enhancement. Routine control of invasive plants and animals is described in Section 4.3. However, additional management of invasive species may be necessary or recommended including the targeted control of invasive wildlife species. For example, nest parasitism by brown-headed cowbirds can adversely affect sensitive avian species including least Bell's vireo and other native birds and may require management to support the sensitive species management objective of maintaining or increasing populations over the first 10 years of Preserve operation.

Climate

Sea level rise is one of the primary ways climate change is expected to affect the Preserve. The risks of sea level rise and potential measures for improving resilience and/or adaptation are analyzed as part of the Coastal Resilience Strategy (CRS) prepared for the Preserve. While the initial findings of the CRS are summarized in Section 3.6 in this RMP, the full analysis and conclusions of the CRS is included as Appendix C.

Wildfire

Managing wildfire risk is addressed in Section 4.2 as part of the planned future stewardship of the Preserve. In general, this includes the selection of plant materials (i.e., plant palettes) to minimize fire risk in restoration areas, thinning to prevent formation of fuel ladders, and post-fire measures to address weeds and any soil or ground disturbance from fire suppression activities.

5.1.3 MONITORING

Two types of ecological monitoring will occur within the Preserve, stewardship monitoring and effectiveness monitoring.

Link between monitoring and management in adaptive management context; monitoring should retain a direct link to actionable management measures.

Stewardship Monitoring

Stewardship monitoring is conducted periodically throughout the Preserve and documents the status of management actions including vegetation management, property stewardship, and invasive species control activities described in Section 4.0. In addition to recording the completion of stewardship management actions, monitoring personnel may record incidental observations of sensitive species, habitat conditions and stressors to supplement data collected from effectiveness monitoring activities.

Effectiveness Monitoring

Effectiveness monitoring evaluates management decisions against specific measurable objectives tied to the status, trends or threats affecting the resource of interest. Effectiveness monitoring is a means for determining whether management decisions are leading to the desired outcomes as articulated in corresponding management objective. Recommended methods for effectiveness monitoring associated with the management objectives identified in Table 5-1 are listed below in Table 5-2.

Table 5-2. Summary of Recommended Effectiveness Monitoring

Focus	Resource	Methods
Effectiveness Monitoring		
Habitat Monitoring	Vegetation Mapping	Update the vegetation map of the Preserve at least once every 10 years. Acreages of individual vegetation community groups
Species Diversity	Monthly Bird Surveys	Continue monthly bird surveys conducted by SASAS to track avian species diversity,

Table 5-2. Summary of Recommended Effectiveness Monitoring

Focus	Resource	Methods
Effectiveness Monitoring		
Sensitive Species	Southern tarplant	Monitor southern tarplant populations at least once every 5 years in years of average or above-average rainfall. Estimate population size (i.e., number of individual plants) and map areal extent as state variables to determine population status. Establish standard polygon mapping rules in first year of monitoring.
Sensitive Species	woolly seablite, southwestern spiny rush, California box-thorn	Monitor perennial rare plant species at least once every 5 years. Map species locations and record estimated populations size (i.e., number individual plants).
Sensitive Species	coastal cactus wren, coastal California gnatcatcher	Conduct focused survey at least once every 3 years within coastal sage scrub habitat. Conduct a minimum of 3 survey visits at least one week apart from March 15 through June 30. Document the number of territories and record breeding status as state variables to
Sensitive Species	Belding's savannah sparrow, light-footed Ridgway's rail	Conduct focused survey at least once every 3 years within pickleweed habitat and adjacent tidal wetlands. Monitoring for these species could occur concurrently with surveys within adjacent Santa Ana River Salt Marsh Project.
Sensitive Species	San Diego fairy shrimp	Conduct focused USFWS-protocol level surveys in San Diego fairy shrimp status within known and suspected seasonal pools should be conducted at least once every 5 years but only in years with average or above-average rainfall.
Sensitive Species	burrowing owl	Conduct focused survey in suitable habitat in accordance with CDFW protocol at least once within the first 3 years of operation.

5.1.4 REPORTING

Reporting is a key component of the adaptive management process and involves documenting and sharing information regarding Preserve activities so that management decisions can be reviewed and adapted if necessary. To that end, the status and outcomes of ongoing and planned activities undertaken to support the management objectives in the Preserve will be documented annually in an annual operating plan described further in Section 5.4.

5.2 Restoration and Enhancement Monitoring

Focused quantitative monitoring of the entire Preserve on a regular basis presents a challenge in regard to funding and available resources to implement a large-scale monitoring program. Therefore, monitoring is generally recommended to be conducted annually in areas undergoing active restoration to determine achievement of performance standards. To provide flexibility in regard to the qualitative monitoring for different vegetation communities, different monitoring methods are provided and described below. Monitoring of each active restoration area should be selected based on the needs of the area and vegetation communities contained within them as well as available resources to implement monitoring programs.

Should new or alternative monitoring methods be available for use, their accuracy and cost-benefits in comparison to existing monitoring methods described below should be evaluated prior to use within the Preserve.

Relevé Monitoring Method (CNPS 2007)

Quantitative monitoring should be conducted annually during the peak season of vegetation within the restoration area. Restoration areas smaller in size (<1 to 3 acres) should consider using the relevé monitoring method (CNPS 2007). This includes a visual assessment of planted and seeded areas to estimate species richness (the number of given species in an area), native species cover (percentage of ground cover) and composition (the types and proportions of given species in an area) , and non-native species cover and composition. Plant establishment within revegetation areas will then be compared to the adjacent, undisturbed portions of the same vegetation community. The adjacent, undisturbed vegetation community used for reference sites, will be of equal size to the temporarily impacted area for adequate comparison. Data collected from the assessments will be used to help document seedling establishment and overall revegetation success over the course of the monitoring program. Permanent photo-documentation stations should be established throughout the revegetation area to visually record plant establishment over the 5-year period. The results of qualitative monitoring and photo-documentation will be included in an annual report.

Point Intercept Transects

Vegetative quantitative monitoring using point intercept transects will be conducted by establishing permanent vegetation transects within active restoration areas at random locations following initial restoration implementation. Transects should generally be placed in areas of substantial non-native clearing and revegetation. These transects will be utilized to help determine achievement of the yearly vegetative performance standards. Permanent photo-documentation stations will be established along each transect to record the progress of each mitigation site and visually record plant establishment.

Transects will be sampled using the point-intercept method (Canfield 1941, adapted by the California Native Plant Society in 2007). A transect tape will be run between two posts, and a vegetative intercept line will be visually projected above and below the tape at every half-meter mark. Transects will vary in length based on the location and size of the individual establishment areas. Each herb, shrub, or tree that intercepts the projected line will be recorded by species. In addition, all plant species present within a 5-meter-wide "species richness" band, or 2.5 meters to each side of the transect will be documented. All data will be utilized to determine total percent plant cover, percent native cover, percent non-native cover, overall species richness and target species growth.

Quantitative monitoring will be conducted once annually when vegetation within the restoration area is in peak season starting in year 2 of restoration implementation and ending once performance standards have been met. Approximately 2 transects per acre should be installed with transects generally 25 or 50 meters long, or the maximum length possible in areas with less than 25 linear meters available. Transect locations will be established at random locations when conducted.

Quadrats Monitoring

[Method Description, Schedule, Timing, and areas it could be used]

5.3 Adaptive Management

Adaptive management will be implemented in the event of unforeseen or unpredictable circumstances. Adaptive management is defined as a flexible, iterative approach to the long-term management of the suite of species on the Preserve. Adaptive management is directed over time by the results of ongoing monitoring activities and direct observation of environmental stressors that produce adverse results within the revegetation areas. It includes the utilization of regular qualitative assessments in the field prior to and during active restoration to assess the health and vigor of plant communities within the revegetation site. If an event damages all or part of an active restoration area, the data will be used in part to drive management considerations for repairing damaged areas. Adaptive management decisions will focus on achieving the key goals of completing and establishing self-sustaining native vegetation communities. Individual environmental stressors are discussed below, along with an anticipated range of management responses to correct any damage that may occur to the revegetation site.

Herbivory

Some grazing and browsing by native mammals is expected to occur within the Preserve and revegetation areas. The plant palettes for each vegetation community included for restoration has been designed to accommodate a moderate level of plant browsing. If browse levels should become elevated (i.e., if significant plant mortality and cover reduction occurs) as indicated by qualitative monitoring of the revegetation areas, remedial measures will have to be implemented. Additional browse guards (protective cages) may be installed around the base of young shrub container plants in affected areas to reduce plant mortality.

Flooding

Flooding is anticipated to occur on occasion within active restoration areas located within the active floodplain. Flooding is a natural process. Flooding from storm events may damage installed vegetation but ultimately is expected to provide long-term benefits through a lift in functional value for the overall wetland system. If monitoring indicates that cover is being reduced below tolerable levels, remedial planting or seeding may be required. Additional mulch, cuttings, or container plants may be placed in strategic areas to address changed flow characteristics of the river

Drought

Seasonal drought is a normal annual cycle in Orange County, and all plant palettes have been designed with drought-tolerant plant species that are capable of withstanding seasonal fluctuations in available moisture. However, an extended drought could occur, including low seasonal rainfall and prolonged high temperatures that may negatively affect the revegetation area (e.g., cause lower native cover, higher plant mortality, or increased potential for pest infestations on site). If it is determined that prolonged drought conditions are unsuitable for some planted species, replacement with suitably adapted species may be required.

Fire/Geologic Events

In the event that active restoration areas or other areas within the Preserve burn in a wildfire or suffer from mass movements (e.g., landslides, slope sloughing, or other geologic events), the land manager shall promptly review the site and determine what action, if any, should be taken. The primary anticipated post-fire management activity involves monitoring the site and controlling annual invasive and non-native species that may invade burned areas following a fire event, especially when such invasive and non-native species were not previously present or were present in lower densities. In the event fire control lines or other forms of bulldozer damage occur in revegetation areas, these areas would be repaired and revegetated to pre-burn conditions or better.

In general, a burned site will be left to recover naturally from wildfire or geologic events. The native habitat types within revegetation areas are well adapted to recover from wildfires unless the fire frequency is artificially increased. Therefore, burned areas should not be seeded or sprayed with soil stabilizer, straw, or hay. The latter two items are usually contaminated with various problematic invasive species seeds and often include noxious non-native plant species seed. In addition, active post-fire revegetation and soil stabilization efforts interfere with natural post-fire successional species and vegetation development stages that should be allowed to occur for the habitat to properly recover and regenerate.

The preferred erosion control measures to be used, if necessary, should prioritize the use of biodegradable materials including jute mesh, coir logs, gravel or sand bags (made of biodegradable burlap), straw wattles certified as weed-free (not just free of "U.S. Department of Agriculture noxious weeds," but free of all invasive species and encased in biodegradable burlap), and judicious seeding with locally Indigenous native species free of invasive species seed.

The same passive, successional regeneration holds true for mass-movement, landslide, or slope-sloughing types of events. Some plant species have evolved and/or adapted to recruit into these types of geologically disturbed areas.

5.4 Reporting

Annual Operating Plan

Preparing an annual operating plan at the end of each operating year is recommended, as funding allows. The annual operating plan should outline proposed activities for the following year that may include, but are not limited to, restoration implementation, stewardship community events, biological surveys, maintenance activities, security updates and maintenance, local agency coordination, educational programs, vector control site visit schedules, resource agency coordination or any other applicable activities that are able to be planned. Additionally, a summary of current funding opportunities that will be used for the following year should be provided to track funding used on site. Potential funding opportunities may also be included as appropriate.

Restoration Area Reporting

A report summarizing active restoration area progress within the Preserve is also recommended on an annual basis, as funding allows. To increase cost efficiencies, it is recommended that if multiple active restoration areas occur within the Preserve simultaneously, that they be included in the same annual report. If annual reporting is a requirement in part for a dedicated funding source, a summary of the information and results included in that report should be included in the Preserve's annual restoration area report with the full report attached as an appendix.

Generally, reports should describe the existing conditions of active restoration areas derived from qualitative field observations and quantitative vegetation data collection. Annual reports will provide a comparison of performance standards with field conditions, identify any shortcomings of the management actions, and recommend potential remedial measures necessary to achieve performance standards. Each report will provide a summary of the accumulated data, as well as the following as applicable to each restoration area:

- Document Preparers. A list of names, titles, and companies of all persons who prepared the content of the annual report and participated in monitoring activities.
- Photographs. Biological monitoring photographs tracking restoration area progress.
- Maps. Maps identifying monitoring areas, planting zones, and invasive and non-native species removal areas as appropriate (i.e., transect locations, quadrat locations, photopoint stations, etc.). Maps identifying previously restored areas within the Preserve.

- Data. Qualitative and/or quantitative vegetative data for each restoration area.
- Analysis. Percentages vegetation cover (Invasive, non-native, native, and bare) as applicable.
- Variances. Any changes in the monitoring or management program that appear to be warranted based on monitoring results to date.

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6 Long-Term Stewardship, Maintenance, and Operations

The estimate of the long-term stewardship, maintenance, and operations costs necessary to implement the RMP will be developed in coordination with MRCA and CCA as part of a future version of this RMP. These estimates will be prepared using a Property Analysis Record (PAR) or similar method.

Responsible Parties

The following list describes the various parties involved in implementing this RMP:

Titleholder/Preserve Manager: MRCA is the titleholder of the Preserve and designated land manager. MRCA is the recipient of funds that include recipient agreements for use in implementing this RMP. MRCA will serve as the designated land manager identified in this RMP, and MRCA and/or its contractors will implement the management and monitoring activities in the Preserve according to this RMP. MRCA's Tribal Engagement Officer is completing government-to-government consultations with Tribes culturally affiliated with the property. Though the focus is on the TAEP, the other plans are discussed and comments provided to this planning team.

Coastal Corridor Alliance: CCA is an on-the-ground partner to MRCA assisting with the Preserve planning effort, community outreach and engagement, as well as fundraising. CCA and MRCA are operating under a Memorandum of Understanding. CCA is the recipient of grant funds from the National Fish and Wildlife Foundation, California Wildlife Conservation Board, The Trust for Public Land, and Orange County Community Foundation. This funding is going toward the creation of the RMP, PAP, and CRS.

Contractors: Contractors may be employed by MRCA or its partners and Tribal Nations to implement habitat restoration and enhancement, management, and/or monitoring activities, or other activities such as educational, interpretive, or cultural programs in the Preserve as described in this RMP.

6.1 Management Funding Needs

Management funding needs are determined by the future stewardship activities detailed in Chapter 4 and the monitoring and management program described in Chapter 5. Management funding needs will be determined in the final RMP.

6.2 Restoration Funding Needs

Due to the programmatic habitat restoration approach described in this RMP, restoration funding needs will depend on the scope and timing of selected restoration projects. For planning purposes and to facilitate the development of future restoration plans, funding needs will be determined for two representative scenarios. First, restoration funding needs will be estimated based on implementing the Preferred Approach as recommended in Section 3.5.3. Second, restoration funding needs will be estimated based on implementing only Management Level 1 restoration activities in the upland and lowland areas of the Preserve.

6.3 Public Programming and Access Needs

Public programming and access funding needs will be determined once a final PAP has been adopted as part of the RMP. However, public programming and access within the Preserve is expected to be established in phases over time and space, and associated funding needs will depend on the scope and timing of planned activities at the time of implementation. For planning purposes and to facilitate future Preserve management, funding needs will be determined based on the levels of public programming and access anticipated upon the initial opening of the Preserve to the public.

7 Funder Requirements

Specific requirements regarding the use and management of the Preserve are tied to the grant deeds, grant agreements, and the Randall Pledge agreement responsible for establishing the Preserve. These requirements are broken down into four general categories:

- Open Space Conservation
- Public Access and Use
- Wildlife and Habitat
- Remediation/Ongoing Activities

The funding sources responsible for establishing the Preserve are listed below and additional details are provided in the following subsections. A summary of these requirements is provided in Table 7-1.

- Randall Donation
- Grant Deeds
- California Department of Fish and Wildlife – Notice of Unrecorded Grant Agreement
- State Coastal Conservancy
- US Fish and Wildlife Service
- California Natural Resources Agency
- Wildlife Conservation Board – Notice of Unrecorded Grant Agreement
- Assemblymember Cottie Petrie-Norris State Budget Request

7.1 Randall Donation

In 2019, a significant private gift of $50 million from Frank and Joan Randall provided the catalyst funding for the property’s conservation purchase and included the following requirements.

Purpose: Public park, open space, and wildlife habitat

Allowed Uses: Recreation, habitat restoration/management, public use and education

Title: Must be owned by a public agency

Term: In perpetuity

Protection Instrument: Conservation easement, deed restriction, or covenant

Requirements:

- Establish an Advisory Committee including stakeholders (e.g., Randall family nominee, Banning Ranch groups)

- Accept development funds with input from Advisory Group

Naming Rights: Frank and Joan Randall Park & Preserve at Banning Ranch (with tribal name to be added)

7.2 Grant Deed

Use Restriction: "Open Space" for public access, recreation, habitat restoration and management

Permanence: Use is permanently restricted

7.3 California Department of Fish and Wildlife (CDFW)

Purpose: Cultural and biological resource protection; wildlife habita

Allowed Uses: Education, research, compatible public/tribal use (including camping/cultural events)

Requirements

- Clean-up per Remedial Action Plan (within 36–60 months post-escrow)
- Tribal Access and Engagement Plan:
  - Ensure tribal access with minimal protocol
  - Tribal input on management and decision-making
  - Potential for co-management or ownership

7.4 State Coastal Conservancy (SCC)

Purpose: Prevent habitat degradation, protect endangered species, promote public/traditional tribal access

Allowed Uses: Cultural protection, open space, habitat, environmental restoration, low-cost coastal accommodations

Restrictions: No development permitted

Requirements:

- Submit a Tribal Access and Engagement Plan within 3 years of purchase
- Mitigation use allowed only with written approval (no wetland mitigation allowed)

7.5 U.S. Fish and Wildlife Service (USFWS)

Purpose: Conserve 44 acres of wetland habitat and protect specific species

Allowed Uses: Activities that do not interfere with habitat conservation

Requirements:

- Two public bird walks
- Monthly bird monitoring with Sea and Sage Audubon
- Develop:
- Habitat Restoration & Enhancement Plan
- Public Access Plan

7.6 California Natural Resources Agency (CNRA)

Purpose: Permanently protect open space and prevent flooding

Mitigation: Only with written permission

7.7 Wildlife Conservation Board (WCB)

Purpose: Same as CDFW – cultural and habitat protection; compatible use for tribes

Requirements:

- Same cleanup and Tribal Access and Engagement Plan as CDFW
- Mitigation use allowed only with written permission of WCB Executive Director

7.8 General Fund

Purpose: Protect open space and prevent fluvial/coastal flooding

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Table 7-1. Summary of Funder Requirements

Funding Agency	Open Space &Habitat	Public Use & Access	Tribal Access/ Engagement Plan	Cultural Resource Protection	Flood Prevention	Species/Wildlife Protection	Cleanup Required	Naming or Advisory Requirement
Randall Donation	✓ Recreation	✓ Recreation, Education				✓ Habitat Management		✓ Advisory Group + Naming Rights
Grant Deed	✓ Restoration, Mgmt	✓ Public Access						
CDFW	✓ Restoration, Mgmt	✓ Camping, Cultural Events	✓ Required	✓		✓ T/E Species Protection	✓ (36–60 months)	
SCC	✓ Coastal Habitat, Restoration	✓ Tribal-Focused Access	✓ Within 3 Years	✓		✓ Endangered Species		
USFWS	✓ Wetlands Conservation	✓ Public Bird Walks				✓ Listed Species		
CNRA	✓				✓ Fluvial & Coastal			
WCB	✓	✓ Cultural Events	✓ Required	✓		✓ T/E Species	✓ (36–60 months)	
General Fund	✓				✓ Fluvial & Coastal			

Legend:
✓ = Requirement or allowance is included

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Appendix A

PLANT COMPENDIUM

VASCULAR SPECIES

EUDICOTS

AIZOACEAE—Fig-marigold Family

Carpobrotus chilensis—sea fig*

Carpobrotus edulis—hottentot fig*

Mesembryanthemum crystallinum—common iceplant*

Mesembryanthemum nodiflorum—slenderleaf iceplant*

Sesuvium verrucosum—western sea-purslane

AMARANTHACEAE—Amaranth Family

Amaranthus albus—prostrate pigweed*

ANACARDIACEAE—Sumac Or Cashew Family

Schinus molle—Peruvian peppertree*

Schinus terebinthifolius—Brazilian peppertree*

APIACEAE—Carrot Family

Conium maculatum—poison hemlock*

Foeniculum vulgare—fennel*

ASTERACEAE—Sunflower Family

Ambrosia psilostachya—western ragweed

Artemisia biennis—biennial wormwood*

Artemisia californica—California sagebrush

Baccharis pilularis—coyote brush

Baccharis salicifolia—mulefat

Baccharis salicina—Emory's baccharis

Carduus pycnocephalus—Italian plumeless thistle*

Carduus tenuiflorus—winged plumeless thistle*

Centaurea melitensis—Maltese star-thistle*

Centromadia parryi ssp. australis—southern tarplant

Cirsium vulgare—bull thistle*

Corethrogyne filaginifolia—sand-aster

Cotula coronopifolia—brass buttons*

Cynara cardunculus—cardoon*

Deinandra fasciculata—clustered tarweed

Encelia californica—California brittle bush

Ericameria palmeri—Palmer's goldenbush

Ericameria pinifolia—pinebush

Erigeron bonariensis—asthmaweed*

Erigeron canadensis—Canadian horseweed

Euthamia occidentalis—western goldentop

Glebionis coronaria—crowndaisy*

Grindelia camporum—Great Valley gumweed

Helianthus annuus—common sunflower

Helminthotheca echioides—bristly oxtongue*

Heterotheca grandiflora—telegraphweed

Isocoma menziesii—Menzies's golden bush

Pluchea odorata—sweetscent

Pseudognaphalium luteoalbum—Jersey cudweed*

Psilocarphus brevissimus—short woollyheads

Pulicaria paludosa—Spanish false fleabane*

Silybum marianum—blessed milkthistle*

Stephanomeria virgata—rod wirelettuce

Xanthium strumarium—cocklebur

BATACEAE—Saltwort Family

Batis maritima—turtleweed

BORAGINACEAE—Borage Family

Heliotropium curassavicum—salt heliotrope

BRASSICACEAE—Mustard Family

Brassica nigra—black mustard*

Brassica rapa—field mustard*

Hirschfeldia incana—shortpod mustard*

Lepidium nitidum—shining pepperweed

Raphanus sativus—cultivated radish*

Sisymbrium irio—London rocket*

CACTACEAE—Cactus Family

Cylindropuntia prolifera—coastal cholla

Opuntia littoralis—coast prickly pear

CARYOPHYLLACEAE—Pink Family

Silene gallica—common catchfly*

Spergularia marina—saltmarsh sand-spurrey

CHENOPODIACEAE—Goosefoot Family

Atriplex lentiformis—quailbush

Bassia hyssopifolia—fivehorn smotherweed*

Chenopodium album—lambsquarters*

Chenopodium rubrum—red goosefoot

Salicornia pacifica—Pacific swampfire

Salsola tragus—prickly Russian thistle*

Suaeda taxifolia—woolly seablite

CLEOMACEAE—Cleome Family

Peritoma arborea—bladderpod

CONVOLVULACEAE—Morning-glory Family

Calystegia macrostegia ssp. cyclostegia—island false bindweed

Cressa truxillensis—alkali weed

CRASSULACEAE—Stonecrop Family

Crassula aquatica—water pygmyweed

Dudleya pulverulenta—chalk dudleya

EUPHORBIACEAE—Spurge Family

Croton setiger—dove weed

Ricinus communis—castorbean*

FABACEAE—Legume Family

Acacia longifolia—Sydney golden wattle*

Acacia pycnantha—golden wattle*

Acmispon glaber—deerweed

Medicago polymorpha—burclover*

Melilotus albus—yellow sweetclover*

Melilotus indicus—annual yellow sweetclover*

FRANKENIACEAE—Frankenia Family

Frankenia salina—alkali heath

GARRYACEAE—Silk Tassel Family

Garrya flavescens—ashy silktassel

GERANIACEAE—Geranium Family

Erodium botrys—longbeak stork's bill*

LAMIACEAE—Mint Family

Marrubium vulgare—horehound*

LYTHRACEAE—Loosestrife Family

Lythrum hyssopifolia—hyssop loosestrife*

MALVACEAE—Mallow Family

Malva parviflora—cheeseweed mallow*

Malvella leprosa—alkali mallow

MONTIACEAE—Montia Family

Calandrinia menziesii—red maids

MYRSINACEAE—Myrsine Family

Lysimachia arvensis—scarlet pimpernel*

MYRTACEAE—Myrtle Family

Eucalyptus camaldulensis—river redgum*

Eucalyptus globulus—Tasmanian bluegum*

OLEACEAE—Olive Family

Olea europaea—olive*

PLANTAGINACEAE—Plantain Family

Plantago elongata—prairie plantain

Plantago erecta—dwarf plantain

POLYGONACEAE—Buckwheat Family

Eriogonum fasciculatum var. foliolosum—California buckwheat

Eriogonum fasciculatum—California buckwheat

Rumex conglomeratus—clustered dock*

Rumex crispus—curly dock*

SALICACEAE—Willow Family

Salix exigua—sandbar willow

Salix gooddingii—Goodding's willow

Salix lasiolepis—arroyo willow

SCROPHULARIACEAE—Figwort Family

Myoporum laetum—myoporum*

SOLANACEAE—Nightshade Family

Lycium californicum—California box-thorn

Lycopersicon esculentum—garden tomato*

Nicotiana glauca—tree tobacco*

Solanum douglasii—greenspot nightshade

Solanum physalifolium var. nitidibaccatum—hoe nightshade*

TAMARICACEAE—Tamarisk Family

Tamarix ramosissima—tamarisk*

URTICACEAE—Nettle Family

Urtica dioica ssp. holosericea—stinging nettle

VERBENACEAE—Vervain Family

Verbena lasiostachys—western vervain

FERNS AND FERN ALLIES

MARSILEACEAE—Marsilea Family

Marsilea vestita ssp. vestita—hairy waterclover

MONOCOTS

ARECACEAE—Palm Family

Phoenix dactylifera—date palm*

Washingtonia robusta—Washington fan palm*

CYPERACEAE—Sedge Family

Bolboschoenus maritimus—salt marsh bulrush

Cyperus eragrostis—tall flatsedge

Eleocharis macrostachya—pale spike rush

Schoenoplectus californicus—California bulrush

JUNCACEAE—Rush Family

Juncus acutus ssp. leopoldii—southwestern spiny rush

Juncus bufonius—toad rush

POACEAE—Grass Family

Arundo donax—giant reed*

Avena barbata—slender oat*

Avena fatua—wild oat*

Brachypodium distachyon—purple false brome*

Bromus diandrus—ripgut brome*

Bromus hordeaceus—soft brome*

Bromus madritensis—compact brome*

Cortaderia jubata—purple pampas grass*

Cortaderia selloana—Uruguayan pampas grass*

Cynodon dactylon—Bermudagrass*

Distichlis spicata—salt grass

Festuca myuros—rat-tail fescue*

Festuca perennis—perennial rye grass*

Hordeum marinum ssp. gussoneanum—Mediterranean barley*

Hordeum murinum—mouse barley*

Poa annua—annual bluegrass*

Polypogon monspeliensis—annual rabbitsfoot grass*

Stipa lepida—foothill needlegrass

Stipa pulchra—purple needlegrass

TYPHACEAE—Cattail Family

Typha domingensis—southern cattail

* signifies introduced (non-native) species

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Appendix B

WILDLIFE COMPENDIUM

AMPHIBIANS

FROGS

HYLIDAE—TREEFROGS

Pseudacris hypochondriaca—Baja California treefrog

BIRDS

BLACKBIRDS, ORIOLES & ALLIES

ICTERIDAE—BLACKBIRDS

Agelaius phoeniceus—red-winged blackbird

Euphagus cyanocephalus—Brewer's blackbird

Icterus bullockii—Bullock's oriole

Icterus cucullatus—hooded oriole

Quiscalus mexicanus—great-tailed grackle

Sturnella neglecta—western meadowlark

Xanthocephalus xanthocephalus—yellow-headed blackbird

Molothrus ater—brown-headed cowbird*

BUSHTITS

AEGITHALIDAE—LONG-TAILED TITS & BUSHTITS

Psaltriparus minimus—bushtit

CARDINALS, GROSBEAKS & ALLIES

CARDINALIDAE—CARDINALS & ALLIES

Passerina amoena—lazuli bunting

Passerina caerulea—blue grosbeak

Pheucticus melanocephalus—black-headed grosbeak

Piranga ludoviciana—western tanager

CORMORANTS

PHALACROCORACIDAE—CORMORANTS

Nannopterum auritus—double-crested cormorant

FALCONS

FALCONIDAE—CARACARAS & FALCONS

Falco columbarius—merlin

Falco mexicanus—prairie falcon

Falco peregrinus anatum—American peregrine falcon

Falco sparverius—American kestrel

FINCHES

FRINGILLIDAE—FRINGILLINE & CARDUELINE FINCHES & ALLIES

Haemorhous mexicanus—house finch

Spinus lawrencei—Lawrence's goldfinch

Spinus psaltria—lesser goldfinch

Spinus tristis—American goldfinch

FLYCATCHERS

TYRANNIDAE—TYRANT FLYCATCHERS

Contopus cooperi—olive-sided flycatcher

Contopus sordidulus—western wood-pewee

Empidonax hammondii—Hammond's flycatcher

Empidonax oberholseri—dusky flycatcher

Empidonax traillii—willow flycatcher

Myiarchus cinerascens—ash-throated flycatcher

Sayornis nigricans—black phoebe

Sayornis saya—Say's phoebe

Tyrannus verticalis—western kingbird

Tyrannus vociferans—Cassin's kingbird

Empidonax difficilis—western flycatcher

GOATSUCKERS

CAPRIMULGIDAE—GOATSUCKERS

Chordeiles acutipennis—lesser nighthawk

Phalaenoptilus nuttallii—common poorwill

GREBES

PODICIPEDIDAE—GREBES

Podilymbus podiceps—pied-billed grebe

HAWKS

ACCIPITRIDAE—HAWKS, KITES, EAGLES, & ALLIES

Accipiter cooperii—Cooper's hawk

Accipiter striatus—sharp-shinned hawk

Buteo jamaicensis—red-tailed hawk

Buteo lineatus—red-shouldered hawk

Elanus leucurus—white-tailed kite

Circus hudsonius—northern harrier

PANDIONIDAE—OSPREYS

Pandion haliaetus—osprey

HERONS & BITTERNS

ARDEIDAE—HERONS, BITTERNS, & ALLIES

Ardea alba—great egret

Ardea herodias—great blue heron

Butorides virescens—green heron

Egretta thula—snowy egret

Nycticorax nycticorax—black-crowned night-heron

Nyctanassa violacea—yellow-crowned night-heron

HUMMINGBIRDS

TROCHILIDAE—HUMMINGBIRDS

Calypte anna—Anna's hummingbird

Calypte costae—Costa's hummingbird

Selasphorus rufus—rufous hummingbird

Selasphorus sasin—Allen's hummingbird

IBISES & SPOONBILLS

THRESKIORNITHIDAE—IBISES & SPOONBILLS

Plegadis chihi—white-faced ibis

JAYS, MAGPIES & CROWS

CORVIDAE—CROWS & JAYS

Aphelocoma californica—California scrub-jay

Corvus brachyrhynchos—American crow

Corvus corax—common raven

KINGFISHERS

ALCEDINIDAE—KINGFISHERS

Megaceryle alcyon—belted kingfisher

KINGLETS

REGULIDAE—KINGLETS

Corthylio calendula—ruby-crowned kinglet

LARKS

ALAUDIDAE—LARKS

Eremophila alpestris—horned lark

MOCKINGBIRDS & THRASHERS

MIMIDAE—MOCKINGBIRDS & THRASHERS

Mimus polyglottos—northern mockingbird

Toxostoma redivivum—California thrasher

NEW WORLD VULTURES

CATHARTIDAE—NEW WORLD VULTURES

Cathartes aura—turkey vulture

OLD WORLD SPARROWS

PASSERIDAE—OLD WORLD SPARROWS

Passer domesticus—house sparrow*

OLD WORLD WARBLERS & GNATCATCHERS

POLIOPTILIDAE—GNATCATCHERS

Polioptila caerulea—blue-gray gnatcatcher

Polioptila californica californica—coastal California gnatcatcher

OWLS

TYTONIDAE—BARN OWLS

Tyto alba—barn owl

STRIGIDAE—TYPICAL OWLS

Athene cunicularia—burrowing owl

Bubo virginianus—great horned owl

PELICANS

PELECANIDAE—PELICANS

Pelecanus erythrorhynchos—American white pelican

Pelecanus occidentalis—brown pelican

PIGEONS & DOVES

COLUMBIDAE—PIGEONS & DOVES

Zenaida macroura—mourning dove

Columba livia—rock pigeon (rock dove)*

Streptopelia decaocto—Eurasian collared-dove*

RAILS, GALLINULES & COOTS

RALLIDAE—RAILS, GALLINULES, & COOTS

Fulica americana—American coot

Porzana carolina—sora

Rallus limicola—Virginia rail

Rallus obsoletus obsoletus—California Ridgeway's rail

ROADRUNNERS & CUCKOOS

CUCULIDAE—CUCKOOS, ROADRUNNERS, & ANIS

Geococcyx californianus—greater roadrunner

SHOREBIRDS

RECURVIROSTRIDAE—STILTS & AVOCETS

Himantopus mexicanus—black-necked stilt

Recurvirostra americana—American avocet

CHARADRIIDAE—LAPWINGS & PLOVERS

Charadrius semipalmatus—semipalmated plover

Charadrius vociferus—killdeer

Pluvialis squatarola—black-bellied plover

SCOLOPACIDAE—SANDPIPERS, PHALAROPES, & ALLIES

Actitis macularius—spotted sandpiper

Calidris alpina—dunlin

Calidris mauri—western sandpiper

Calidris minutilla—least sandpiper

Limnodromus scolopaceus—long-billed dowitcher

Limosa fedoa—marbled godwit

Numenius americanus—long-billed curlew

Numenius phaeopus—whimbrel

Phalaropus lobatus—red-necked phalarope

Tringa flavipes—lesser yellowlegs

Tringa melanoleuca—greater yellowlegs

Tringa semipalmata—willet

SHRIKES

LANIIDAE—SHRIKES

Lanius ludovicianus—loggerhead shrike

STARLINGS & ALLIES

STURNIDAE—STARLINGS

Sturnus vulgaris—European starling*

SWALLOWS

HIRUNDINIDAE—SWALLOWS

Hirundo rustica—barn swallow

Petrochelidon pyrrhonota—cliff swallow

Stelgidopteryx serripennis—northern rough-winged swallow

Tachycineta bicolor—tree swallow

Tachycineta thalassina—violet-green swallow

SWIFTS

APODIDAE—SWIFTS

Aeronautes saxatalis—white-throated swift

Chaetura vauxi—Vaux's swift

TERNS & GULLS

LARIDAE—GULLS, TERNS, & SKIMMERS

Chroicocephalus philadelphia—Bonaparte's gull

Hydroprogne caspia—Caspian tern

Larus californicus—California gull

Larus delawarensis—ring-billed gull

Larus heermanni—Heermann's gull

Larus occidentalis—western gull

Rynchops niger—black skimmer

Sterna forsteri—Forster's tern

Sternula antillarum—least tern

Thalasseus elegans—elegant tern

THRUSHES

TURDIDAE—THRUSHES

Catharus guttatus—hermit thrush

Catharus ustulatus—Swainson's thrush

Sialia mexicana—western bluebird

Turdus migratorius—American robin

VIREOS

VIREONIDAE—VIREOS

Vireo bellii pusillus—least Bell's vireo

Vireo bellii—Bell's vireo

Vireo gilvus—warbling vireo

Vireo huttoni—Hutton's vireo

Vireo cassinii—Cassin's vireo

WAGTAILS & PIPITS

MOTACILLIDAE—WAGTAILS & PIPITS

Anthus rubescens—American pipit

WATERFOWL

ANATIDAE—DUCKS, GEESE, & SWANS

Anas acuta—northern pintail

Anas platyrhynchos—mallard

Aythya affinis—lesser scaup

Aythya americana—redhead

Branta canadensis—Canada goose

Bucephala albeola—bufflehead

Bucephala clangula—common goldeneye

Mergus serrator—red-breasted merganser

Oxyura jamaicensis—ruddy duck

Anas crecca—green-winged teal

Spatula discors—blue-winged teal

Spatula cyanoptera—cinnamon teal

Mareca strepera—gadwall

Spatula clypeata—northern shoveler

Mareca americana—American wigeon

WAXWINGS

BOMBYCILLIDAE—WAXWINGS

Bombycilla cedrorum—cedar waxwing

WOOD WARBLERS & ALLIES

PARULIDAE—WOOD-WARBLERS

Cardellina pusilla—Wilson's warbler

Geothlypis tolmiei—MacGillivray's warbler

Geothlypis trichas—common yellowthroat

Setophaga coronata—yellow-rumped warbler

Setophaga nigrescens—black-throated gray warbler

Setophaga occidentalis—hermit warbler

Setophaga petechia—yellow warbler

Setophaga townsendi—Townsend's warbler

Leiothlypis celata—orange-crowned warbler

Leiothlypis ruficapilla—Nashville warbler

WOODPECKERS

PICIDAE—WOODPECKERS & ALLIES

Colaptes auratus—northern flicker

Dryobates nuttallii—Nuttall's woodpecker

Dryobates pubescens—downy woodpecker

WRENS

TROGLODYTIDAE—WRENS

Campylorhynchus brunneicapillus—cactus wren

Cistothorus palustris—marsh wren

Salpinctes obsoletus—rock wren

Troglodytes aedon—house wren

Thryomanes bewickii—Bewick's wren

WAXBILLS

ESTRILDIDAE—WAXBILLS

Lonchura punctulata—scaly-breasted munia*

NEW WORLD SPARROWS

PASSERELLIDAE—NEW WORLD SPARROWS

Aimophila ruficeps—rufous-crowned sparrow

Ammodramus savannarum—grasshopper sparrow

Chondestes grammacus—lark sparrow

Junco hyemalis—dark-eyed junco

Melospiza lincolnii—Lincoln's sparrow

Melospiza melodia—song sparrow

Melozone crissalis—California towhee

Passerculus sandwichensis beldingi—Belding's savannah sparrow

Passerculus sandwichensis—savannah sparrow

Passerella iliaca—fox sparrow

Pipilo maculatus—spotted towhee

Spizella passerina—chipping sparrow

Zonotrichia atricapilla—golden-crowned sparrow

Zonotrichia leucophrys—white-crowned sparrow

CHATS

ICTERIIDAE—YELLOW-BREASTED CHAT

Icteria virens—yellow-breasted chat

TYPICAL WARBLERS, PARROTBILLS, WRENTIT

SYLVIIDAE—SYLVIID WARBLERS

Chamaea fasciata—wrentit

INVERTEBRATES

BUTTERFLIES

LYCAENIDAE—BLUES, HAIRSTREAKS, & COPPERS

Icaricia acmon acmon—Acmon blue

NYMPHALIDAE—BRUSH-FOOTED BUTTERFLIES

Adelpha bredowii—California sister

Danaus plexippus—monarch

Junonia coenia—common buckeye

Limenitis lorquini—Lorquin's admiral

Nymphalis antiopa—mourning cloak

Vanessa atalanta—red admiral

Vanessa cardui—painted lady

HESPERIIDAE—SKIPPERS

Erynnis funeralis—funereal duskywing

Heliopetes ericetorum—northern white-skipper

PAPILIONIDAE—SWALLOWTAILS

Papilio eurymedon—pale swallowtail

PIERIDAE—WHITES & SULFURS

Colias eurytheme—orange sulphur

Phoebis sennae—cloudless sulphur

Pieris rapae—cabbage white

Pontia beckerii—Becker's white

Pontia protodice—checkered white

FAIRY SHRIMP

BRANCHINECTIDAE—FAIRY SHRIMP

Branchinecta lynchi—vernal pool fairy shrimp

Branchinecta sandiegonensis—San Diego fairy shrimp

ANTS

FORMICIDAE—ANTS

Linepithema humile—Argentine ant*

BEES

APIDAE—BEES

Bombus crotchii—Crotch's bumble bee

MAMMALS

CANIDS

CANIDAE—WOLVES & FOXES

Canis latrans—coyote

HARES & RABBITS

LEPORIDAE—HARES & RABBITS

Sylvilagus audubonii—desert cottontail

MUSTELIDS

MEPHITIDAE—SKUNKS

Mephitis mephitis—striped skunk

OPOSSUMS

DIDELPHIDAE—NEW WORLD OPOSSUMS

Didelphis virginiana—Virginia opossum*

POCKET GOPHERS

GEOMYIDAE—POCKET GOPHERS

Thomomys bottae—Botta's pocket gopher

SQUIRRELS

SCIURIDAE—SQUIRRELS

Otospermophilus beecheyi—California ground squirrel

RATS, MICE, & VOLES

CRICETIDAE—RATS, MICE, & VOLES

Neotoma fuscipes—dusky-footed woodrat

Reithrodontomys megalotis—western harvest mouse

MURIDAE—RATS, MICE, & VOLES

Rattus rattus—roof rat*

RACCOONS

PROCYONIDAE—RACCOONS & RELATIVES

Procyon lotor—northern raccoon

REPTILES

LIZARDS

PHRYNOSOMATIDAE—IGUANID LIZARDS

Sceloporus occidentalis—western fence lizard

Uta stansburiana—common side-blotched lizard

TEIIDAE—WHIPTAIL LIZARDS

Aspidoscelis tigris—tiger whiptail

SNAKES

COLUBRIDAE—COLUBRID SNAKES

Pituophis catenifer—gophersnake

*   signifies introduced (non-native) species

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Appendix C

COASTAL RESILIENCE STUDY

COASTAL CORRIDOR ALLIANCE

Mountains Recreation & Conservation Authority

DRAFT

RANDALL PRESERVE/GENGA*

Coastal Resilience Strategy

MAY 13, 2025

Prepared By:
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Aerial image: AirViews

*Tribal name to be determined

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Glossary

AHT	Annual High Tide
AR6	Sixth Assessment Report
CCA	Coastal Corridor Alliance
CCC	California Coastal Commission
CoNED	Coastal National Elevation Database
CoSMoS	Coastal Storm Modeling System
CRS	Coastal Resilience Strategy
cm	Centimeters
DTL	Mean Diurnal Tide Level
ENSO	El Niño and the Southern Oscillation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FJRP	Frank and Joan Randall Preserve
ft	Feet
GIS	Geographic Information Systems
GSW	Global Surface Warming
HAT	Highest Astronomical Tide
HEC-RAS	Hydrologic Engineering Center – River Analysis System
HOT	Highest Observed Tide
HOWL	Highest Observed Water Level
in.	Inches
IPCC	International Panel of Climate Change
Int	Intermediate
Int-High	Intermediate-High
ITF	Interagency Task Force
k	Hydraulic Conductivity
LAT	Lowest Astronomical Tide
LCP	Low-Confidence Processes
LF	Linear Feet
LOWL	Lowest Observed Water Level
m	Meters
MHW	Mean High Water
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MRCA	Mountains Recreation and Conservation Authority

MSL	Mean Sea Level
MTL	Mean Tide Level
NAVD88	North American Vertical Datum of 1988
NFAT	NASA Flooding Analysis Tool
NFHL	National Flood Hazard Analysis
NOAA	National Oceanic and Atmospheric Administration
OCFCD	Orange County Flood Control District
OCPW	Orange County Public Works
OCOF	Our Coast Our Future
OPC	State of California Ocean Protection Council
PAP	Public Access Plan
PCH	Pacific Coast Highway (Highway One)
RMP	Resource Management Plan
SAR	Santa Ana River
SART	Santa Ana River Trail
SARWQB	Santa Ana Regional Water Quality Control Board
SFHA	Special Flood Hazard Analysis
SIM	Static Inundation Modelling
SLR	Sea Level Rise
SLRVA	Sea Level Rise Vulnerability Assessment
SRT	Self-Regulating Tide
sq ft	Square Feet
SWL	Still Water Level (ft, NAVD88)
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TAEP	Tribal Access and Engagement Plan
TPL	Trust for Public Land
TWL	Total Water Level (ft, NAVD88)
USGS	United States Geological Society
USACE	U.S. Army Corps of Engineers
VHE	Very High Emissions
WL	Water Level
YOI	Year of Inflection

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1. Introduction

1.1. General Overview

This report presents and recommends a set of actions designed to provide protection to the low-lying areas (lowlands) of Randall Preserve (or "Preserve") from the impacts of rising sea levels, coastal storms, and flooding. Resilience is accomplished by taking several steps including identifying and assessing the risks from sea level rise (SLR), developing adaptation plans and resiliency measures, prioritizing those measures, implementing them, and then monitoring the effectiveness of those measures.

Following guidance in the California Coastal Commission (CCC) SLR Policy Guidance Document (CCC Guidance), the objective of this Coastal Resiliency Strategy (CRS) document is to identify coastal resilience strategies intended to reduce negative impacts and improve the Preserve's ability to prepare for, withstand, and recover from extreme coastal events and rising sea levels. Strategies focus on improving resilience of the natural and built environments and include implementing solutions that are either nature-based or engineered structures, or a hybrid of the two. While this document was developed in consideration of the Preserve's site-specific needs, it was also developed with a holistic landscape perspective in mind, which considers the Preserve's connection to the Santa Ana River, adjacent uplands and communities, and its significance to the region (Figure 1).

Building on these findings, this plan outlines potential adaptation strategies to mitigate or reduce the potential impacts of SLR to vulnerable locations across the Preserve. This adaptation plan is not meant to dictate a specific set of actions the Preserve must take but rather provide a range of options to be further debated, considered, and potentially implemented in the future. It is flexible and meant to be a community planning document that is revised over time as new information emerges, climate science advances, and community preferences evolve.

FIGURE 1. LANDSCAPE PERSPECTIVE OF THEPRESERVE

In combination with the SLR Vulnerability Assessment (*full document provided in Appendix A*), these reports outline a cyclical process to address SLR hazards over time, illustrated in Figure 2. Steps 1-3, from identifying appropriate SLR projections to assessing risks to resources and development, are covered within the Sea Level Rise Vulnerability Assessment (SLRVA). Strategies on the development of adaptation measures and the implementation of these measures (Steps 4-5) are covered within this document.

FIGURE 2. COASTAL RESILIENCE STRATEGY PLANNING PROCESS

1.2. CRS Plan Objectives

As a result of melting land ice, thermal ocean expansion, and coastal land subsidence, global sea levels have been observably rising since 1900; the rate of SLR is expected to increase through the 21st century (NOAA 2015; NRC 2012). As sea levels continue to rise, portions of the Preserve and adjacent areas may experience more frequent and severe coastal hazards that will test the area's resilience.

The Coastal Corridor Alliance (CCA) and Mountain Recreation and Conservation Authority (MRCA) developed explicit objectives for the lowlands:

1. **<u>Goal #1</u>: Restore coastal processes and functions to the maximum extent possible for ecological benefit.**

   Objectives:

   1.1 Increase estuarine habitat with a mix of tidal channels, mudflat, salt marsh, and brackish/freshwater marsh.
   1.2 Enhance and maintain wetland-upland ecotone and upland habitat to support habitat resiliency and species diversity.
   1.3 Restore and maintain coastal habitat that supports species of special concern (e.g., federal and state listed species), essential fish habitat, and migratory birds.

1.4 Maintain hydrological integrity for the benefit of habitats.

2. **<u>Goal #2:</u> Plan for changing environments and design for ecological resilience.**

   Objectives:

   2.1. Design habitats to accommodate climate change related SLR and other coastal impacts (e.g., incorporate topographic and salinity gradients, habitat diversity and natural buffers and transition zones to accommodate migration of wetlands with rising sea levels).
   2.2. Prioritize nature-based solutions.
   2.3. Develop and implement a comprehensive sediment-management plan.
   2.4. Work toward increased unification and collaboration of management with appropriate entities, such as OC Parks, Orange County Vector Control, the City of Newport Beach, and U.S. Army Corps of Engineers (USACE).

3. **<u>Goal #3</u>: Identify opportunities for contiguous coastal habitat areas and increase the buffer between sensitive habitat and sources of human activities**.

   Objectives:

   3.1. Bridge wildlife connectivity between the Preserve/Genga and adjacent natural areas.
   3.2. Balance ecological sustainability with an appropriate level of public access and Tribal cultural uses.
   3.3. Increase habitat buffer zones by limiting or reducing impacts from urban infrastructure and intrusions (e.g., stormwater pipelines, powerlines, lighting, excessive noise).

The potential strategies presented in the following sections are evaluated based on their ability to meet the criteria outlined above.

2. Description of Coastal Hazards

The previous Sea Level Rise Vulnerability Assessment (SLRVA) (M&N 2025) analyzed the effects of SLR on the Preserve's existing project site and adjacent waterways using the best available science and data to determine potential coastal hazard zones in accordance with California Coastal Commission (CCC) Guidance. The State of California Ocean Protection Council (OPC) Science Advisory Taskforce compiled the best available SLR science relevant to California in the "Rising Seas in California" report (Griggs, et al. 2017). Reflecting statewide guidance, the OPC recently released the 2024 State of California SLR Guidance: Science and Policy Update in January 2024. The CCC currently recognizes this document as the best available science for SLR projections in California.

The following is a brief description of the coastal hazards evaluated in the previous vulnerability assessment. A combination of analytical methods and numerical models (described in Appendix A) were used to develop potential resilience and adaptation solutions for each type of hazard under the different SLR scenarios.

4. **Flooding Driven by Severe Storm Events and High Tides:** SLR is expected to significantly affect the extent, depth, and frequency of coastal flooding at adjacent surrounding areas (Santa Ana River [SAR], West Newport Bay, Pacific Coast Highway [PCH], etc.). It was deduced that the site is heavily protected by the existing hydraulic infrastructure (tide gates, storm drain outlets, etc.) under most scenarios; thus, highlighting the dependance on this critical hydraulics infrastructure's operability. Flood hazard projections were modeled using the USGS CoSMoS platform for both non-storm spring high tide conditions and 100-year (YR) coastal storm conditions, with an additional scenario analyzed in which no agency intervention occurs, and critical infrastructure is not retrofitted to meet increasing hazard demands (4.9 feet [ft] SLR, 100-YR storm unprotected scenario). Analysis showed that under this 4.9 ft SLR unprotected scenario, most of the lowlands including portions of wetlands, floodplain, and infrastructure — are projected to experience extensive inundation during storm events, especially where levees or coastal roadways such as PCH could be overtopped. These events could also lead to increased backflow through municipal storm drains and reduced drainage performance. Figure 1 provides a cross-section of the project site showing critical water levels as they relate to the various SLR and storm scenarios.

5. **Groundwater Emergence:** Groundwater emergence, a form of flooding driven by rising shallow groundwater tables, presents a potential risk for the site under future SLR. This occurs when groundwater levels, influenced by rising marine water levels, approach or exceed the ground surface, leading to surface flooding even in the absence of rainfall or storm surge. CoSMoS groundwater modeling was used to project water table responses under various SLR scenarios. Results indicate that much of the site will be subject to a shallow (0-3 ft) or emergent groundwater table condition under MHHW as SLR progresses. These conditions can precede surface inundation and impact underground infrastructure and result in persistent saturation of low-lying zones. As wetland creation and expansion of existing wetlands is a long-term management goal, however, groundwater emergence could make wetland creation easier at the Preserve.

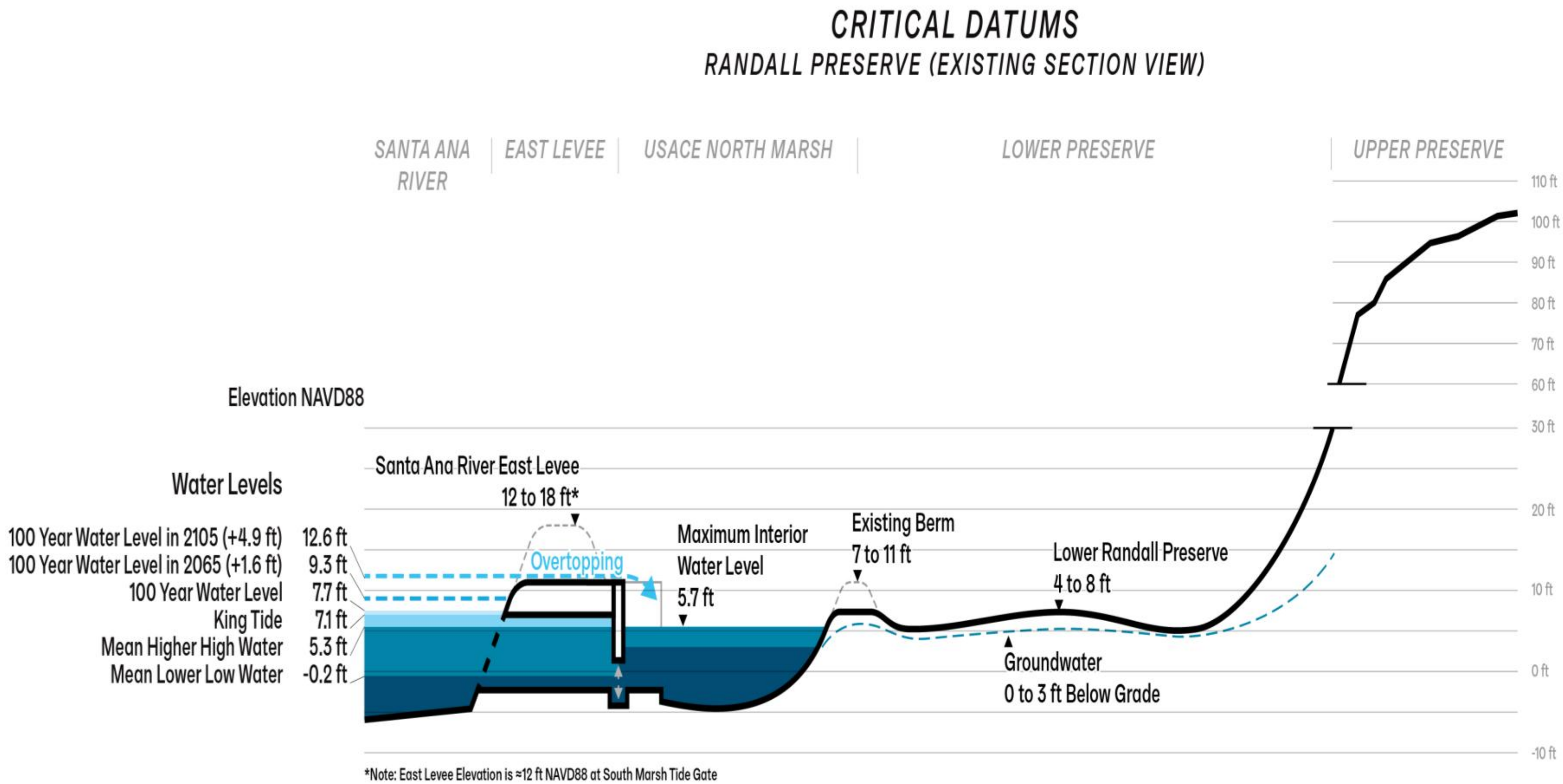


FIGURE 3. CRITICAL DATUMS AND STORM EVENTS AS THEY RELATE TO THE PRESERVE

3. Basis for Coastal Resilience Strategies

The initial phase of crafting this CRS document involved determining the vulnerability of different locations and resources within the Preserve to SLR. These findings are presented in Appendix A (the SLRVA). The SLRVA examines the vulnerability of the Preserve's assets and coastal resources under SLR scenarios ranging from 1.6 ft (0.25 meters [m]) to 4.9 ft (1.5 m), covering projected SLR from 2080 to 2140 as shown in Table 1 below.

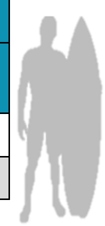
A total of seven (7) SLR and storm scenarios were mapped for the vulnerability assessment:

- Existing conditions (no SLR)
  - Non-Storm – Annual High Tide (AHT) of +6.79 ft NAVD88
  - 100-YR Storm – Highest Observed Tide (HOT) of +7.72 ft NAVD88
- 1.6 ft SLR conditions
  - Non-Storm – AHT of +6.79 ft NAVD88
  - 100-YR Storm – HOT of +7.72 ft NAVD88
- 4.9 ft SLR conditions
  - Non-Storm – AHT of +6.79 ft NAVD88
  - 100-YR Storm – HOT of +7.72 ft NAVD88
  - 100-YR Storm (*Unprotected*) – HOT of +7.72 ft NAVD88

Evidence in the updated 2024 report suggests that it is reasonable to view the *Intermediate* scenario as the most representative of the SLR expected to occur in the near term and provides a reasonable upper bound for the most likely range of SLR by 2100.

TABLE 1. PROBABLE TIMING ASSOCIATED WITH SELECTED SLR SCENARIOS FOR THE LOS ANGELES REGION (OPC, 2024)

SLR Scenarios, ft (cm)	Probable Timing Associated with SLR Projections (2024 Draft Guidance Update)				
	Low	Int-Low	Intermediate	Int-High	High
1.6 (50)	2150+	2120	2080	2065	2055
4.9 (150)	2150+	2150+	2140	2105	2090



3.1. SLRVA Summary and Findings

Vulnerability of the Preserve as it relates to SLR is defined based on three characteristics:

- **Hazard Exposure**: The hazard *type, duration, and frequency* subjected upon the Project Site. In general, the degree of flooding exposure due to SLR at a specific site typically dictates how exposed the site is to these hazards.
- **Hazard Sensitivity**: The *degree* to which a resource is impaired by exposure to hazards. It relates to the susceptibility of the site to the various coastal hazards associated with SLR and considers the ecological, social, and economic factors that make certain areas or assets more sensitive or vulnerable to hazards.
- **Adaptive Capacity**: The *ability* of a site to respond effectively to changing conditions, including coastal hazards, while maintaining or enhancing their well-being and functionality.

The overall vulnerability of coastal assets at the Preserve is determined by evaluating these three interrelated factors by first identifying key resources within and adjacent to the Preserve — such as recreational areas, infrastructure, roadways, and natural habitats — then evaluating how each of these resources responds to increasing SLR scenarios. Resources that are highly exposed to coastal hazards (e.g., tidal inundation, groundwater emergence, etc.), highly sensitive to impacts such as flooding or saturation, and lack the ability to adapt or be protected over time are classified as highly vulnerable. The resulting vulnerability classifications provide a snapshot of which assets within the Preserve are most at risk and help inform future adaptation planning. Summary vulnerability scores for different resource types and hazard conditions are provided in Table 2.

TABLE 2. SLR VULNERABILITY RATINGS AND DESCRIPTIONS

Category	Rating	Description
Hazard Exposure	N/A	No exposure to flooding or erosion.
	Low	Exposure to storm flooding in select areas.
	Moderate	Significant exposure to storm flooding and/or partial exposure to non-storm inundation.
	High	Significant exposure to non-storm inundation.
Hazard Sensitivity	Low	Minimal impacts to structure and function as a result of coastal hazards unless inundated on a regular basis.
	Moderate	Moderate impacts to structure and function during temporary storm flooding. Significant impacts if inundated.
	High	Significant impacts to structure and function from short-term storm flooding or inundation.
Adaptive Capacity	Low	Limited options for adaptation. Adaptation likely to have significant costs.
	Moderate	Multiple options for adaptation over time with relatively moderate effort and cost.
	High	Multiple options for adaptation over time with minor additional cost.

The vulnerability of coastal resources at the Preserve varies significantly depending on the presence or absence of protection provided by the existing tide gates and coastal infrastructure. To reflect these conditions, assets were evaluated under two SLR scenarios: Protected (existing, 1.6 ft, and 4.9 ft SLR with fully operational hydraulic infrastructure) and Unprotected (4.9 ft SLR with no agency intervention and allowed overtopping). The Preserve remains largely protected from direct SLR impacts under current and near-term conditions — primarily due to the functionality of existing levee, tide gates, and other hydraulic connections along the Santa Ana River.

Under the *Protected* scenario, most resources exhibit low to moderate overall vulnerability, due to reduced hazard exposure from tidal inundation and storm surge. This includes critical infrastructure such as storm drains, utilities, and natural vegetation, which benefit from the function of the tide gates and structural protections. In contrast, the Unprotected scenario shows a marked increase in vulnerability across nearly all asset categories. Lowland development, stormwater infrastructure, and recreation amenities show high overall risk, driven by increased hazard exposure and limited adaptive capacity.

This distinction reflects the differing levels of exposure to SLR-related hazards such as tidal inundation, storm-driven flooding, and groundwater emergence, and allows for a more accurate evaluation of risk based on site-specific conditions and infrastructure performance. The following tables summarize the overall vulnerability of coastal assets identified in the SLRVA, organized by this protection status.

TABLE 3. IDENTIFIED RISK ASSESSMENT FOR THE PRESERVE COASTAL RESOURCES UNDER PROTECTED (EXISTING, 1.6 FT SLR, AND 4.9 FT SLR) SCENARIOS

Resource Category	Resource	Specific Assets	Within Project Boundary	Hazard Exposure	Hazard Sensitivity	Adaptive Capacity	Vulnerability (Overall Risk)
Existing Vegetation and Habitat	*Preserve Vegetation*	Open Space Vegetation	Yes	Low	Moderate	Moderate	Low
	Submerged Waterways	Semeniuk Slough	No	Low	Low	High	
		SAR	No	Moderate	Low	Moderate	
	Uplands	Coastal Bluffs and Arroyos	Yes	N/A	Moderate	High	
	USACE SAR Marshes	North Marsh (USACE Project)	No	Moderate	Low	High	
		South Marsh (USACE Project)	No	Moderate	Low	High	
Critical Infrastructure and Development	*Hydraulic Infrastructure*	Levee	No	Moderate	Low	Low	Low
		Tide Gate Facilities	No	Moderate	Low	Moderate	
		Culverts	Yes	Moderate	Low	Moderate	
		Outlet Drains/Gates	No	Moderate	Low	Moderate	
		Easements	Yes	N/A	Moderate	Moderate	
	Lowlands Development	Bulkhead Walls	Yes	Low	Moderate	Moderate	
		Oil Operator Facilities	Yes	Low	Moderate	Moderate	
		Staging/Laydown and Other Development Areas	Yes	N/A	Moderate	Low	
		Fencing	Yes	Low	Moderate	Low	
	Upland Development	Site Access Area/Parking	Yes	N/A	Moderate	Moderate	
	Major Roadways	Pacific Coast Highway	No	High	High	Low	
	Service Roads	Industrial Way	Yes	Low	Moderate	Moderate	
		Oil Operator Service Dirt Roads	Yes	Moderate	Moderate	Moderate	
		Access Bridge (at North Marsh)	No	Low	Moderate	Moderate	
	Residential Areas	Newport Bay Residential Area	No	High	High	Low	
Utilities	*Existing Site Utilities*	Storm Drains	Yes	Moderate	Low	Moderate	Low
		Electrical (Overhead Power)	Yes	Low	High	Moderate	
		Exist Oil Piping	Yes	Low	Moderate	Low	
Recreation and Public Access	*Recreation and Public Access*	Future Access Trails and Amenities[1]	Yes	N/A	Low	Low	Low
		SART Pedestrian Trail	Yes	N/A	Low	Low	

TABLE 4. IDENTIFIED RISK ASSESSMENT FOR THE PRESERVE COASTAL RESOURCES UNDER UNPROTECTED 4.9 FT SLR SCENARIO

Resource Category	Resource	Specific Assets	Within Project Boundary	Hazard Exposure	Hazard Sensitivity	Adaptive Capacity	Vulnerability (Overall Risk)
Existing Vegetation and Habitat	*Preserve Vegetation*	Open Space Vegetation	Yes	High	Low	Moderate	High
	Submerged Waterways	Semeniuk Slough	No	High	Low	High	
		SAR	No	High	Low	Moderate	
	Uplands	Coastal Bluffs and Arroyos	Yes	N/A	Moderate	High	
	USACE Salt Marshes	North Marsh (USACE Project)	No	High	Low	High	
		South Marsh (USACE Project)	No	High	Low	High	
Critical Infrastructure and Development	*Hydraulic Infrastructure*	Levee	No	High	Low	Low	High
		Tide Gate Facilities	No	High	Low	Moderate	
		Culverts	Yes	High	Low	Moderate	
		Outlet Drains/Gates	No	High	Low	Moderate	
		Easements	Yes	High	Moderate	Moderate	
	Lowlands Development	Bulkhead Walls	Yes	High	Moderate	Moderate	
		Oil Operator Facilities	Yes	High	Moderate	Moderate	
		Staging/Laydown and Other Development Areas	Yes	Moderate	Moderate	Low	
		Fencing	Yes	High	Moderate	Low	
	Upland Development	Site Access Area/Parking	Yes	N/A	Moderate	Moderate	
	Major Roadways	Pacific Coast Highway	No	High	High	Low	
	Service Roads	Industrial Way	Yes	High	Moderate	Moderate	
		Oil Operator Service Dirt Roads	Yes	High	Moderate	Moderate	
		Access Bridge (at North Marsh)	No	High	Moderate	Moderate	
	Residential Areas	Newport Bay Residential Area	No	High	High	Low	
Utilities	*Existing Site Utilities*	Storm Drains	Yes	High	Low	Moderate	High
		Electrical (Overhead Power)	Yes	High	High	Moderate	
		Exist Oil Piping	Yes	Moderate	Moderate	Low	
Recreation and Public Access	*Recreation and Public Access*	Future Access Trails and Amenities[1]	Yes	Moderate	Low	Low	Moderate
		SART Pedestrian Trail	Yes	Moderate	Low	Low	

The following is a preliminary list of assets that have been indicated as being potentially impacted by 1.6 ft and/or 4.9 ft SLR at the Preserve:

Inside the Preserve Project Boundary

- Existing Habitat/OpenSpace/Vegetation communities
- Oil Retainer Property/Operator Facilities
- Perimeter Fencing
- Culverts at southern area of the Preserve
- Storm Drains
- Industrial Way
- Electrical Utilities (w/ Overhead Power Transmission Lines)
- Vector Control routes
- Public access paths
- Vehicular access roads
- Service access road that connects PCH to SAR East levee

Outside the Preserve Project boundary, but still pertinent:

- Santa Ana River (SAR) East Levee
- Outlet Drains/Gates (SAR East Levee)
- North Marsh (USACE) at Santa Ana River Salt Marsh (SARSM)
- South Marsh (USACE) at Santa Ana River Salt Marsh (SARSM)
- Tide Gates at USACE North Marsh and South Marsh
- Culverts at North Marsh and South Marsh that connect to the Preserve
- Newport Beach Harbor at the Channel Place Park shoreline
- West Newport Beach
- Newport Shores
- Pacific Coast Highway

3.2. Strategies from CCC SLR Policy Guidance

The California OPC's updated 2024 Sea-Level Rise Guidance provides guidance on selecting SLR projections, which helps to standardize the process across the state. It points planners and engineers toward the best available SLR science and helps them understand how to practically consider and design for SLR risks. Figure 4 summarizes the major steps.

This State guidance provides the framework for the Preserve's SLR Vulnerability Assessment including the selection of the modeling scenarios. While these are not formal design guidelines, they include information on SLR projections and risk tolerance and could form the foundation of future Preserve design guidelines. This CRS document is intended to draw upon the analyses and findings from the original SLRVA document (Steps 1-4) and explore the decision-making process as it pertains to various adaptation approaches (Steps 5-6).

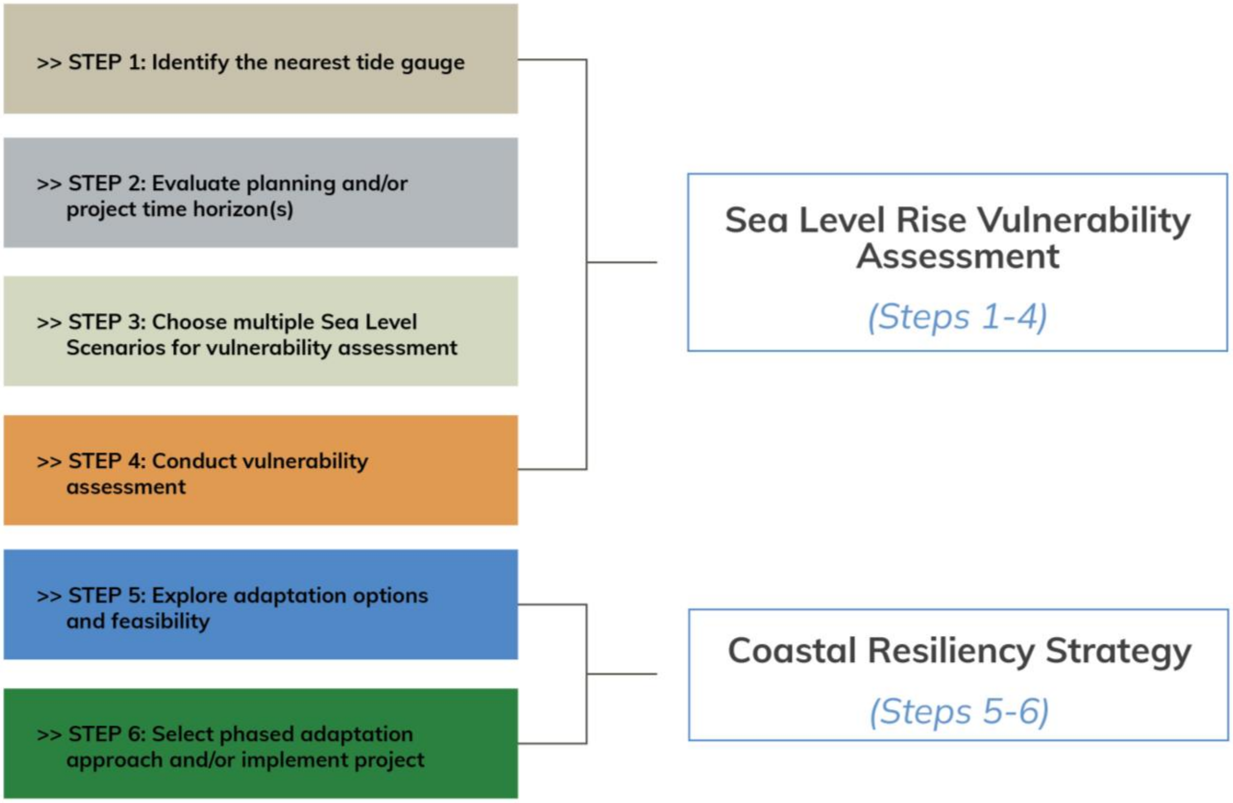


FIGURE 4. OPC'S UPDATED 2024 SLR GUIDANCE DECISION FRAMEWORK
(SOURCE: OPC'S 2024 UPDATED SLR GUIDANCE)

4. Resilience and Adaptation Strategies

4.1. General Adaptation Strategies

Changing coastal hazards due to SLR can be addressed in several different ways. Though numerous adaptation methods are available, adaptation measures generally fall into one of three categories or a combination of them:

- **Protection:** Strategies that employ hardened or nature-based engineered measures to defend an existing coastal asset from future SLR hazards without making changes to the asset itself.
- **Accommodation**: Strategies that involve modifying existing assets or designing new assets in a way that reduces the potential future impacts of SLR.
- **Retreat or Relocation:** Strategies focused on relocating or removing existing assets from identified high-hazard areas while limiting construction of new assets in such areas.

In unison with all of these different strategies, adaptive management will be a continually evolving and dynamic process for implementing SLR adaptation strategies that incorporate monitoring, evaluation, and iterative decision-making in tandem with the aforementioned strategies. It enables coastal planners, engineers, and stakeholders to respond to evolving climate impacts by adjusting actions or designs based on performance, new data, or changing community needs. In practice, SLR adaptation often relies on hybrid approaches that combine elements from multiple categories over different spatial and temporal scales. Examples of these strategies are provided in Figure 5.

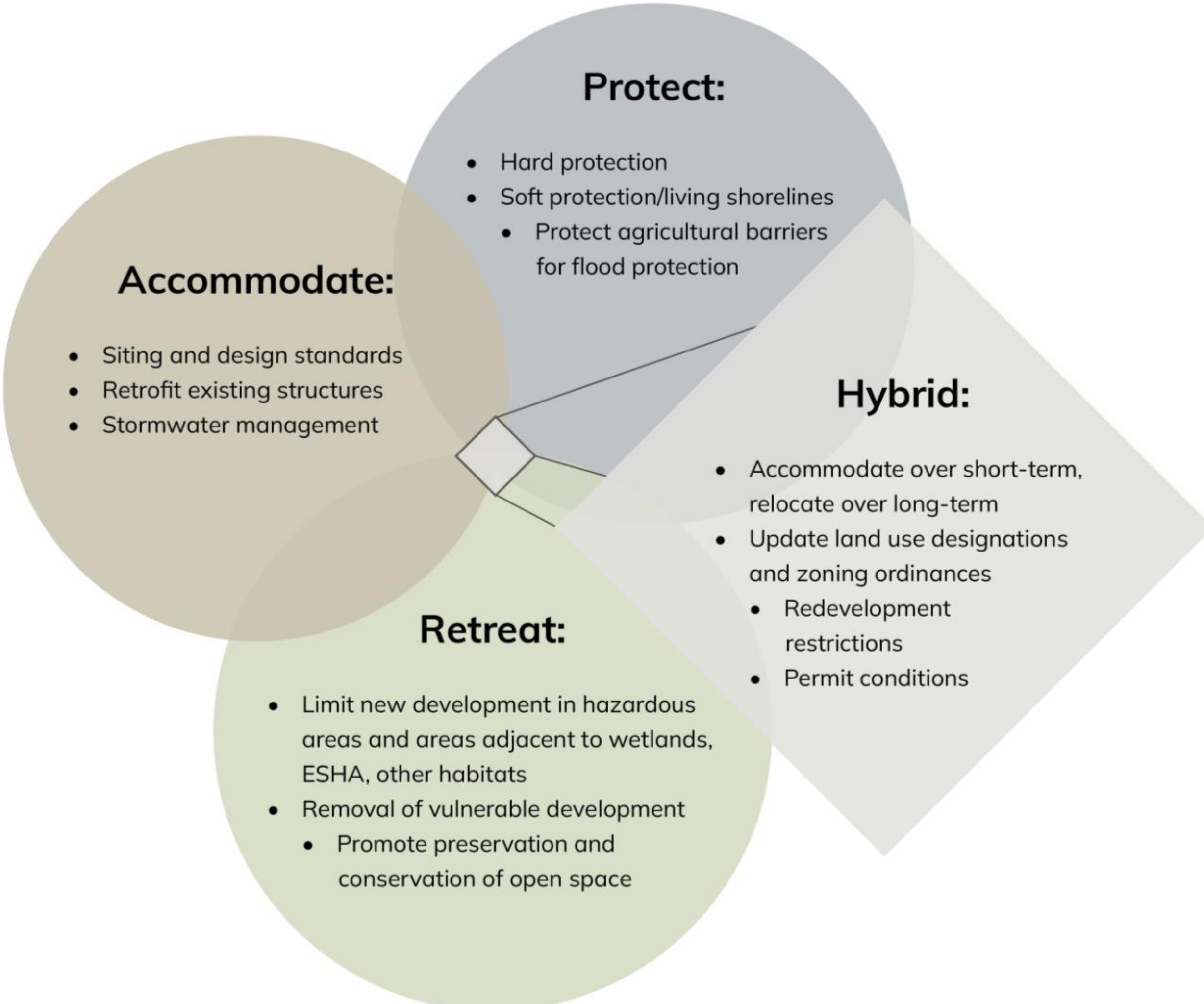


FIGURE 5. GENERAL SLR ADAPTATION STRATEGIES AND MECHANISMS

The following sections outline potential project-level resilience strategies that could be implemented within the four coastal planning areas to mitigate projected SLR-related hazards. Project-level strategies are provided for current conditions as well as projected near-term (1.6 ft) and long-term (4.9ft +) SLR scenarios. A breakdown of the potential benefits and challenges associated with various types of project-level resilience strategies are described in Section 5.

The RMP defines three distinct levels of management, which are provided in Table 5 below. They involve increasing levels of land alteration or “touch” that were developed for the RMP. Each level informs resiliency and adaptation solutions. For this CRS, the term “adaptation” is defined as those retrofitted to increase the resiliency of the existing condition or actions taken under the Low Touch and Intermediate Touch Management Levels. The term “*resilience*” is used for any solution added as part of future mitigation actions ascribed to the High-Touch Management Level.

The original SLVRA document provides analysis for the lower levels of management (Level 1: Low-Touch and Level 2: Intermediate-Touch) scenarios. Therefore, this CRS will focus primarily on higher Level 3 management approaches. The following section presents high-level concept summaries and evaluations of each resiliency and adaptation solution. These evaluations are intended to help narrow the range of options to those most suitable for potential implementation at the Preserve.

TABLE 5. SUMMARY OF MANAGEMENT LEVELS AS THEY RELATE TO COASTAL RESILIENCE AND ADAPTATION SOLUTIONS

Management Level	Focus	Key Actions	Outcomes/Goals
Level 1 – *Low Touch*	Basic preserve management and ecological stabilization	- Trail designation, signage, and safety reviews - Erosion and drainage control - Trash collection and perimeter patrols - Invasive species removal, suppression, and reliance on natural recruitment of native vegetation - Public behavior guidance (e.g., trail use, camping, vandalism)	Establish safe, sustainable public access and promote natural native vegetation recovery through weed suppression.
Level 2 – *Intermediate Touch*	Habitat enhancement and public experience improvements	- Upland road decommissioning and regrading - Native seeding and erosion control - Vernal pool and species habitat improvements - Construct amenities (e.g., platforms, trail bridges) - Establish nursery and community access points	Restore habitat in previously disturbed upland areas, enhance biodiversity, and support educational and recreational use.
Level 3 – *High Touch*	Transformative ecological restoration and tidal reconnection	- Mass grading and tidal channel excavation - Salt marsh and transitional habitat creation - Planting with temporary irrigation systems - Coordination with USACE and OCPW on tide gate management	Reestablish tidal influence in lowlands, enhance coastal wetland habitat, and achieve regional-scale ecological benefits.

Due to the limited changes in site topography under Management Levels 1 (*Low*) and 2 (*Intermediate*), the existing coastal hazard analysis presented in the SLRVA remains applicable and relevant to these approaches. In contrast, Management Level 3 involves significant site regrading and transformation, warranting additional analysis and updated hydrological modeling to assess its implications on flood risk and coastal processes on the altered proposed landscape.

4.2. Proposed Conditions (Management Level 3: *High Touch Scenario*)

Figure 6Figure 10 present an updated flood analysis consistent with the methodology used in the SLRVA but applied to a conceptual proposed final site condition. Due to legacy oil infrastructure across the site, the proposed grading plan lowers the surface elevation by approximately 3 ft throughout to accommodate anticipated subsurface conditions (Note: existing oil wells are cut-off and capped 3 ft below the existing terrain). Therefore, this assessment evaluates flood depths under combined SLR and coastal storm scenarios for the conceptual surface elevations, as described below and shown in Figure 5 through Figure 9.

- 1.6 ft SLR conditions
    - Non-Storm – AHT of +6.79 ft NAVD88
    - 100-YR Storm – HOT of +7.72 ft NAVD88
- 4.9 ft SLR conditions
    - Non-Storm – AHT of +6.79 ft NAVD88
    - 100-YR Storm – HOT of +7.72 ft NAVD88
- 100-YR Storm (*Unprotected*) – HOT of +7.72 ft NAVD88

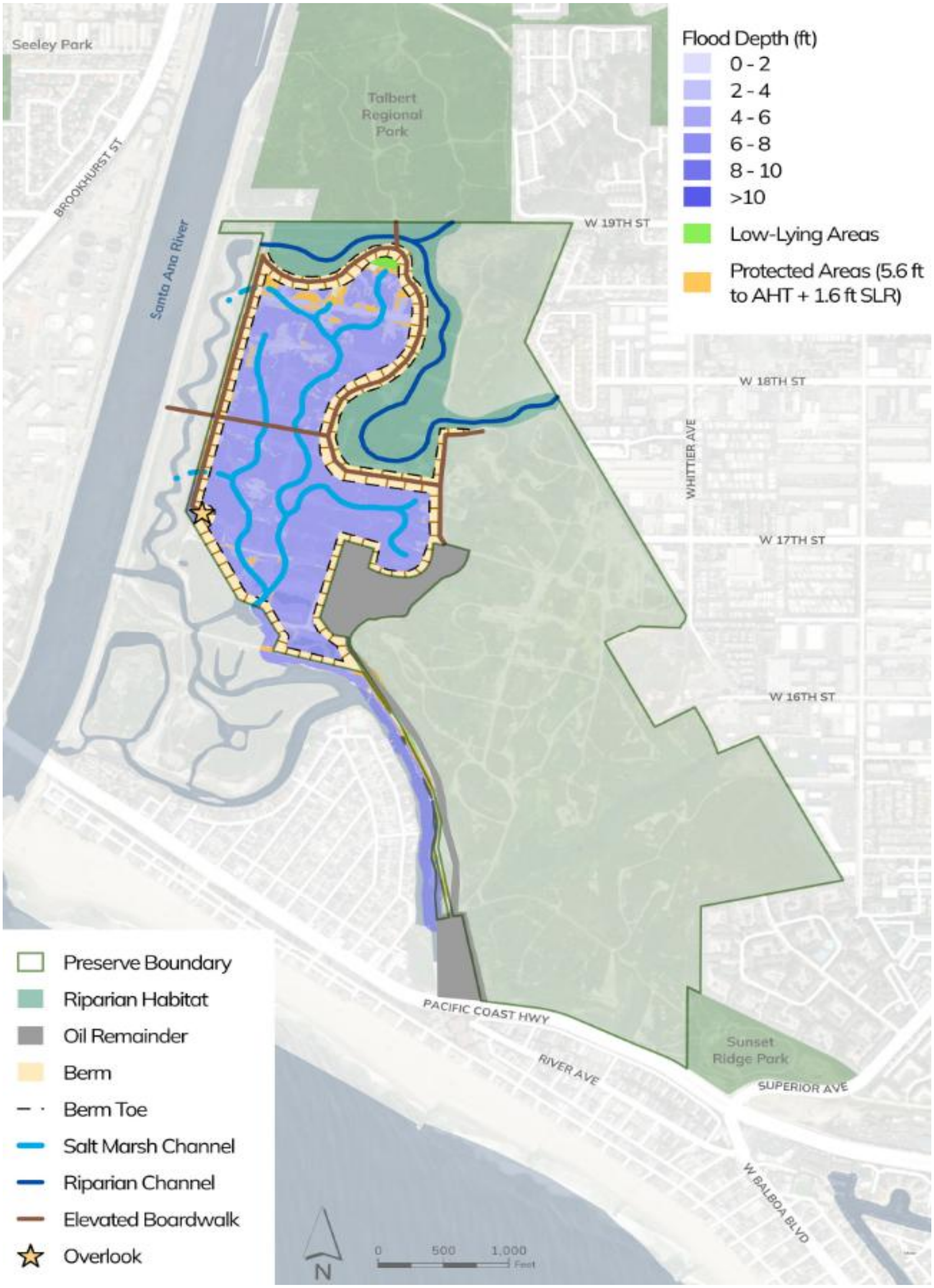


FIGURE 6. PROPOSED CONDITION UNDER 1.6 FT SLR + NO STORM

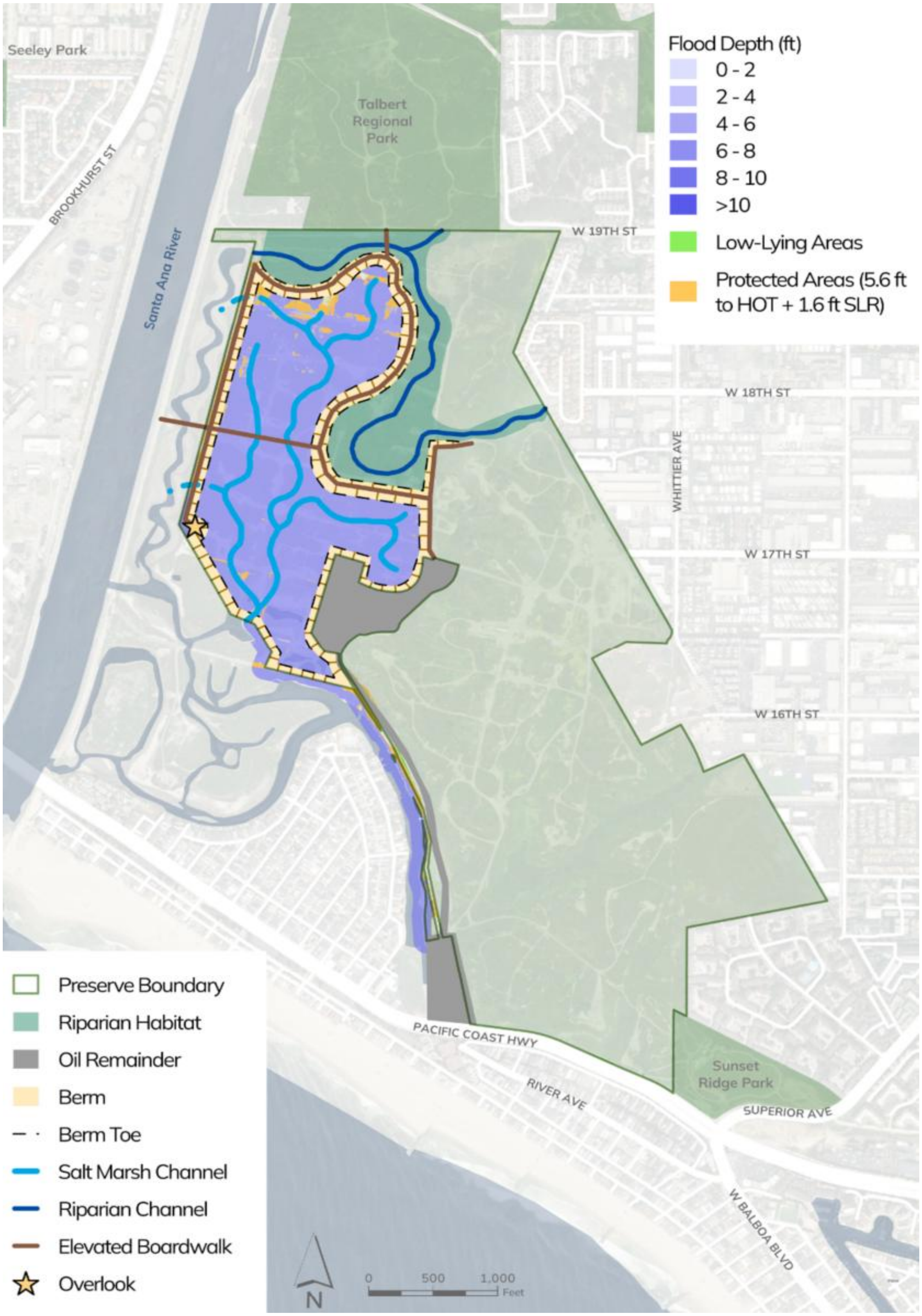


FIGURE 7. PROPOSED CONDITION UNDER 1.6 FT SLR + 100-YR STORM

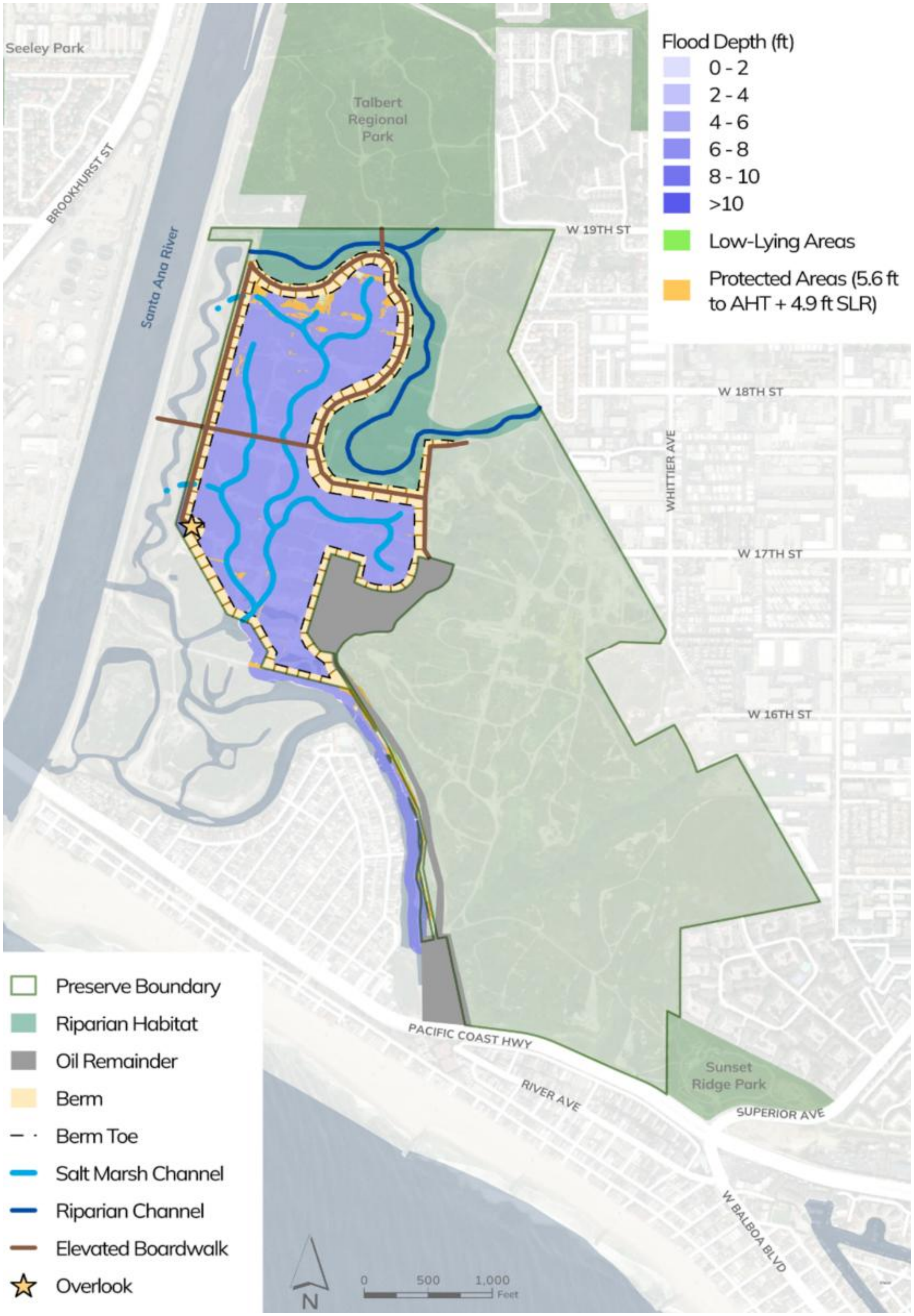


FIGURE 8. PROPOSED CONDITION UNDER 4.9 FT SLR + NO STORM

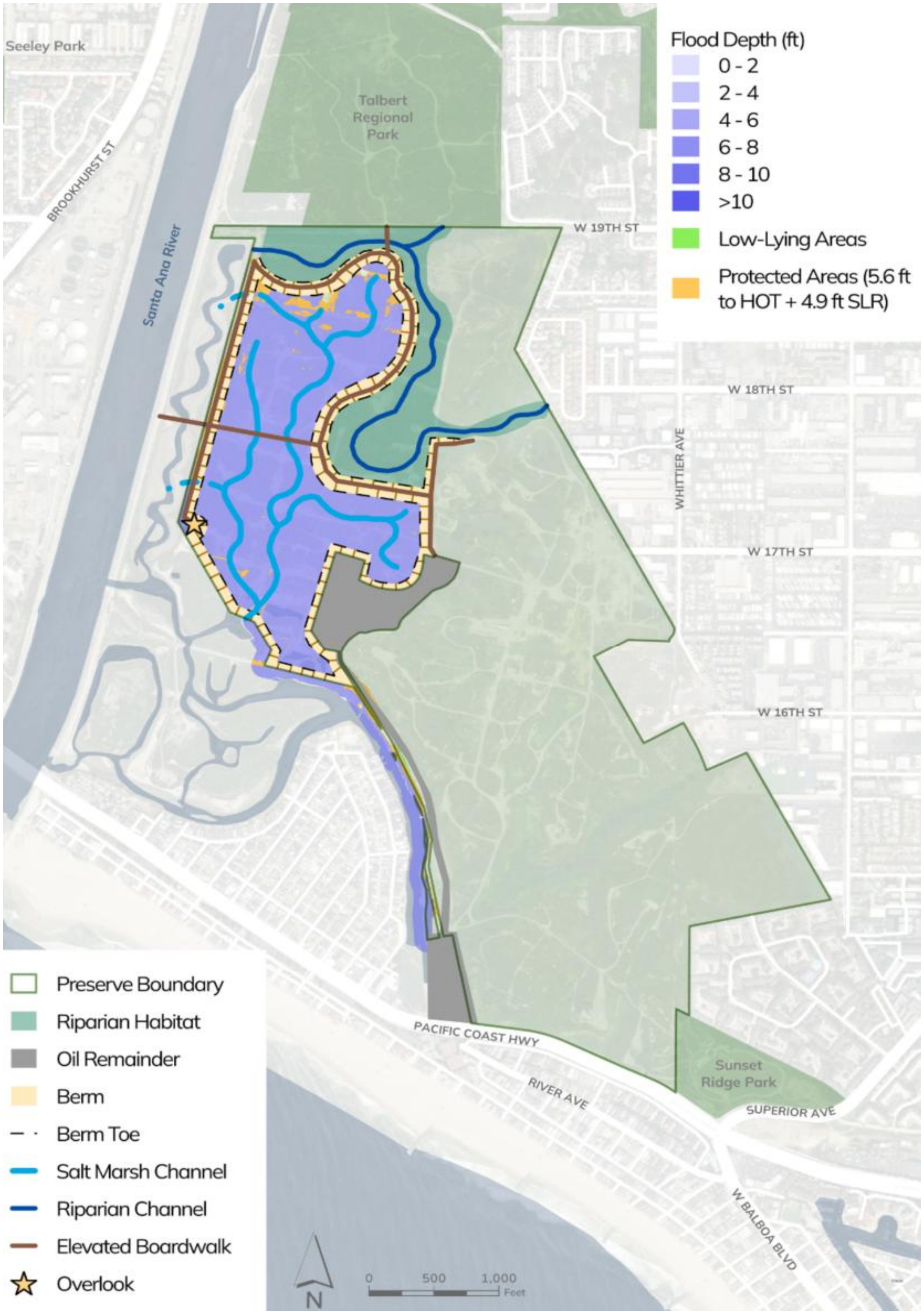


FIGURE 9. PROPOSED CONDITION UNDER 4.9 FT SLR + 100-YR STORM

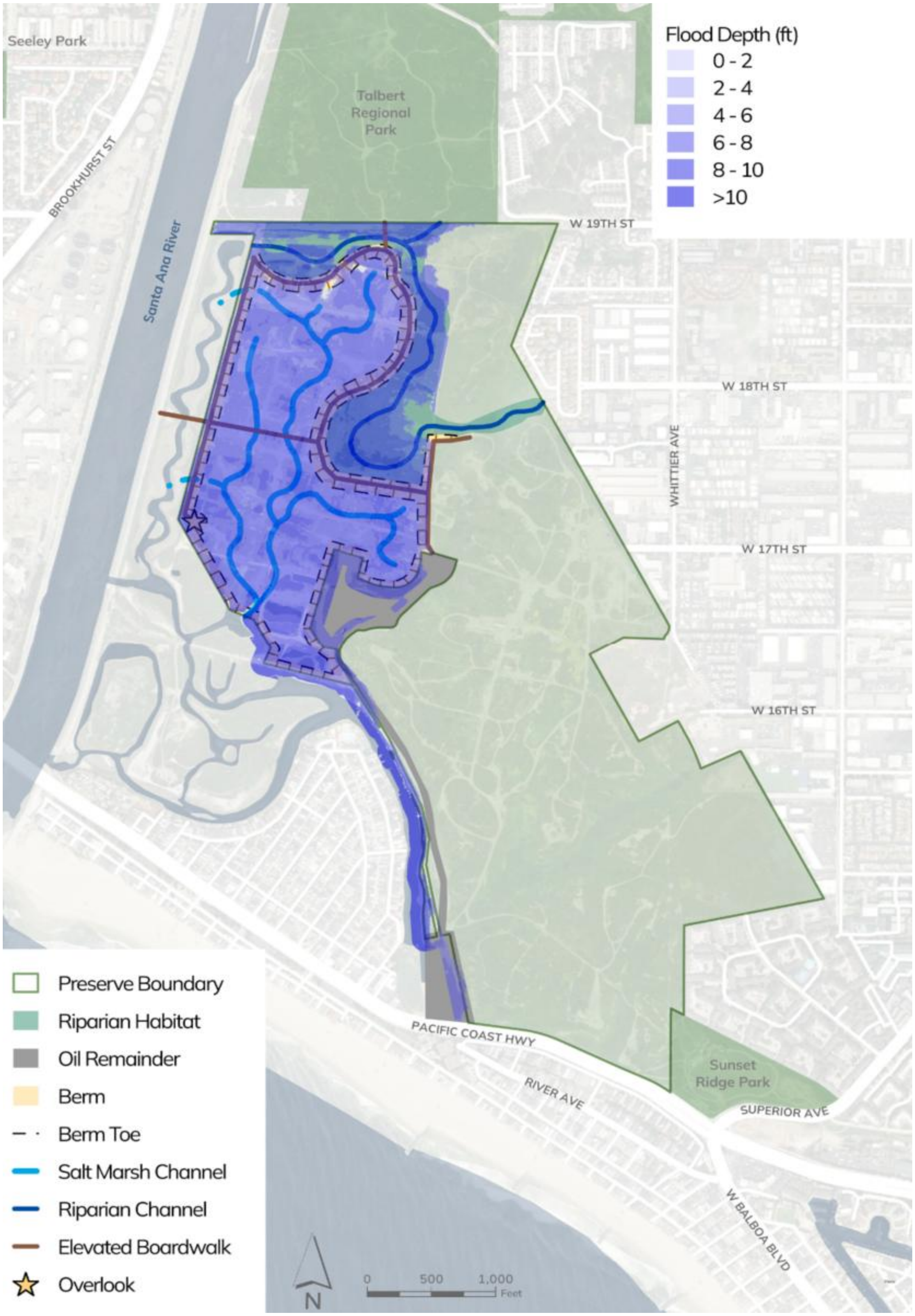


FIGURE 10. PROPOSED CONDITION UNDER 4.9 FT SLR + 100-YR STORM (UNPROTECTED)

4.3. Site-Specific Coastal Resilience Strategies

The strategies provided below will focus primarily on higher Level 3 management approaches, as these involve substantial site reconfiguration (including mass grading, restored hydrologic connectivity, and elevation changes) that significantly alter existing conditions. Unlike Levels 1 and 2, which maintain much of the current site form, Level 3 introduces transformative earthwork that requires updated hydrologic modeling, reassessment of flood pathways, and evaluation of long-term resilience under SLR scenarios. Given the complexity of these strategies, focused analysis is required to evaluate their feasibility, performance, and alignment with future environmental conditions. As such, the following section assumes that Management Levels 1 and 2 **–** as addressed in the broader RMP **–** will continue to serve as foundational components within the overall adaptation pathway. The resiliency strategies presented below are intended to help narrow the range of options to those most suitable for potential implementation at the Preserve.

4.3.1. Planning and Adaptive Management

Planning and adaptive management in the context of coastal resilience is a dynamic, iterative approach that allows communities and land managers to respond to changing coastal conditions—such as SLR, erosion, and extreme weather—over time. It involves setting clear long-term goals, identifying potential risks and vulnerabilities, implementing phased strategies, and continuously monitoring environmental and infrastructure conditions.

4.3.1.1. Strategic Partnerships

Strategic partnerships are a cornerstone of effective planning and adaptive management, particularly in complex, dynamic coastal environments like the Preserve. SLR, flooding, habitat shifts, and infrastructure vulnerability do not always adhere to defined jurisdictional boundaries making collaboration across agencies, landowners, and community groups essential. By establishing strong partnerships early, project proponents can align timelines, leverage technical expertise, and reduce redundancies in planning and implementation. These relationships also facilitate coordinated permitting, integrated data sharing, and access to joint funding opportunities that may not be available to a single entity acting in isolation. Most importantly, strategic partnerships build institutional memory and shared accountability, enabling a more nimble and resilient response as site conditions evolve and new adaptation needs emerge. In this way, partnerships are not just supportive — they are foundational to delivering long-term, flexible, and cost-effective coastal resilience.

For the Preserve in particular, strategic partnerships are essential due to its location at the intersection of multiple jurisdictions, infrastructure systems, and ecological corridors. Its long-term resilience depends on coordination with agencies such as USACE for permitting tidal connectivity, Orange County Public Works (OCPW) for levee and stormwater management, and the City of Newport Beach for future actions it might take to prevent flooding at West Newport. Without these partnerships, efforts to restore habitat, manage flood risk, or implement adaptive strategies could be delayed or rendered ineffective. Early and effective collaboration with these agencies will ensure the Preserve can operate as an integrated part of the larger coastal environment at West Newport, rather than in isolation, and allows it to serve as a model for collaborative, climate-ready land stewardship. The following is a list of potential partner organizations and agencies:

1. City of Newport Beach
    - Relevance: Jurisdictional authority over the Newport Harbor shoreline, including areas with protective bulkhead walls, community beaches, boat launching areas, the Channel Place Park neighborhood, stormwater outfalls, and local access routes such as Industrial Park Way.
    - Why it matters: These areas are among the first to flood under high SLR scenarios. Collaborative adaptation planning will ensure upstream interventions (e.g., levee improvements, tide gate operations) are not undermined by downstream vulnerabilities.
    - Coordination Topics: Public works, stormwater planning, land use planning, emergency response, coastal permitting.

2. USACE
   - Relevance: Owner and operator of the Santa Ana River Marsh (North and South Marsh), including tide gates, Santa Ana River levees, and hydraulic connections directly adjacent to and hydrologically connected with the Preserve.
   - Why it matters: Currently all high-touch restoration concepts rely on reintroducing tidal flow from the USACE-managed wetlands. Coordination is critical for culvert alignments, timing of tidal gate operations, and adaptive management of wetland hydrology.
   - Coordination Topics: Permit approvals (Section 408/404), tide gate control, infrastructure retrofits, and marsh maintenance.
3. OCPW/Orange County Flood Control District (OCFCD)
   - Relevance: Responsible for the maintenance and operation of the SAR East Levee tide gates, flood infrastructure, and related regional stormwater management assets.
   - Why it matters: Any modification to the SAR East Levee or tide gates or coordinating flood protection near the Preserve must be done with OCPW's input to maintain the regional flood control system's integrity and FEMA levee certification status.
   - Coordination Topics: Levee elevation scenarios, sediment routing, culvert design, and access to public lands.
   - Potential future connection to the Talbert Regional Park (South) to mutually benefit both sites under SLR projections that are higher than today.
4. Tribal Nations
   - Relevance: There are many Tribes that are culturally affiliated with lands encompassed by the Preserve. This includes important cultural resource areas. Why it matters: Incorporating Tribal consultation, access rights, and cultural preservation priorities is essential for equitable and culturally informed adaptation planning.
   - Coordination Topics: Access corridors, interpretive elements, and inclusion in decision-making processes.
5. Caltrans
   - Relevance: Oversees PCH, a major transportation corridor vulnerable to overtopping near the Preserve.
   - Why it matters: Under extreme SLR scenarios, Caltrans-led armoring or rerouting projects will directly impact flood pathways and backflow conditions at the Preserve.
   - Coordination Topics: Transportation resilience, design alignments, flood modeling compatibility.
6. Orange County Parks and Orange County Vector Control
   - Relevance: Co-managers or users of access infrastructure; active in mosquito abatement and vegetation maintenance.
   - Why it matters: Habitat changes tied to SLR, and wetland expansion could affect vector control responsibilities and park use. Salt marsh restoration typically reduces mosquito problems associated with freshwater ponds and freshwater habitats. This project may decrease the demand for mosquito abatement in the lowlands.
   - Coordination Topics: Public access management, invasive species control, and buffer zone planning.
7. FEMA/National Flood Insurance Program (NFIP)
   - Relevance: Regulatory body for floodplain mapping, risk designation, and flood insurance compliance.
   - Why it matters: Modifications to flood protection systems, wetlands, or levees may require FEMA approval and could influence flood insurance rate maps (FIRMs).
   - Coordination Topics: Map amendments, mitigation credit, etc.

4.3.1.2. Monitoring SLR

Ongoing monitoring of SLR is essential to inform adaptive management at the Preserve. This involves regularly reviewing data from local tide gauges, including but not limited to NOAA's National Water Level Observation Network and other regionally relevant platforms (such as gauges maintained by UC San Diego and Orange County agencies). Monitoring supports a data-driven understanding of how SLR is affecting coastal processes, habitat transitions, and the frequency or severity of inundation. At the Preserve, this monitoring effort can feed directly into the adaptive pathway framework — informing and triggering the phased implementation of restoration or infrastructure strategies once certain water level or ecological thresholds are reached. Annual updates should include both gauge data and a review of the latest SLR science, projections, and observed changes in regional hydrodynamics.

Tracking flood patterns associated with SLR across the Preserve and adjacent areas (SAR East Levee, Channel Park, etc.) helps identify vulnerable infrastructure and ecological stress points. Low-lying trails, roads, utility corridors, and marsh edges are most likely to experience recurrent flooding as SLR progresses. Recording these events — along with any access disruptions, habitat degradation, or maintenance costs — supports prioritization of site investments and informs long-term retreat or redesign strategies.

4.3.2. Nature-Based Adaptation

Nature-based adaptation refers to the intentional use of natural processes, ecosystems, and landscape features—either on their own or in combination with engineered systems—to enhance coastal resilience, reduce risk, and deliver broader environmental, economic, and social benefits. This strategy is designed to work with, rather than against, natural systems, leveraging the inherent functions of wetlands, dunes, reefs, forests, and other landscape elements to provide sustainable flood protection while also supporting habitat, water quality, recreation, and carbon sequestration. These solutions are adaptive over time and inherently multifunctional, often improving in performance as ecosystems mature.

4.3.2.1. Wetland Creation/Restoration

Wetland habitat creation and restoration at the Preserve is in and of itself is a nature-based solution. Natural environments can mitigate and reduce the impacts of flooding and bounce back from their effects better than any hardened structure. Due to the lowland's connection to the historic Santa Ana River Marsh, wetland creation within the Preserve refers to the strategic re-establishment or enhancement of tidal salt marshes, mudflats, and transitional ecotones that have been lost or degraded due to past land use, altered hydrology, or SLR. This process aims to restore the natural structure and function of a coastal salt marsh by regrading existing topography, improving tidal connectivity, increasing habitat complexity, and/or reintroducing native vegetation. In highly urbanized areas, salt marsh restoration sometimes blends engineering and ecological objectives, to create systems that deliver flood protection, carbon sequestration, biodiversity support, and recreational opportunities. Wetland restoration is both a climate adaptation strategy and a tool for improving watershed-scale resilience, and therefore a holistic resilience approach. Figure 10 shows a conceptual section view of a wetland/recreational/riverine interface at the Preserve.

FIGURE 11. CONCEPTUAL RENDERING OF RESTORATION AT THE PRESERVE (SALT MARSH, PEDESTRIAN PATH, BERM, AND RIPARIAN ENVIRONMENT)

4.3.2.2. Ecotone Levees

Any proposed berms at the Preserve could be designed to become an ecotone levee. An ecotone levee (shown in Figure 11) is a nature-based flood protection feature that blends traditional levee stability with ecological uplift by incorporating gentle side slopes, native transitional vegetation, and hydrologic connectivity. Unlike conventional levees that rely solely on engineered materials and steep armored slopes, an ecotone levee is designed to act as a multi-functional buffer zone—gradually transitioning from wetland to upland habitat while providing flood risk reduction and supporting biodiversity, sediment dynamics, and resilience to SLR. This feature may also be called a "living levee." At the Preserve, the ecotone levee would feature a minimum slope of 1:15, designed to accommodate maintenance access and habitat migration upslope as SLR increases. This gentle grade allows for the establishment of ecological transition zones (e.g., high marsh, brackish meadow, coastal sage scrub), which are often lost in traditional levee construction. The design also encourages tidal attenuation, storm surge buffering, and adaptive flood protection — all while avoiding hardscape structures where possible.

FIGURE 12. CONCEPTUAL RENDERING OF THE ECOTONE LEVEE STRATEGY

4.3.2.3. Thin Layer Sediment Deposition

Thin Layer Sediment Deposition is a habitat enhancement and resilience-building technique where a controlled, thin layer of sediment is placed over existing wetland or transitional areas to elevate marsh surfaces, counteract subsidence, and keep pace with SLR. The approach aims to extend marsh longevity and functionality without completely burying existing vegetation or disrupting ecological processes. At the Preserve, thin layer sediment deposition may be used to raise the elevation of vulnerable wetland platforms that are at risk of drowning due to SLR, subsidence from oil extraction, or sediment supply limitations.

Sediment delivery is typically implemented using hydraulic methods, where sediment is dredged from nearby channels or designated borrow sites, mixed with water into a slurry, and then pumped through pipes to the deposition area. From there, the slurry is either sprayed (a method known as rainbowing as shown in Figure 13) or allowed to settle naturally across the wetland surface. In some cases, sediment can be rehandled on-site using low-ground-pressure equipment or amphibious excavators to shape and distribute material in more confined areas. The choice of construction method depends on site access, habitat sensitivity, available sediment sources, and the required precision of elevation gain. Containment measures — such as sediment curtains or low berms made of haybales — may also be used to manage flow and ensure even application.

Fortunately, the Preserve is well-positioned to benefit from nearby sediment dredging efforts—such as those at the Santa Ana River Mouth, Talbert Inlet Channel, and Santa Ana River Marsh— which present valuable opportunities for regional beneficial sediment reuse. This underscores the ongoing importance of strong partnerships with local and regional agencies. With thoughtful planning, future design strategies could be tailored to support sediment delivery operations by incorporating features such as widened access roads for truck transport, or channel improvements that allow small, self-operated vessels to navigate and offload material efficiently.

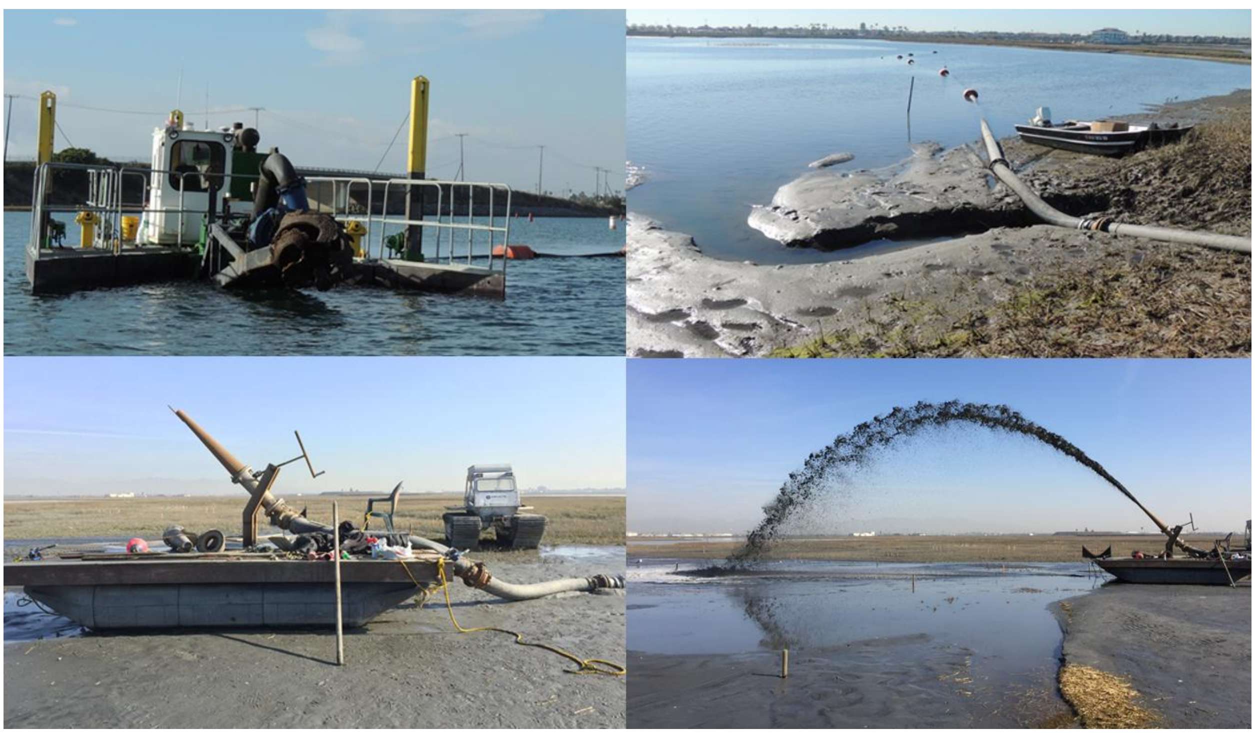


FIGURE 13. THIN LAYER SEDIMENT DEPOSITION CONSTRUCTION METHODS

A successful sediment delivery system requires careful attention to sediment quality, vegetation tolerance, elevation targets, and regulatory compliance. Sediment must be clean and appropriately sized to match native marsh conditions, while the existing vegetation's ability to tolerate burial—typically no more than 10 in. in a single lift—must be accounted for to avoid long-term ecological damage (USFWS Refuge Manager Experimental Findings 2015). Elevation targets should align with the optimal tidal range for the site's desired plant communities, ensuring the wetland remains resilient under projected SLR conditions. Access logistics, environmental constraints, and seasonal wildlife considerations will influence construction timing and techniques. Finally, permitting, and post-construction monitoring are critical to evaluate sediment performance, vegetation recovery, and ongoing adaptation potential.

4.3.2.4. Development of a Sediment Management Plan

Prior to permitting and implementation of any thin layers sediment deposition, an analysis of potential sediment donor sites and soil suitability must be undertaken. The plan would also include analysis of site access and sediment delivery methods as well as any regulatory constraints. This plan would developed as a precursor to importing any sediment that could be beneficially reused for wetland restoration and maintenance at the Preserve. The plan would establish strict sediment quality and grain size criteria as mandated by the regulatory agencies.

4.3.3. Protection (Engineering)

Protection involves the design and implementation of structural measures to prevent or reduce the impacts of coastal hazards (such as storm surge, wave attack, and SLR) on existing property, ecosystems, and infrastructure. The primary goal is to preserve the current existing amenities and protect assets behind it.

4.3.3.1. Raising the Elevation of the SAR Levee

Levees are critical components of flood risk management systems, acting as linear barriers that protect adjacent lands from tidal inundation, fluvial flooding, and storm surge. As SLR accelerates and extreme weather events become more frequent, existing levees—many of which were constructed decades ago—may no longer provide adequate protection for the populations, infrastructure, and habitats they were designed to defend. In many cases, raising the elevation of existing levees is a practical adaptation strategy to maintain or enhance their protective capacity over time. Elevation increases can delay overtopping, reduce the frequency of flooding, and buy time for other long-term adaptation measures to take effect (See Figure 14).

Raising the elevation of the SAR East Levee represents a potential regional adaptation strategy to manage increased flood risk driven by SLR and storm surge; however, this action lies outside the direct jurisdiction of the Preserve. Any such intervention would require close coordination with key stakeholders and agencies, including the USACE, Orange County Flood Control District (OCFCD), and the City of Newport Beach, among others. From a construction standpoint, levee raising typically involves widening the levee footprint, regrading slopes, compacting engineered fill, and potentially armoring or revegetating the new surface for durability and habitat compatibility. The feasibility of this approach depends on available space, existing utilities, regulatory approvals, and the degree to which existing design capacity has been exceeded. Additionally, raising the levee would benefit the Santa Ana River Trail (SART), which runs along the levee crown and serves as a heavily used recreational and commuter corridor. Any proposed design would need to preserve trail continuity, access, and safety—potentially through phased construction, detours, or reconfiguration of the trail alignment along the new grade. While this action is not a Preserve-led strategy, its implementation could provide critical regional protection benefits that indirectly enhance the long-term resilience of the Preserve and adjacent habitat corridors.

FIGURE 14. RAISE ELEVATION OF THE EXISTING LEVEE

4.3.3.2. Enhancements to Hydraulic Exchange Infrastructure

Enhancing the hydraulic exchange infrastructure at the Preserve would focus on modernizing and optimizing existing systems that regulate tidal flow (Figure 15), stormwater drainage, and internal water levels — key to both flood resilience and ecological function. This could include retrofitting or replacing the existing tide gates to improve their responsiveness during extreme high tides or storm events, ensuring reliable protection while maintaining tidal flushing critical for wetland health. Outlet drains and side drains may be regraded, resized, or equipped with tide-flex valves to reduce backflow, improve drainage efficiency, and prevent water stagnation in interior marsh zones. Storm drains discharging into the Marsh — particularly from adjacent urbanized areas like Newport Shores — could be fitted with more efficient sediment traps, backflow preventers, or low-impact design features to reduce pollutant loads and manage inflows more sustainably. Finally, culverts and interior hydraulic connectors may be reconfigured or expanded to restore flow between marsh zones, improving hydrologic connectivity and supporting marsh migration as part of a long-term adaptive management strategy. These upgrades, in combination, would build flexibility into the Preserve's water infrastructure and better align it with evolving SLR and habitat conditions.

FIGURE 15. EXAMPLES OF SELF-REGULATING TIDE GATES

4.3.3.3. Installation of Sluice Gates at Strategic Locations

As part of long-term adaptation planning, the installation of sluice gates at key hydraulic control points within the Preserve could offer added flexibility in managing tidal exchange, stormwater retention, and sediment movement. Strategically placed gates — particularly at culvert or channel inlet locations — can help modulate water levels, minimize backflow during extreme high tides, and regulate water levels to support habitat conditions under rising SLR scenarios (Figure 15). Sluice gates could also play a role in coordinating with regional sediment delivery, allowing for temporary closure or flow control during thin layer sediment deposition events. Their inclusion would need to be carefully evaluated based on ecological goals, hydrodynamic modeling, maintenance capacity, and compatibility with surrounding infrastructure.

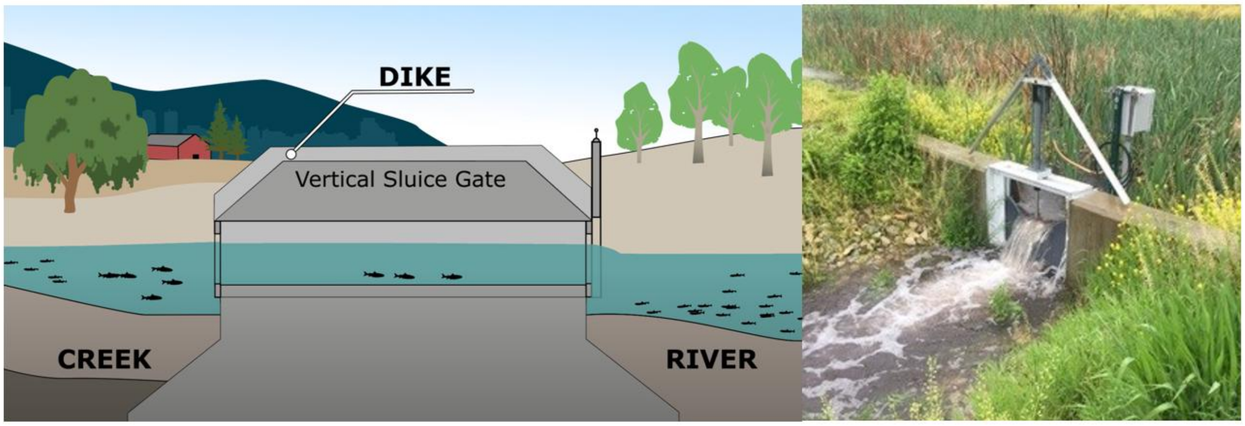


FIGURE 16. EXAMPLES OF A SLUICE GATE

4.3.4. Accommodation

Accommodation focuses on modifying existing structures and developments to withstand future SLR. This is typically achieved by elevating, retrofitting, or repurposing buildings that are exposed to coastal hazards. These measures often allow for the inland migration of SLR impacts, with fronting landscapes serving a sacrificial role.

4.3.4.1. Installation of Boardwalks

As part of a nature-compatible public access strategy, the Preserve may implement elevated boardwalks designed to float above sensitive marsh and transitional habitats, allowing for both ecological function and managed visitor experience. Unlike traditional at-grade trails, these structures would be installed on piles (typically timber) or low-impact footings, allowing sunlight, tidal flow, and vegetation to persist beneath the walkways (Figure 17). This approach minimizes trampling, soil compaction, and habitat fragmentation while enabling habitat migration in response to SLR. Strategically placed boardwalks would offer interpretive access across wetland, ecotone or regular levees, and upland zones while simultaneously supporting educational, recreational, and cultural goals without compromising ecological integrity. Where feasible, boardwalk elevations and spans could be varied to accommodate future sediment deposition operations or thin-layer sediment placement underneath. Overall, elevated boardwalks exemplify a low-impact adaptation solution that aligns visitor engagement with long-term habitat resilience.

4.3.4.1. Elevating Pedestrian Trails, Berms, and Boardwalks

A proposed resilience and access strategy at the Preserve involves constructing perimeter berms integrated with pedestrian trails and boardwalks, offering a dual function of passive flood protection and public recreation. These berms would frame key edges of the Preserve, particularly along low-lying zones, and serve as gentle, accessible walkways with panoramic views of the marsh. Initially designed at a modest elevation, the berms could be engineered with future adaptability in mind — allowing for staged elevation increases as SLR progresses. For the berms, this could involve designing the base width to accommodate additional lifts of engineered fill, incorporating geotextile reinforcement, or planning for modular trail surface adjustments over time. Vegetated side slopes would provide ecological value and erosion control, while alignment would be carefully planned to avoid sensitive habitat and accommodate marsh migration corridors. For the boardwalks, the decking could be elevated to adapt to increasing water levels while continuing to provide safe and dry access for the public (Figure 18). By embedding this elevation-flexible infrastructure, the Preserve can provide safe, engaging public access in the near term, while maintaining the ability to scale up protection in the long term as environmental thresholds are reached.

FIGURE 17. CONCEPTUAL RENDERING OF THE INSTALLATION OF BOARDWALK

FIGURE 18. CONCEPTUAL RENDERING OF ACCOMMODATION (ELEVATION OF BOARDWALKS, PATHS, ETC.) UNDER UNPROTECTED SCENARIO

4.3.5. Managed Retreat/Relocation

Managed relocation would promote the relocation, removal, and/or upslope migration of certain amenities in order to provide sufficient buffer for areas at high risk of coastal hazards, allowing natural processes to occur without interference.

4.3.5.1. Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities

For the Preserve, a managed retreat approach would involve the gradual relocation of vulnerable infrastructure — such as trails, service roads, utilities (if present), and interpretive elements — from low-lying, flood-prone areas to higher ground within the uplands. Rather than relying solely on engineered defenses, this strategy allows the landscape to naturally respond to SLR by making space for tidal marsh migration and increased inundation over time. As coastal conditions evolve, this approach supports long-term ecological resilience while minimizing future maintenance costs and damage to critical infrastructure. Managed retreat at the Preserve would be phased and adaptive; however, under any protected scenario, it is unlikely that hazard conditions would escalate to a level requiring full retreat.

4.4. Hybrid Strategies

4.4.1. Implementation of Multiple Strategies (*Over Time*)

A hybrid phased approach to coastal resilience allows different strategies to be implemented incrementally based on the progression of SLR-related hazards. By sequencing strategies across multiple time horizons, this strategy provides a framework for sites like the Preserve to evolve over time in response to changing coastal conditions and is later discussed in Section 6.

4.4.2. Implementation of Multiple Strategies (*Simultaneously*)

4.4.2.1. High Touch Wetland Restoration (Management Level 3) – The Habitat Approach

The high-touch restoration strategy within the Preserve represents a transformative hybrid SLR adaptation strategy with both engineering and nature-based solutions focused on reestablishing ecological function, hydrological connectivity, and long-term habitat resilience in the face of rising water levels and changing coastal dynamics. Historically, the Preserve's lowlands functioned as a dynamic floodplain influenced by both freshwater flows and tidal processes. However, legacy oil field activities and the channelization of the Santa Ana River for flood control have cut off the area from these vital inputs. As a result, the site is now hydraulically isolated and ecologically constrained.

A high-touch approach would restore tidal exchange by re-grading the lowlands to reintroduce tidal flow from the adjacent USACE-managed wetlands (Figure 19). This would include the excavation of a backbone network of subtidal channels, which would extend into newly established salt marsh platforms within the Preserve. Elevations would be carefully designed to support a range of habitat types—including low, mid- and high-marsh vegetation zones and transitional upland habitat surrounding capped oil wells. These higher-elevation areas would also function as future habitat migration corridors, helping the restored system adjust over time to projected SLR.

Vegetation establishment would be jumpstarted with native container plantings and could be supported by a temporary irrigation system for upland transitional zones to ensure early survival, growth, and reproductive success under variable environmental conditions. Over time, the restored marsh system would transition into a self-sustaining, tidally influenced ecosystem capable of absorbing SLR impacts while providing critical habitat, water quality benefits, and flood buffering. The Mesa Water District supplies reclaimed water, which could potentially be used as a water source for upland transitional and/or riparian zones.

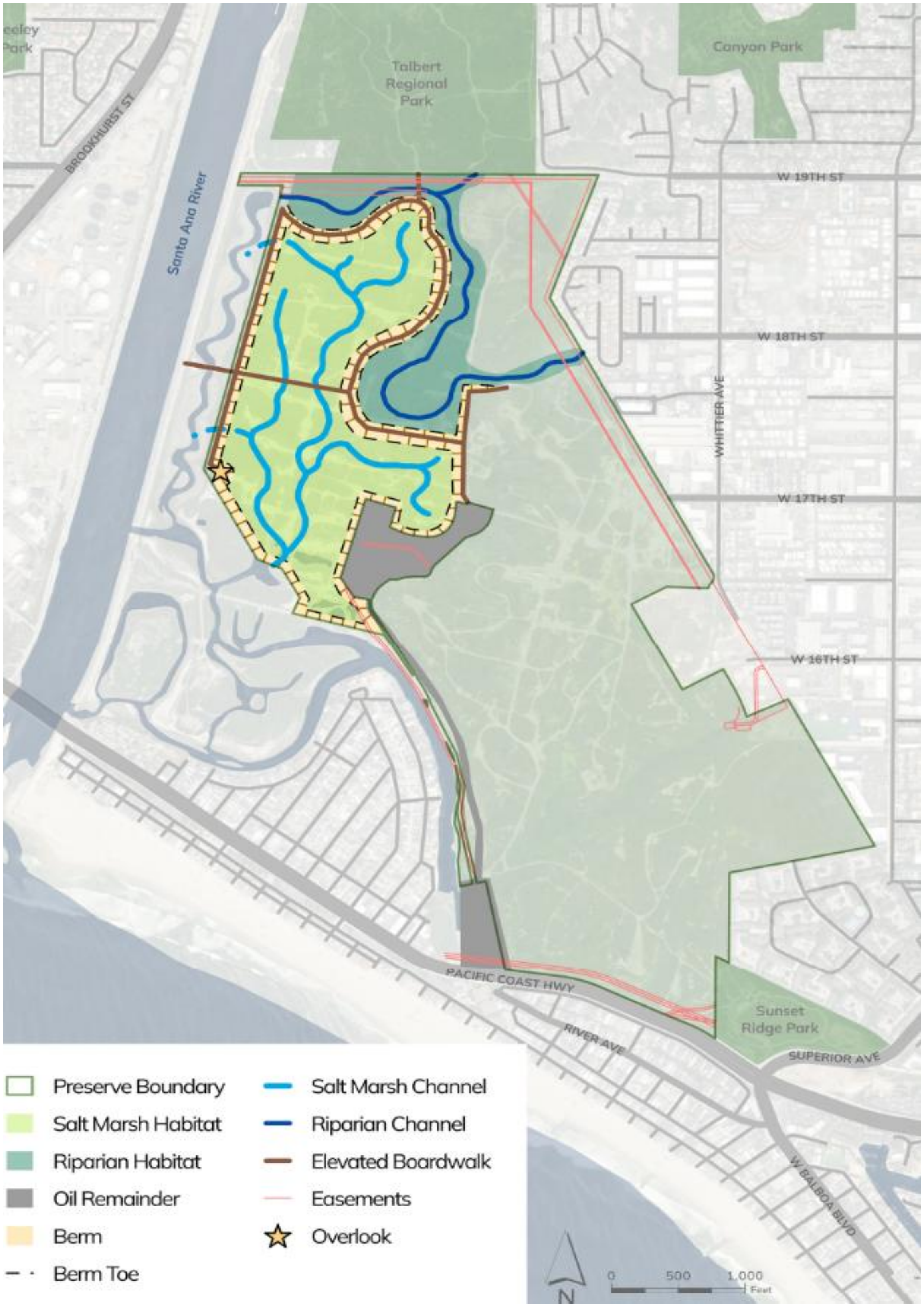


FIGURE 19. PROPOSED HIGH TOUCH SCENARIO (HYBRID STRATEGY)

4.4.2.2. Elevating and Vegetating the Existing Levee – The Perimeter Approach

As SLR increases the frequency and severity of tidal flooding, raising protective features (such as the levee and/or berms) incrementally can extend their protective function, helping buffer interior wetlands and trails from encroaching water. Designing these elements with broad, gently sloped profiles creates opportunities for vegetated surfaces — including native grasses, shrubs, and transitional plant communities — that provide both erosion control and habitat value. These vegetated berms not only stabilize soil and improve water filtration but also serve as important corridors for wildlife and pollinators, creating a natural interface between marsh and upland environments. Over time, these features can be incrementally built up with additional sediment lifts or engineered fill as environmental thresholds are met. Their multi-functional design supports public access, shoreline resilience, and habitat continuity—positioning them as an adaptable and ecologically integrated SLR defense system for the Preserve. This measure can be implemented for existing berms and any proposed levee.

4.4.2.3. Elevating Access Paths + Thin Layer Sediment Deposition –Raising Internal Features Approach

A hybrid adaptation strategy that combines elevating access roads and paths with Thin Layer Sediment Deposition offers a balanced solution that supports both public use and ecological resilience at the Preserve. As SLR and higher groundwater levels increase the risk of frequent inundation and marsh submergence, raising existing access routes ensures that maintenance, monitoring, and recreational use can continue uninterrupted. At the same time, Thin Layer Sediment Deposition allows for targeted placement of clean, compatible sediment across low-lying wetland areas to gradually increase marsh surface elevation—helping existing vegetation within the lower elevation ranges stay within the optimal tidal range for survival and growth. Together, these actions preserve hydrologic function, facilitate marsh migration, and extend habitat viability without full reconstruction. Access routes can be elevated in phased lifts to match SLR projections, while sediment application can be done incrementally to reduce stress on plant communities. This integrated approach supports both human and habitat needs, allowing the Preserve to evolve with changing conditions while minimizing long-term disruption and maximizing adaptability.

4.4.3. Implementation of Multiple Strategies (*Holistically Integrated Approach*)

Rather than applying a single broad solution across the entire project site, the combined approach allows for adaptive interventions based on the unique physical conditions, exposure levels, and challenges of each area.

Figure 20 below illustrates a conceptual example of how combining various standalone strategies highlights how different strategies could be applied within the various areas of the project site, each suited to their localized conditions but with a connection to the overall vision. Note that the following examples are intended to illustrate potential conceptual approaches; final designs may vary based on further analysis, stakeholder input, and site-specific conditions. For instance, the Preserve could consider the following provided in Table 6.

TABLE 6. HOLISTIC INTEGRATED OPTIONS

Strategy	Segment/Area	Advantage
Ecotone Levee	Levee near Semeniuk Slough	Localized resilience for Industrial Way without the high cost of doing the whole site
Elevate Perimeter Pedestrian Trails and Berms	Berm bordering North Marsh	Provides resilience via elevation gain at most vulnerable lowland inundation areas
Ecotone Levee/Vegetated Berm	Berm dividing riparian and wetland areas	Provides resilience for large runoff flows and coastal hazards alike
Installation of Sluice Gates at Strategic Locations	At proposed riparian area and various South marsh locations	Boosts hydraulic exchange control within the site
Relocate Vulnerable Main Service Roads (ex. Industrial Way)	Lower portions of Industrial Way	Allows for only the main service roads to be relocated

FIGURE 20. CONCEPTUAL HOLISTICALLY INTEGRATED APPROACH

4.5. Summary of Analyzed Solutions

The following table provides a summary of each coastal adaptation strategy categorized by solution type, including Planning and Adaptive Management, Nature-Based Adaptation, Protection (Engineering), Accommodation, and Managed Retreat/Relocation. Each strategy includes a brief description outlining its purpose, mechanism, and relevance to enhancing the resilience of coastal resources and infrastructure. These strategies are intended to inform a flexible, site-responsive adaptation pathway for the Preserve in the face of SLR and evolving coastal hazards.

TABLE 7. SUMMARY OF PROPOSED STANDALONE STRATEGIES

Strategy Category	Strategy	Description
Planning and Adaptive Management	Strategic Partnerships	This involves building collaborative relationships between agencies, tribes, NGOs, academic institutions, and/or adjacent property owners to coordinate resilience planning and implementation. For the Preserve, this could strengthen alignment with regional plans and leverage shared resources for long-term adaptation.
	Identify Grant Funding Source(s) for Resiliency	Some funding sources for resiliency are already available (see Section 7), and in some instances, funders look for projects that provide a regional benefit. If the Preserve partnerships benefit from a collaborative approach then maybe there can also be a collaborative funding approach to finding and applying for grant funds.
	Monitor SLR	Monitoring SLR involves consistently tracking changes in sea level using data from various observational tools and leveraging agencies like NOAA. This type of monitoring is critical for understanding the local impacts of SLR, determining the rate of change, and identifying areas that are increasingly vulnerable to flooding or coastal hazards. At the Preserve, real-time data can track "triggers" and inform timely adaption pathways to avoid reactive emergency measures.
Nature-Based Adaptation	Wetland Restoration	Restoring degraded tidal wetlands to improve ecosystem services and promote biodiversity. At the Preserve, this can buffer flooding impacts while enhancing biodiversity and resilience of marsh ecosystems.
	Ecotone Levees	Levees are wide areas with raised ground that are constructed along coastlines to reduce the risks of flooding by presenting a physical barrier to the incoming floodwaters. "Ecotone " levees are hybrid levees with gentle, vegetated slopes (rather than steep armored sides) that support transitional habitats and reduce erosion. At the Preserve, they could replace existing berms to allow for migration of wetlands inland.
	Thin Layer Sediment Deposition	This strategy involves the targeted placement of small amounts of clean sediment across marsh or wetland surfaces to raise elevation and help natural systems keep pace with SLR. It mimics natural sedimentation processes and supports the vertical accretion necessary for tidal marshes to remain viable over time. At the Preserve, this could help maintain marsh elevation and vegetation health while only temporarily disrupting ecosystem function.
Protection (Engineering)	Raising the Elevation of the Levee	Increasing levee height provides greater protection from storm surge and tidal inundation. At the Preserve, the existing East SAR levee provides protection from hazards associated with SLR. Low crest elevations nearest the SAR mouth are vulnerable to hazards associated under 4.9 ft SLR if left unaltered. This strategy would need to be coordinated with regional partners but would greatly impact the site.
	Replacement or Enhancement of Hydraulic Exchange Infrastructure	This strategy involves upgrading or modifying existing water conveyance features—such as culverts, tide gates, storm drains, and outfalls—to improve tidal exchange, manage water levels, and enhance ecosystem resilience. At the Preserve, this is especially relevant given the presence of two tide gates on the SAR east levee, along with several culverts and stormwater outfalls that currently regulate hydrologic connectivity between the river, marsh, and adjacent lowlands.
	Installation of Sluice Gates at Strategic Locations	Sluice gates manage water levels by controlling tidal inflow at specific points. For the Preserve, this may offer flexible control over flooding in sensitive zones, especially where wetland function and access routes intersect.
Accommodation	Installation of Boardwalks	Elevated walkways allow public access through wetlands without damaging vegetation and provide passive flood resilience. At the Preserve, boardwalks could preserve trail connectivity even during seasonal or tidal inundation. Boardwalks also allow for channels and water sources to flow freely underneath them.
	Elevating Pedestrian Trails, Berms, and Boardwalks	Raising existing infrastructure prevents chronic flooding and improves safety/access. This is essential in the Preserve for maintaining public access and emergency response routes as sea levels rise.
Managed Retreat/Relocation	Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	This entails moving infrastructure away from high-risk flood areas. For the Preserve, this could apply to vulnerable access roads or recreational facilities to ensure long-term usability without costly armoring. Because the site has enough space, any service roads (such as Industrial Way) could be re-routed to areas that are more protected and upland.

5. Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis of Adaptation Strategies and Alternatives

This section provides a comparative summary of the potential strategies, evaluating their respective pros and cons, effectiveness in mitigating coastal hazards, estimated construction and maintenance costs, and potential regulatory hurdles and legal challenges. These comparisons are intended to assess the viability of each solution if implemented as a stand-alone measure. Some of the identified limitations could potentially be addressed by implementing hybrid solutions (discussed previously in Section 4) as a more holistic approach to solve multiple problems with selective approaches.

5.1. General Overview

To further support decision-making and comparative evaluation of the proposed solutions, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) Analysis was conducted. This qualitative assessment summarizes the internal advantages and limitations (strengths and weaknesses), as well as the external factors that may present favorable conditions or pose potential challenges (opportunities and threats).

The SWOT framework provides an additional layer of insight to complement the technical evaluations presented above, supporting the selection and refinement of coastal resiliency strategies with each solution being evaluated based on the following criteria:

- **Pros and Cons**. Refer to Table 8.
- **Coastal Hazards Mitigation (Level of Protection)**. Tools were evaluated for their effectiveness in mitigating coastal hazards such as future SLR and groundwater emergence, both with and without elevation adjustments or further adaptation. See Table 10. Green shading indicates the most effective mitigation for a given hazard.
- **Probable Construction and Maintenance Costs.** Table 11 provides a relative comparison of construction and maintenance costs. These rankings and associated dollar symbols are not intended to represent exact cost estimates but serve as a relative cost comparison. The left column reflects relative construction costs, while the right column indicates relative maintenance costs (which will vary depending on the tool and frequency of maintenance). Darker shading and a greater number of dollar signs indicate higher costs.
- **Regulatory Hurdles/Potential Legal Issues.** Table 13 compares the relative difficulty of securing regulatory permits under current laws, along with the potential challenges related to property rights and ownership. Dark shading indicates increased difficulty in obtaining permits and resolving property rights/legal concerns.
- **Alignment with CRS Plan Goals.** Each strategy was evaluated based on its ability to support the primary goals identified in the CRS. These include restoring coastal processes and ecological function, planning for changing environments with resilient design, and increasing habitat connectivity while buffering human impacts. Strategies that directly advance one or more of these goals were prioritized for further consideration. See Table 14.

To support informed decision-making, each proposed strategy was evaluated using the above criteria to help drive the SWOT analysis. By pairing the SWOT framework with these technical assessments, decision-makers gain a more holistic understanding of each solution’s feasibility and impact. This integrative approach ensures that both practical performance and implementation realities are factored into the selection and refinement of the most appropriate adaptation pathways.

5.2. Pros and Cons

Table 8 below provides a comparison of the Pros/Cons for each of the analyzed alternatives.

TABLE 8. COMPARISON OF SOLUTIONS (PROS AND CONS)

Strategy	Pros	Cons
Strategic Partnerships	✓ Strengthens coordination and resource sharing ✓ Builds regional support for resilience projects ✓ Facilitates information sharing	☒ Time consuming and requires long-term stakeholder commitment and engagement. Potentially requires a long lead up time to obtaining desired outcomes and results ☒ Success depends on sustained participation ☒ Partners might not agree to partner unless there is a mutual benefit or win-win scenario by taking a prescribed action
Monitor SLR	✓ Provides critical scientific data to inform adaptive triggers ✓ Low cost compared to hard infrastructure solutions	☒ Does not directly mitigate hazards—only informs decision-making ☒ Long-term funding for monitoring may be uncertain
Ecosystem Restoration	✓ A nature-based way to reduce flood risks while simultaneously fostering biodiversity and public access ✓ Many projects around Southern California to reference	☒ May require long establishment periods ☒ Regulatory permitting timeline (e.g., Clean Water Act Section 404) can be lengthy and expensive ☒ Engineering design and construction costs are high
Ecotone Levees	✓ Blends flood protection with habitat creation ✓ Allows for gradual upland wetland migration	☒ Higher upfront construction cost than traditional levees ☒ Requires larger footprint area or space than a berm or levee with steep slopes
Thin Layer Sediment Deposition	✓ Relatively low-impact, cost-effective way to maintain marsh elevation against rising sea levels ✓ Can use dredged sediment from nearby sources to benefit salt marsh	☒ Equipment access and constructability may pose a challenge and would have to be carefully thought out and planned ☒ Dredging is relatively expensive compared to land-based construction
Raising the Elevation of the SAR Levee	✓ Most direct and cost-effective way of providing protection against overtopping and storm surge caused by SLR ✓ Long-term resilience strategy	☒ High construction cost ☒ Could potentially require significant regulatory approvals (e.g., FEMA, USACE) and is out of the Preserve's jurisdiction
Enhancements to Hydraulic Exchange Infrastructure	✓ Improves ecosystem health and flood resilience ✓ Extends useful life of infrastructure without massive rebuilds	☒ High construction costs and more permitting effort for retrofits ☒ Needs detailed hydrologic studies and design reviews
Installation of Sluice Gates	✓ Offers adjustable control over tidal flows and floodwaters within the Preserve ✓ Protects infrastructure while maintaining some ecological function ✓ Can be integrated as part of an oil spill response plan	☒ Expensive to install and maintain ☒ Operational complexity; may require staffing or automation
Installation of Boardwalks	✓ Provides resilient public access even as water levels rise ✓ Impact to habitat can be minimized if well-designed	☒ Moderate construction cost; periodic maintenance (decking, supports) needed ☒ Coastal Commission permits and ADA compliance required ☒ Fragments habitat
Elevating Pedestrian Trails, Berms, and Boardwalks	✓ Maintains trail access and visitor experience during minor flooding or weather events ✓ Adds protection via vertical increases	☒ Higher construction cost than at-grade trails ☒ Requires additional planning and a more interconnected design ☒ Fragments habitat
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	✓ Reduces the long-term hazard exposure to these amenities ✓ Frees up open space for wetland creation, wetland migration, and nature-based design solutions	☒ High upfront planning and relocation costs ☒ Potential loss of public access or utility service if not carefully reconfigured
Hybrid 1: Full High Touch Scenario	✓ Strong dual benefit — wetlands absorb and purify floodwaters, boardwalks and berm pathways maintain resilient public access ✓ Likely strong agency and public support; regulatory complexity moderate (restoration permits, ADA for paths)	☒ Need coordination with multiple agencies (e.g., USACE, Coastal Commission), especially around wetland delineations and public access plans ☒ Slower to realize full flood protection compared to hard structures (time for wetland establishment)
Hybrid 2: Elevation + Vegetation	✓ Elevation provides immediate passive flood protection; vegetation stabilizes soil, adds ecological value ✓ Lower regulatory burden compared to levee construction; more likely to qualify as enhancement rather than new development	☒ Hauling/importing fill can become expensive depending on sourcing ☒ Potential impacts to existing wetlands could trigger mitigation requirements
Hybrid 3: Elevation + Thin Layer Sediment Deposition	✓ Supports both short-term protection (elevation) and long-term resilience (ecosystem adaptation) ✓ Seen favorably as "nature-positive" adaptation; could be easier to permit under beneficial reuse frameworks.	☒ Elevation gain from thin layer sediment alone may be incremental and require repeated applications ☒ Need sediment quality testing and possible water quality certifications

5.3. Hazard Mitigation Efficacy (Level of Protection)

Table 10 below provides a comparison of the effectiveness of each analyzed alternative as it pertains to mitigating hazards. Darker shades of green represent an increasingly effective mitigation for that particular hazard.

TABLE 9. LEGEND FOR TABLE 10

Legend	Hazard Mitigation Effectiveness
ΔΔΔ	Beyond 4.9 ft SLR
ΔΔ	Up to 4.9 ft SLR
Δ	Up to 1.6 ft SLR

TABLE 10. COMPARISON OF SOLUTIONS (HAZARD MITIGATION EFFICACY/LEVEL OF PROTECTION)

Strategy	Groundwater	Future SLR
Strategic Partnerships	ΔΔΔ	ΔΔΔ
Monitor SLR	ΔΔΔ	ΔΔΔ
Ecosystem Restoration	ΔΔΔ	ΔΔΔ
Ecotone Levees	ΔΔΔ	ΔΔΔ
Thin Layer Sediment Deposition	ΔΔ	ΔΔ
Raising the Elevation of the SAR Levee	ΔΔΔ	ΔΔΔ
Enhancements to Hydraulic Exchange Infrastructure	ΔΔΔ	ΔΔΔ
Installation of Sluice Gates	Δ	Δ
Installation of Boardwalks	ΔΔ	ΔΔ
Elevating Pedestrian Trails, Berms, and Boardwalks	ΔΔΔ	ΔΔΔ
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities Upland	ΔΔ	ΔΔΔ
Hybrid 1: Full High Touch Scenario	ΔΔΔ	ΔΔΔ
Hybrid 2: Elevation + Vegetation	ΔΔΔ	ΔΔΔ
Hybrid 3: Elevation + Thin Layer Sediment Deposition	ΔΔΔ	ΔΔΔ

5.4. Probable Construction and Maintenance Costs

Table 11 below provides a rough comparison of the construction and maintenance costs associated with each solution. Darker shading and a greater number of dollar signs indicate higher costs. Note that these are not detailed opinions of probable costs but rather are provided to differentiate the different rough order of magnitude (ROM) probable costs for planning and decision-making purposes only.

TABLE 11. COMPARISON OF SOLUTIONS (PROBABLE CONSTRUCTION AND MAINTENANCE COSTS)

Strategy	Construction Cost	Maintenance Cost
Strategic Partnerships	$	$
Monitor SLR	$	$
Ecosystem Restoration	$$$	$$$
Ecotone Levees	$$$	$$
Thin Layer Sediment Deposition	$$$$	$$
Raising the Elevation of the SAR Levee	$$$$$	$$$$
Enhancements to Hydraulic Exchange Infrastructure	$$$$	$$$$
Installation of Sluice Gates	$$$	$$$$
Installation of Boardwalks	$$	$$
Elevating Pedestrian Trails, Berms, and Boardwalks	$$$	$$
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	$$$	$$
Hybrid 1: Full High Touch Scenario	$$$$	$$$$
Hybrid 2: Elevation + Vegetation	$$$	$$
Hybrid 3: Elevation + Thin Layer Sediment Deposition	$$$$	$$$$

5.5. Regulatory/Permitting

Table 13 below provides a rough comparison of the potential regulatory hurdles and potential legal issues associated with each solution. A legend for the table is provided below in Table 12. Darker shading indicates increased difficulty in obtaining permits and resolving property rights/legal concerns and relying on other agencies or outside stakeholders.

TABLE 12. LEGEND FOR TABLE 13

Relative Degree of Difficulty for Obtaining Regulator Permits	Legend	Relative Degree of Difficulty in Addressing Property Rights, Ownership Issues, Relying on Other Agencies, etc.
Impossible/Extremely Difficult	•••••	Lengthy Process
Very Difficult	••••	Very Difficult
Difficult	•••	Difficult
Challenging but Feasible	••	Challenging but Feasible
No Issues, within Current Preserve Boundaries	•	No Issues, within Current Preserve Boundaries
N/A to Stakeholders	N/A	N/A to Stakeholders

TABLE 13. COMPARISON OF REGULATORY HURDLE/POTENTIAL ISSUE DIFFICULTY

Strategy	Relative Degree of Difficulty for Obtaining Regulatory Permits	Relative Degree of Difficulty in Addressing Property Rights, Ownership Issues, Relying on Other Agencies, etc.
Strategic Partnerships	•	••
Monitor SLR	•	•
Ecosystem Restoration	••	••
Ecotone Levees	•	•
Thin Layer Sediment Deposition	••	•••
Raising the Elevation of the SAR Levee	.••	•••••
Enhancements to Hydraulic Exchange Infrastructure	••••	••••
Installation of Sluice Gates	•••	•••
Installation of Boardwalks	•	••
Elevating Pedestrian Trails, Berms, and Boardwalks	•	•
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	••	•
Hybrid 1: Full High Touch Scenario	••	••
Hybrid 2: Elevation + Vegetation	•	•
Hybrid 3: Elevation + Thin Layer Sediment Deposition	••	•••

5.6. Alignment with CRS Plan Goals

This section evaluates each proposed adaptation strategy based on its alignment with the goals outlined in the Coastal Resilience Strategy (CRS) Plan. Specifically, the assessment considers how well each strategy supports the three primary goals: (1) restoring coastal processes and maximizing ecological benefit, (2) designing for climate resilience and future environmental conditions, and (3) enhancing habitat connectivity and buffering against human-related impacts. Each strategy is qualitatively reviewed to determine whether it supports or does not support the objectives associated with these goals.

Table 14 below provides an additional layer of decision-making criteria to ensure that proposed solutions not only address physical risk but also contribute meaningfully to the long-term ecological and management vision for the Preserve. Strategies that directly satisfy each objective are designated with a checkmark ("✓"), while strategies that only partially or indirectly satisfy each objective are designated with a dot ("•"). Those that do not satisfy the objective are intentionally left blank. Objectives for each goal can be found in Section 1 of this report.

TABLE 14. SUMMARY OF EACH STRATEGY'S ALIGNMENT TO CRS GOALS AND OBJECTIVES

The Strategy	**Goal #1:** *Restore Coastal Processes and Functions to the Maximum Extent Possible for Ecological Benefit*				**Goal #2:** *Plan for Changing Environments and Designs for Ecological Resilience*				**Goal #3:** *Identify Opportunities for Contiguous Coastal Habitat Areas and Increase the Buffer between Sensitive Habitat and Sources of Human Activities*		
Objectives	***1.1***	***1.2***	***1.3***	***1.4***	***2.1***	***2.2***	***2.3***	***2.4***	***3.1***	***3.2***	***3.3***
Strategic Partnerships	•	•	•	•	✓	•	•	✓	•	✓	•
Monitor SLR	•	•	•	•	•	•		✓	•	•	•
Ecosystem Restoration	✓	✓	✓	✓	✓	✓	•	✓	✓	✓	✓
Ecotone Levees	✓	✓	✓	✓	✓	✓	•	✓	✓	✓	•
Thin Layer Sediment Deposition	•	✓	✓	✓	✓	✓	✓	✓	•	•	•
Raising Elevation of the SAR Levee	•	•	•	✓	•			✓		✓	✓
Replacement or Enhancements of Hydraulic Exchange Infrastructure	•	•	•	✓	•	•		✓	✓		•
Installation of Sluice Gates	•	•	•	✓	•	•		✓	•		•
Installation of Boardwalks	√	•	•	✓	•	•			•	✓	
Elevating Pedestrian Trails, Berms, and Boardwalks	•	•	•	•	✓	•			•	✓	•
Relocation and Reconfiguration of Service Roads, Paths, and/or Facilities	•	•	•		✓				•	✓	✓
Hybrid 1: Full High Touch Scenario	✓	✓	✓	✓	✓	✓	•	✓	✓	✓	✓
Hybrid 2: Elevation + Vegetation	✓	✓	✓	✓	✓	✓	•	✓	✓	✓	✓
Hybrid 3: Elevation + Thin Layer Sediment Deposition	✓	✓	✓	✓	✓	✓	•	✓	✓	✓	✓

5.7. Summary

The following table provides a comparative SWOT analysis summary between all the solutions presented in the previous section. Definitions for each of the SWOT elements are presented below:

- **Strengths:** What the strategy does well (e.g., strong hazard mitigation, ecosystem benefits, scalability)
- **Weaknesses:** Limitations (e.g., high cost, time to implement, maintenance burdens)
- **Opportunities:** External chances for success (e.g., grant funding, alignment with state/federal priorities, public support)
- **Threats:** Potential risks or barriers (e.g., permitting challenges, stakeholder opposition, climate uncertainties)

TABLE 15. SWOT ANALYSIS SUMMARY OF EVALUATED SOLUTIONS

Strategy	Strengths	Weaknesses	Opportunities	Threats
Strategic Partnerships	• Shared funding and expertise • Builds cross-agency trust	• Coordination complexity • Differing timelines or priorities	• Long-term collaboration • Joint grant opportunities	• Conflicting agendas • Delays due to partner misalignment
Monitor SLR	• Real-time data to inform action • Supports adaptive management	• Does not prevent damage • Needs consistent and proactive attention	• Informs thresholds for adaptation • Enhances long-term planning	• Data gaps • Inaction from prolonged monitoring
Ecosystem Restoration	• Improves resilience and biodiversity • Passive adaptation benefits	• Potential long lead time for ecological function • Sensitive to disturbances	• Supports habitat goals • Unlocks ecological funding	• SLR outpaces habitat establishment • Invasive species
Ecotone Levees	• Dual benefit: habitat + flood control • Supports transitional zones	• Requires wide footprint • Complex design	• Natural buffer integration • Increases flood attenuation	• Not enough funding • High permitting burden
Thin Layer Sediment Deposition	• Elevates habitat with minimal disruption • Encourages natural growth	• Requires sediment sourcing • Temporary impacts to existing habitat and vegetation	• Boosts habitat function • Enhances ecological resilience; • Nearby maintenance dredging activities	• Stringent permitting and testing process • Potential contaminants in sediment if not tested thoroughly
Raising the Elevation of the SAR Levee	• Direct flood defense • Protects area from severe storm events	• Expensive and visually intrusive • Out of the Preserve's direct jurisdiction	• Better preserves assets for longer time period • Opportunity to integrate ecotones	• No agency intervention will lead to devastating impacts (unlikely) • Funding
Enhancements to Hydraulic Exchange Infrastructure	• Restores tidal flow • Improves habitat quality	• Engineering-intensive • Needs agency coordination	• Enhances hydraulic exchange and water quality • Supports species movement	• Conflicting agendas amongst different stakeholders or agencies • Infrastructure vulnerability
Installation of Sluice Gates	• Flexible water control • Protects during storms and emergency oil spill situations	• Requires active management • Mechanical risks	• Balances flood protection and habitat access • Opportunity for emergency response protection to be adapted in broader response plan framework	• Gate failure • SLR may surpass gate height if not planned properly
Installation of Boardwalks	• Maintains and elevates access • Provides ability for channels to flow through wetlands without additional hydraulic infrastructure	• Can be expensive and have large impact footprint • Maintenance required	• Public education tool and ability to have informative signage • Scenic, ADA-friendly access opportunity	• Material degradation • More vulnerable to unprotected SLR hazards such as extreme storm flows (unlikely due to operational infrastructure)
Elevating Pedestrian Trails, Berms, and Boardwalks	• Maintains recreational use while accommodating future SLR • Creates long-standing resilience and public access	• Can be expensive if not planned properly • Visual obstruction and larger footprint	• Enhances public engagement • Resilient trail network	• Limited ecological benefit • High cost of retrofitting
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	• Removes assets from high-risk zones • Opens space for restoration	• High upfront cost • Typically met with stakeholder resistance	• Enables long-term retreat • Avoids recurring damage	• Political pushback • Potential loss of public utility
Hybrid 1: Full High Touch Scenario	• Maximizes resilience and habitat connectivity • Comprehensive planning	• Potential long lead time for full ecosystem development and restoration • Multi-agency complexity	• Region-wide transformation • Eligible for high-level grants	• Execution challenges • Long implementation timeline
Hybrid 2: Elevation + Vegetation	• Integrates green infrastructure • Balanced risk reduction from both engineering and nature-based perspectives	• Requires ongoing maintenance and monitoring • More intricate design process	• Adaptable design • Supports ecological uplift	• Long implementation timeline • May underperform in extreme events in an unprotected scenario
Hybrid 3: Elevation + Thin Layer Sediment Deposition	• Ability to do more than once to accommodate SLR intervals • Enhances wetland function and resiliency in the long-term	• Logistics-intensive • Requires sediment access	• Scalable solution • Compatible with restoration goals	• Sediment sourcing limitations • Permitting delays

6. Preferred Adaptation Pathway

There is still significant uncertainty associated with when the SLR and storm surge projections may actually occur. The severity of future SLR largely depends on global efforts to decrease greenhouse gas (GHG) emissions and slow the effects of climate change. Because the adaptation planning timeline is looking forward 30 to 80 years and beyond, it is likely that the projections and science will change and that global policies will advance. To guide long-term decision-making, adaptation strategies are linked to a series of defined "triggers" rather than fixed timelines. These triggers represent measurable thresholds that, once reached, signal the need for implementation of specific adaptation actions. Examples of various trigger types include, but are not limited to:

- *Environmental Triggers* – Actual observed SLR benchmarks passing certain thresholds;
- *Operational Triggers* – Functional impacts to critical infrastructure such as overtopping or inundation of nearby critical infrastructure;
- *Biological Triggers* – Ecological shifts such as the decline or loss of key marsh vegetation communities.

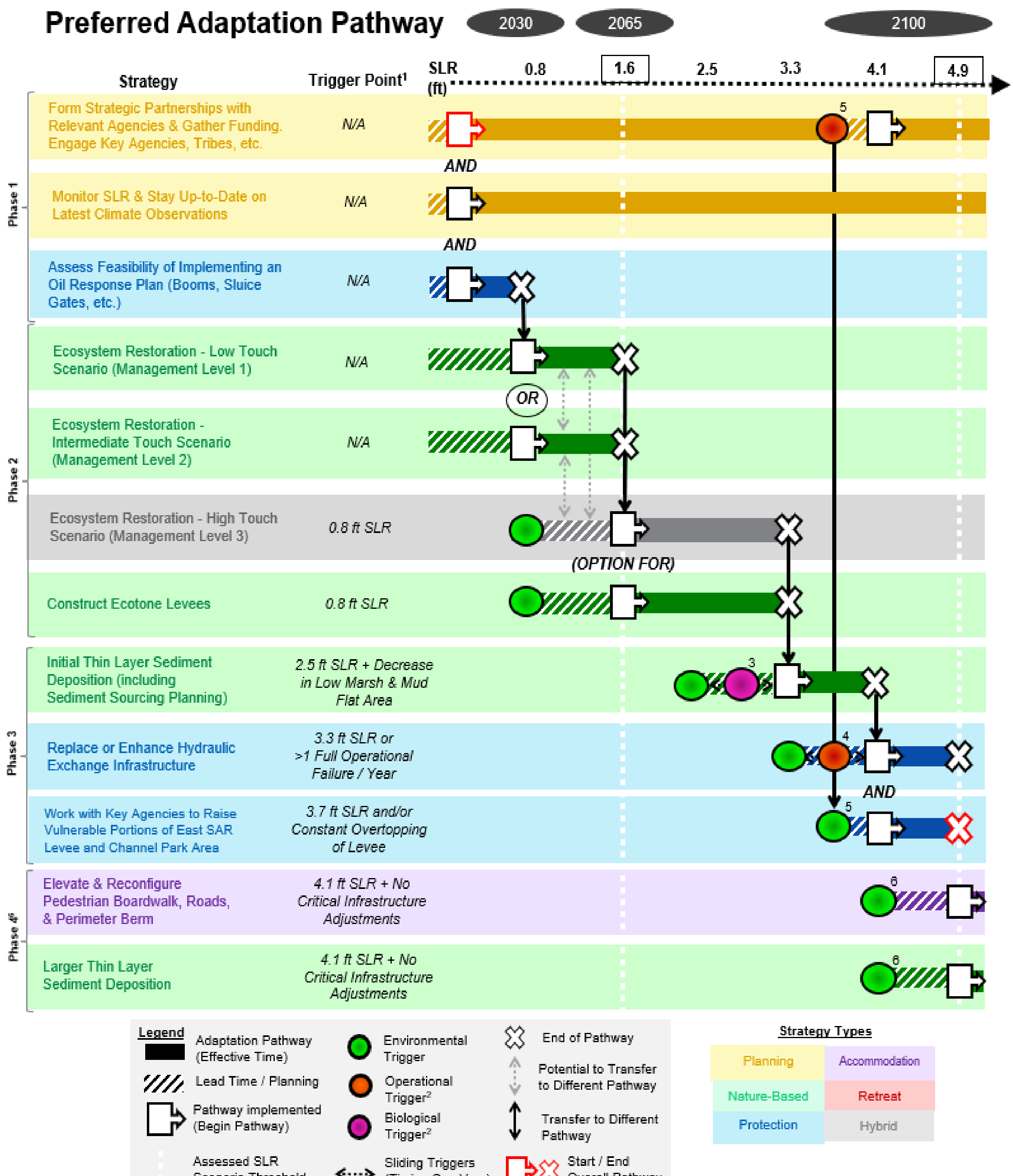
This trigger-based approach allows Preserve managers to make informed, responsive decisions as SLR materializes, enabling timely action based on real-world conditions rather than relying solely on projected future scenarios. The adaptation strategies are primarily presented as either/or options at different points in time, although in some cases more than one action could be taken for a given timeframe. Adaptation strategies are intended to build on one another once an earlier phase of the strategy ends or certain triggers occur. More advanced or aggressive strategies are triggered by higher levels of SLR. The exact timing of when those triggers will be reached is uncertain and requires constant monitoring.

The wants and needs of the local communities are likely to change as well, and planning efforts should offer the flexibility to adjust accordingly. For example, it is difficult for anyone to envision the major changes and improvements that may ultimately be required to protect the waterfront of the adjacent areas; however, these changes may present opportunities to enhance the features that attract people to the Preserve and uphold the qualities that residents love. For that reason, a range of potential future options are provided rather than a single set of solutions where possible.

Regardless of the uncertainty, adaptation planning is an important process to prepare decision makers and stakeholders for upcoming impacts and to implement strategies proactively. A long-term coastal resiliency strategy and adaptation plan should include the following core principles:

- Multiple Lines of Defense
- Flexibility to Adapt Over Time
- Integration of Green and Grey Infrastructure for Greater Resilience
- Multi-functional Solutions that Provide Broader Benefits

The following *Preferred Adaptation Pathway* for the Preserve is meant to be flexible and allow space to be revised over time as new information emerges, climate science advances, and community preferences evolve. The pathway provides an illustrative example of effectiveness at different planning horizons under the assumed *Intermediate-High* SLR scenario (Figure 21).



NOTES:

1. Trigger points indicate when to begin planning for implementation. This should be at least one (1) SLR scenario before projected impacts.

2. Operational and Biological Triggers are estimated based on proposed conditions and the best available science at the time of this report. In the case or scenario that the timing varies; pathway beginnings may be adjusted to accommodate changing conditions.

3. Biological trigger timing can vary. Thin Layer Sediment Deposition to occur once a noticeable decrease in low marsh and mud flat area occurs.

4. Operational Trigger timing can vary. Replacement or Enhancement of Hydraulic Exchange Infrastructure should occur at whichever trigger occurs first between 1.6 ft SLR or >1 operational failure / year of any hydraulic infrastructure.

5. Ensure agency & stakeholder coordination begins plan of raising the vulnerable portions of the East SAR Levee near the mouth and Channel Park in Newport Bay.

6. Phase 4 strategies only required in unlikely event that surrounding critical infrastructure does not receive retrofits from Agencies and Regional Stakeholders.

FIGURE 21. PREFERRED ADAPTATION PATHWAY FOR THE PRESERVE

TABLE 16. ADAPTATION PATHWAY SUMMARY

Phase		Pathway Strategy	Planning Horizon	Effective Horizon	Occurs If	Can Be Coupled With	Protects Until (Min.)	Likely?
1	A	Form Strategic Partnerships with Relevant Agencies and Gather Funding. Engage Key Agencies, Tribes, etc.	Now	Now to 2105+	N/A	All	2105+	Yes
	B	Monitor SLR and Stay Up to Date on Latest Climate Observations	Now	Now to 2105+	N/A	All	2105+	Yes
	C	Assess Feasibility of Implementing an Oil Response Plan (Booms, Sluice Gates, etc.)	Now	Now to 2045	N/A	1A, 1B, 2A, 2B	2105+	Yes
2	A	Ecosystem Restoration - Low Touch Scenario (Management Level 1)	Now to 2045	2045 to 2065	N/A	1A, 1B, 1C	2065	Yes
	B	Ecosystem Restoration - Intermediate Touch Scenario (Management Level 2)	Now to 2045	2045 to 2065	N/A	1A, 1B, 1C	2065	Yes
	C	Ecosystem Restoration - High Touch Scenario (Management Level 3)	2045 to 2065	2065 to 2085+	0.8 ft SLR	1A, 1B, 2D	2085	Yes
	D	Construct Ecotone Levees	2045 to 2065	2065 to 2085+	0.8 ft SLR	1A, 1B, 2C	2085	Yes
3	A	Initial Thin Layer Sediment Deposition (including Sediment Sourcing Planning)	2075 to 2085	2085 to 2095+	2.5 ft SLR + Decrease in Low Marsh and Mudflat	1A, 1B	2095	Yes
	B	Replace or Enhance Hydraulic Exchange Infrastructure	2085 to 2095	2095 to 2105+	3.3 ft SLR + >1 Full Operational Failure/Year	1A, 1B, 3C	2105	Yes
	C	Work with Key Agencies to Raise Vulnerable Portions of East SAR Levee and Channel Park Area	2090 to 2095	2095 to 2105+	3.7 ft SLR and/or Constant Overtopping at Levee	1A, 1B, 3B	2105	Yes
4	A	Elevate and Reconfigure Pedestrian Boardwalk, Roads, and Perimeter Berm	2095 to 2105	2105+	4.1 ft SLR + No Critical Infrastructure Adjustments	1A, 1B, 4B	2105+	No
	B	Larger Scale Thin Layer Sediment Deposition	2095 to 2105	2105+	4.1 ft SLR + No Critical Infrastructure Adjustments	1A, 1B, 4A	2105+	No

Phase 1 begins with foundational strategies already in motion, including forming strategic partnerships with relevant agencies and tribes (**1A**), maintaining alignment with the latest and most up-to-date SLR science (**1B**), and exploring emergency oil spill response measures (**1C**). These coordination-based actions are both feasible and crucial for long-term success. Importantly, these early-phase strategies will set the foundations and carry through the entirety of the Preserve's adaptation pathway.

Phase 2 focuses on ecosystem-based interventions that prioritize resilience through restoration. This includes Management Levels 1 and 2 — low and intermediate-touch ecosystem restoration strategies (**2A** and **2B**) — which aim to improve ecological function while maintaining most of the site's existing form and functions. These are likely to be implemented by 2045 and provide resilience benefits through at least 2065.

Management Level 3 (**2C**), however, represents a more transformative ecological strategy that are not technically required until 0.8 feet of SLR and is projected to remain effective through 2085+. This strategy extends protection to approximately 2085 and marks the transition point between nature-based solutions and more engineered interventions.

Phase 3 strategies are focused on infrastructure adaptations that become necessary as higher levels of SLR are observed, tide range decreases within the Preserve, and the lower wetland zones (mudflat and low marsh) increase in area while higher intertidal areas decrease. These include thin layer sediment deposition to offset marsh loss (**3A**), and replacement or redesign of hydraulic infrastructure (**3B**), such as culverts, tide gates, or levees. These strategies are not initiated until 2.5–3.7 ft of SLR is observed and the distance between the highest observed water levels and the top of the levee (freeboard) decreases to less than 2 feet at key levee points.

Phase 4 includes adaption measures such as raising pedestrian boardwalks and increasing the elevation of the Preserve's perimeter berms (**4A**) or undertaking larger-scale thin layer sediment deposition across the site to increase the marsh plain elevation and prevent the marsh from being submerged by SLR (**4B**). These adaptation measures are only triggered under extreme conditions i.e., 4.1 ft of SLR or more, assuming no prior infrastructure adaptation. However, Phase 4A is considered unlikely to be necessary due to anticipated regional interventions led by state, county, and local agencies. Specifically, agencies are expected to prioritize protection of major critical infrastructure such as the SAR levee and at residential areas like Channel Place Park in Newport Harbor - which lies at a lower elevation and is vulnerable to early SLR impacts.

The pathways are phased to allow for adaptive decision-making that aligns with real-world observations. Management Levels 1 and 2 form the backbone of near- and mid-term resilience and are covered by existing hazard modeling and environmental review. Management Level 3 represents transformational shifts in land use, requiring additional feasibility analyses, updated hydrologic modeling, and sustained investment. By coupling ecosystem-based restoration with engineered adaptations as needed, this adaptive approach extends resilience for decades while maintaining flexibility in the face of uncertainty about rising sea levels. It positions the Preserve to be both responsive to environmental thresholds and proactive in safeguarding critical natural and cultural resources.

7. Funding Opportunities for Implementing Resilience Strategies

A list of sources for financing projects that implement resilience projects is presented on the following page. Since some funding sources change over time, we recommend the list be maintained for tracking and updates.

Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
California Coastal Conservancy	State Agency	Coastal Conservancy Grant Program	Provides funding for projects that restore and protect the California coast, expand public access to it, and enhance its resilience to climate change.	No set minimum or maximum, however, most grants will be from $200,000 -$5 million	Rolling	Not required but encouraged	Applications are accepted on a rolling basis and will be evaluated when they are received. Two-step process – the first step is to submit a pre-application. If a pre-application meets the Conservancy's eligibility criteria and there is available funding for the project, applicants will be invited to submit a full application. Coastal Conservancy Grants – California State Coastal Conservancy
Caltrans	State Agency	Climate Adaptation Planning Grant	Supports local, regional and Tribal identification of transportation-related climate vulnerabilities through the development of climate adaptation plans as well as project level adaptation planning to identify adaptation projects and strategies for transportation infrastructure.	$100,000-$1 M for a single organization, up to $1.5 M for partnership applications.	Annual	11.47% match required	Application deadline was January 22, 2025. Eligible primary applicants include MPOs, RTPAs, transit agencies, cities and counties, Native American Tribal Governments, Joint Exercise of Powers Authority, Local Transportation Authority. Eligible sub-applicants include Primary Applicants, Universities and Community Colleges, Community-Based Organizations, Non-Profit Organizations (501.C.3), Other Public Entities* $31.9 M available. Sustainable Transportation Planning Grants | Caltrans Contact: Julia Biggar, Caltrans Julia.Biggar@dot.ca.gov

Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
Wildlife Conservation Board	State Board	Habitat Enhancement and Restoration Program	Provides funding for projects that involve habitat restoration to protect wildlife values and habitat.		Rolling	Not required	Pre-applications are accepted on a continuous basis. Habitat Enhancement and Restoration Program (ca.gov)
National Oceanic and Atmospheric Administration	Federal Agency	Coastal Habitat Restoration and Resilience Grants for Underserved Communities	Supports projects that will advance the coastal habitat restoration and climate resilience priorities of tribes and underserved communities, support community-driven habitat restoration and build the capacity of tribes and underserved communities to more fully participate in restoration activities.	$75,000- $2,000,000	Annual	Not required	Deadline for 2025 funding is May 12, 2025. $20 million in funding available. Coastal Habitat Restoration and Resilience Grants for Underserved Communities | NOAA Fisheries Contact: underserved.community.grants@noaa.gov
National Oceanic and Atmospheric Administration	Federal Agency	Transformational Habitat Restoration and Coastal Resilience Grants Under the Bipartisan Infrastructure Law	Supports transformational habitat restoration projects that restore marine, estuarine, coastal, or Great Lakes ecosystems, using approaches that enhance community and ecosystem resilience to climate hazards.	$750,000- $10,000,000 over 3 years	Annual	Not required but encouraged	Application deadline for 2025 was April 16, 2025. $100 million was available Eligible applicants are institutions of higher education, non-profits, for profit organizations, U.S. territories, and state, local, and tribal governments. Transformational Habitat Restoration and Coastal Resilience Grants | NOAA Fisheries Contact: resilience.grants@noaa.gov
National Fish and Wildlife Foundation	Non-Profit	National Coastal Resilience Fund Grant Program	Seeks to restore, increase and strengthen natural infrastructure to protect coastal communities while also	Planning and Design: $100,000 - $1 million Implementation:	Annual	Not required but encouraged	Pre-proposal deadline is May 6, 2025. Full proposals by invitation only due July 17, 2025.

Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
			enhancing habitats for fish and wildlife.	$1 million- $10 million			National Coastal Resilience Fund | NFWF
Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
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National Fish and Wildlife Foundation	Non-Profit	National Coastal Resilience Fund Grant Program	Seeks to restore, increase and strengthen natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife.	Planning and Design: $100,000- $1 million Implementation: $1 million- $10 million	Annual	Not required but encouraged	Pre-proposal deadline is May 6, 2025. Full proposals by invitation only due July 17, 2025. National Coastal Resilience Fund | NFWF

8. Gathering and Sharing Information

Inspired by NOAA's Climate Program Office, the CRS will recommend enhancements to the Preserve Website – to include a portal or web page where the public can access important information and tools that help keep the Preserve resilient. This strategy involves the development and sharing of science-based information and planning decisions to inform the coastal communities and advance the resilience of and coastal\marine ecosystems.

9. Conclusion and Recommendations

Based on the evaluation of resilience strategies (Section 4), SWOT analysis (Section 5), and the development of the adaptation pathway (Section 6), this Coastal Resiliency Strategy recommends a phased, hybrid approach to adaptation that supports both ecological restoration and public access while planning for future SLR conditions.

- The strategy begins with Phase 1, which consists of early actions already underway or readily achievable —such as continued coordination with regional partners, ecological monitoring, and maintenance of the Preserve's foundational infrastructure. These actions establish a strong base for future adaptation while supporting immediate resilience and habitat stewardship in the *near term*.
- Phase 2 focuses on nature-based restoration strategies that align with Management Levels 1 and 2, including ecosystem uplift through vegetation management, thin-layer sediment deposition, and strategic grading. These actions enhance tidal connectivity and habitat health without significant topographic change and are compatible with current use and access conditions.
- Phases 3 and 4 also include nature-based and hybrid strategies and represent longer-term, higher-touch activities that have longer planning horizons. This includes potential mass grading and tidal reconnection to adjacent USACE-managed wetlands, which would reestablish tidal exchange and support marsh function at the Preserve. These high-touch strategies are not assumed to be immediately necessary but are included in the pathway to support planning, permitting, and phased readiness—ensuring the Preserve can respond effectively if and when conditions call for more transformative change.

Throughout all phases, the pathway recommends that infrastructure — such as berms, trails, and boardwalks — be designed with elevation flexibility in mind. These design elements serve both recreational and functional needs and can be adapted incrementally as SLR conditions evolve. Ultimately, the recommended pathway supports a layered, dynamic approach to adaptation that enables the Preserve to evolve in step with environmental factors, avoids premature overdesign, and aligns with broader regional efforts. The strategies in this document were developed to begin the planning for the technical, regulatory, and partnership groundwork that will be necessary to ensure the Preserve remains resilient for generations.

CoSMoS Modeling results indicate that the Preserve is highly protected. However, localized flood hazards could impact the project site and surrounding areas under long-term SLR projections—particularly during extreme storm events and if existing infrastructure is not maintained or upgraded.

The Preserve is unique in that its habitat will not feel the effects of rising sea levels for several decades (until greater than 4 feet of SLR occurs). This makes resiliency feasible inside the lowlands, but it also makes resiliency highly dependent on the infrastructure that protects it. The vulnerability of coastal resources at the Preserve varies significantly depending on the presence or absence of existing infrastructure and protection provided by the Santa Ana River East Levee and the existing tide gates that provide a hydraulic connection to the Santa Ana River.

<u>Key Findings:</u>

- Flood exposure remains minimal under all protected scenarios, assuming the tide gates and existing hydraulic structures remain fully functional. However, under higher SLR scenarios, the site's resilience is highly dependent on the continued operability of this infrastructure to prevent significant inundation.
- The surrounding infrastructure that protects the Preserve makes it possible to integrate nature-based and holistic designs at all scales within the lowlands.
- Groundwater emergence is expected to increase significantly under higher SLR scenarios, particularly in the low-lying freshwater marshes and riparian areas of the Preserve. Under existing conditions, groundwater remains below the surface in most areas. However, as SLR reaches 1.6 ft, isolated areas—especially in the southern and central lowlands—may begin to experience shallow groundwater close to the surface, potentially causing soil saturation, changes in plant community composition, and infrastructure degradation. Under the 4.9-foot SLR scenario,

groundwater is projected to emerge at the surface in many low-lying areas, even without direct coastal flooding. This includes areas that are otherwise protected from surface water inundation by tide gates or levees.

- Under a 4.9 ft SLR scenario combined with a 100-YR storm event, the site is projected to experience widespread flooding in an unprotected condition (i.e., without agency-led improvements to infrastructure along the SAR, Newport Bay, or PCH). This includes inundation of wetlands, floodplains, and nearby infrastructure, as well as backflow through storm drains and utilities, which could compromise drainage systems and lead to localized flooding.
- Within the project site, lowland areas are projected to be more at risk of widespread inundation under scenarios in which the existing infrastructure fails and little to no agency intervention occurs, which is unlikely.
- Under the *Protected* scenario, most resources exhibit low to moderate overall vulnerability, due to reduced hazard exposure from tidal inundation and storm surge. This includes critical infrastructure such as storm drains, utilities, and natural vegetation, which benefit from the function of the tide gates and structural protections. In contrast, the Unprotected scenario shows a marked increase in vulnerability across nearly all asset categories. Lowland development, stormwater infrastructure, and recreation amenities show high overall risk, driven by increased hazard exposure and limited adaptive capacity.
- This distinction reflects the differing levels of exposure to SLR-related hazards such as tidal inundation, storm-driven flooding, and groundwater emergence, and allows for a more accurate evaluation of risk based on site-specific conditions and infrastructure performance.

Recommendations:

- Proceed with improvements planned for the Preserve but develop relationships with the agencies responsible for maintaining and operating the SAR East Levee and tide gates at North Marsh and South Marsh.
- Due to its regional setting, consider the Preserve's potential for tidal flows and connectivity to the adjacent USACE wetland projects and Talbert Regional Park (South) to increase the overall coastal wetland acreage and open space in this region.
- Periodically track tide levels at West Newport Harbor to see if the coastal area within the vicinity of Channel Park Place begin to experience the effects of rising tide levels. Nature will provide specific environmental cues such as loss of beach area or flooding of the beach park, public sidewalks, and streets (River Avenue and Channel Park Place). If flooding begins to emerge in this area, that is a trigger to start planning for rising sea level.
- Apply for grants to support wetland creation, enhancement, and resiliency.
- Create a portal on the Preserve website where SLR science and planning information about the Preserve can be shared with the public.
- This document provides land managers of the Preserve with a roadmap of activities to implement. It presents a series of measures that could be planned and initiated as standalone projects or in combination with other ones. Before adopting and implementing any pathways and measures described in this report it is recommended that the public and State and Federal agencies be involved in the planning process.

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Appendix A
Final SLRVA

moffatt & nichol

FRANK AND JOAN RANDALL PRESERVE

Coastal Resiliency Strategy (CRS) Report

DRAFT REPORT

Produced For Coastal Corridor Alliance (CCA), Mountains and Recreation Conservation Authority (MRCA), & Dudek

Date: 5/5/2025

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Glossary

AHT	Annual High Tide
AR6	Sixth Assessment Report
CCA	Coastal Corridor Alliance
CCC	California Coastal Commission
CoNED	Coastal National Elevation Database
CoSMoS	Coastal Storm Modelling System
CRS	Coastal Resilience Strategy
cm	Centimeters
DTL	Mean Diurnal Tide Level
ENSO	El Niño and the Southern Oscillation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FJRP	Frank and Joan Randall Preserve
ft	Feet
GIS	Geographic Information Systems
GSW	Global Surface Warming
HAT	Highest Astronomical Tide
HEC-RAS	Hydrologic Engineering Center – River Analysis System
HOT	Highest Observed Tide
HOWL	Highest Observed Water Level
in.	Inches
IPCC	International Panel of Climate Change
Int	Intermediate
Int-High	Intermediate-High
ITF	Interagency Task Force
k	Hydraulic Conductivity
LAT	Lowest Astronomical Tide
LCP	Low-Confidence Processes
LF	Linear Feet
LOWL	Lowest Observed Water Level
m	Meters
MHW	Mean High Water
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MRCA	Mountains Recreation and Construction Authority

MSL	Mean Sea Level
MTL	Mean Tide Level
NAVD88	North American Vertical Datum of 1988
NFAT	NASA Flooding Analysis Tool
NFHL	National Flood Hazard Analysis
NOAA	National Oceanic and Atmospheric Administration.
OCFCD	Orange County Flood Control District
OCPW	Orange County Public Works
OCOF	Our Coast Our Future
OPC	State of California Ocean Protection Council
PAP	Public Access Plan
PCH	Pacific Coast Highway (Highway 1)
RMP	Resource Management Plan
SAR	Santa Ana River
SART	Santa Ana River Trail
SARWQB	Santa Ana Regional Water Quality Control Board
SFHA	Special Flood Hazard Analysis
SIM	Static Inundation Modelling
SLR	Sea Level Rise
SLRVA	Sea Level Rise Vulnerability Assessment
SRT	Self-Regulating Tide
sq ft	Square Feet
SWL	Still Water Level (ft, NAVD88)
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TAEP	Tribal Access and Engagement Plan
TPL	Trust for Public Land
TWL	Total Water Level (ft, NAVD88)
USGS	United States Geological Society
USACE	U.S. Army Corps of Engineers
VHE	Very High Emissions
WL	Water Level
YOI	Year of Inflection

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1. Introduction

1.1. General Overview

This report presents and recommends a set of actions designed to provide protection to the low lying areas (lowlands) of Randall Preserve (or "Preserve") from the impacts of rising sea levels, coastal storms, and flooding. Resiliency is accomplished by taking several steps including identifying and assessing the risks from sea level rise (SLR), developing adaptation plans and resiliency measures, prioritizing those measures, implementing them, and then monitoring the effectiveness of those measures.

Following guidance in the California Coastal Commission (CCC) Sea Level Rise Policy Guidance Document (CCC Guidance), the objective of this Coastal Resiliency Strategy (CRS) document is to identify coastal resilience strategies intended to reduce negative impacts and improve the Preserve's ability to prepare for, withstand, and recover from extreme coastal events and rising sea levels. Strategies focus on improving resilience of the natural and built environments and include implementing solutions that are nature-based or engineered structures or a hybrid of the two While this document was developed in consideration of the Preserve's site-specific needs, it was also developed with a holistic landscape perspective in mind, which considers the Preserve's connection to the Santa Ana River, adjacent uplands and communities, and its significance to the region (Figure 1).

Building on these findings, this plan outlines potential adaptation strategies to mitigate or reduce the potential impacts of sea level rise to vulnerable locations across the Preserve. This adaptation plan is not meant to dictate a specific set of actions the Preserve must take but rather provide a range of options to be further debated, considered, and potentially implemented in the future. It is flexible and meant to be a community planning document that is revised over time as new information emerges, climate science advances, and community preferences evolve.

FIGURE 1. LANDSCAPE PERSPECTIVE OF RANDALL PRESERVE

In combination with the SLR Vulnerability Assessment (full document provided in Appendix A), these reports outline a cyclical process to address sea level rise hazards over time, illustrated in Figure 2. Steps 1-3, from identifying appropriate sea level rise projections to assessing risks to resources and development, are covered within the Sea Level Rise Vulnerability Assessment. Strategies on the development of adaptation measures and the implementation of these measures (Steps 4-5) is covered within this document.

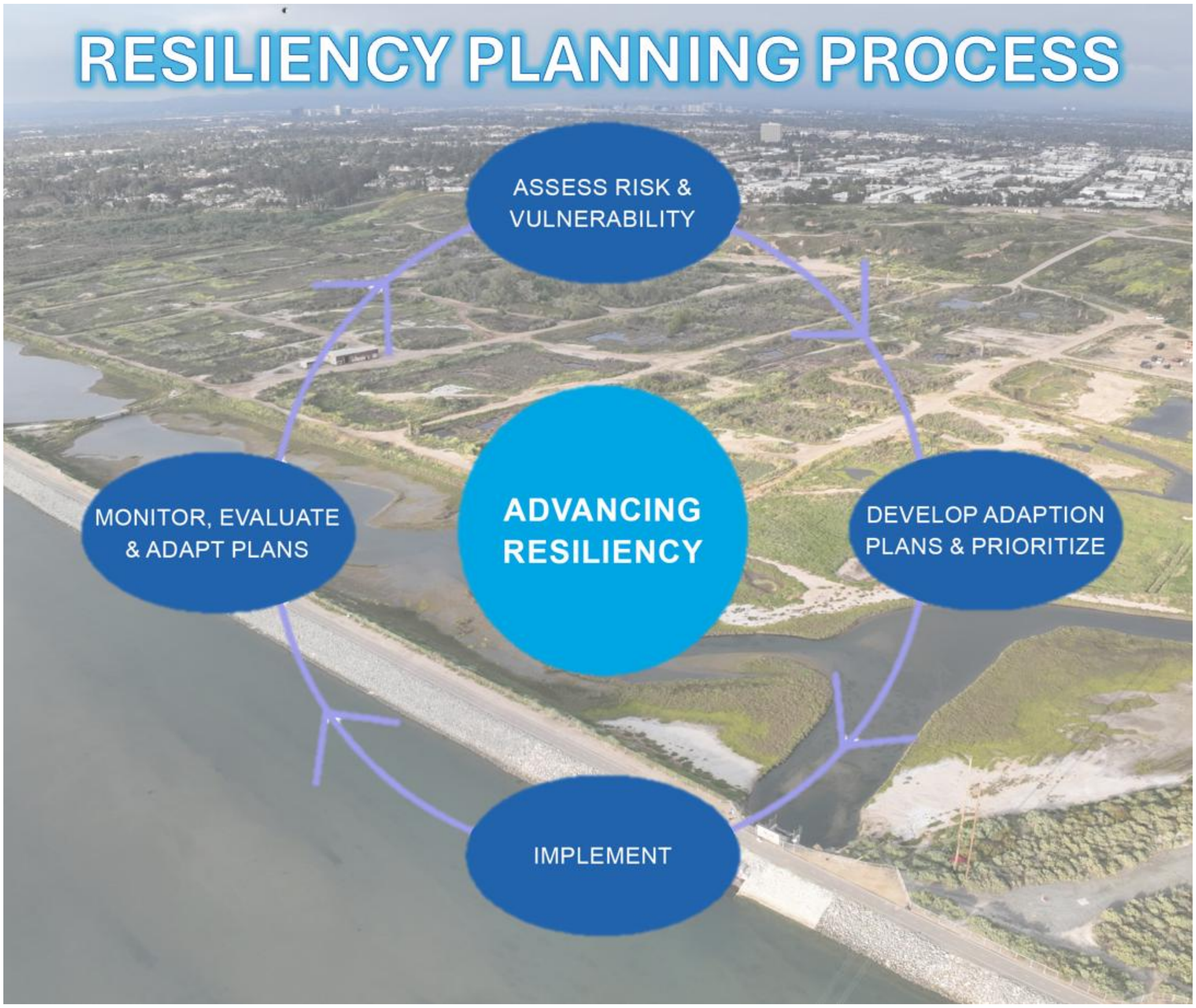


FIGURE 2. COASTAL RESILIENCE STRATEGY PLANNING PROCESS

1.2. CRS Plan Objectives

As a result of melting land ice, thermal ocean expansion, and coastal land subsidence, global sea levels have been observably rising since 1900; the rate of sea level rise is expected to increase through the twenty first century (NOAA 2015; NRC 2012). As sea levels continue to rise, portions of the Preserve and adjacent areas may experience more frequent and severe coastal hazards that will test the area's resilience.

The Coastal Corridor Alliance (CCA) and Mountain and Recreation Conservation Authority (MRCA) developed explicit objectives for the lowlands:

- **Goal #1: Restore coastal processes and functions to the maximum extent possible for ecological benefit.**

  Objectives:

  1. Increase estuarine habitat with a mix of tidal channels, mudflat, salt marsh, and brackish/freshwater marsh.
  2. Enhance and maintain wetland-upland ecotone and upland habitat to support habitat resiliency and species diversity.

3. Restore and maintain coastal habitat that supports species of special concern (e.g., federal and state listed species), essential fish habitat, and migratory birds.
4. Maintain hydrological integrity for the benefit of habitats.

- **Goal #2: Plan for changing environments and design for ecological resilience.**

  Objectives:

  1. Design habitats to accommodate climate change related sea level rise and other coastal impacts (e.g., incorporate topographic and salinity gradients, habitat diversity and natural buffers and transition zones to accommodate migration of wetlands with rising sea levels).
  2. Prioritize nature-based solutions.
  3. Develop and implement a comprehensive sediment-management plan.
  4. Work toward increased unification and collaboration of management with appropriate entities, such as OC Parks, Orange County Vector Control, the City of Newport Beach, and U.S. Army Corps of Engineers (USACE).

- **Goal #3: Identify opportunities for contiguous coastal habitat areas and increase the buffer between sensitive habitat and sources of human activities**.

  Objectives:

  1. Bridge wildlife connectivity between Randall Preserve/Genga and adjacent natural areas.
  2. Balance ecological sustainability with an appropriate level of public access and Tribal cultural uses.
  3. Increase habitat buffer zones by limiting or reducing impacts from urban infrastructure and intrusions (e.g. stormwater pipelines, powerlines, lighting, excessive noise).

The potential strategies presented in the following sections are evaluated based on their ability to meet the criteria outlined above.

2. Description of Coastal Hazards

The previous Sea Level Rise Vulnerability Assessment (SLRVA) (M&N 2025) analyzed the effects of sea level rise on the Preserve's existing project site and adjacent waterways using the best available science and data to determine potential coastal hazard zones in accordance with California Coastal Commission (CCC) Guidance. The State of California Ocean Protection Council (OPC) Science Advisory Taskforce compiled the best available sea level rise science relevant to California in the "Rising Seas in California" report (Griggs, et al. 2017). Reflecting statewide guidance, the OPC recently released the 2024 State of California Sea Level Rise Guidance: Science and Policy Update in January 2024. The CCC currently recognizes this document as the best available science for sea level rise projections in California.

The following is a brief description of the coastal hazards evaluated in the previous vulnerability assessment. A combination of analytical methods and numerical models (described in Appendix A) were used to develop potential resilience and adaptation solutions for each type of hazard under the different sea level rise scenarios.

- **Flooding Driven by Severe Storm Events and High Tides:** Sea level rise is expected to significantly affect the extent, depth, and frequency of coastal flooding at adjacent surrounding areas (Santa Ana River [SAR], West Newport Bay, Pacific Coast Highway [PCH], etc.). It was deduced that the site is heavily protected by the existing hydraulic infrastructure (tide gates, storm drain outlets, etc.) under most scenarios; thus, highlighting the dependance on this critical hydraulics infrastructure's operability. Flood hazard projections were modeled using the USGS CoSMoS platform for both non-storm spring high tide conditions and 100-year (YR) coastal storm conditions, with an additional scenario analyzed in which no agency intervention occurs, and critical infrastructure is not retrofitted to meet increasing hazard demands (4.9 feet [ft] SLR, 100-YR storm unprotected scenario). Analysis showed that under this 4.9 ft SLR unprotected scenario, most of the lowlands including portions of wetlands, floodplain, and infrastructure — are projected to experience extensive inundation during storm events, especially where levees or coastal roadways such as PCH could be overtopped. These events could also lead to increased backflow through municipal storm drains and reduced drainage performance. Figure 1 provides a cross-section of the project site showing critical water levels as they relate to the various SLR and storm scenarios.

- **Groundwater Emergence:** Groundwater emergence, a form of flooding driven by rising shallow groundwater tables, presents a potential risk for the Banning Ranch site under future sea level rise. This occurs when groundwater levels, influenced by rising marine water levels, approach or exceed the ground surface, leading to surface flooding even in the absence of rainfall or storm surge. CoSMoS groundwater modeling was used to project water table responses under various SLR scenarios. Results indicate that much of the site will be subject to a shallow (0-3 ft) or emergent groundwater table condition under MHHW as SLR progresses. These conditions can precede surface inundation and impact underground infrastructure and result in persistent saturation of low-lying zones. As wetland creation and expansion of existing wetlands is a long-term management goal, however, groundwater emergence could make wetland creation easier at the Preserve.

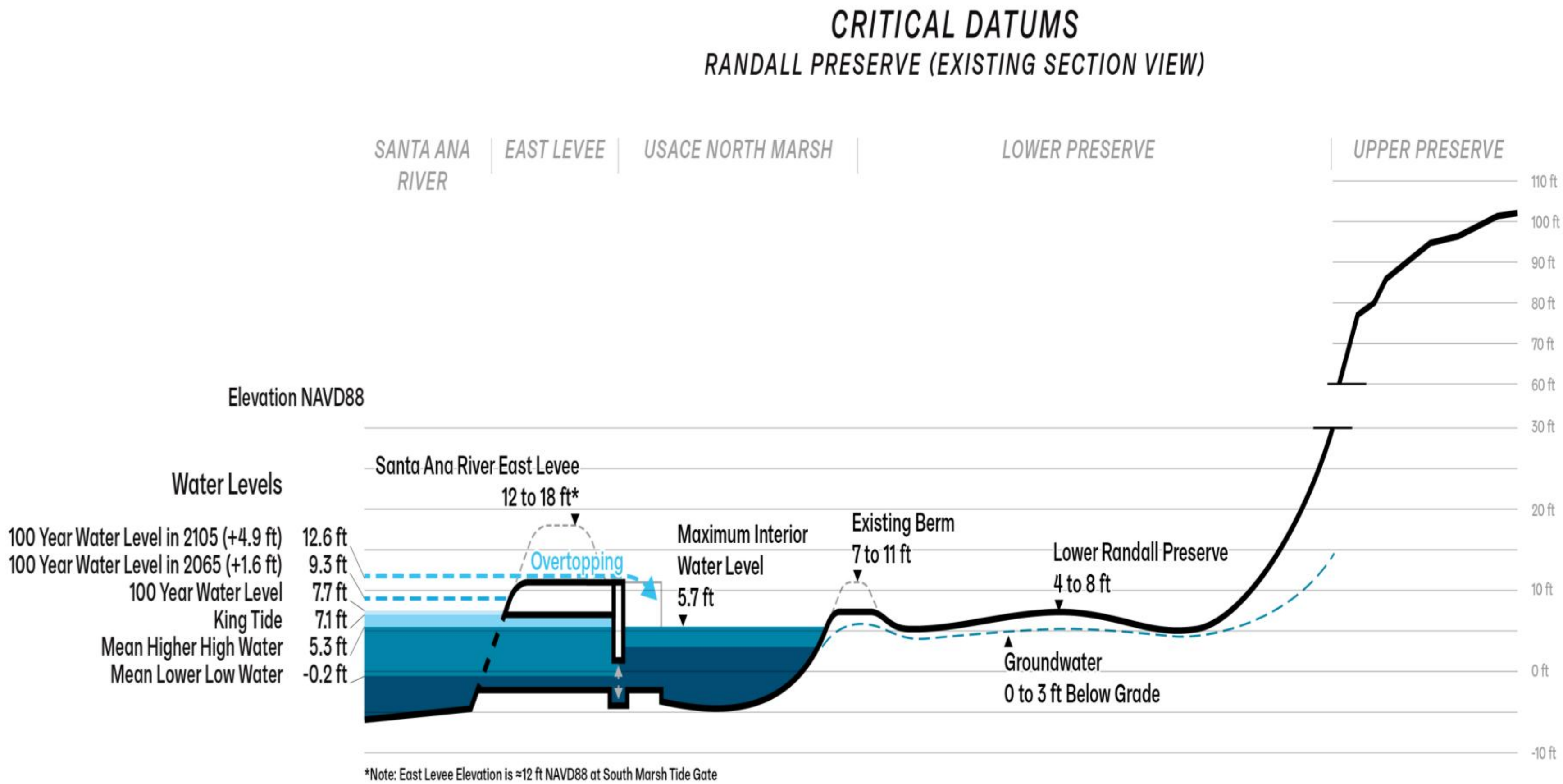


FIGURE 3. CRITICAL DATUMS & STORM EVENTS AS THEY RELATE TO THE PRESERVE

3. Basis for Coastal Resiliency Strategies

The initial phase of crafting this CRS document involved determining the vulnerability of different locations and resources within the Preserve to sea level rise. These findings are presented in Appendix A (the SLRVA). The SLRVA examines the vulnerability of the Preserve's assets and coastal resources under sea level rise scenarios ranging from 1.6 ft (0.25 meters [m]) to 4.9 ft (1.5 m), covering projected sea level rise from 2080 to 2140 as shown in Table 1 below.

A total of seven (7) SLR and storm scenarios were mapped for the vulnerability assessment:

- Existing conditions (no SLR)
  - Non-Storm – Annual High Tide (AHT) of +6.79 ft NAVD88
  - 100-YR Storm – Highest Observed Tide (HOT) of +7.72 ft NAVD88
- 1.6 ft SLR conditions
  - Non-Storm – AHT of +6.79 ft NAVD88
  - 100-YR Storm – HOT of +7.72 ft NAVD88
- 4.9 ft SLR conditions
  - Non-Storm – AHT of +6.79 ft NAVD88
  - 100-YR Storm – HOT of +7.72 ft NAVD88
  - 100-YR Storm (*Unprotected*) – HOT of +7.72 ft NAVD88

Evidence in the updated 2024 report suggests that it is reasonable to view the *Intermediate* scenario as the most representative of the SLR expected to occur in the near term and provides a reasonable upper bound for the most likely range of SLR by 2100.

TABLE 1. PROBABLE TIMING ASSOCIATED WITH SELECTED SLR SCENARIOS FOR THE LOS ANGELES REGION (OPC, 2024)

SLR Scenarios, ft (cm)	Probable Timing Associated with SLR Projections (2024 Draft Guidance Update)				
	Low	Int-Low	Intermediate	Int-High	High
1.6 (50)	2150+	2120	2080	2065	2055
4.9 (150)	2150+	2150+	2140	2105	2090

3.1. SLRVA Summary & Findings

Vulnerability of the Preserve as it relates to sea level rise is defined based on three characteristics:

- **Hazard Exposure**: The hazard *type, duration, and frequency* subjected upon the Project Site. In general, the degree of flooding exposure due to SLR at a specific site typically dictates how exposed the site is to these hazards.
- **Hazard Sensitivity**: The *degree* to which a resource is impaired by exposure to hazards. It relates to the susceptibility of the site to the various coastal hazards associated with SLR and considers the ecological, social, and economic factors that make certain areas or assets more sensitive or vulnerable to hazards.
- **Adaptive Capacity**: The *ability* of a site to respond effectively to changing conditions, including coastal hazards, while maintaining or enhancing their well-being and functionality.

The overall vulnerability of coastal assets at Randall Preserve is determined by evaluating the three interrelated factors by first identifying key resources within and adjacent to the Preserve—such as recreational areas, infrastructure, roadways, and natural habitats—then evaluating how each of these resources responds to increasing sea level rise scenarios. Resources that are highly exposed to coastal hazards (e.g., tidal inundation, groundwater emergence, etc.), highly sensitive to impacts such as flooding or saturation, and lack the ability to adapt or be protected over time are classified as highly vulnerable. The resulting vulnerability classifications provide a snapshot of which assets within Randall Preserve are most at risk and help inform future adaptation planning. Summary vulnerability scores for different resource types and hazard conditions are provided in Table 2.

TABLE 2. SLR VULNERABILITY RATINGS AND DESCRIPTIONS

Category	Rating	Description
Hazard Exposure	N/A	No exposure to flooding or erosion.
	Low	Exposure to storm flooding in select areas.
	Moderate	Significant exposure to storm flooding and/or partial exposure to non-storm inundation.
	High	Significant exposure to non-storm inundation.
Hazard Sensitivity	Low	Minimal impacts to structure and function as a result of coastal hazards unless inundated on a regular basis.
	Moderate	Moderate impacts to structure and function during temporary storm flooding. Significant impacts if inundated.
	High	Significant impacts to structure and function from short-term storm flooding or inundation.
Adaptive Capacity	Low	Limited options for adaptation. Adaptation likely to have significant costs.
	Moderate	Multiple options for adaptation over time with relatively moderate effort and cost.
	High	Multiple options for adaptation over time with minor additional cost.

The vulnerability of coastal resources at the Preserve varies significantly depending on the presence or absence of protection provided by the existing tide gates and coastal infrastructure. To reflect these conditions, assets were evaluated under two SLR scenarios: Protected (existing, 1.6 ft, and 4.9 ft SLR with fully operational hydraulic infrastructure) and Unprotected (4.9 ft SLR with no agency intervention and allowed overtopping). The Preserve remains largely protected from direct SLR impacts under current and near-term conditions — primarily due to the functionality of existing levee, tide gates, and other hydraulic connections along the Santa Ana River.

Under the *Protected* scenario, most resources exhibit low to moderate overall vulnerability, due to reduced hazard exposure from tidal inundation and storm surge. This includes critical infrastructure such as storm drains, utilities, and natural vegetation, which benefit from the function of the tide gates and structural protections. In contrast, the Unprotected scenario shows a marked increase in vulnerability across nearly all asset categories. Lowland development, stormwater infrastructure, and recreation amenities show high overall risk, driven by increased hazard exposure and limited adaptive capacity.

This distinction reflects the differing levels of exposure to SLR-related hazards such as tidal inundation, storm-driven flooding, and groundwater emergence, and allows for a more accurate evaluation of risk based on site-specific conditions and infrastructure performance. The following tables summarize the overall vulnerability of coastal assets identified in the SLRVA, organized by this protection status.

TABLE 3. IDENTIFIED RISK ASSESSMENT FOR RANDALL PRESERVE COASTAL RESOURCES UNDER PROTECTED (EXISTING, 1.6 FT SLR, & 4.9 FT SLR) SCENARIOS

Resource Category	Resource	Specific Assets	Within Project Boundary	Hazard Exposure	Hazard Sensitivity	Adaptive Capacity	Vulnerability (Overall Risk)
Existing Vegetation & Habitat	*Preserve Vegetation*	Open Space Vegetation	Yes	Low	Moderate	Moderate	Low
	Submerged Waterways	Semeniuk Slough	No	Low	Low	High	
		SAR	No	Moderate	Low	Moderate	
	Uplands	Coastal Bluffs & Arroyos	Yes	N/A	Moderate	High	
	USACE Salt Marshes	North Marsh (USACE Project)	No	Moderate	Low	High	
		South Marsh (USACE Project)	No	Moderate	Low	High	
Critical Infrastructure & Development	*Hydraulic Infrastructure*	Levee	No	Moderate	Low	Low	Low
		Tide Gate Facilities	No	Moderate	Low	Moderate	
		Culverts	Yes	Moderate	Low	Moderate	
		Outlet Drains / Gates	No	Moderate	Low	Moderate	
		Easements	Yes	N/A	Moderate	Moderate	
	Lowlands Development	Bulkhead Walls	Yes	Low	Moderate	Moderate	
		Oil Operator Facilities	Yes	Low	Moderate	Moderate	
		Staging / Laydown & Other Development Areas	Yes	N/A	Moderate	Low	
		Fencing	Yes	Low	Moderate	Low	
	Upland Development	Site Access Area / Parking	Yes	N/A	Moderate	Moderate	
	Major Roadways	Pacific Coast Highway	No	High	High	Low	
	Service Roads	Industrial Way	Yes	Low	Moderate	Moderate	
		Oil Operator Service Dirt Roads	Yes	Moderate	Moderate	Moderate	
		Access Bridge (at North Marsh)	No	Low	Moderate	Moderate	
	Residential Areas	Newport Bay Residential Area	No	High	High	Low	
Utilities	*Existing Site Utilities*	Storm Drains	Yes	Moderate	Low	Moderate	Low
		Electrical (Overhead Power)	Yes	Low	High	Moderate	
		Exist Oil Piping	Yes	Low	Moderate	Low	
Recreation & Public Access	*Recreation & Public Access*	Future Access Trails & Amenities[1]	Yes	N/A	Low	Low	Low
		SART Pedestrian Trail	Yes	N/A	Low	Low	

TABLE 4. IDENTIFIED RISK ASSESSMENT FOR RANDALL PRESERVE COASTAL RESOURCES UNDER UNPROTECTED 4.9 FT SLR SCENARIO

Resource Category	Resource	Specific Assets	Within Project Boundary	Hazard Exposure	Hazard Sensitivity	Adaptive Capacity	Vulnerability (Overall Risk)
Existing Vegetation & Habitat	*Preserve Vegetation*	Open Space Vegetation	Yes	High	Low	Moderate	High
	Submerged Waterways	Semeniuk Slough	No	High	Low	High	
		SAR	No	High	Low	Moderate	
	Uplands	Coastal Bluffs & Arroyos	Yes	N/A	Moderate	High	
	USACE Salt Marshes	North Marsh (USACE Project)	No	High	Low	High	
		South Marsh (USACE Project)	No	High	Low	High	
Critical Infrastructure & Development	*Hydraulic Infrastructure*	Levee	No	High	Low	Low	High
		Tide Gate Facilities	No	High	Low	Moderate	
		Culverts	Yes	High	Low	Moderate	
		Outlet Drains / Gates	No	High	Low	Moderate	
		Easements	Yes	High	Moderate	Moderate	
	Lowlands Development	Bulkhead Walls	Yes	High	Moderate	Moderate	
		Oil Operator Facilities	Yes	High	Moderate	Moderate	
		Staging / Laydown & Other Development Areas	Yes	Moderate	Moderate	Low	
		Fencing	Yes	High	Moderate	Low	
	Upland Development	Site Access Area / Parking	Yes	N/A	Moderate	Moderate	
	Major Roadways	Pacific Coast Highway	No	High	High	Low	
	Service Roads	Industrial Way	Yes	HIgh	Moderate	Moderate	
		Oil Operator Service Dirt Roads	Yes	High	Moderate	Moderate	
		Access Bridge (at North Marsh)	No	High	Moderate	Moderate	
	Residential Areas	Newport Bay Residential Area	No	High	High	Low	
Utilities	*Existing Site Utilities*	Storm Drains	Yes	High	Low	Moderate	High
		Electrical (Overhead Power)	Yes	High	High	Moderate	
		Exist Oil Piping	Yes	Moderate	Moderate	Low	
Recreation & Public Access	*Recreation & Public Access*	Future Access Trails & Amenities[1]	Yes	Moderate	Low	Low	Moderate
		SART Pedestrian Trail	Yes	Moderate	Low	Low	

The following is a preliminary list of assets that have been indicated as being potentially impacted by 1.6 ft and/or 4.9 ft SLR at Randall Preserve:

Inside Randall Preserve Project Boundary

- Existing Habitat\Open Space\Vegetation communities
- Oil Retainer Property\Operator Facilities
- Perimeter Fencing
- Culverts at southern area of the Preserve
- Storm Drains
- Industrial Way
- Electrical Utilities (w/ Overhead Power Transmission Lines)
- Vector Control routes
- Public access paths
- Vehicular access roads
- Service access road that connects PCH to SAR East levee

Outside Randall Preserve Project boundary, but still pertinent:

- Santa Ana River (SAR) East Levee
- Outlet Drains/Gates (SAR East Levee)
- North Marsh (USACE)
- South Marsh (USACE)\Santa Ana River Salt Marsh (SARSM)
- Tide Gates at USACE North Marsh and South Marsh
- Culverts at North Marsh and South Marsh that connect to Randall Preserve
- Newport Beach Harbor at the Channel Place Park shoreline
- West Newport Beach
- Newport Shores
- Pacific Coast Highway

3.2. Strategies from CCC SLR Policy Guidance

The California OPC's updated 2024 Sea-Level Rise Guidance provides guidance on selecting sea level rise projections, which helps to standardize the process across the state. It points planners and engineers toward the best available sea level rise science and helps them understand how to practically consider and design for sea level rise risks. Figure 4 summarizes the major steps.

This State guidance provides the framework for the Preserve's SLR Vulnerability Assessment including the selection of the modeling scenarios. While these are not formal design guidelines, they include information on sea level rise projections and risk tolerance and could form the foundation of future Preserve design guidelines. This CRS document is intended to draw upon the analyses and findings from the original SLRVA document (Steps 1-4) and explore the decision-making process as it pertains to various adaptation approaches (Steps 5-6).

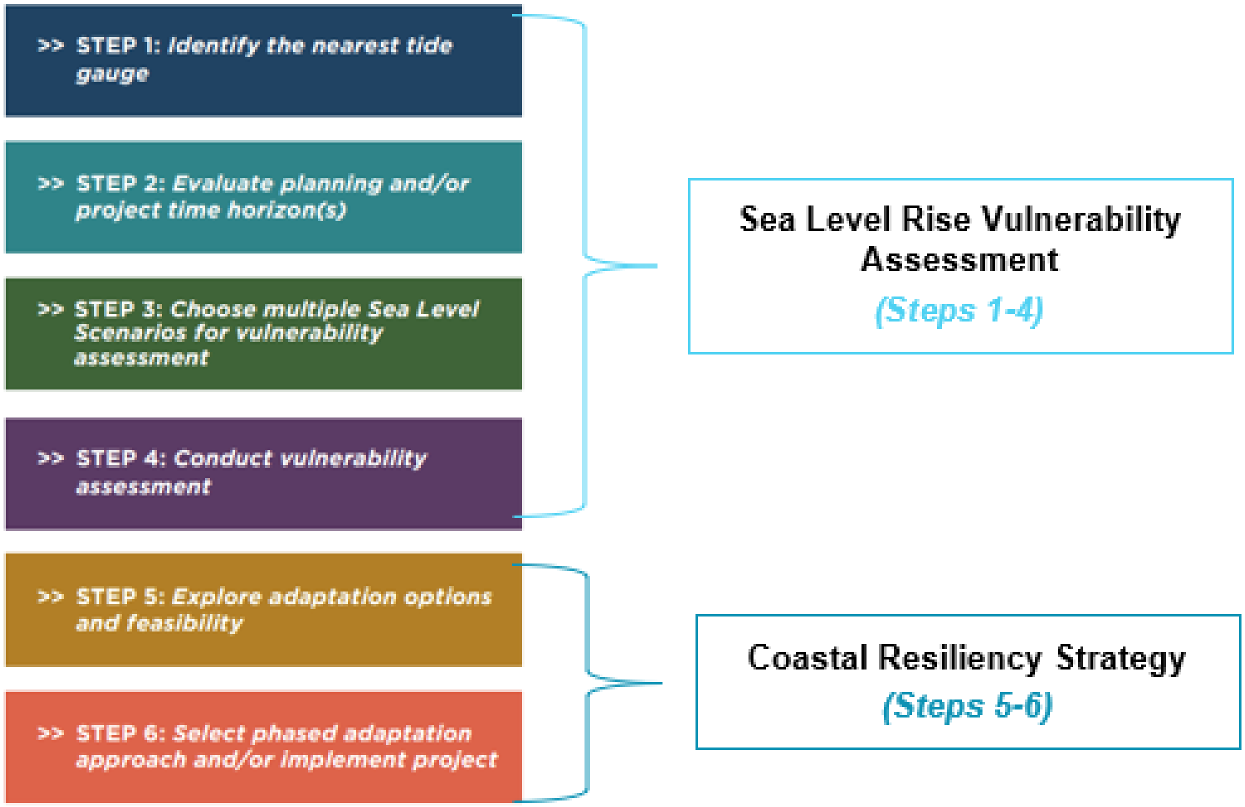


FIGURE 4. OPC'S UPDATED 2024 SLR GUIDANCE DECISION FRAMEWORK
(SOURCE: OPC'S 2024 UPDATED SLR GUIDANCE)

4. Resilience & Adaptation Strategies

4.1. General Adaptation Strategies

Changing coastal hazards due to SLR can be addressed in several different ways. Though numerous adaptation methods are available, adaptation measures generally fall into one of three categories or a combination of them:

- **Protection:** Strategies that employ hardened or nature-based engineered measures to defend an existing coastal asset from future SLR hazards without making changes to the asset itself.
- **Accommodation**: Strategies that involve modifying existing assets or designing new assets in a way that reduces the potential future impacts of SLR.
- **Retreat or Relocation:** Strategies focused on relocating or removing existing assets from identified high-hazard areas while limiting construction of new assets in such areas.

In unison with all these different strategies, adaptive management will be a continually evolving and dynamic process for implementing SLR adaptation strategies that incorporate monitoring, evaluation, and iterative decision-making in tandem with the strategies aforementioned. It enables coastal planners, engineers, and stakeholders to respond to evolving climate impacts by adjusting actions or designs based on performance, new data, or changing community needs. In practice, SLR adaptation often relies on hybrid approaches that combine elements from multiple categories over different spatial and temporal scales. Examples of these strategies are provided in Figure 5.

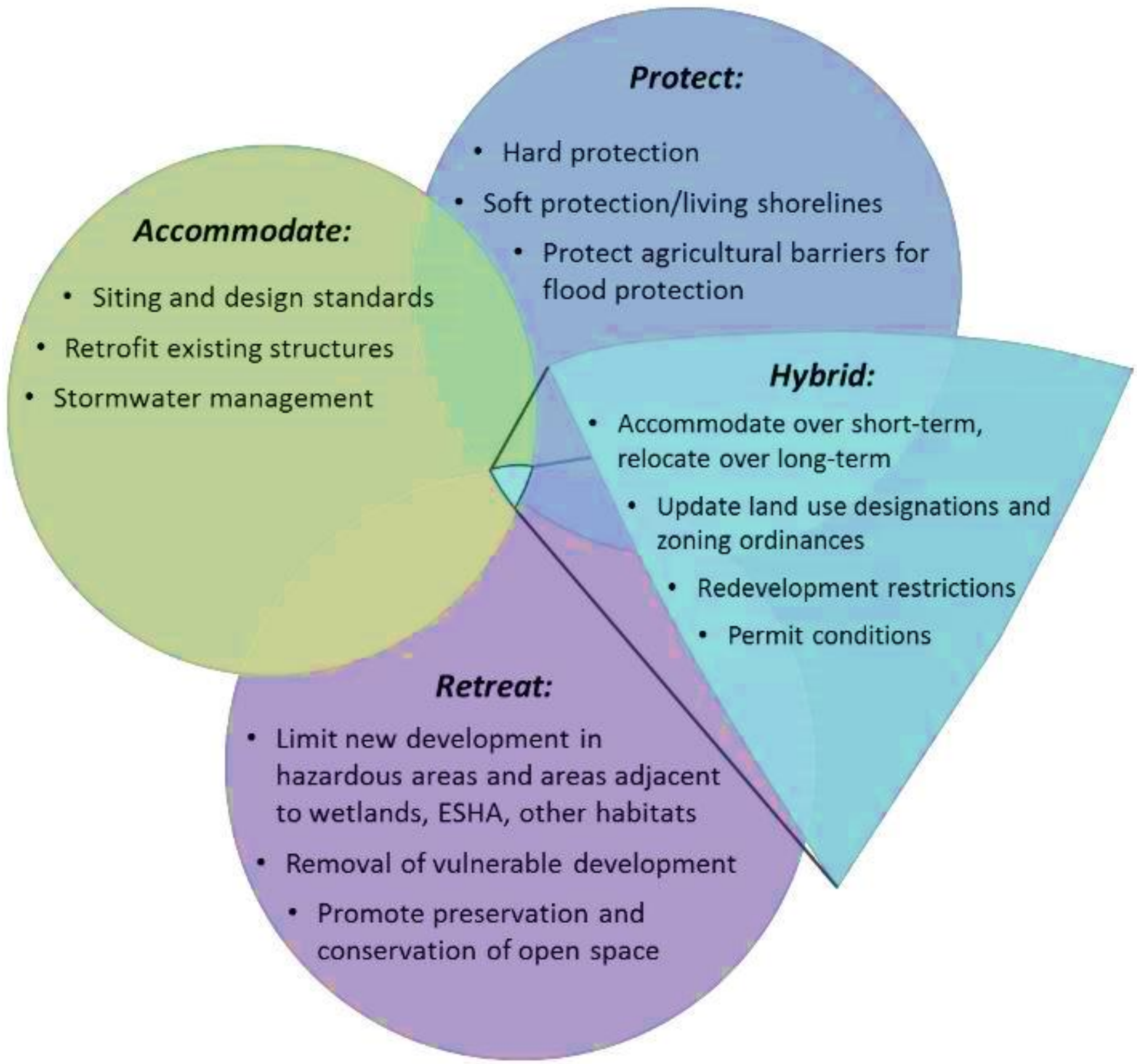


FIGURE 5. GENERAL SLR ADAPTATION STRATEGIES AND MECHANISMS

The following sections outline potential project-level resilience strategies that could be implemented within the four coastal planning areas to mitigate projected SLR-related hazards. Project-level strategies are provided for current conditions as well as projected near-term (1.6 ft) and long-term (4.9ft +) SLR scenarios. A breakdown of the potential benefits and challenges associated with various types of project-level resilience strategies are described in Section 5.

Three distinct levels of management are provided in Table 5 below. They involve increasing levels of land alteration or "touch" that were developed for the RMP. Each level informs resiliency and adaptation solutions. For this CRS, the term "adaptation" is defined as those retrofitted to increase the resiliency of the existing condition or actions taken under the Low Touch and Intermediate Touch Management Levels. The term "*resilience*" is used for any solution added as part of future mitigation actions ascribed to the High-Touch Management Level.

The original SLVRA document provides analysis for the lower levels of management (Level 1: Low-Touch and Level 2: Intermediate-Touch) scenarios. Therefore, this CRS will focus primarily on higher Level 3 management approaches. The following section presents high-level concept summaries and evaluations of each resiliency and adaptation solution. These evaluations are intended to help narrow the range of options to those most suitable for potential implementation at the Preserve.

TABLE 5. SUMMARY OF MANAGEMENT LEVELS AS THEY RELATE TO COASTAL EESILIENCY & ADAPTATION SOLUTIONS

Management Level	Focus	Key Actions	Outcomes / Goals
Level 1 – *Low Touch*	Basic preserve management and ecological stabilization	- Trail designation, signage, and safety reviews - Erosion and drainage control - Trash collection and perimeter patrols - Invasive species removal, suppression, and reliance on natural recruitment of native vegetation - Public behavior guidance (e.g., trail use, camping, vandalism)	Establish safe, sustainable public access and promote natural native vegetation recovery through weed suppression.
Level 2 – *Intermediate Touch*	Habitat enhancement and public experience improvements	- Upland road decommissioning and regrading - Native seeding and erosion control - Vernal pool and species habitat improvements - Construct amenities (e.g., platforms, trail bridges) - Establish nursery and community access points	Restore habitat in previously disturbed upland areas, enhance biodiversity, and support educational and recreational use.
Level 3 – *High Touch*	Transformative ecological restoration and tidal reconnection	- Mass grading and tidal channel excavation - Salt marsh and transitional habitat creation - Planting with temporary irrigation systems - Coordination with USACE and OCPW on tide gate management	Reestablish tidal influence in lowlands, enhance coastal wetland habitat, and achieve regional-scale ecological benefits.

Due to the limited changes in site topography under Management Levels 1 (*Low*) and 2 (*Intermediate*), the existing coastal hazard analysis presented in the SLRVA remains applicable and relevant to these approaches. In contrast, Management Level 3 involves significant site regrading and transformation, warranting additional analysis and updated hydrological modeling to assess its implications on flood risk and coastal processes on the altered proposed landscape.

4.2. Proposed Conditions (Management Level 3: *High Touch Scenario*)

Figure 6Figure 10 presents an updated flood analysis consistent with the methodology used in the SLRVA but applied to a conceptual proposed final site condition. Due to legacy oil infrastructure across the site, the proposed grading plan lowers the surface elevation by approximately 3 ft throughout to accommodate anticipated subsurface conditions (Note: existing oil wells are cut-off and capped 3 ft below the existing terrain). Therefore, this assessment evaluates flood depths under combined sea level rise and coastal storm scenarios for the conceptual surface elevations, as described below and shown in Figure 5 through Figure 9.

- 1.6 ft SLR conditions
  - Non-Storm – AHT of +6.79 ft NAVD88
  - 100-YR Storm – HOT of +7.72 ft NAVD88
- 4.9 ft SLR conditions
  - Non-Storm – AHT of +6.79 ft NAVD88
  - 100-YR Storm – HOT of +7.72 ft NAVD88
- 100-YR Storm (*Unprotected*) – HOT of +7.72 ft NAVD88

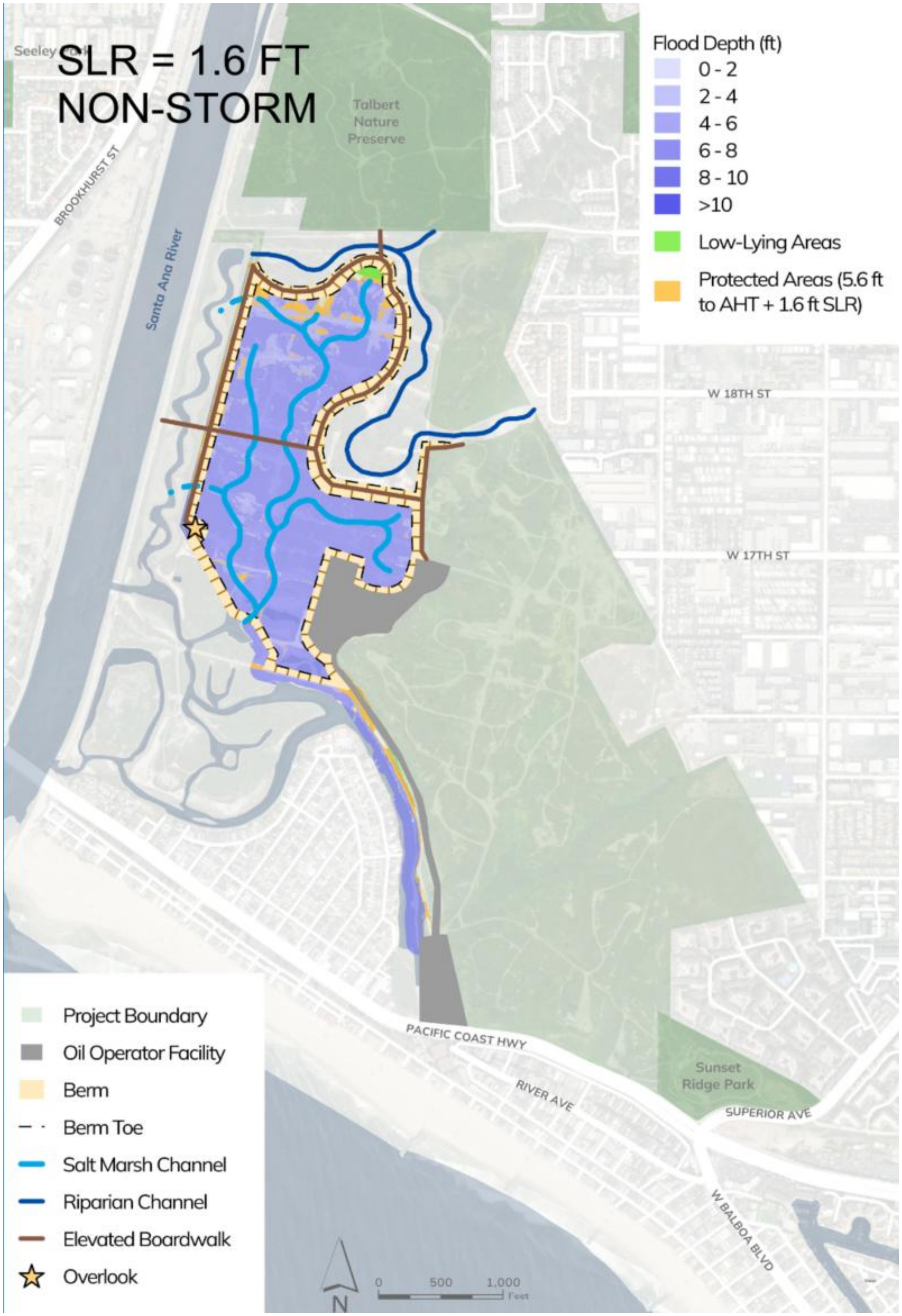


FIGURE 6. PROPOSED CONDITION UNDER 1.6 FT SLR + NO STORM

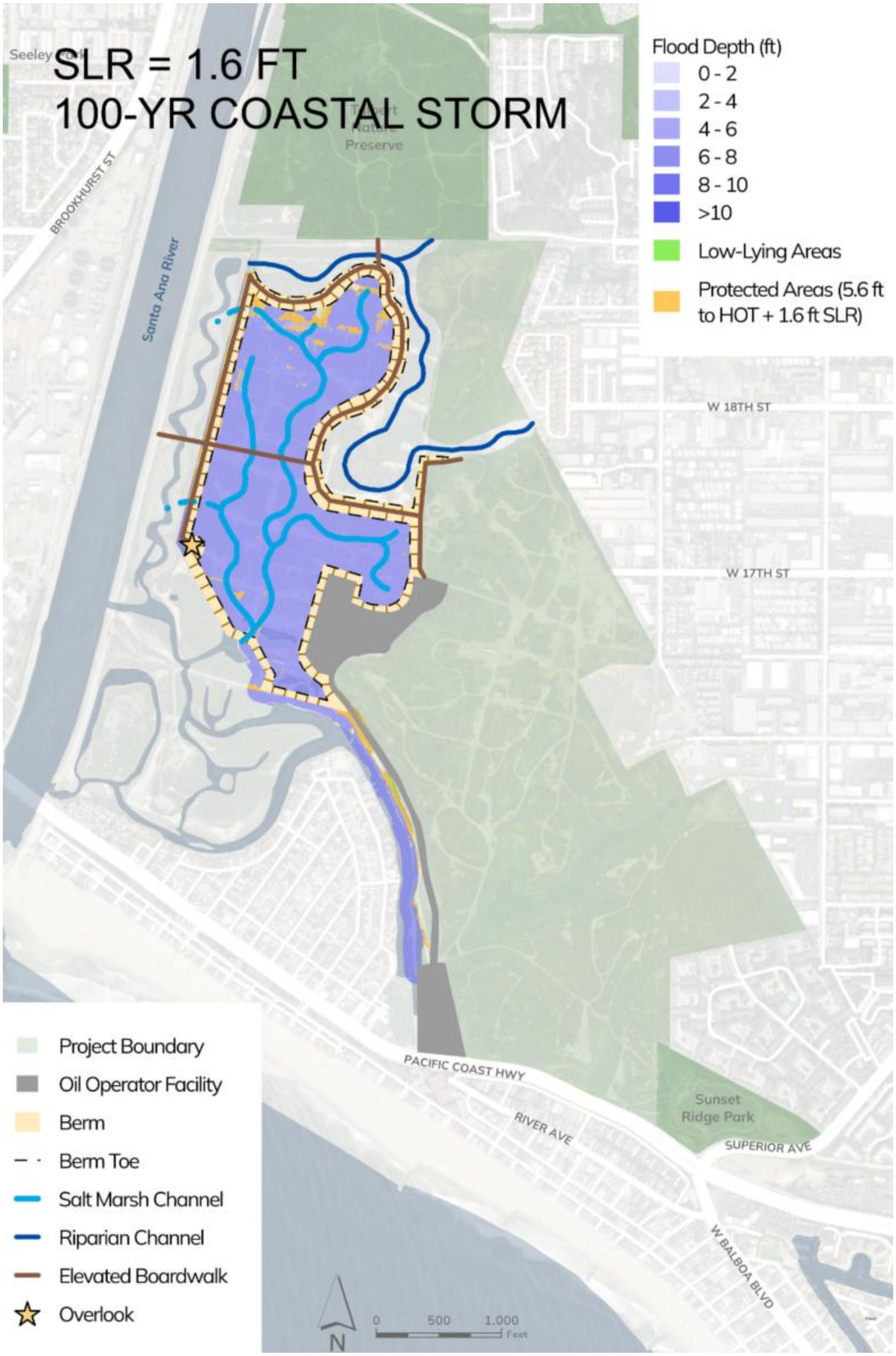


FIGURE 7. PROPOSED CONDITION UNDER 1.6 FT SLR + 100-YR STORM

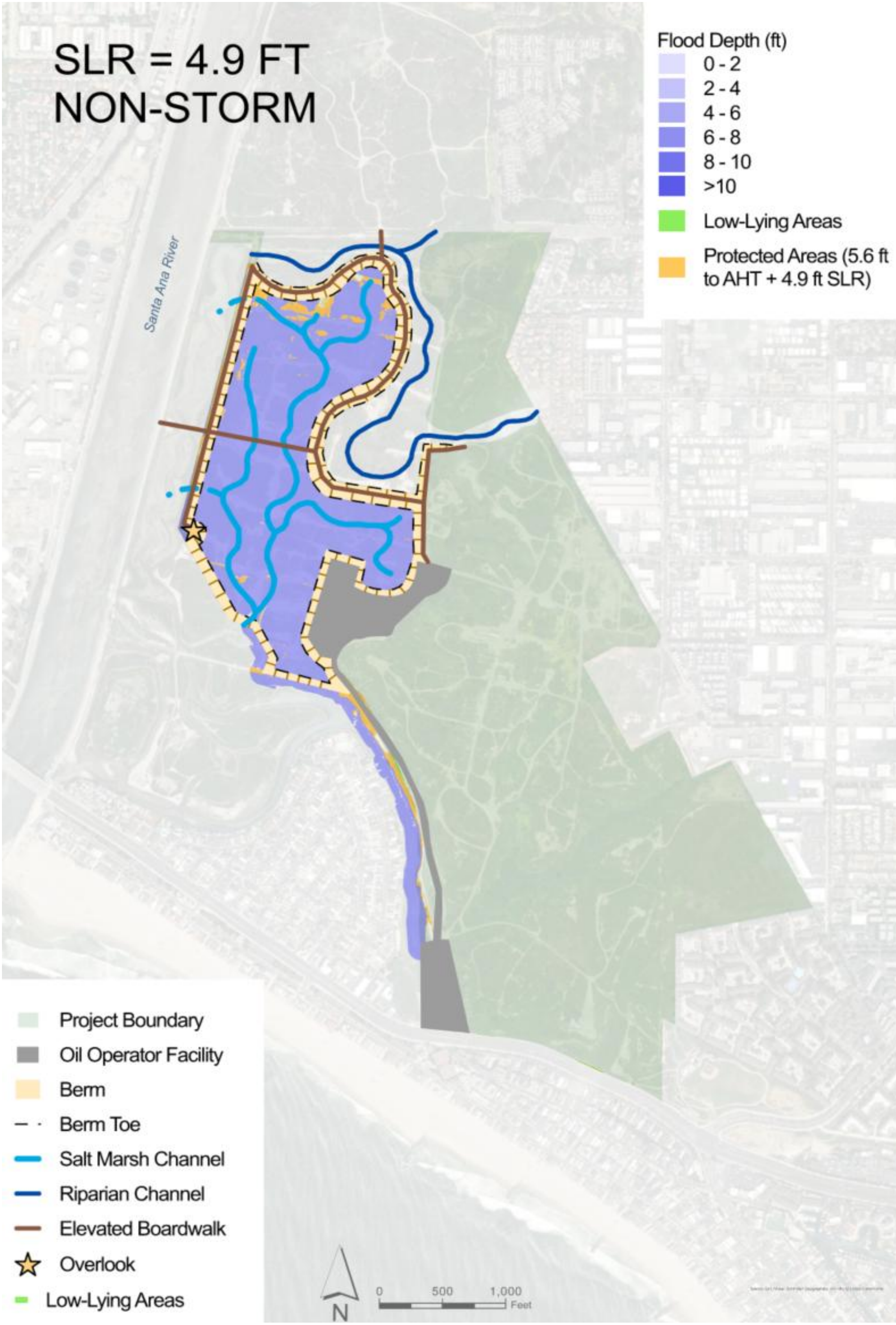


FIGURE 8. PROPOSED CONDITION UNDER 4.9 FT SLR + NO STORM

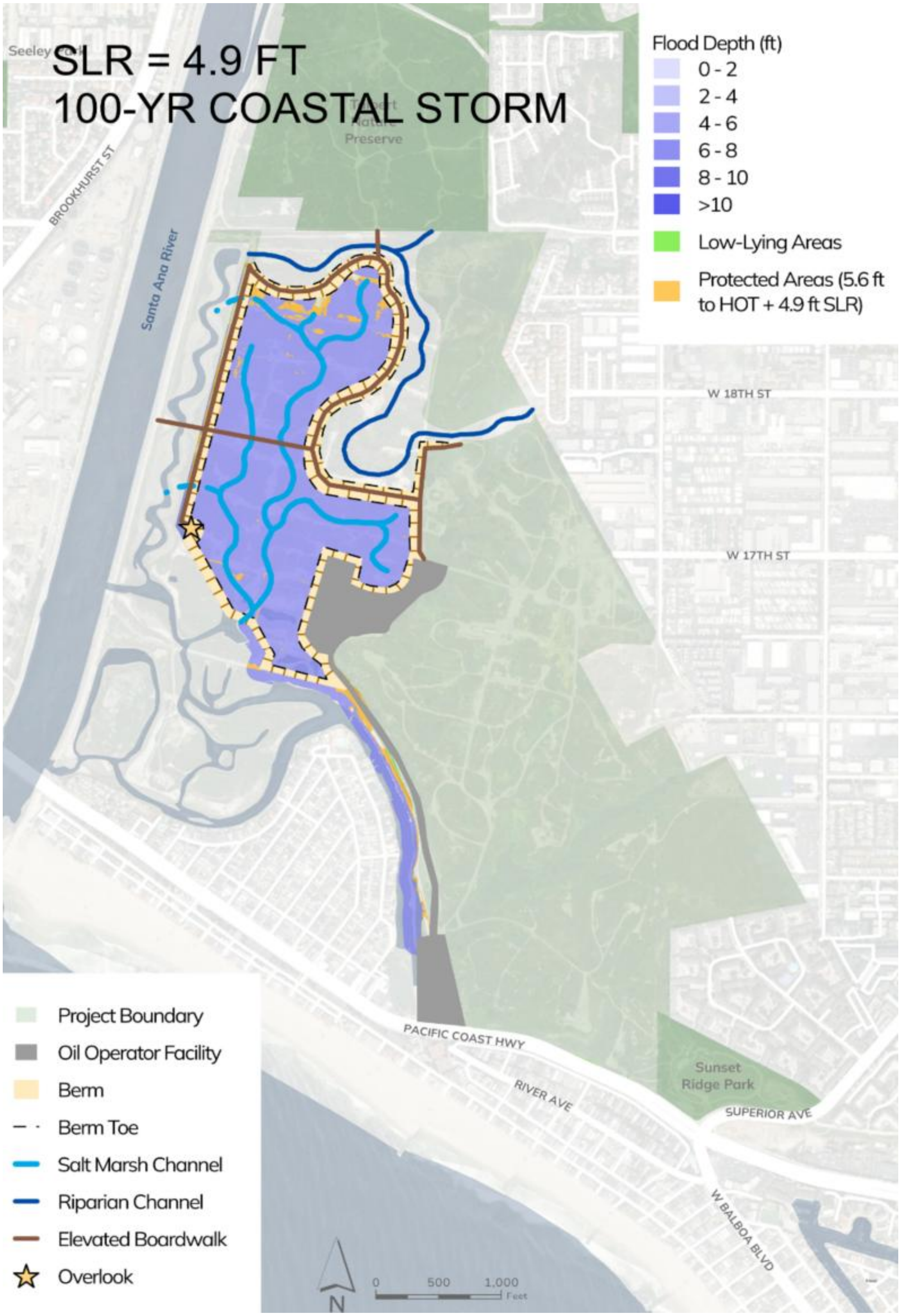


FIGURE 9. PROPOSED CONDITION UNDER 4.9 FT SLR + 100-YR STORM

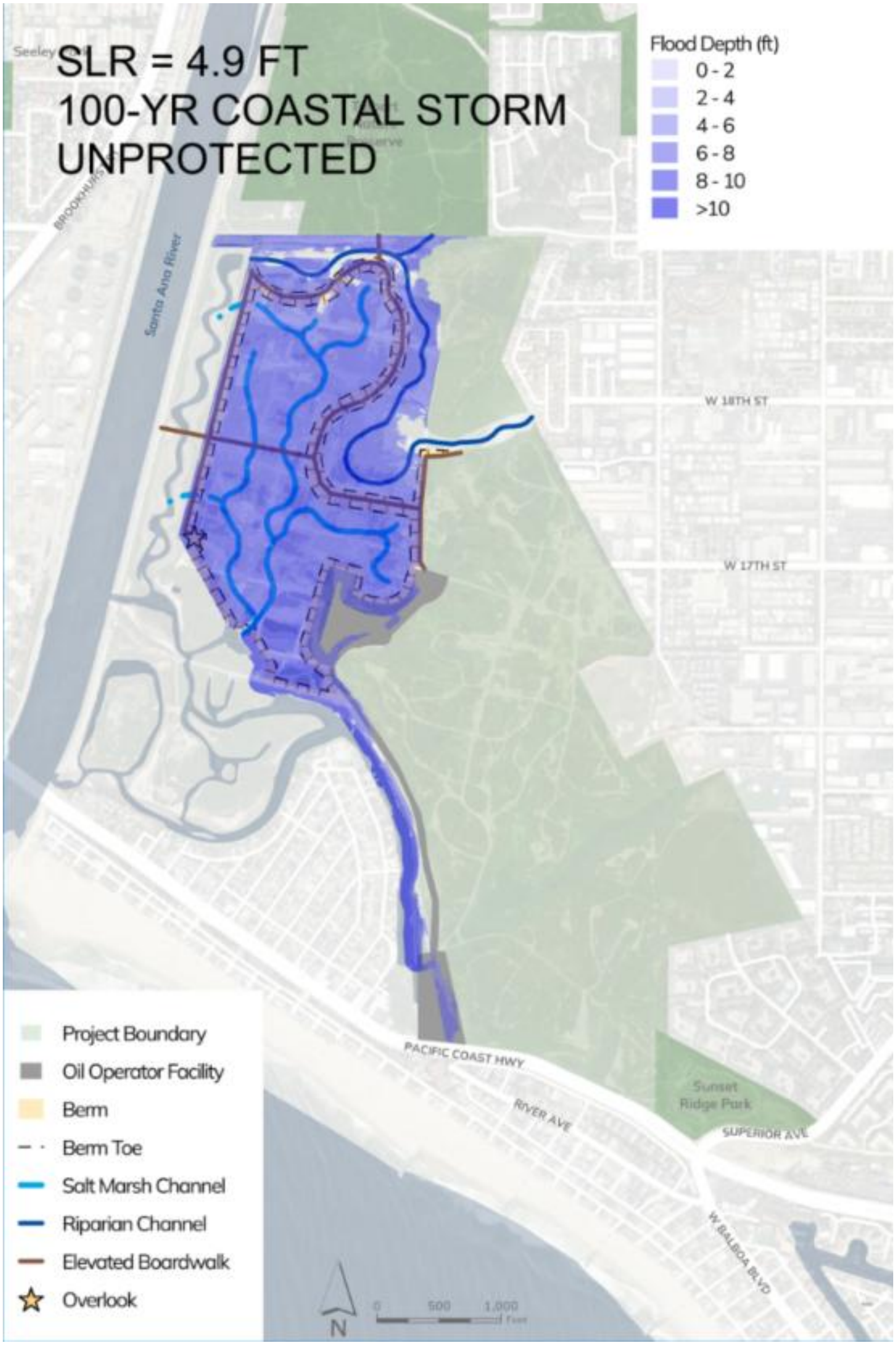


FIGURE 10. PROPOSED CONDITION UNDER 4.9 FT SLR + 100-YR STORM (UNPROTECTED)

4.3. Site-Specific Coastal Resilience Strategies

The strategies provided below will focus primarily on higher Level 3 management approaches, as these involve substantial site reconfiguration (including mass grading, restored hydrologic connectivity, and elevation changes) that significantly alter existing conditions. Unlike Levels 1 and 2, which maintain much of the current site form, Level 3 introduces transformative earthwork that require updated hydrologic modeling, reassessment of flood pathways, and evaluation of long-term resilience under sea level rise scenarios. Given the complexity of these strategies, focused analysis is required to evaluate their feasibility, performance, and alignment with future environmental conditions. As such, the following section assumes that Management Levels 1 and 2 **–** as addressed in the broader RMP **–** will continue to serve as foundational components within the overall adaptation pathway. The resiliency strategies presented below are intended to help narrow the range of options to those most suitable for potential implementation at the Preserve.

4.3.1. Planning & Adaptive Management

Planning and adaptive management in the context of coastal resilience is a dynamic, iterative approach that allows communities and land managers to respond to changing coastal conditions—such as sea level rise, erosion, and extreme weather—over time. It involves setting clear long-term goals, identifying potential risks and vulnerabilities, implementing phased strategies, and continuously monitoring environmental and infrastructure conditions.

4.3.1.1. Strategic Partnerships

Strategic partnerships are a cornerstone of effective planning and adaptive management, particularly in complex, dynamic coastal environments like the Preserve. SLR, flooding, habitat shifts, and infrastructure vulnerability do not always adhere to defined jurisdictional boundaries making collaboration across agencies, landowners, and community groups essential. By establishing strong partnerships early, project proponents can align timelines, leverage technical expertise, and reduce redundancies in planning and implementation. These relationships also facilitate coordinated permitting, integrated data sharing, and access to joint funding opportunities that may not be available to a single entity acting in isolation. Most importantly, strategic partnerships build institutional memory and shared accountability, enabling a more nimble and resilient response as site conditions evolve and new adaptation needs emerge. In this way, partnerships are not just supportive — they are foundational to delivering long-term, flexible, and cost-effective coastal resilience.

For the Preserve in particular, strategic partnerships are essential due to its location at the intersection of multiple jurisdictions, infrastructure systems, and ecological corridors. Its long-term resilience depends on coordination with agencies such as USACE for permitting tidal connectivity, Orange County Public Works (OCPW) for levee and stormwater management, and the City of Newport Beach for future actions it might take to prevent flooding at West Newport. Without these partnerships, efforts to restore habitat, manage flood risk, or implement adaptive strategies could be delayed or rendered ineffective. Early and effective collaboration with these agencies will ensure the Preserve can operate as an integrated part of the larger coastal environment at West Newport, rather than in isolation, and allows it to serve as a model for collaborative, climate-ready land stewardship. The following is a list of potential partner organizations and agencies:

1. City of Newport Beach
    - Relevance: Jurisdictional authority over the Newport Harbor shoreline, including areas with protective bulkhead walls, community beaches, boat launching areas, the Channel Place Park neighborhood, stormwater outfalls, and local access routes such as Industrial Park Way.
    - Why it matters: These areas are among the first to flood under high SLR scenarios. Collaborative adaptation planning will ensure upstream interventions (e.g., levee improvements, tide gate operations) are not undermined by downstream vulnerabilities.
    - Coordination Topics: Public works, stormwater planning, land use planning, emergency response, coastal permitting.

2. USACE
    - Relevance: Owner and operator of the Santa Ana River Marsh (North and South Marsh), including tide gates, Santa Ana River levees, and hydraulic connections directly adjacent to and hydrologically connected with the Preserve.
    - Why it matters: Currently all high-touch restoration concepts rely on reintroducing tidal flow from the USACE-managed wetlands. Coordination is critical for culvert alignments, timing of tidal gate operations, and adaptive management of wetland hydrology.
    - Coordination Topics: Permit approvals (Section 408/404), tide gate control, infrastructure retrofits, and marsh maintenance.
3. OCPW/Orange County Flood Control District (OCFCD)
    - Relevance: Responsible for the maintenance and operation of the SAR East Levee tide gates, flood infrastructure, and related regional stormwater management assets.
    - Why it matters: Any modification to the SAR East Levee or tide gates or coordinating flood protection near the Preserve must be done with OCPW's input to maintain the regional flood control system's integrity and FEMA levee certification status.
    - Coordination Topics: Levee elevation scenarios, sediment routing, culvert design, and access to public lands.
    - Potential future connection to the South Talbert Nature Preserve to mutually benefit both sites under SLR projections that are higher than today.
4. Tribal Nations
    - Relevance: The Preserve is located on lands historically stewarded by Tribal communities and includes cultural resource areas.
    - Why it matters: Incorporating Tribal consultation, access rights, and cultural preservation priorities is essential for equitable and culturally informed adaptation planning.
    - Coordination Topics: Access corridors, interpretive elements, and inclusion in decision-making processes.
5. Caltrans
    - Relevance: Oversees PCH, a major transportation corridor vulnerable to overtopping near the Preserve.
    - Why it matters: Under extreme SLR scenarios, Caltrans-led armoring or rerouting projects will directly impact flood pathways and backflow conditions at the Preserve.
    - Coordination Topics: Transportation resilience, design alignments, flood modeling compatibility.
6. Orange County Parks & Orange County Vector Control
    - Relevance: Co-managers or users of access infrastructure; active in mosquito abatement and vegetation maintenance.
    - Why it matters: Habitat changes tied to SLR, and wetland expansion could affect vector control responsibilities and park use. Salt marsh restoration typically reduces mosquito problems associated with freshwater ponds and freshwater habitats. This project may decrease the demand for mosquito abatement in the lowlands.
    - Coordination Topics: Public access management, invasive species control, and buffer zone planning.
7. FEMA / National Flood Insurance Program (NFIP)
    - Relevance: Regulatory body for floodplain mapping, risk designation, and flood insurance compliance.
    - Why it matters: Modifications to flood protection systems, wetlands, or levees may require FEMA approval and could influence flood insurance rate maps (FIRMs).
    - Coordination Topics: Map amendments, mitigation credit, etc.

4.3.1.2. Monitoring SLR

Ongoing monitoring of SLR is essential to inform adaptive management at the Preserve. This involves regularly reviewing data from local tide gauges, including but not limited to NOAA's National Water Level Observation Network and other regionally relevant platforms (such as gauges maintained by UC San Diego and Orange County agencies). Monitoring supports a data-driven understanding of how SLR is affecting coastal processes, habitat transitions, and the frequency or severity of inundation. At the Preserve, this monitoring effort can feed directly into the adaptive pathway framework — informing and triggering the phased implementation of restoration or infrastructure strategies once certain water level or ecological thresholds are reached. Annual updates should include both gauge data and a review of the latest SLR science, projections, and observed changes in regional hydrodynamics.

Tracking flood patterns associated with SLR across the Preserve and adjacent areas (SAR East Levee, Channel Park, etc.) helps identify vulnerable infrastructure and ecological stress points. Low-lying trails, roads, utility corridors, and marsh edges are most likely to experience recurrent flooding as SLR progresses. Recording these events — along with any access disruptions, habitat degradation, or maintenance costs — supports prioritization of site investments and informs long-term retreat or redesign strategies.

4.3.2. Nature-Based Adaptation

Nature-Based adaptation refers to the intentional use of natural processes, ecosystems, and landscape features—either on their own or in combination with engineered systems—to enhance coastal resilience, reduce risk, and deliver broader environmental, economic, and social benefits. This strategy is designed to work with, rather than against, natural systems, leveraging the inherent functions of wetlands, dunes, reefs, forests, and other landscape elements to provide sustainable flood protection while also supporting habitat, water quality, recreation, and carbon sequestration. These solutions are adaptive over time and inherently multifunctional, often improving in performance as ecosystems mature.

4.3.2.1. Wetland Creation\Restoration

Wetland habitat creation and restoration at the Preserve is in and of itself is a nature-based solution. Natural environments can mitigate and reduce the impacts of flooding and bounce back from their effects better than any hardened structure. Due to the lowland's connection to the historic Santa Ana River Marsh, wetland creation within the Preserve refers to the strategic re-establishment or enhancement of tidal salt marshes, mudflats, and transitional ecotones that have been lost or degraded due to past land use, altered hydrology, or SLR. This process aims to restore the natural structure and function of a coastal salt marsh by regrading existing topography, improving tidal connectivity, increasing habitat complexity, and/or reintroducing native vegetation. In highly urbanized areas, salt marsh restoration sometimes blends engineering and ecological objectives, to create systems that deliver flood protection, carbon sequestration, biodiversity support, and recreational opportunities. Wetland restoration is both a climate adaptation strategy and a tool for improving watershed-scale resilience, and therefore a holistic resilience approach. Figure 10 shows a conceptual section view of a wetland\recreational\riverine interface at the Preserve.

FIGURE 11. CONCEPTUAL RENDERING OF RESTORATION AT THE PRESERVE (SALT MARSH, PEDESTRIAN PATH, BERM, & RIPARIAN ENVIRONMENT)

4.3.2.2. Ecotone Levees

Any proposed berms at the Preserve could be designed to become an ecotone levee. An ecotone levee (shown in Figure 11) is a nature-based flood protection feature that blends traditional levee stability with ecological uplift by incorporating gentle side slopes, native transitional vegetation, and hydrologic connectivity. Unlike conventional levees that rely solely on engineered materials and steep armored slopes, an ecotone levee is designed to act as a multi-functional buffer zone—gradually transitioning from wetland to upland habitat while providing flood risk reduction and supporting biodiversity, sediment dynamics, and resilience to SLR. This feature may also be called a “living levee.” At the Preserve, the ecotone levee would feature a minimum slope of 1:15, designed to accommodate maintenance access and habitat migration upslope as SLR increases. This gentle grade allows for the establishment of ecological transition zones (e.g., high marsh, brackish meadow, coastal sage scrub), which are often lost in traditional levee construction. The design also encourages tidal attenuation, storm surge buffering, and adaptive flood protection — all while avoiding hardscape structures where possible.

FIGURE 12. CONCEPTUAL RENDERING OF THE ECOTONE LEVEE STRATEGY

4.3.2.3. Thin Layer Sediment Deposition

Thin Layer Sediment Deposition is a habitat enhancement and resilience-building technique where a controlled, thin layer of sediment is placed over existing wetland or transitional areas to elevate marsh surfaces, counteract subsidence, and keep pace with SLR. The approach aims to extend marsh longevity and functionality without completely burying existing vegetation or disrupting ecological processes. At the Preserve, thin layer sediment deposition may be used to raise the elevation of vulnerable wetland platforms that are at risk of drowning due to SLR, subsidence from oil extraction, or sediment supply limitations.

Sediment delivery is typically implemented using hydraulic methods, where sediment is dredged from nearby channels or designated borrow sites, mixed with water into a slurry, and then pumped through pipes to the deposition area. From there, the slurry is either sprayed (a method known as rainbowing as shown in Figure 13) or allowed to settle naturally across the wetland surface. In some cases, sediment can be rehandled on-site using low-ground-pressure equipment or amphibious excavators to shape and distribute material in more confined areas. The choice of construction method depends on site access, habitat sensitivity, available sediment sources, and the required precision of elevation gain. Containment measures — such as sediment curtains or low berms made of haybales — may also be used to manage flow and ensure even application.

Fortunately, the Preserve is well-positioned to benefit from nearby sediment dredging efforts—such as those at the Santa Ana River Mouth, Talbert Inlet Channel, and Santa Ana River Marsh— which present valuable opportunities for regional beneficial sediment reuse. This underscores the ongoing importance of strong partnerships with local and regional agencies. With thoughtful planning, future design strategies could be tailored to support sediment delivery operations by incorporating features such as widened access roads for truck transport, or channel improvements that allow small, self-operated vessels to navigate and offload material efficiently.

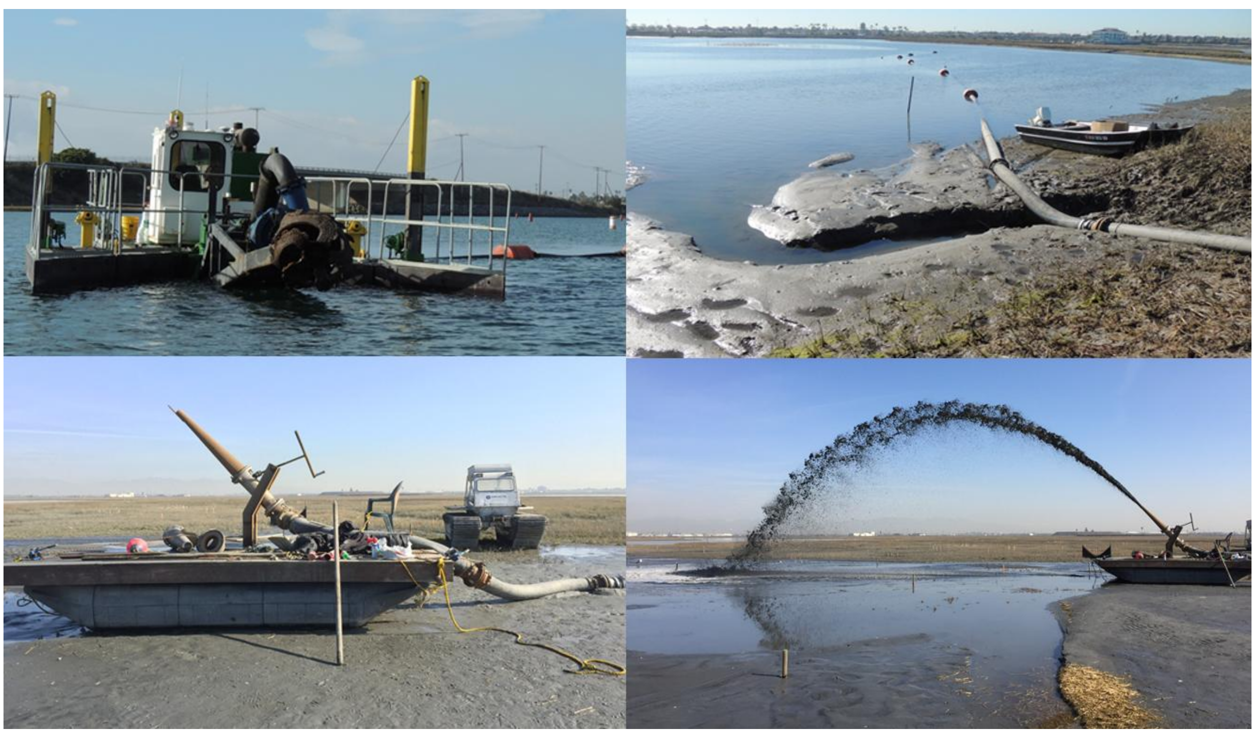


FIGURE 13. THIN LAYER SEDIMENT DEPOSITION CONSTRUCTION METHODS

A successful sediment delivery system requires careful attention to sediment quality, vegetation tolerance, elevation targets, and regulatory compliance. Sediment must be clean and appropriately sized to match native marsh conditions, while the existing vegetation's ability to tolerate burial—typically no more than 10 inches in a single lift—must be accounted for to avoid long-term ecological damage (USFWS Refuge Manager Experimental Findings 2015). Elevation targets should align with the optimal tidal range for the site's desired plant communities, ensuring the wetland remains resilient under projected SLR conditions. Access logistics, environmental constraints, and seasonal wildlife considerations will influence construction timing and techniques. Finally, permitting and post-construction monitoring are critical to evaluate sediment performance, vegetation recovery, and ongoing adaptation potential.

4.3.2.4. Development of a Sediment Management Plan

Prior to permitting and implementation of any thin layers sediment deposition, an analysis of potential sediment donor sites and soil suitability must be undertaken. The plan would also include analysis of site access and sediment delivery methods as well as any regulatory constraints. This plan would developed as a precursor to importing any sediment that could be beneficially reused for wetland restoration and maintenance at the Preserve. The plan would establish strict sediment quality and grain size criteria as mandated by the regulatory agencies.

4.3.3. Protection (Engineering)

Protection involves the design and implementation of structural measures to prevent or reduce the impacts of coastal hazards (such as storm surge, wave attack, and SLR) on existing property, ecosystems, and infrastructure. The primary goal is to preserve the current existing amenities and protect assets behind it.

4.3.3.1. Raising the Elevation of the SAR Levee

Levees are critical components of flood risk management systems, acting as linear barriers that protect adjacent lands from tidal inundation, fluvial flooding, and storm surge. As SLR accelerates and extreme weather events become more frequent, existing levees—many of which were constructed decades ago—may no longer provide adequate protection for the populations, infrastructure, and habitats they were designed to defend. In many cases, raising the elevation of existing levees is a practical adaptation strategy to maintain or enhance their protective capacity over time. Elevation increases can delay overtopping, reduce the frequency of flooding, and buy time for other long-term adaptation measures to take effect.

Raising the elevation of the SAR East Levee represents a potential regional adaptation strategy to manage increased flood risk driven by SLR and storm surge; however, this action lies outside the direct jurisdiction of the Randall Preserve. Any such intervention would require close coordination with key stakeholders and agencies, including the USACE, Orange County Flood Control District (OCFCD), and the City of Newport Beach, among others. From a construction standpoint, levee raising typically involves widening the levee footprint, regrading slopes, compacting engineered fill, and potentially armoring or revegetating the new surface for durability and habitat compatibility. The feasibility of this approach depends on available space, existing utilities, regulatory approvals, and the degree to which existing design capacity has been exceeded. Additionally, raising the levee would benefit the Santa Ana River Trail (SART), which runs along the levee crown and serves as a heavily used recreational and commuter corridor. Any proposed design would need to preserve trail continuity, access, and safety—potentially through phased construction, detours, or reconfiguration of the trail alignment along the new grade. While this action is not a Preserve-led strategy, its implementation could provide critical regional protection benefits that indirectly enhance the long-term resilience of the Preserve and adjacent habitat corridors.

4.3.3.2. Enhancements to Hydraulic Exchange Infrastructure

Enhancing the hydraulic exchange infrastructure at the Preserve would focus on modernizing and optimizing existing systems that regulate tidal flow, stormwater drainage, and internal water levels — key to both flood resilience and ecological function. This could include retrofitting or replacing the existing tide gates to improve their responsiveness during extreme high tides or storm events, ensuring reliable protection while maintaining tidal flushing critical for wetland health. Outlet drains and side drains may be regraded, resized, or equipped with tide-flex valves to reduce backflow, improve drainage efficiency, and prevent water stagnation in interior marsh zones. Storm drains discharging into the Marsh — particularly from adjacent urbanized areas like Newport Shores — could be fitted with more efficient sediment traps, backflow preventers, or low-impact design features to reduce pollutant loads and manage inflows more sustainably. Finally, culverts and interior hydraulic connectors may be reconfigured or expanded to restore flow between marsh zones, improving hydrologic connectivity and supporting marsh migration as part of a long-term adaptive management strategy. These upgrades, in combination, would build flexibility into the Preserve's water infrastructure and better align it with evolving SLR and habitat conditions.

4.3.3.3. Installation of Sluice Gates at Strategic Locations

As part of long-term adaptation planning, the installation of sluice gates at key hydraulic control points within the Preserve could offer added flexibility in managing tidal exchange, stormwater retention, and sediment movement. Strategically placed gates — particularly at culvert or channel inlet locations — can help modulate water levels, minimize backflow during extreme high tides, and regulate water levels to support habitat conditions under rising SLR scenarios. Sluice gates could also play a role in coordinating with regional sediment delivery, allowing for temporary closure or flow control during thin layer sediment deposition events. Their inclusion would need to be carefully evaluated based on ecological goals, hydrodynamic modeling, maintenance capacity, and compatibility with surrounding infrastructure.

4.3.4. Accommodation

Accommodation focuses on modifying existing structures and developments to withstand future sea level rise. This is typically achieved by elevating, retrofitting, or repurposing buildings that are exposed to coastal hazards. These measures often allow for the inland migration of sea level rise impacts, with fronting landscapes serving a sacrificial role.

4.3.4.1. Installation of Boardwalks

As part of a nature-compatible public access strategy, the Preserve may implement elevated boardwalks designed to float above sensitive marsh and transitional habitats, allowing for both ecological function and managed visitor experience. Unlike traditional at-grade trails, these structures would be installed on piles (typically timber) or low-impact footings, allowing sunlight, tidal flow, and vegetation to persist beneath the walkways (Figure 14). This approach minimizes trampling, soil compaction, and habitat fragmentation while enabling habitat migration in response to SLR. Strategically placed boardwalks would offer interpretive access across wetland, ecotone or regular levees, and upland zones while simultaneously supporting educational, recreational, and cultural goals without compromising ecological integrity. Where feasible, boardwalk elevations and spans could be varied to accommodate future sediment deposition operations or thin-layer sediment placement underneath. Overall, elevated boardwalks exemplify a low-impact adaptation solution that aligns visitor engagement with long-term habitat resilience.

4.3.4.1. Elevating Pedestrian Trails, Berms, & Boardwalks

A proposed resilience and access strategy at the Preserve involves constructing perimeter berms integrated with pedestrian trails and boardwalks, offering a dual function of passive flood protection and public recreation. These berms would frame key edges of the Preserve, particularly along low-lying zones, and serve as gentle, accessible walkways with panoramic views of the marsh. Initially designed at a modest elevation, the berms could be engineered with future adaptability in mind — allowing for staged elevation increases as SLR progresses. For the berms, this could involve designing the base width to accommodate additional lifts of engineered fill, incorporating geotextile reinforcement, or planning for modular trail surface adjustments over time. Vegetated side slopes would provide ecological value and erosion control, while alignment would be carefully planned to avoid sensitive habitat and accommodate marsh migration corridors. For the boardwalks, the decking could be elevated to adapt to increasing water levels while continuing to provide safe and dry access for the public (Figure 15). By embedding this elevation-flexible infrastructure, the Preserve can provide safe, engaging public access in the near term, while maintaining the ability to scale up protection in the long term as environmental thresholds are reached.

FIGURE 14. CONCEPTUAL RENDERING OF THE INSTALLATION OF BOARDWALKS

FIGURE 15. CONCEPTUAL RENDERING OF ACCOMMODATION (ELEVATION OF BOARDWALKS, PATHS, ETC.) UNDER UNPROTECTED SCENARIO

4.3.5. Managed Retreat / Relocation

Managed relocation would promote the relocation, removal, and/or upslope migration of certain amenities in order to provide sufficient buffer for areas at high risk of coastal hazards, allowing natural processes to occur without interference.

4.3.5.1. Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities

For the Preserve, a managed retreat approach would involve the gradual relocation of vulnerable infrastructure — such as trails, service roads, utilities (if present), and interpretive elements — from low-lying, flood-prone areas to higher ground within the uplands. Rather than relying solely on engineered defenses, this strategy allows the landscape to naturally respond to SLR by making space for tidal marsh migration and increased inundation over time. As coastal conditions evolve, this approach supports long-term ecological resilience while minimizing future maintenance costs and damage to critical infrastructure. Managed retreat at the Preserve would be phased and adaptive; however, under any protected scenario, it is unlikely that hazard conditions would escalate to a level requiring full retreat.

4.4. Hybrid Strategies

4.4.1. Implementation of Multiple Strategies (*Over Time*)

A hybrid phased approach to coastal resilience allows different strategies to be implemented incrementally based on the progression of SLR-related hazards. By sequencing strategies across multiple time horizons, this strategy provides a framework for sites like the Preserve to evolve over time in response to changing coastal conditions and is later discussed in Section 6.

4.4.2. Implementation of Multiple Strategies (*Simultaneously*)

4.4.2.1. High Touch Wetland Restoration (Management Level 3) – The Habitat Approach

The high-touch restoration strategy within the Preserve represents a transformative hybrid SLR adaptation strategy with both engineering and nature-based solutions focused on reestablishing ecological function, hydrological connectivity, and long-term habitat resilience in the face of rising water levels and changing coastal dynamics. Historically, the Preserve's lowlands functioned as a dynamic floodplain influenced by both freshwater flows and tidal processes. However, legacy oil field activities and the channelization of the Santa Ana River for flood control have cut off the area from these vital inputs. As a result, the site is now hydraulically isolated and ecologically constrained.

A high-touch approach would restore tidal exchange by re-grading the lowlands to reintroduce tidal flow from the adjacent USACE-managed wetlands (Figure 16). This would include the excavation of a backbone network of subtidal channels, which would extend into newly established salt marsh platforms within the Preserve. Elevations would be carefully designed to support a range of habitat types—including low, mid- and high-marsh vegetation zones and transitional upland habitat surrounding capped oil wells. These higher-elevation areas would also function as future habitat migration corridors, helping the restored system adjust over time to projected SLR.

Vegetation establishment would be jumpstarted with native container plantings and could be supported by a temporary irrigation system for upland transitional zones to ensure early survival, growth, and reproductive success under variable environmental conditions. Over time, the restored marsh system would transition into a self-sustaining, tidally influenced ecosystem capable of absorbing SLR impacts while providing critical habitat, water quality benefits, and flood buffering. The Mesa Water District supplies reclaimed water, which could be used to as a water source for upland transitional and/or riparian zones.

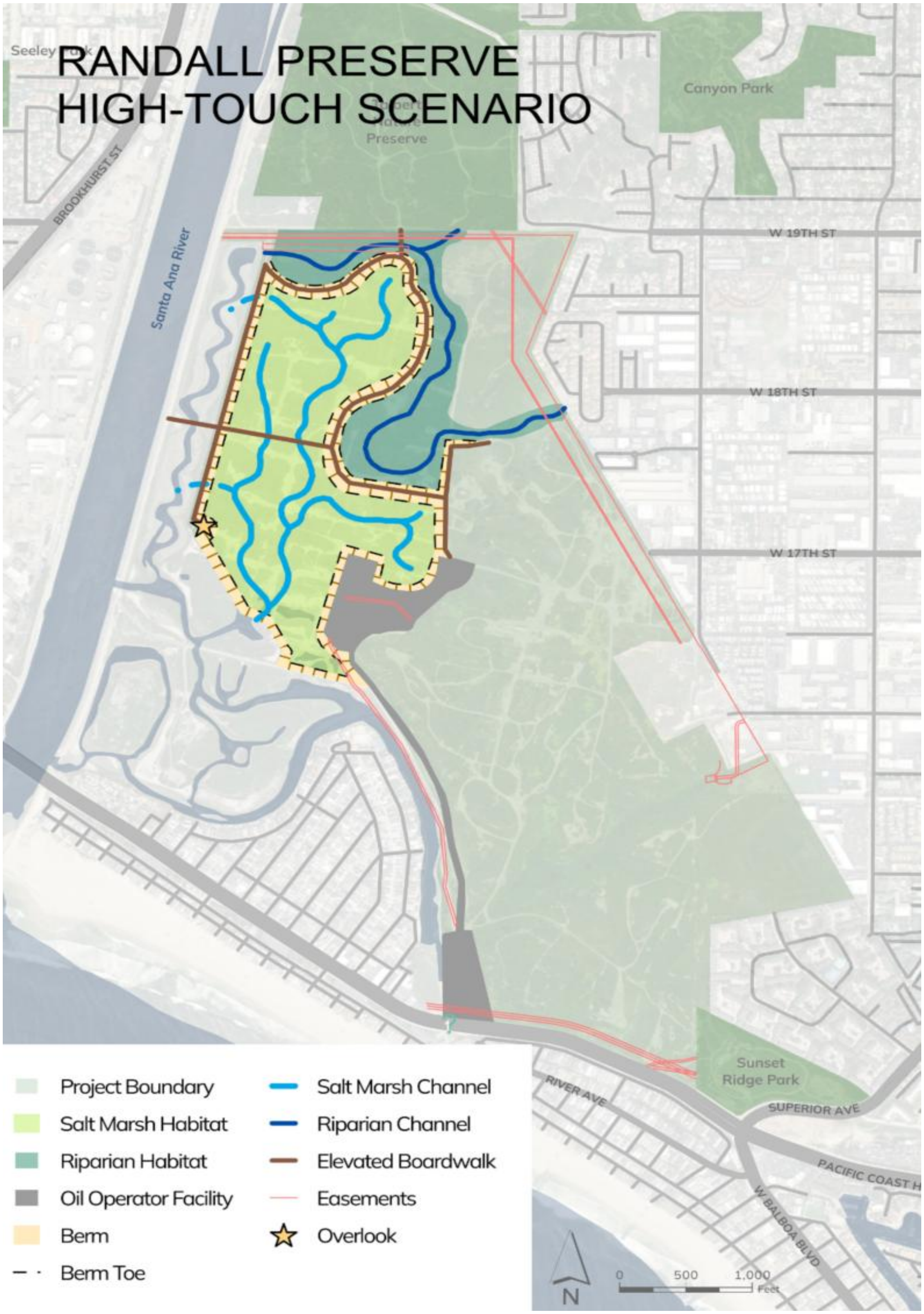


FIGURE 16. PROPOSED HIGH TOUCH SCENARIO (HYBRID STRATEGY)

4.4.2.2. Elevating and Vegetating the Existing Levee – The Perimeter Approach

As SLR increases the frequency and severity of tidal flooding, raising protective features (such as the levee and/or berms) incrementally can extend their protective function, helping buffer interior wetlands and trails from encroaching water. Designing these elements with broad, gently sloped profiles creates opportunities for vegetated surfaces — including native grasses, shrubs, and transitional plant communities — that provide both erosion control and habitat value. These vegetated berms not only stabilize soil and improve water filtration but also serve as important corridors for wildlife and pollinators, creating a natural interface between marsh and upland environments. Over time, these features can be incrementally built up with additional sediment lifts or engineered fill as environmental thresholds are met. Their multi-functional design supports public access, shoreline resilience, and habitat continuity—positioning them as an adaptable and ecologically integrated SLR defense system for the Preserve. This measure can be implemented for existing berms and any proposed levee.

4.4.2.3. Elevating Access Paths + Thin Layer Sediment Deposition –Raising Internal Features Approach

A hybrid adaptation strategy that combines elevating access roads and paths with Thin Layer Sediment Deposition offers a balanced solution that supports both public use and ecological resilience at the Preserve. As SLR and higher groundwater levels increase the risk of frequent inundation and marsh submergence, raising existing access routes ensures that maintenance, monitoring, and recreational use can continue uninterrupted. At the same time, Thin Layer Sediment Deposition allows for targeted placement of clean, compatible sediment across low-lying wetland areas to gradually increase marsh surface elevation—helping existing vegetation within the lower elevation ranges stay within the optimal tidal range for survival and growth. Together, these actions preserve hydrologic function, facilitate marsh migration, and extend habitat viability without full reconstruction. Access routes can be elevated in phased lifts to match SLR projections, while sediment application can be done incrementally to reduce stress on plant communities. This integrated approach supports both human and habitat needs, allowing the Preserve to evolve with changing conditions while minimizing long-term disruption and maximizing adaptability.

4.4.3. Implementation of Multiple Strategies (*Holistically Integrated Approach*)

Rather than applying a single broad solution across the entire project site, the combined approach allows for adaptive interventions based on the unique physical conditions, exposure levels, and challenges of each area.

Figure 17 below illustrates a conceptual example of how combining various standalone strategies highlights how different strategies could be applied within the various areas of the project site, each suited to their localized conditions but with a connection to the overall vision. Note that the following examples are intended to illustrate potential conceptual approaches; final designs may vary based on further analysis, stakeholder input, and site-specific conditions. For instance, the Preserve could consider the following provided in Table 6.

TABLE 6. HOLISTIC INTEGRATED OPTIONS

Strategy	Segment / Area	Advantage
Ecotone Levee	Levee near Semeniuk Slough	Localized resilience for Industrial Way without the high cost of doing the whole site
Elevate Perimeter Pedestrian Trails & Berms	Berm bordering North Marsh	Provides resilience via elevation gain at most vulnerable lowland inundation areas
Ecotone Levee / Vegetated Berm	Berm dividing riparian and wetland areas	Provides resilience for large runoff flows and coastal hazards alike
Installation of Sluice Gates at Strategic Locations	At proposed riparian area and various South marsh locations	Boosts hydraulic exchange control within the site
Relocate Vulnerable Main Service Roads (ex. Industrial Way)	Lower portions of Industrial Way	Allows for only the main service roads to be relocated

FIGURE 17. CONCEPTUAL HOLISTICALLY INTEGRATED APPROACH

4.5. Summary of Analyzed Solutions

The following table provides a summary of each coastal adaptation strategy categorized by solution type, including Planning & Adaptive Management, Nature-Based Adaptation, Protection (Engineering), Accommodation, and Managed Retreat/Relocation. Each strategy includes a brief description outlining its purpose, mechanism, and relevance to enhancing the resilience of coastal resources and infrastructure. These strategies are intended to inform a flexible, site-responsive adaptation pathway for the Randall Preserve in the face of sea level rise and evolving coastal hazards.

TABLE 7. SUMMARY OF PROPOSED STANDALONE STRATEGIES

Strategy Category	Strategy	Description
Planning & Adaptive Management	Strategic Partnerships	This involves building collaborative relationships between agencies, tribes, NGOs, academic institutions, and/or adjacent property owners to coordinate resilience planning and implementation. For Randall Preserve, this could strengthen alignment with regional plans and leverage shared resources for long-term adaptation.
	Identify Grant Funding Source(s) for Resiliency	Some funding sources for resiliency are already available (see Section 7), and in some instances, funders look for projects that provide a regional benefit. If Randall Preserve partnerships benefit from a collaborative approach then maybe there can also be a collaborative funding approach to finding and applying for grant funds.
	Monitor SLR	Monitoring sea level rise involves consistently tracking changes in sea level using data from various observational tools and leveraging agencies like NOAA. This type of monitoring is critical for understanding the local impacts of SLR, determining the rate of change, and identifying areas that are increasingly vulnerable to flooding or coastal hazards. At Randall Preserve, real-time data can track "triggers" and inform timely adaption pathways to avoid reactive emergency measures.
Nature-Based Adaptation	Wetland Restoration	Restoring degraded tidal wetlands to improve ecosystem services and promote biodiversity. At Randall Preserve, this can buffer flooding impacts while enhancing biodiversity and resilience of marsh ecosystems.
	Ecotone Levees	Levees are wide areas with raised ground that are constructed along coastlines to reduce the risks of flooding by presenting a physical barrier to the incoming floodwaters. "Ecotone " levees are hybrid levees with gentle, vegetated slopes (rather than steep armored sides) that support transitional habitats and reduce erosion. At Randall Preserve, they could replace existing berms to allow for migration of wetlands inland.
	Thin Layer Sediment Deposition	This strategy involves the targeted placement of small amounts of clean sediment across marsh or wetland surfaces to raise elevation and help natural systems keep pace with sea level rise. It mimics natural sedimentation processes and supports the vertical accretion necessary for tidal marshes to remain viable over time. At Randall Preserve, this could help maintain marsh elevation and vegetation health while only temporarily disrupting ecosystem function.
Protection (Engineering)	Raising the Elevation of the Levee	Increasing levee height provides greater protection from storm surge and tidal inundation. At Randall Preserve, the existing East SAR levee provides protection from hazards associated with SLR. Low crest elevations nearest the SAR mouth are vulnerable to hazards associated under 4.9 ft SLR if left unaltered. This strategy would need to be coordinated with regional partners but would greatly impact the site.
	Replacement or Enhancement of Hydraulic Exchange Infrastructure	This strategy involves upgrading or modifying existing water conveyance features—such as culverts, tide gates, storm drains, and outfalls—to improve tidal exchange, manage water levels, and enhance ecosystem resilience. At Randall Preserve, this is especially relevant given the presence of two tide gates on the SAR east levee, along with several culverts and stormwater outfalls that currently regulate hydrologic connectivity between the river, marsh, and adjacent lowlands.
	Installation of Sluice Gates at Strategic Locations	Sluice gates manage water levels by controlling tidal inflow at specific points. For Randall Preserve, this may offer flexible control over flooding in sensitive zones, especially where wetland function and access routes intersect.
Accommodation	Installation of Boardwalks	Elevated walkways allow public access through wetlands without damaging vegetation and provide passive flood resilience. At Randall Preserve, boardwalks could preserve trail connectivity even during seasonal or tidal inundation. Boardwalks also allow for channels and water sources to flow freely underneath them.
	Elevating Pedestrian Trails, Berms, & Boardwalks	Raising existing infrastructure prevents chronic flooding and improves safety/access. This is essential in Randall Preserve for maintaining public access and emergency response routes as sea levels rise.
Managed Retreat / Relocation	Relocation & Reconfiguration of Service Roads, Paths, and/or Other Facilities	This entails moving infrastructure away from high-risk flood areas. For Randall Preserve, this could apply to vulnerable access roads or recreational facilities to ensure long-term usability without costly armoring. Because the site has enough space, any service roads (such a industrial Way) could be re-routed to areas that are more protected and upland.

5. Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis of Adaptation Strategies and Alternatives

This section provides a comparative summary of the potential strategies, evaluating their respective pros and cons, effectiveness in mitigating coastal hazards, estimated construction and maintenance costs, and potential regulatory hurdles and legal challenges. These comparisons are intended to assess the viability of each solution if implemented as a stand-alone measure. Some of the identified limitations could potentially be addressed by implementing hybrid solutions (discussed previously in Section 4) as a more holistic approach to solve multiple problems with selective approaches.

5.1. General Overview

To further support decision-making and comparative evaluation of the proposed solutions, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) Analysis was conducted. This qualitative assessment summarizes the internal advantages and limitations (strengths and weaknesses), as well as the external factors that may present favorable conditions or pose potential challenges (opportunities and threats).

The SWOT framework provides an additional layer of insight to complement the technical evaluations presented above, supporting the selection and refinement of coastal resiliency strategies with each solution being evaluated based on the following criteria:

- **Pros and Cons**. Refer to Table 8.
- **Coastal Hazards Mitigation (Level of Protection)**. Tools were evaluated for their effectiveness in mitigating coastal hazards such as future SLR and groundwater emergence, both with and without elevation adjustments or further adaptation. See Table 10. Green shading indicates the most effective mitigation for a given hazard.
- **Probable Construction & Maintenance Costs.** Table 11 provides a relative comparison of construction and maintenance costs. These rankings and associated dollar symbols are not intended to represent exact cost estimates but serve as a relative cost comparison. The left column reflects relative construction costs, while the right column indicates relative maintenance costs (which will vary depending on the tool and frequency of maintenance). Darker shading and a greater number of dollar signs indicate higher costs.
- **Regulatory Hurdles / Potential Legal Issues.** Table 13 compares the relative difficulty of securing regulatory permits under current laws, along with the potential challenges related to property rights and ownership. Darker shading indicates increased difficulty in obtaining permits and resolving property rights/legal concerns.
- **Alignment with CRS Plan Goals.** Each strategy was evaluated based on its ability to support the primary goals identified in the CRS. These include restoring coastal processes and ecological function, planning for changing environments with resilient design, and increasing habitat connectivity while buffering human impacts. Strategies that directly advance one or more of these goals were prioritized for further consideration. See Table 14.

To support informed decision-making, each proposed strategy was evaluated using the above criteria to help drive the SWOT analysis. By pairing the SWOT framework with these technical assessments, decision-makers gain a more holistic understanding of each solution's feasibility and impact. This integrative approach ensures that both practical performance and implementation realities are factored into the selection and refinement of the most appropriate adaptation pathways.

5.2. Pros & Cons

Table 8 below provides a comparison of the Pros / Cons for each of the analyzed alternatives.

TABLE 8. COMPARISON OF SOLUTIONS (PROS & CONS)

Strategy	Pros	Cons
Strategic Partnerships	✓ Strengthens coordination and resource sharing ✓ Builds regional support for resilience projects ✓ Facilitates information sharing	☒ Time consuming and requires long-term stakeholder commitment and engagement. Potentially requires a long lead up time to obtaining desired outcomes and results ☒ Success depends on sustained participation ☒ Partners might not agree to partner unless there is a mutual benefit or win-win scenario by taking a prescribed action
Monitor SLR	✓ Provides critical scientific data to inform adaptive triggers ✓ Low cost compared to hard infrastructure solutions	☒ Does not directly mitigate hazards—only informs decision-making ☒ Long-term funding for monitoring may be uncertain
Ecosystem Restoration	✓ A nature-based way to reduce flood risks while simultaneously fostering biodiversity and public access ✓ Many projects around Southern California to reference	☒ May require long establishment periods ☒ Regulatory permitting timeline (e.g., Clean Water Act Section 404) can be lengthy and expensive ☒ Engineering design and construction costs are high
Ecotone Levees	✓ Blends flood protection with habitat creation ✓ Allows for gradual upland wetland migration	☒ Higher upfront construction cost than traditional levees ☒ Requires larger footprint area or space than a berm or levee with steep slopes
Thin Layer Sediment Deposition	✓ Relatively low-impact, cost-effective way to maintain marsh elevation against rising sea levels ✓ Can use dredged sediment from nearby sources to benefit salt marsh	☒ Equipment access and constructability may pose a challenge and would have to be carefully thought out and planned ☒ Dredging is relatively expensive compared to land-based construction
Raising the Elevation of the SAR Levee	✓ Most direct and cost-effective way of providing protection against overtopping and storm surge caused by SLR ✓ Long-term resilience strategy	☒ High construction cost Could potentially require significant regulatory approvals (e.g., FEMA, USACE) and is out of the Preserve's jurisdiction
Enhancements to Hydraulic Exchange Infrastructure	✓ Improves ecosystem health and flood resilience ✓ Extends useful life of infrastructure without massive rebuilds	☒ High construction costs and more permitting effort for retrofits ☒ Needs detailed hydrologic studies and design reviews
Installation of Sluice Gates	✓ Offers adjustable control over tidal flows and floodwaters within the Preserve ✓ Protects infrastructure while maintaining some ecological function ✓ Can be integrated as part of an oil spill response plan	☒ Expensive to install and maintain ☒ Operational complexity; may require staffing or automation
Installation of Boardwalks	✓ Provides resilient public access even as water levels rise ✓ Impact to habitat can be minimized if well-designed	☒ Moderate construction cost; periodic maintenance (decking, supports) needed ☒ Coastal Commission permits and ADA compliance required ☒ Fragments habitat
Elevating Pedestrian Trails, Berms, & Boardwalks	✓ Maintains trail access and visitor experience during minor flooding or weather events ✓ Adds protection via vertical increases	☒ Higher construction cost than at-grade trails ☒ Requires additional planning and a more interconnected design ☒ Fragments habitat
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	✓ Reduces the long-term hazard exposure to these amenities ✓ Frees up open space for wetland creation, wetland migration, and nature-based design solutions	☒ High upfront planning and relocation costs ☒ Potential loss of public access or utility service if not carefully reconfigured
Hybrid 1: Full High Touch Scenario	✓ Strong dual benefit — wetlands absorb and purify floodwaters, boardwalks and berm pathways maintain resilient public access ✓ Likely strong agency and public support; regulatory complexity moderate (restoration permits, ADA for paths)	☒ Need coordination with multiple agencies (e.g., USACE, Coastal Commission), especially around wetland delineations and public access plans ☒ Slower to realize full flood protection compared to hard structures (time for wetland establishment)
Hybrid 2: Elevation + Vegetation	✓ Elevation provides immediate passive flood protection; vegetation stabilizes soil, adds ecological value ✓ Lower regulatory burden compared to levee construction; more likely to qualify as enhancement rather than new development	☒ Hauling/importing fill can become expensive depending on sourcing ☒ Potential impacts to existing wetlands could trigger mitigation requirements.
Hybrid 3: Elevation + Thin Layer Sediment Deposition	✓ Supports both short-term protection (elevation) and long-term resilience (ecosystem adaptation) ✓ Seen favorably as "nature-positive" adaptation; could be easier to permit under beneficial reuse frameworks.	☒ Elevation gain from thin layer sediment alone may be incremental and require repeated applications ☒ Need sediment quality testing and possible water quality certifications.

5.3. Hazard Mitigation Efficacy (Level of Protection)

Table 10 below provides a comparison of the effectiveness of each analyzed alternative as it pertains to mitigating hazards. Darker shades of green represent an increasingly effective mitigation for that particular hazard.

TABLE 9. LEGEND FOR TABLE 10

Legend	Hazard Mitigation Effectiveness
ΔΔΔ	Beyond 4.9 ft SLR
ΔΔ	Up to 4.9 ft SLR
Δ	Up to 1.6 ft SLR

TABLE 10. COMPARISON OF SOLUTIONS (HAZARD MITIGATION EFFICACY/LEVEL OF PROTECTION)

Strategy	Groundwater	Future SLR
Strategic Partnerships	ΔΔΔ	ΔΔΔ
Monitor SLR	ΔΔΔ	ΔΔΔ
Ecosystem Restoration	ΔΔΔ	ΔΔΔ
Ecotone Levees	ΔΔΔ	ΔΔΔ
Thin Layer Sediment Deposition	ΔΔ	ΔΔ
Raising the Elevation of the SAR Levee	ΔΔΔ	ΔΔΔ
Enhancements to Hydraulic Exchange Infrastructure	ΔΔΔ	ΔΔΔ
Installation of Sluice Gates	Δ	Δ
Installation of Boardwalks	ΔΔ	ΔΔ
Elevating Pedestrian Trails, Berms, & Boardwalks	ΔΔΔ	ΔΔΔ
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities Upland	ΔΔ	ΔΔΔ
Hybrid 1: Full High Touch Scenario	ΔΔΔ	ΔΔΔ
Hybrid 2: Elevation + Vegetation	ΔΔΔ	ΔΔΔ
Hybrid 3: Elevation + Thin Layer Sediment Deposition	ΔΔΔ	ΔΔΔ

5.4. Probable Construction & Maintenance Costs

Table 11 below provides a rough comparison of the construction and maintenance costs associated with each solution. Darker shading and a greater number of dollar signs indicate higher costs. Note that these are not detailed opinions of probable costs but rather are provided to differentiate the different rough order of magnitude (ROM) probable costs for planning and decision-making purposes only.

TABLE 11. COMPARISON OF SOLUTIONS (PROBABLE CONSTRUCTION & MAINTENANCE COSTS)

Strategy	Construction Cost	Maintenance Cost
Strategic Partnerships	$	$
Monitor SLR	$	$
Ecosystem Restoration	$$$	$$$
Ecotone Levees	$$$	$$
Thin Layer Sediment Deposition	$$$$	$$
Raising the Elevation of the SAR Levee	$$$$$	$$$$
Enhancements to Hydraulic Exchange Infrastructure	$$$$	$$$$
Installation of Sluice Gates	$$$	$$$$
Installation of Boardwalks	$$	$$
Elevating Pedestrian Trails, Berms, & Boardwalks	$$$	$$
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	$$$	$$
Hybrid 1: Full High Touch Scenario	$$$$	$$$$
Hybrid 2: Elevation + Vegetation	$$$	$$
Hybrid 3: Elevation + Thin Layer Sediment Deposition	$$$$	$$$$

5.5. Regulatory / Permitting

Table 13 below provides a rough comparison of the potential regulatory hurdles and potential legal issues associated with each solution. A legend for the table is provided below in Table 12. Darker shading indicates increased difficulty in obtaining permits and resolving property rights/legal concerns and relying on other agencies or outside stakeholders.

TABLE 12. LEGEND FOR TABLE 15

Relative Degree of Difficulty for Obtaining Regulator Permits	Legend	Relative Degree of Difficulty in Addressing Property Rights, Ownership Issues, Relying on Other Agencies, etc.
Impossible / Extremely Difficult	•••••	Lengthy Process
Very Difficult	••••	Very Difficult
Difficult	•••	Difficult
Challenging but Feasible	••	Challenging but Feasible
No Issues, within Current Preserve Boundaries	•	No Issues, within Current Preserve Boundaries
N/A to Stakeholders	N/A	N/A to Stakeholders

TABLE 13. COMPARISON OF REGULATORY HURDLE/POTENTIAL ISSUE DIFFICULTY

Strategy	Relative Degree of Difficulty for Obtaining Regulatory Permits	Relative Degree of Difficulty in Addressing Property Rights, Ownership Issues, Relying on Other Agencies, etc.
Strategic Partnerships	•	••
Monitor SLR	•	•
Ecosystem Restoration	••	••
Ecotone Levees	•	•
Thin Layer Sediment Deposition	••	•••
Raising the Elevation of the SAR Levee	.••	•••••
Enhancements to Hydraulic Exchange Infrastructure	••••	••••
Installation of Sluice Gates	•••	•••
Installation of Boardwalks	•	••
Elevating Pedestrian Trails, Berms, & Boardwalks	•	•
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	••	•
Hybrid 1: Full High Touch Scenario	••	••
Hybrid 2: Elevation + Vegetation	•	•
Hybrid 3: Elevation + Thin Layer Sediment Deposition	••	•••

5.6. Alignment with CRS Plan Goals

This section evaluates each proposed adaptation strategy based on its alignment with the goals outlined in the Coastal Resilience Strategy (CRS) Plan. Specifically, the assessment considers how well each strategy supports the three primary goals: (1) restoring coastal processes and maximizing ecological benefit, (2) designing for climate resilience and future environmental conditions, and (3) enhancing habitat connectivity and buffering against human-related impacts. Each strategy is qualitatively reviewed to determine whether it supports or does not support the objectives associated with these goals.

Table 14 below provides an additional layer of decision-making criteria to ensure that proposed solutions not only address physical risk but also contribute meaningfully to the long-term ecological and management vision for the Preserve. Strategies that directly satisfy each objective are designated with a checkmark ("√"), while strategies that only partially or indirectly satisfy each objective are designated with a dot ("•"). Those that do not satisfy the objective are intentionally left blank. Objectives for each goal can be found in Section 1 of this report.

TABLE 14. SUMMARY OF EACH STRATEGY'S ALIGNMENT TO CRS GOALS AND OBJECTIVES

Strategy	**Goal #1:** *Restore Coastal Processes and Functions to the Maximum Extent Possible for Ecological Benefit*				**Goal #2:** *Plan for Changing Environments and Deign for Ecological Resilience*				**Goal #3:** *Identify Opportunities for Contiguous Coastal Habitat Areas and Increase the Buffer between Sensitive Habitat and Sources of Human Activities*		
Objectives	***1.1***	***1.2***	***1.3***	***1.4***	***2.1***	***2.2***	***2.3***	***2.4***	***3.1***	***3.2***	***3.3***
Strategic Partnerships	•	•	•	•	√	•	•	√	•	√	•
Monitor SLR	•	•	•	•	•	•		√	•	•	•
Ecosystem Restoration	√	√	√	√	√	√	•	√	√	√	√
Ecotone Levees	√	√	√	√	√	√	•	√	√	√	•
Thin Layer Sediment Deposition	•	√	√	√	√	√	√	√	•	•	•
Raising Elevation of the SAR Levee	•	•	•	√	•			√		√	√
Replacement or Enhancements of Hydraulic Exchange Infrastructure	•	•	•	√	•	•		√	√		•
Installation of Sluice Gates	•	•	•	√	•	•		√	•		•
Installation of Boardwalks	√	•	•	√	•	•			•	√	
Elevating Pedestrian Trails, Berms, & Boardwalks	•	•	•	•	√	•			•	√	•
Relocation and Reconfiguration of Service Roads, Paths, and/or Facilities	•	•	•		√				•	√	√
Hybrid 1: Full High Touch Scenario	√	√	√	√	√	√	•	√	√	√	√
Hybrid 2: Elevation + Vegetation	√	√	√	√	√	√	•	√	√	√	√
Hybrid 3: Elevation + Thin Layer Sediment Deposition	√	√	√	√	√	√	•	√	√	√	√

5.7. Summary

The following table provides a comparative SWOT analysis summary between all the solutions presented in the previous section. Definitions for each of the SWOT elements are presented below:

- **Strengths:** What the strategy does well (e.g., strong hazard mitigation, ecosystem benefits, scalability)
- **Weaknesses:** Limitations (e.g., high cost, time to implement, maintenance burdens)
- **Opportunities:** External chances for success (e.g., grant funding, alignment with state/federal priorities, public support)
- **Threats:** Potential risks or barriers (e.g., permitting challenges, stakeholder opposition, climate uncertainties)

TABLE 15. SWOT ANALYSIS SUMMARY OF EVALUATED SOLUTIONS

Strategy	Strengths	Weaknesses	Opportunities	Threats
Strategic Partnerships	• Shared funding and expertise; • Builds cross-agency trust	• Coordination complexity; Differing timelines or priorities	• Long-term collaboration; • Joint grant opportunities	• Conflicting agendas; • Delays due to partner misalignment
Monitor SLR	• Real-time data to inform action; • Supports adaptive management	• Does not prevent damage; • Needs consistent and proactive attention	• Informs thresholds for adaptation; • Enhances long-term planning	• Data gaps; • Inaction from prolonged monitoring
Ecosystem Restoration	• Improves resilience and biodiversity; • Passive adaptation benefits	• Potential long lead time for ecological function; • Sensitive to disturbances	• Supports habitat goals; • Unlocks ecological funding	• Sea level rise outpaces habitat establishment; • Invasive species
Ecotone Levees	• Dual benefit: habitat + flood control; • Supports transitional zones	• Requires wide footprint; • Complex design	• Natural buffer integration; • Increases flood attenuation	• Not enough funding; • High permitting burden
Thin Layer Sediment Deposition	• Elevates habitat with minimal disruption; • Encourages natural growth	• Requires sediment sourcing; • Temporary impacts to existing habitat and vegetation	• Boosts habitat function; • Enhances ecological resilience; • Nearby maintenance dredging activities	• Stringent permitting and testing process; • Potential contaminants in sediment if not tested thoroughly
Raising the Elevation of the SAR Levee	• Direct flood defense; • Protects area from severe storm events	• Expensive and visually intrusive; • Out of the Preserve's direct jurisdiction	• Better preserves assets for longer time period; • Opportunity to integrate ecotones	• No agency intervention will lead to devastating impacts (unlikely); • Funding
Enhancements to Hydraulic Exchange Infrastructure	• Restores tidal flow; • Improves habitat quality	• Engineering-intensive; Needs agency coordination	• Enhances hydraulic exchange and water quality; • Supports species movement	• Conflicting agendas amongst different stakeholders or agencies; • Infrastructure vulnerability
Installation of Sluice Gates	• Flexible water control; • Protects during storms and emergency oil spill situations	• Requires active management; • Mechanical risks	• Balances flood protection and habitat access; • Opportunity for emergency response protection to be adapted in broader response plan framework	• Gate failure; • SLR may surpass gate height if not planned properly
Installation of Boardwalks	• Maintains and elevates access; • Provides ability for channels to flow through wetlands without additional hydraulic infrastructure	• Can be expensive and have large impact footprint; • Maintenance required	• Public education tool and ability to have informative signage; • Scenic, ADA-friendly access opportunity	• Material degradation; • More vulnerable to unprotected SLR hazards such as extreme storm flows (unlikely due to operational infrastructure)
Elevating Pedestrian Trails, Berms, & Boardwalks	• Maintains recreational use while accommodating future SLR; • Creates long-standing resilience and public access	• Can be expensive if not planned properly; • Visual obstruction and larger footprint	• Enhances public engagement; • Resilient trail network	• Limited ecological benefit; • High cost of retrofitting
Relocation and Reconfiguration of Service Roads, Paths, and/or Other Facilities	• Removes assets from high-risk zones; • Opens space for restoration	• High upfront cost; • Typically met with stakeholder resistance	• Enables long-term retreat; • Avoids recurring damage	• Political pushback; • Potential loss of public utility
Hybrid 1: Full High Touch Scenario	• Maximizes resilience and habitat connectivity; • Comprehensive planning	• Potential long lead time for full ecosystem development and restoration; • Multi-agency complexity	• Region-wide transformation; • Eligible for high-level grants	• Execution challenges; • Long implementation timeline
Hybrid 2: Elevation + Vegetation	• Integrates green infrastructure; • Balanced risk reduction from both engineering and nature-based perspectives	• Requires ongoing maintenance and monitoring; • More intricate design process	• Adaptable design; • Supports ecological uplift	• Long implementation timeline; • May underperform in extreme events in an unprotected scenario
Hybrid 3: Elevation + Thin Layer Sediment Deposition	• Ability to do more than once to accommodate SLR intervals; • Enhances wetland function and resiliency in the long-term	• Logistics-intensive; • Requires sediment access	• Scalable solution; • Compatible with restoration goals	• Sediment sourcing limitations; • Permitting delays

6. Preferred Adaptation Pathway

There is still significant uncertainty associated with when the sea level rise and storm surge projections may actually occur. The severity of future sea level rise largely depends on global efforts to decrease greenhouse gas (GHG) emissions and slow the effects of climate change. Because the adaptation planning timeline is looking forward thirty to eighty years and beyond, it is likely that the projections and science will change and that global policies will advance. To guide long-term decision-making, adaptation strategies are linked to a series of defined "triggers" rather than fixed timelines. These triggers represent measurable thresholds that, once reached, signal the need for implementation of specific adaptation actions. Examples of various trigger types include, but are not limited to:

- *Environmental Triggers* – Actual observed sea level rise benchmarks passing certain thresholds;
- *Operational Triggers* – Functional impacts to critical infrastructure such as overtopping or inundation of nearby critical infrastructure;
- *Biological Triggers* – Ecological shifts such as the decline or loss of key marsh vegetation communities.

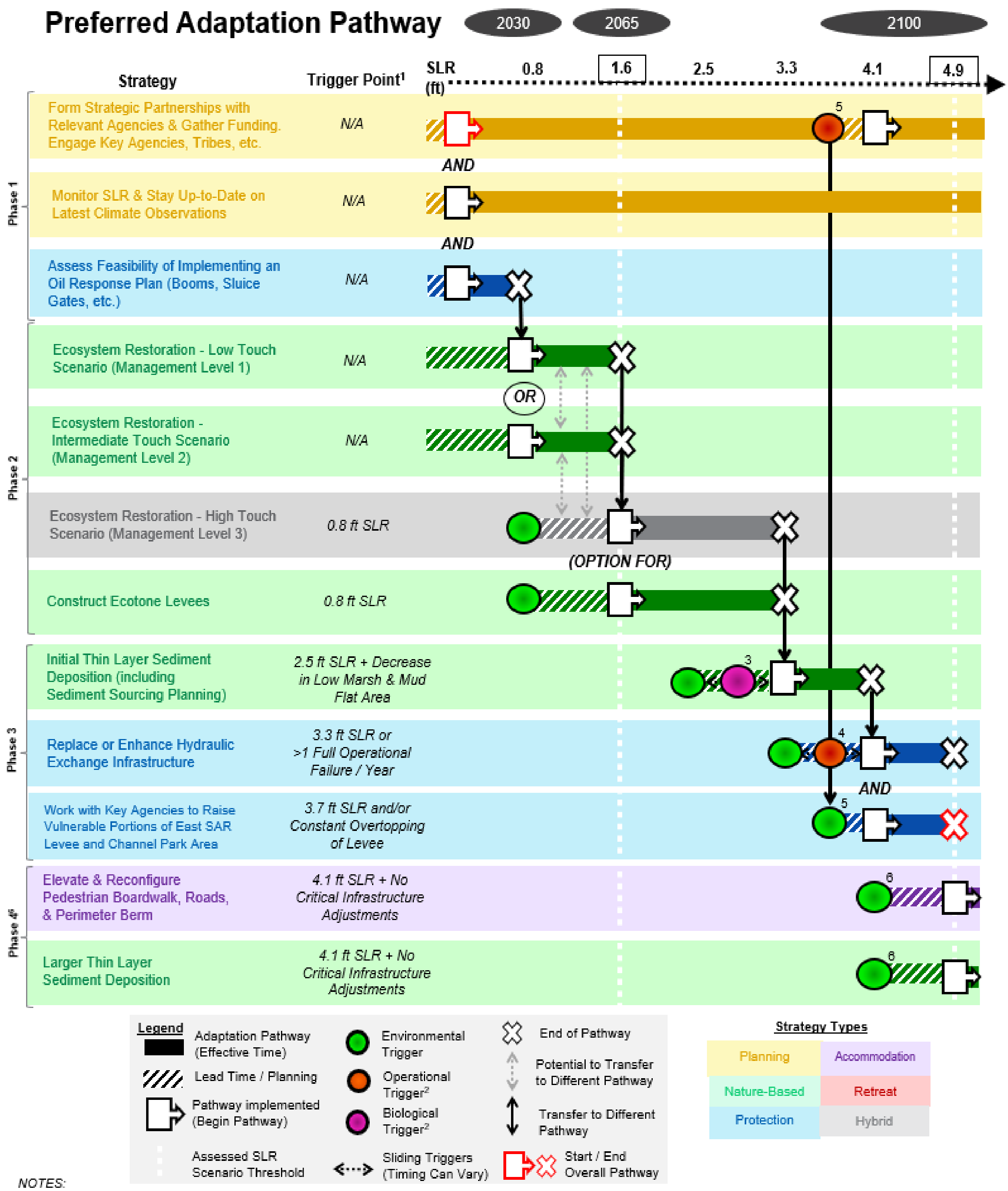
This trigger-based approach allows Preserve managers to make informed, responsive decisions as sea level rise materializes, enabling timely action based on real-world conditions rather than relying solely on projected future scenarios. The adaptation strategies are primarily presented as either/or options at different points in time, although in some cases more than one action could be taken for a given timeframe. Adaptation strategies are intended to build on one another once an earlier phase of the strategy ends or certain triggers occur. More advanced or aggressive strategies are triggered by higher levels of sea level rise. The exact timing of when those triggers will be reached is uncertain and requires constant monitoring.

The wants and needs of the local communities are likely to change as well, and planning efforts should offer the flexibility to adjust accordingly. For example, it is difficult for anyone to envision the major changes and improvements that may ultimately be required to protect the waterfront of the adjacent areas; however, these changes may present opportunities to enhance the features that attract people to the Preserve and uphold the qualities that residents love. For that reason, a range of potential future options are provided rather than a single set of solutions where possible.

Regardless of the uncertainty, adaptation planning is an important process to prepare decision makers and stakeholders for upcoming impacts and to implement strategies proactively. A long-term coastal resiliency strategy and adaptation plan should include the following core principles:

- Multiple Lines of Defense
- Flexibility to Adapt Over Time
- Integration of Green and Grey Infrastructure for Greater Resilience
- Multi-functional Solutions that Provide Broader Benefits

The following *Preferred Adaptation Pathway* for the Preserve is meant to be flexible and allow space to be revised over time as new information emerges, climate science advances, and community preferences evolve. The pathway provides an illustrative example of effectiveness at different planning horizons under the assumed *Intermediate-High* SLR scenario.



NOTES:

1. Trigger points indicate when to begin planning for implementation. This should be at least one (1) SLR scenario before projected impacts.
2. Operational and Biological Triggers are estimated based on proposed conditions and the best available science at the time of this report. In the case or scenario that the timing varies; pathway beginnings may be adjusted to accommodate changing conditions.
3. Biological trigger timing can vary. Thin Layer Sediment Deposition to occur once a noticeable decrease in low marsh and mud flat area occurs.
4. Operational Trigger timing can vary. Replacement or Enhancement of Hydraulic Exchange Infrastructure should occur at whichever trigger occurs first between 1.6 ft SLR or >1 operational failure / year of any hydraulic infrastructure.
5. Ensure agency & stakeholder coordination begins plan of raising the vulnerable portions of the East SAR Levee near the mouth and Channel Park in Newport Bay.
6. Phase 4 strategies only required in unlikely event that surrounding critical infrastructure does not receive retrofits from Agencies and Regional Stakeholders.

FIGURE 18. PREFERRED ADAPTATION PATHWAY FOR THE PRESERVE

TABLE 16. ADAPTATION PATHWAY SUMMARY

Phase		Pathway Strategy	Planning Horizon	Effective Horizon	Occurs If	Can Be Coupled With	Protects Until (Min.)	Likely?
1	A	Form Strategic Partnerships with Relevant Agencies & Gather Funding. Engage Key Agencies, Tribes, etc.	Now	Now to 2105+	N/A	All	2105+	Yes
	B	Monitor SLR & Stay Up to Date on Latest Climate Observations	Now	Now to 2105+	N/A	All	2105+	Yes
	C	Assess Feasibility of Implementing an Oil Response Plan (Booms, Sluice Gates, etc.)	Now	Now to 2045	N/A	1A, 1B, 2A, 2B	2105+	Yes
2	A	Ecosystem Restoration - Low Touch Scenario (Management Level 1)	Now to 2045	2045 to 2065	N/A	1A, 1B, 1C	2065	Yes
	B	Ecosystem Restoration - Intermediate Touch Scenario (Management Level 2)	Now to 2045	2045 to 2065	N/A	1A, 1B, 1C	2065	Yes
	C	Ecosystem Restoration - High Touch Scenario (Management Level 3)	2045 to 2065	2065 to 2085+	0.8 ft SLR	1A, 1B, 2D	2085	Yes
	D	Construct Ecotone Levees	2045 to 2065	2065 to 2085+	0.8 ft SLR	1A, 1B, 2C	2085	Yes
3	A	Initial Thin Layer Sediment Deposition (including Sediment Sourcing Planning)	2075 to 2085	2085 to 2095+	2.5 ft SLR + Decrease in Low Marsh & Mudflat	1A, 1B	2095	Yes
	B	Replace or Enhance Hydraulic Exchange Infrastructure	2085 to 2095	2095 to 2105+	3.3 ft SLR + >1 Full Operational Failure / Year	1A, 1B, 3C	2105	Yes
	C	Work with Key Agencies to Raise Vulnerable Portions of East SAR Levee and Channel Park Area	2090 to 2095	2095 to 2105+	3.7 ft SLR and/or Constant Overtopping at Levee	1A, 1B, 3B	2105	Yes
4	A	Elevate & Reconfigure Pedestrian Boardwalk, Roads, & Perimeter Berm	2095 to 2105	2105+	4.1 ft SLR + No Critical Infrastructure Adjustments	1A, 1B, 4B	2105+	No
	B	Larger Scale Thin Layer Sediment Deposition	2095 to 2105	2105+	4.1 ft SLR + No Critical Infrastructure Adjustments	1A, 1B, 4A	2105+	No

Phase 1 begins with foundational strategies already in motion, including forming strategic partnerships with relevant agencies and tribes (**1A**), maintaining alignment with the latest and most up-to-date SLR science (**1B**), and exploring emergency oil spill response measures (**1C**). These coordination-based actions are both feasible and crucial for long-term success. Importantly, these early-phase strategies will set the foundations and carry through the entirety of the Preserve's adaptation pathway.

Phase 2 focuses on ecosystem-based interventions that prioritize resilience through restoration. This includes Management Levels 1 and 2 — low and intermediate-touch ecosystem restoration strategies (**2A** and **2B**) — which aim to improve ecological function while maintaining most of the site's existing form and functions. These are likely to be implemented by 2045 and provide resilience benefits through at least 2065.

Management Level 3 (**2C**), however, represents a more transformative ecological strategy that are not technically required until 0.8 feet of SLR and is projected to remain effective through 2085+. This strategy extends protection to approximately 2085 and marks the transition point between nature-based solutions and more engineered interventions.

Phase 3 strategies are focused on infrastructure adaptations that become necessary as higher levels of SLR are observed, tide range decreases within the Preserve, and the lower wetland zones (mudflat and low marsh) increase in area while higher intertidal areas decrease. These include thin layer sediment deposition to offset marsh loss (**3A**), and replacement or redesign of hydraulic infrastructure (**3B**), such as culverts, tide gates, or levees. These strategies are not initiated until 2.5–3.7 ft of SLR is observed and the distance between the highest observed water levels and the top of the levee (freeboard) decreases to less than 2 feet at key levee points.

Phase 4 includes adaption measures such as raising pedestrian boardwalks and increasing the elevation of the Preserve's perimeter berms (**4A**) or undertaking larger-scale thin layer sediment deposition across the site to increase the marsh plain elevation and prevent the marsh from being submerged by SLR (**4B**). These adaptation measures are only triggered under extreme conditions i.e., 4.1 ft of SLR or more, assuming no prior infrastructure adaptation. However, Phase 4A is considered unlikely to be necessary due to anticipated regional interventions led by state, county, and local agencies. Specifically, agencies are expected to prioritize protection of major critical infrastructure such as the SAR levee and at residential areas like Channel Place Park in Newport Harbor - which lies at a lower elevation and is vulnerable to early SLR impacts.

The pathways are phased to allow for adaptive decision-making that aligns with real-world observations. Management Levels 1 and 2 form the backbone of near- and mid-term resilience and are covered by existing hazard modeling and environmental review. Management Level 3 represents transformational shifts in land use, requiring additional feasibility analyses, updated hydrologic modeling, and sustained investment. By coupling ecosystem-based restoration with engineered adaptations as needed, this adaptive approach extends resilience for decades while maintaining flexibility in the face of uncertainty about rising sea levels. It positions the Preserve to be both responsive to environmental thresholds and proactive in safeguarding critical natural and cultural resources.

7. Funding Opportunities for Implementing Resiliency Strategies

A list of sources for financing projects that implement resiliency projects is presented on the following page. Since some funding sources change over time, we recommend the list be maintained for tracking and updates.

Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
California Coastal Conservancy	State Agency	Coastal Conservancy Grant Program	Provides funding for projects that restore and protect the California coast, expand public access to it, and enhance its resilience to climate change.	No set minimum or maximum, however, most grants will be from $200,000 -$5 million	Rolling	Not required but encouraged	Applications are accepted on a rolling basis and will be evaluated when they are received. Two-step process – the first step is to submit a pre-application. If a pre-application meets the Conservancy's eligibility criteria and there is available funding for the project, applicants will be invited to submit a full application. Coastal Conservancy Grants – California State Coastal Conservancy
Caltrans	State Agency	Climate Adaptation Planning Grant	Supports local, regional and Tribal identification of transportation-related climate vulnerabilities through the development of climate adaptation plans as well as project level adaptation planning to identify adaptation projects and strategies for transportation infrastructure.	$100,000-$1 M for a single organization, up to $1.5 M for partnership applications.	Annual	11.47% match required	Application deadline was January 22, 2025. Eligible primary applicants include MPOs, RTPAs, transit agencies, cities and counties, Native American Tribal Governments, Joint Exercise of Powers Authority, Local Transportation Authority. Eligible sub-applicants include Primary Applicants, Universities and Community Colleges, Community-Based Organizations, Non-Profit Organizations (501.C.3), Other Public Entities* $31.9 M available. Sustainable Transportation Planning Grants | Caltrans Contact: Julia Biggar, Caltrans Julia.Biggar@dot.ca.gov

Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
Wildlife Conservation Board	State Board	Habitat Enhancement and Restoration Program	Provides funding for projects that involve habitat restoration to protect wildlife values and habitat.		Rolling	Not required	Pre-applications are accepted on a continuous basis. Habitat Enhancement and Restoration Program (ca.gov)
National Oceanic and Atmospheric Administration	Federal Agency	Coastal Habitat Restoration and Resilience Grants for Underserved Communities	Supports projects that will advance the coastal habitat restoration and climate resilience priorities of tribes and underserved communities, support community-driven habitat restoration and build the capacity of tribes and underserved communities to more fully participate in restoration activities.	$75,000- $2,000,000	Annual	Not required	Deadline for 2025 funding is May 12, 2025. $20 million in funding available. Coastal Habitat Restoration and Resilience Grants for Underserved Communities | NOAA Fisheries Contact: underserved.community.grants@noaa.gov
National Oceanic and Atmospheric Administration	Federal Agency	Transformational Habitat Restoration and Coastal Resilience Grants Under the Bipartisan Infrastructure Law	Supports transformational habitat restoration projects that restore marine, estuarine, coastal, or Great Lakes ecosystems, using approaches that enhance community and ecosystem resilience to climate hazards.	$750,000- $10,000,000 over 3 years	Annual	Not required but encouraged	Application deadline for 2025 was April 16, 2025. $100 million was available Eligible applicants are institutions of higher education, non-profits, for profit organizations, U.S. territories, and state, local, and tribal governments. Transformational Habitat Restoration and Coastal Resilience Grants | NOAA Fisheries Contact: resilience.grants@noaa.gov
National Fish and Wildlife Foundation	Non-Profit	National Coastal Resilience Fund Grant Program	Seeks to restore, increase and strengthen natural infrastructure to protect coastal communities while also	Planning and Design: $100,000- $1 million Implementation:	Annual	Not required but encouraged	Pre-proposal deadline is May 6, 2025. Full proposals by invitation only due July 17, 2025.

Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
			enhancing habitats for fish and wildlife.	$1 million- $10 million			National Coastal Resilience Fund | NFWF
Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
California Coastal Conservancy	State Agency	Coastal Conservancy Grant Program	Provides funding for projects that restore and protect the California coast, expand public access to it, and enhance its resilience to climate change.	No set minimum or maximum, however, most grants will be from $200,000 -$5 million	Rolling	Not required but encouraged	Applications are accepted on a rolling basis and will be evaluated when they are received. Two-step process – the first step is to submit a pre-application. If a pre-application meets the Conservancy's eligibility criteria and there is available funding for the project, applicants will be invited to submit a full application. Coastal Conservancy Grants – California State Coastal Conservancy
Caltrans	State Agency	Climate Adaptation Planning Grant	Supports local, regional and Tribal identification of transportation-related climate vulnerabilities through the development of climate adaptation plans as well as project level adaptation planning to identify adaptation projects and strategies for transportation infrastructure.	$100,000-$1 M for a single organization, up to $1.5 M for partnership applications.	Annual	11.47% match required	Application deadline was January 22, 2025. Eligible primary applicants include MPOs, RTPAs, transit agencies, cities and counties, Native American Tribal Governments, Joint Exercise of Powers Authority, Local Transportation Authority. Eligible sub-applicants include Primary Applicants, Universities and Community Colleges, Community-Based Organizations, Non-Profit Organizations (501.C.3), Other Public Entities* $31.9 M available. Sustainable Transportation Planning Grants | Caltrans Contact: Julia Biggar, Caltrans Julia.Biggar@dot.ca.gov

Funding Entity	Funder Type	Grant	Purpose	Approximate Grant Award Value	Program Funding Interval	Match Required	Notes
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National Oceanic and Atmospheric Administration	Federal Agency	Coastal Habitat Restoration and Resilience Grants for Underserved Communities	Supports projects that will advance the coastal habitat restoration and climate resilience priorities of tribes and underserved communities, support community-driven habitat restoration and build the capacity of tribes and underserved communities to more fully participate in restoration activities.	$75,000- $2,000,000	Annual	Not required	Deadline for 2025 funding is May 12, 2025. $20 million in funding available. Coastal Habitat Restoration and Resilience Grants for Underserved Communities | NOAA Fisheries Contact: underserved.community.grants@noaa.gov
National Oceanic and Atmospheric Administration	Federal Agency	Transformational Habitat Restoration and Coastal Resilience Grants Under the Bipartisan Infrastructure Law	Supports transformational habitat restoration projects that restore marine, estuarine, coastal, or Great Lakes ecosystems, using approaches that enhance community and ecosystem resilience to climate hazards.	$750,000- $10,000,000 over 3 years	Annual	Not required but encouraged	Application deadline for 2025 was April 16, 2025. $100 million was available Eligible applicants are institutions of higher education, non-profits, for profit organizations, U.S. territories, and state, local, and tribal governments. Transformational Habitat Restoration and Coastal Resilience Grants | NOAA Fisheries Contact: resilience.grants@noaa.gov
National Fish and Wildlife Foundation	Non-Profit	National Coastal Resilience Fund Grant Program	Seeks to restore, increase and strengthen natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife.	Planning and Design: $100,000- $1 million Implementation: $1 million- $10 million	Annual	Not required but encouraged	Pre-proposal deadline is May 6, 2025. Full proposals by invitation only due July 17, 2025. National Coastal Resilience Fund | NFWF

8. Gathering and Sharing Information

Inspired by NOAA's Climate Program Office, the CRS will recommend enhancements to the Randall Preserve Website – to include a portal or web page where the public can access important information and tools that help keep the Preserve resilient. This strategy involves the development and sharing of science-based information and planning decisions to inform the coastal communities and advance the resilience of and coastal\marine ecosystems.

9. Conclusion and Recommendations

Based on the evaluation of resilience strategies (Section 4), SWOT analysis (Section 5), and the development of the adaptation pathway (Section 6), this Coastal Resiliency Strategy recommends a phased, hybrid approach to adaptation that supports both ecological restoration and public access while planning for future SLR conditions.

- The strategy begins with Phase 1, which consists of early actions already underway or readily achievable —such as continued coordination with regional partners, ecological monitoring, and maintenance of the Preserve's foundational infrastructure. These actions establish a strong base for future adaptation while supporting immediate resilience and habitat stewardship in the *near term*.
- Phase 2 focuses on nature-based restoration strategies that align with Management Levels 1 and 2, including ecosystem uplift through vegetation management, thin-layer sediment deposition, and strategic grading. These actions enhance tidal connectivity and habitat health without significant topographic change and are compatible with current use and access conditions.
- Phases 3 and 4 also include nature-based and hybrid strategies and represent longer-term, higher-touch activities that have longer planning horizons. This includes potential mass grading and tidal reconnection to adjacent USACE-managed wetlands, which would reestablish tidal exchange and support marsh function at the Preserve. These high-touch strategies are not assumed to be immediately necessary but are included in the pathway to support planning, permitting, and phased readiness—ensuring the Preserve can respond effectively if and when conditions call for more transformative change.

Throughout all phases, the pathway recommends that infrastructure — such as berms, trails, and boardwalks — be designed with elevation flexibility in mind. These design elements serve both recreational and functional needs and can be adapted incrementally as SLR conditions evolve. Ultimately, the recommended pathway supports a layered, dynamic approach to adaptation that enables the Preserve to evolve in step with environmental factors, avoids premature overdesign, and aligns with broader regional efforts. The strategies in this document were developed to begin the planning for the technical, regulatory, and partnership groundwork that will be necessary to ensure the Preserve remains resilient for generations.

CoSMoS Modeling results indicate that the Preserve is highly protected. However, localized flood hazards could impact the project site and surrounding areas under long-term SLR projections—particularly during extreme storm events and if existing infrastructure is not maintained or upgraded.

Randall Preserve is unique in that its habitat will not feel the effects of rising sea levels for several decades (until greater than 4 feet of SLR occurs). This makes resiliency feasible inside the lowlands, but it also makes resiliency highly dependent on the infrastructure that protects it. The vulnerability of coastal resources at the Preserve varies significantly depending on the presence or absence of existing infrastructure and protection provided by the Santa Ana River East Levee and the existing tide gates that provide a hydraulic connection to the Santa Ana River.

Key Findings:

- Flood exposure remains minimal under all protected scenarios, assuming the tide gates and existing hydraulic structures remain fully functional. However, under higher SLR scenarios, the site's resilience is highly dependent on the continued operability of this infrastructure to prevent significant inundation.
- The surrounding infrastructure that protects the Preserve makes it possible to integrate nature-based and holistic designs at all scales within the lowlands.
- Groundwater emergence is expected to increase significantly under higher SLR scenarios, particularly in the low-lying freshwater marshes and riparian areas of the Preserve. Under existing conditions, groundwater remains below the surface in most areas. However, as SLR reaches 1.6 ft, isolated areas—especially in the southern and central lowlands—may begin to experience shallow groundwater close to the surface, potentially causing soil saturation, changes in plant community composition, and infrastructure degradation. Under the 4.9-foot SLR scenario,

groundwater is projected to emerge at the surface in many low-lying areas, even without direct coastal flooding. This includes areas that are otherwise protected from surface water inundation by tide gates or levees.

- Under a 4.9 ft SLR scenario combined with a 100-YR storm event, the site is projected to experience widespread flooding in an unprotected condition (i.e., without agency-led improvements to infrastructure along the SAR, Newport Bay, or PCH). This includes inundation of wetlands, floodplains, and nearby infrastructure, as well as backflow through storm drains and utilities, which could compromise drainage systems and lead to localized flooding.
- Within the project site, lowland areas are projected to be more at risk of widespread inundation under scenarios in which the existing infrastructure fails and little to no agency intervention occurs, which is unlikely.
- Under the *Protected* scenario, most resources exhibit low to moderate overall vulnerability, due to reduced hazard exposure from tidal inundation and storm surge. This includes critical infrastructure such as storm drains, utilities, and natural vegetation, which benefit from the function of the tide gates and structural protections. In contrast, the Unprotected scenario shows a marked increase in vulnerability across nearly all asset categories. Lowland development, stormwater infrastructure, and recreation amenities show high overall risk, driven by increased hazard exposure and limited adaptive capacity.
- This distinction reflects the differing levels of exposure to SLR-related hazards such as tidal inundation, storm-driven flooding, and groundwater emergence, and allows for a more accurate evaluation of risk based on site-specific conditions and infrastructure performance.

Recommendations:

- Proceed with improvements planned for the Preserve but develop relationships with the agencies responsible for maintaining and operating the SAR East Levee and tide gates at North Marsh and South Marsh.
- Due to its regional setting, consider the Preserve’s potential for tidal flows and connectivity to the adjacent USACE wetland projects and Talbert Regional Park South to increase the overall coastal wetland acreage and open space in this region.
- Periodically track tide levels at West Newport Harbor to see if the coastal area within the vicinity of Channel Park Place begin to experience the effects of rising tide levels. Nature will provide specific environmental cues such as loss of beach area or flooding of the beach park, public sidewalks, and streets (River Avenue and Channel Park Place). If flooding begins to emerge in this area, that is a trigger to start planning for rising sea level.
- Apply for grants to support wetland creation, enhancement, and resiliency.
- Create a portal on the Randall Preserve website where SLR science and planning information about the Preserve can be shared with the public.
- This document provides land managers of Randall Preserve with a roadmap of activities to implement. It presents a series of measures that could be planned and initiated as standalone projects or in combination with other ones. Before adopting and implementing any pathways and measures described in this report it is recommended that the public and State and Federal agencies be involved in the planning process.

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