FINAL
NAPA-SONOMA MARSHES WILDLIFE AREA
LAND MANAGEMENT PLAN

Prepared for:

California Department of Fish and Game
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Bay Delta Region (3)
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DRAFT LAND MANAGEMENT PLAN FOR THE NAPA-SONOMA MARSHES WILDLIFE AREA NAPA/SONOMA/SOLANO COUNTIES, CALIFORNIA

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D Initial Study

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Acronyms and Abbreviations

ADA	Americans with Disabilities Act
APN	Assessor Parcel Number
Basin Plan	*Water Quality Control Plan, San Francisco Bay Region*
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta
BCDC	San Francisco Bay Conservation and Development Commission
BMMP	Biosentinel Mercury Monitoring Program
BMP	Best Management Practice
Cal-IPC	California Invasive Plan Council
CALFED	CALFED Bay-Delta Program
Caltrans	California Department of Transportation
Cargill	Cargill Salt Company
CCCC	California Climate Change Center
CCMP	Comprehensive Conservation Management Plan
CCR	California Code of Regulations
CCTS	Central California Taxonomic System
CDM	Camp Dresser & McKee
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRAM	California Rapid Assessment Method
CRHR	California Register of Historical Resources
CRLF	California red-legged frog
CSCC	California State Coastal Conservancy
CWA	Clean Water Act
CWCB	California Wildlife Conservation Board
CWF	California Wildlife Foundation
DDE	dichlorodiphenyldichloroethelene
DEIR	Draft Environmental Impact Report
DFG	California Department of Fish and Game
DPS	Distinct Population Segment
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ERP	Ecosystem Restoration Program
ERPP	Ecosystem Restoration Program Plan
ESA	Environmental Science Associates
ESU	Evolutionarily Significant Unit
GIS	geographic information system
GPS	Global Positioning System
Habitat Goals Report	Baylands Ecosystem Habitat Goals Report
HDPE	high-density polyethylene

IRWM	Integrated Regional Wetland Monitoring
kg/yr	kilogram(s)/year
LMP	Land Management Plan
MAD	mosquito abatement district
Marshes	Napa-Sonoma Marshes Wildlife Area
MOU	Memorandum of Understanding
N	nitrogen
NAHC	Native American Heritage Commission
NAWCA	North American Wetlands Conservation Act
NCFCWD	Napa County Flood Control and Water District
NCMAD	Napa County Mosquito Abatement District
NPS	Napa Plant Site
NPSR	Napa Plant Site Restoration
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSMRG	Napa-Sonoma Marsh Restoration Group
NSMWA	Napa-Sonoma Marshes Wildlife Area
NVCS	National Vegetation Classification Standard
NWIC	Northwest Information Center
P	phosphorus
PCB	polychlorinated biphenyl
PG&E	Pacific Gas and Electric Company
PRBO	Point Reyes Bird Observatory
PWA	Philip Williams & Associates
RHS	Relative Hazard Score
RMP	Regional Monitoring Program
RMSL	relative mean sea level
ROW	right-of-way
RWQCB	Regional Water Quality Control Board
SCWA	Sonoma County Water Agency
SFBJV	San Francisco Bay Joint Venture
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
SFEP	San Francisco Estuary Project
SHPO	State Historic Preservation Officer
SLC	California State Lands Commission
SLT	Sonoma Land Trust
SR	State Route
SSCRCD	Southern Sonoma County Resource Conservation District
SVCSD	Sonoma Valley County Sanitation District
SWRCB	State Water Resources Control Board
TMDL	total maximum daily load

USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCB	Wildlife Conservation Board
WWT	Wastewater Treatment Plant

1. INTRODUCTION

The California Department of Fish and Game (DFG) manages the approximately 14,000-acre Napa-Sonoma Marshes Wildlife Area (NSMWA or the Marshes). The NSMWA is in the San Pablo Bay region of San Francisco Bay Estuary (**Figure 1**), one of the largest estuaries in North America. Originally one of the richest wetland ecosystems in the nation, the San Francisco Estuary once comprised more than 4,600 square miles of habitat, ranging from open water mud flats to tidal salt, brackish, and freshwater marshes to associated upland grasslands and riparian areas. The area was of global importance to the millions of migrating shorebirds and waterfowl that used it as well as the resident populations of mammals, fish, and crustaceans. Since the first Spanish explorers arrived, more than 90% of the wetland habitats have been dramatically altered or destroyed (CDFG 2008) (**Figure 2**). Much of the area was reclaimed around the turn of the century for agricultural uses, and in the 1950s, approximately 7,000 acres were diked and used for solar salt production by Leslie Salt, Inc. (Wyckoff 2000).

The Marshes support a variety of habitats and a diversity of fish and wildlife, including thousands of waterfowl and shorebirds migrating on the Pacific Flyway, fish spawning, rearing, and migration, and small mammals using high marsh, levees, riparian areas, and grasslands. This NSMWA Land Management Plan (LMP) addresses management of the tidal and seasonal wetlands, sloughs, managed ponds, former salt ponds, riparian corridors, and upland grasslands. The LMP presents practical, science-based management and conservation of the natural resources of the NSMWA based on an ecosystem approach to habitat management. This LMP is intended to integrate management of all NSMWA wetland and upland habitats. The LMP habitat management approach uses natural processes to create a sustainable system over the long term. The management approach is intended to benefit both common and sensitive species of wildlife and plants and may contribute to the recovery of state and federally listed species. The LMP has been developed with guidance from the DFG's Guide and Annotated Outline for Preparing Land Management Plans (CDFG 2006a).

1.1 THE MISSION OF THE CALIFORNIA DEPARTMENT OF FISH AND GAME

The mission of DFG is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. DFG manages fish, wildlife and plant species, and natural communities for their intrinsic and ecological value and their benefits to the citizens of California. The mission includes the goal of maintaining and protecting habitat in an amount and quality sufficient to ensure the survival of all native species using the area and natural communities that support those species. DFG is also responsible for managing the many uses of fish and wildlife, including recreational, commercial, scientific, and educational.

The LMP represents the commitment of DFG to manage the resources of the NSMWA in accordance with the laws of the United States and the State of California, incorporating the best

available scientific information and professional judgment. It also incorporates the commitment of DFG to coordinate and cooperate with NSMWA neighbors, other local stakeholders, and other conservation entities that are active through the region. Funding for the development of this LMP was provided by the Wildlife Conservation Board (WCB) and administered through the California Wildlife Foundation (CWF). Funding of the NSMWA and other wildlife areas comes in large part through hunting and fishing licenses issued in California.

1.2 CALIFORNIA DEPARTMENT OF FISH AND GAME WILDLIFE AREAS

California is renowned as a land with magnificent natural scenery and a wealth of wildlife. Some of the state's most important sites for wildlife are designated DFG wildlife areas. These areas, including the NSMWA, provide habitat for a wide array of plant and animal species, including many that are listed for protection under state and federal endangered species acts or otherwise protected due to their rarity. Consistent with its mission, DFG administers 108 state wildlife areas and ecological reserves that encompass approximately 650,000 acres of wildlife habitat. These areas are located throughout the state, with most in central and northern California. NSMWA falls within DFG's Bay-Delta Region. Major wildlife areas in the Bay-Delta region include Petaluma Marsh, San Pablo Bay, and NSMWA. DFG's stated purpose in managing these wildlife areas is:

> *… to protect and enhance habitat for wildlife species, and to provide the public with compatible, wildlife-related recreational uses.*

The principal natural resource management consideration for the NSMWA is to restore and enhance a mosaic of habitats, including tidal salt and brackish water marshes, managed ponds, seasonal wetlands, and adjacent uplands, that will benefit many species of rare, threatened, and endangered species as well as a broad range of fish, wildlife, and plant species. The LMP also focuses on the management of wildlife-related recreational activities that are compatible with the diverse mosaic of habitats because DFG is committed to providing wildlife compatible recreation.

1.3 PURPOSE OF THE NSMWA LAND MANAGEMENT PLAN

Continued acquisition, restoration, and management of the NSMWA will increase habitat area and improve habitat quality for the thousands of migratory waterfowl and shorebirds that depend on the area for feeding, resting, and nesting. Fish and other aquatic species will benefit with the addition of many thousands of acres of new habitat. The restoration of these lands will create a greatly expanded habitat base for the benefit of plants, wildlife, and fish and other aquatic species, including rare, threatened, and endangered species (Wyckoff 2000).

Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 1

Project Vicinity Map

SONOMA COUNTY
NAPA COUNTY
SOLANO COUNTY
MARIN COUNTY
CONTRA COSTA COUNTY
ALAMEDA COUNTY
SUISUN MARSH
Suisun Bay
San Pablo Bay
San Francisco Bay
Pacific Ocean
Napa
Vacaville
Fairfield
Petaluma
Novato
Vallejo
Pittsburg
Antioch
Concord
San Rafael
Richmond
Walnut Creek
Berkeley
Oakland
San Francisco
San Leandro
Castro Valley
Livermore
Pleasanton
Daly City
South San Francisco
Hayward
12
29
121
80
113
221
116
101
37
141
780
160
4
242
1
580
131
123
24
980
13
680
185
112
880
280
35
82
380
92
238
84

Management Unit
County boundary
Major road

SCALE 1:13 million

0 2.5 5 10
MILES

OREGON
NEVADA
Map area
CALIFORNIA
Pacific Ocean

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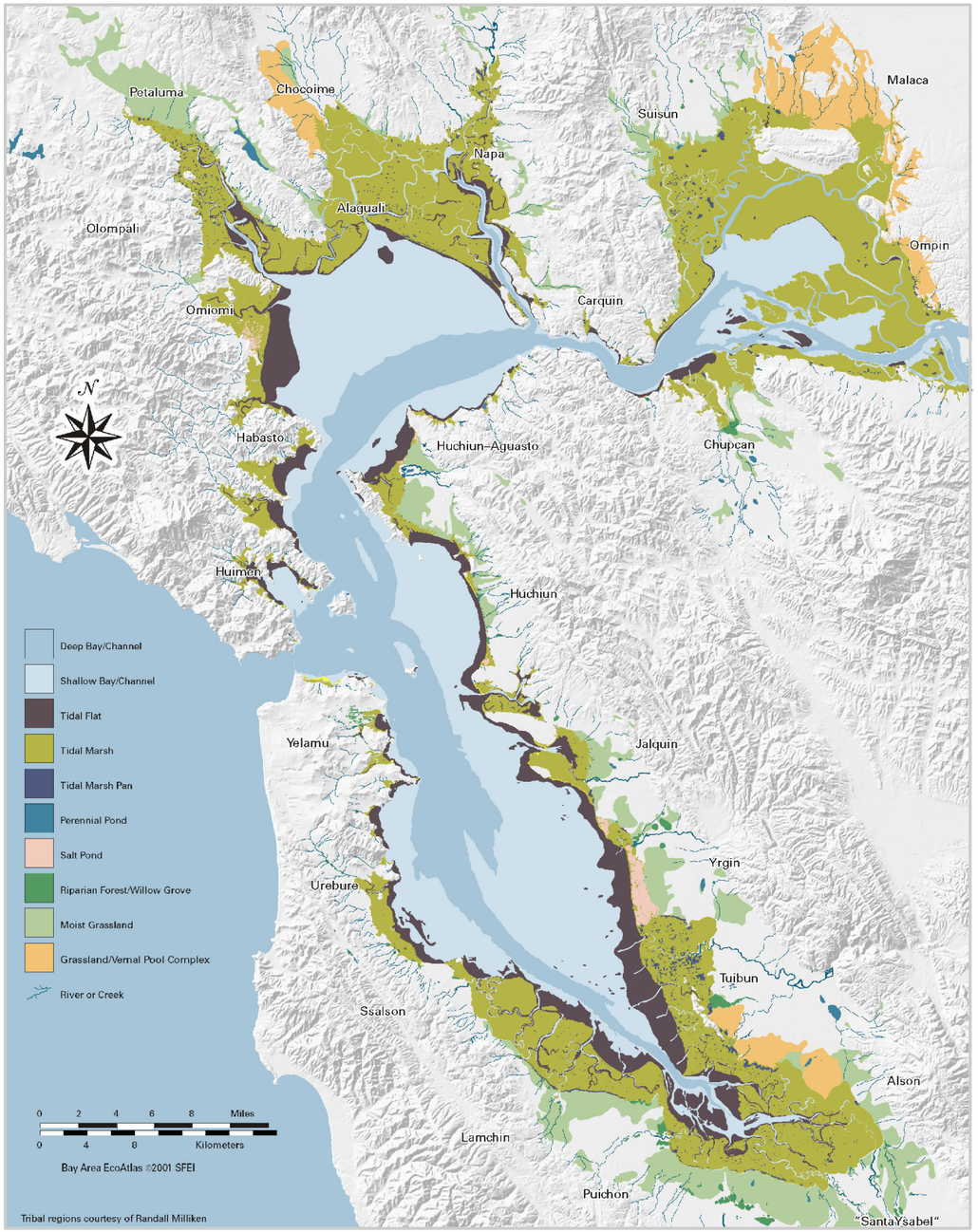
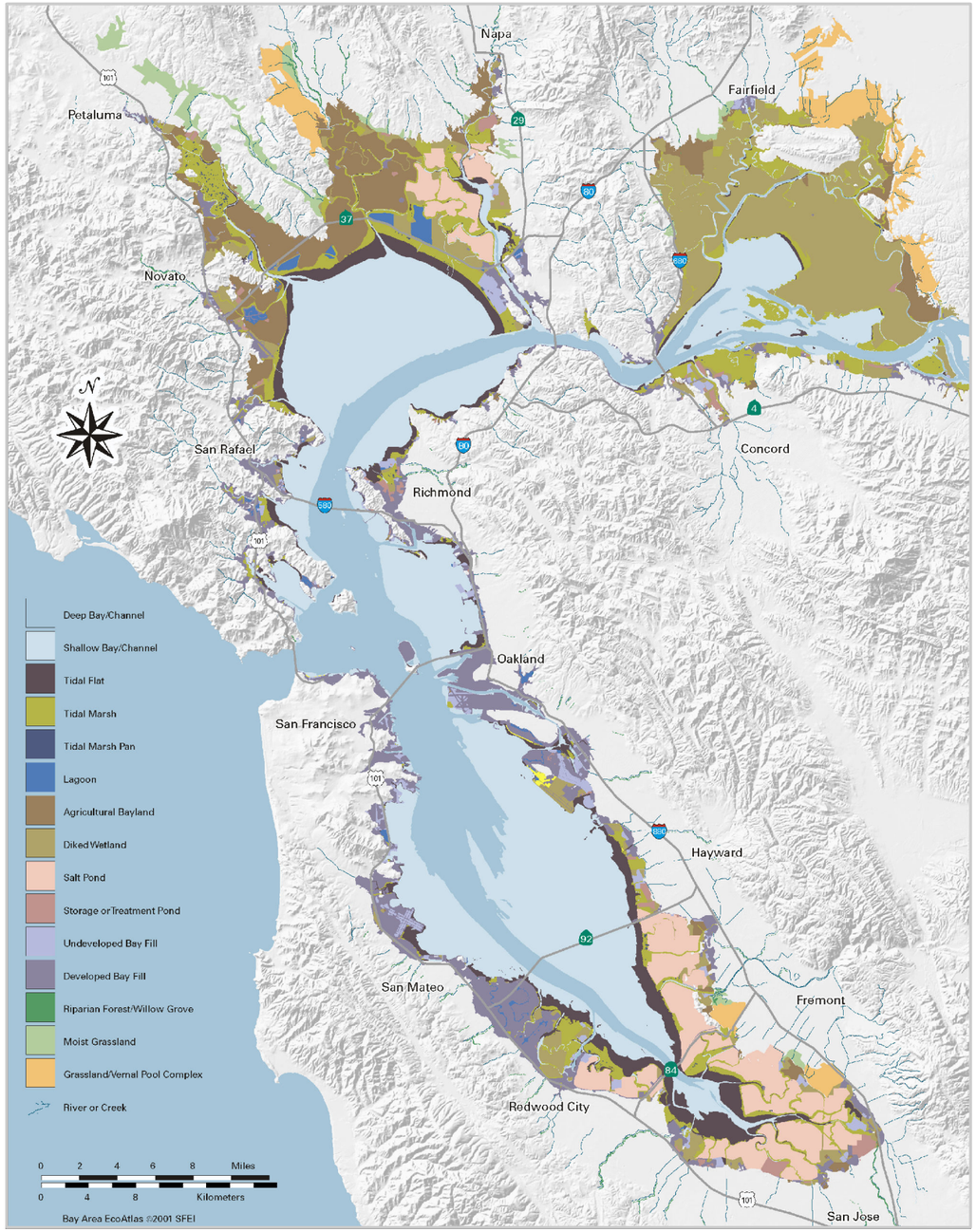
Historical Baylands circa 1800



Modern Baylands circa 1998



Napa Sonoma Marshes Wildlife Area
Land Management Plan

FIGURE 2

Historical and Modern Baylands

Map and data source:
Bay Area EcoAtlas Version 1.50b4,
San Francisco Estuary Institute, 1998

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The purposes of the Napa-Sonoma Marshes Wildlife Area Land Management Plan are:

- To guide the adaptive management of habitats, species, and programs described herein by achieving the DFG's mission of protecting and enhancing fish, wildlife, and native plant values
- To serve as a guide for appropriate public uses of the property
- To serve as a descriptive inventory of fish, wildlife, and native plant habitats that occur on or use this property, and to outline appropriate public uses of these resources
- To provide an overview of the area's operation and maintenance and personnel requirements to implement management goals and objectives and to serve as a budget planning aid for annual budget preparation
- To identify environmental impacts and subsequent mitigation that may occur during management; the LMP contains environmental documentation to comply with state and federal statutes and regulations

1.4 DEVELOPMENT OF THE NAPA-SONOMA MARSHES WILDLIFE AREA AND LAND MANAGEMENT PLANS

In the 1970s, the State of California began purchasing parcels to create the NSMWA (Wyckoff 2002). The Draft Interim NSMWA LMP was prepared in 1997 and updated in 2000 (Wyckoff 1997, 2000). It provided guidance primarily for the management and restoration of 7,000 acres of salt ponds acquired in 1994. The NSMWA has grown substantially since the first plans were written and now encompasses approximately 14,000 acres distributed among 12 Management Units acquired in more than 37 transactions between 1975 and 2004. The primary purposes of the NSMWA land acquisitions are to protect existing wetlands and restore and enhance areas of the Marshes that were historically wetlands. Land acquisitions since 2000 include the Southern Crossing Unit, Little Island Farms, and the Green Island Unit (Napa Plant Site [NPS]) (**Figure 3**). The acquisition history of each Management Unit is described in **Chapter 2**.

Much restoration planning and implementation has taken place since the first interim plans were released, advancing the understanding of salt marsh ecology and restoration. Multi-year datasets now exist for fish, avian, small mammal, macro invertebrate, and plant colonization from monitoring of the early restoration work implemented in the NSMWA Napa River Unit. Tidal action was restored to Pond 2A in 1995 and 1997 and to Ponds 3, 4, and 5 in 2006–2007; levees were repaired to maintain managed Ponds 1 and 1A. Restoration projects at the Huichica Creek Unit and the Wingo Management Unit were implemented and are currently being monitored. The Green Island Central Unit is scheduled to be breached in 2008, and the Green Island South Unit breaching is planned for 2010–1012. The 90%Restoration design was completed for Ponds 6, 6A, 7, 7A, and 8 in February of 2008.

Potential acquisitions include properties such as the former Port of Oakland lands, totaling 461 acres, purchased by the City of American Canyon using a CALFED Bay-Delta Program

(CALFED) grant awarded under the 1998 CALFED Ecosystem Restoration Program Plan (ESA 2000). This land parcel is bordered by the American Canyon Sanitary Landfill along the northwestern boundary, the American Canyon Unit along the southern and southwestern boundaries, and the City of American Canyon to the east. The grant stipulated that not less than 70% of the property will be granted in fee title to the DFG to manage as part of the NSMWA. The City of American Canyon will restore the lands with CALFED funds before they are transferred to the DFG. An addition to the Southern Crossing Unit (Stanly Ranch) acquisition of the 170-acre North Stanly Ranch is currently in progress (Wyckoff 2007).

1.5 LAND MANAGEMENT PLAN ORGANIZATION

This Draft Land Management Plan for the NSMWA is organized as follows:

- *Chapter 1, "Introduction,"* summarizes the purpose of the land acquisition for the NSMWA, acquisition history, purpose of the LMP, and the planning process and explains the scope and uses of the LMP.
- *Chapter 2, "Property Description and Management Setting,"* summarizes the most current information available to describe the geographical setting, property boundaries and easements, existing infrastructure, and management setting, including legal constraints, existing agreements, and descriptions of existing working partnerships with other agencies and nonprofit groups.
- *Chapter 3, "Environmental Setting,"* describes the primary existing resource conditions on the property and includes a discussion of planning influences and considerations.
- *Chapter 4, "Resource Management and Public Use Issues,"* describes general rules and regulations of the NSMWA and management issues.
- *Chapter 5, "Management Goals,"* describes the resource management direction of the LMP and the project description necessary for performing environmental review pursuant to CEQA. The chapter includes conceptual descriptions of management actions.
- *Chapter 6, "Operations and Maintenance,"* guides the budget preparation and work plans for the property; summarizes the number of staff employed at the property and any additional requirements for personnel; summarizes all estimated operations and maintenance costs associated with management of the property; and lists potential funding sources.
- *Chapter 7, "Future Revisions to the Plan,"* describes the process that will be used to update and revise to the LMP.
- *Chapter 8, "Document Preparers,"* lists the agencies involved in preparation or review of the LMP and the individuals who prepared the LMP.
- *Chapter 9, "References and Personal Communications,"* lists the sources of information cited throughout the LMP.

Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 3

Management Unit Boundaries

Other

- Ecological Reserve (DFG, current)
- Ecological Reserve (proposed after restoration monitoring is complete in 2024), closed to hunting (DFG, future)
- Highway
- Paved road
- Closed to public
- Power line
- Railroad

Base imagery: Airphoto USA, 1 April 2007, 0.3-meter cell size

NRU = Napa River Unit
HCU = Huichica Creek Unit

N

SCALE 1:57,000

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2. PROPERTY DESCRIPTION AND MANAGEMENT SETTING

The approximately 14,000-acre NSMWA is composed of predominantly former tidelands on the plain at the northern edge of San Pablo Bay. It is located in Sonoma, Napa, and Solano counties and is circumscribed by the ridges that form the Napa and Sonoma Valleys. The NSMWA is shown on Cuttings Wharf, Sears Point and the Mare Island U.S. Geological Survey 7.5-Minute Quadrangles. NSMWA lies within an area bounded by State Route (SR) 37 and the broad expanse of San Pablo Bay mudflats and intertidal marshes on the south, SR 121 on the west, the Union Pacific Railroad tracks and SR 121/12 on the north, and SR 29 on the east (see **Figure 1**). Approximately 810 square miles of Contra Costa, Solano, Napa, Sonoma, and Marin counties drain to San Pablo Bay (USACE 1999). The major watersheds providing freshwater to the NSMWA include the Napa River and Sonoma, Tolay, and Huichica creeks.

Land uses adjacent to the NSMWA include agriculture, light industry, commercial, residential, and federal wildlife refuge and military installations. Agriculture is the most prominent private land use in the NSMWA region. Oat hay farms and vineyards are the principal agricultural enterprises and they are located to the west and north of the Napa River and Huichica Creek units. Commercial development adjacent to the Marshes occurs in Schellville, Napa, American Canyon, and Vallejo. Residential development exists adjacent to Management Units in Vallejo, Napa and American Canyon. The San Pablo Bay National Wildlife Refuge, managed by the USFWS, is located to the south of NSMWA.

This chapter describes the NSMWA Management Units and their acquisition history. Additional property description details regarding agricultural resources, soils, climate, hydrology, water resources, biological resources, cultural resources, and recreation and public access are provided in **Chapter 3**.

The management setting discussion includes descriptions of land ownership and leases, easements, legal constraints and agreements, existing infrastructure and its management, including water delivery and management, roads, levees, utilities, and houses and other structures and the regional planning context.

2.1 MANAGEMENT UNIT DESCRIPTIONS AND ACQUISITION HISTORY

The NSMWA is composed of 11 separate Management Units that together total approximately 14,000 acres (**Table 2-1; Figure 3**). A brief description of each Management Unit is provided below. Management units are organized by primary acquisitions/previous ownership and the proximity of land parcels. **Table 2-1** specifies the total area, habitat types, and vegetation communities in each Management Unit. Past, current, and planned restoration activities in each management unit are outlined in **Table 2-2**.

Table 2-1. NSMWA Management Unit dominant habitat types and vegetation communities.

Management Unit	Acreage (approximate)[1]	Dominant Wildlife Habitat Types (2008)[2]	Dominant Vegetation Types (2008)[3]
American Canyon Unit	452	Tidal marsh, upland grassland, seasonal wetland	Mixed Tule and Cattail, California Cordgrass, Non-native Forbs
Coon Island Unit	216	Tidal marsh, levees	Pickleweed, Mixed Scirpus, Mixed Tule, and Cattail
Green Island Unit	1,190	Salt ponds, levees	Non-native Forbs, Iceplant, Mixed Salt Marsh
Huichica Creek Unit	1,091	Upland grassland, seasonal wetland, managed former salt ponds	Annual Grasses, Mixed Tules and Cattail, Mixed Salt Marsh, Non-native Forbs
Napa River Unit	8,149	Managed former salt ponds, tidal marsh	Mixed Scirpus, Mixed Tule and Cattail, Mixed Salt Marsh, Pickleweed
Ringstrom Bay Unit	396	Tidal wetland, upland grassland	Non-native Forbs, Mixed Tule and Cattails, Mixed Salt Marsh
Sonoma Creek Unit	474	Tidal wetland, levees	Pickleweed, Mixed Salt Marsh, Coyotebrush-Gumplant
Tolay Creek Unit	349	Tidal wetland, levees, seasonal wetlands, open water	Pickleweed, Non-native Forbs, Meadows and Swales, Saltgrass-Alkali Heath
Southern Crossing Unit	260	Upland grassland, tidal wetland, levees	Saltgrass-Alkali Heath, Non-native Forbs, Mixed Salt Marsh
Wingo Unit	783	Open water, seasonal wetland (planned), levees	Areas with Little to No Vegetation, Non-native Forbs
White Slough Unit	383	Tidal marsh, levees	Mixed Scirpus, Mixed Salt Marsh, Mixed Tule and Cattails
TOTAL	13,777	—	—

[1] Acreages are approximate due to accretion within the NSMWA after purchase of parcels.

[2] Wildlife habitats are described in **Section 3.8.2.**

[3] Vegetation types are described in **Section 3.8.1.**

Table 2-2. NSMWA restoration and enhancement projects.

Management Unit	Restoration Project	Collaborators/ Funding Source	Status
American Canyon Unit	The Mini Novelli property (approximately 335 acres) was acquired, restored, and added to the American Canyon Unit by the City of Vallejo as mitigation for impacts from three projects. The freshwater mitigation site is 17.73 acres in size and is currently comprised of permanently flooded wetland, seasonal wetland, and a riparian corridor along American Canyon Creek (Demgen Aquatic Biology 1996). Project activities included creating a floodplain for the creek through excavation and re-grading, and planting native riparian and upland species. The saltwater mitigation site is 5.7 acres and receives flows from the Napa River.	City of Vallejo	Complete
Huichica Creek Unit	The Huichica Creek Native Grassland Restoration Project involved restoring upland nesting and feeding habitat for waterfowl, songbirds, and pheasants (Ducks Unlimited 2004). The project restored native, perennial grassland on approximately 25 acres of fallow pasture between 2000 and 2004. The restoration project involved weed removal, seedbed preparation, native plant seeding, and post-seeding management.	North American Wetlands Conservation Act (NAWCA) Grant[1]	Complete
Huichica Creek Unit	In 2002 the Huichica Creek Wetland Enhancement project installed a water control structure to improve water management and conveyance on 70 acres of palustrine emergent wetlands and wetland associated uplands (WCB 2004). A contour levee was constructed. The enhancement project provided critical habitat for waterfowl, shorebirds, wading birds, and other wildlife.	NAWCA	Complete
Huichica Creek Unit	Black walnut and coast live oak trees, and a row of wild rose bushes were planted at the Huichica Creek Unit to form a “living fence” that provides cover and food for the wildlife. Acacia employees also constructed a wildlife viewing blind at an adjacent location.	Acacia Winery, DFG	Complete
Huichica Creek Unit	As a subproject of the San Pablo Bay Tidal Wetlands Habitat Restoration Project, Pond 8 was converted from a hypersaline pond into a productive foraging pond (WCB 2004). Water is diverted from the Napa River through an improved water control structure with a fish screen and conveyed to Ponds 7/7A to dilute hypersaline brines. The project was designed in 2000 and constructed between November 200l and March 2002. Waterbird use and diversity increased in all the connected salt ponds within two years of the project.	NAWCA	Complete

Table 2-2. NSMWA restoration and enhancement projects.

Management Unit	Restoration Project	Collaborators/ Funding Source	Status
White Slough Unit	In 1989, the 23-acre Meadows Drive Mitigation Project was implemented in the White Slough Unit to compensate for wetland impacts resulting from bay fill by the City of Vallejo (Demgen Aquatic Biology 1990). The project site is bounded on the east by Meadows Drive, on the north by Catalina Circle, and to the southwest by a levee separating it from the Napa River's tidal marshlands. Channels were excavated to increase tidal exchange. The mitigation project restored and enhanced a mosaic of tidal and seasonal wetlands, small ponds, and upland habitats.	City of Vallejo, DFG	Complete
Ringstrom Bay Unit	A subproject of the San Pablo Bay Tidal Wetlands Habitat Restoration Project in 2004, the Ringstrom Bay Unit Project enhanced 313 acres of palustrine emergent wetlands by replacing degraded water control structures, installing additional water control structures, contouring of pond bottoms to increase habitat diversity and improve drainage, and improving perimeter levees. This wetland enhancement project provides critical habitat for waterfowl, shorebirds, wading birds and other wildlife in the San Pablo Bay area. (Ducks Unlimited n.d.[a]; WCB 2004).	NAWCA	Complete
Southern Crossing Unit	DFG is planning to enhance wildlife habitat at Southern Crossing by creating ponds and other grading to create habitat (Huffman 2007b).	DFG	Planned
Wingo Unit	In 2003–2004, the Camp 2 project was implemented as a subproject of the San Pablo Bay Tidal Wetlands Habitat Restoration project, enhancing 608 acres of palustrine emergent wetlands and associated uplands. Project activities included levee construction, pond bottom excavation, and installation of a new well to provide water for creating permanent freshwater wetlands. The ponds were designed for two operating levels: a full winter water surface elevation encompassing the entire area inside the pond's levee, and a lower, permanent pond. There are channels excavated on the pond bottom to collect and concentrate water as the pond water surface elevation drops. DFG maintains the pond throughout the summer not only to provide waterfowl brood rearing habitat, but also to maintain mosquito fish as mosquito larvae predators (WCB 2004; Ducks Unlimited n.d.[b]).	NAWCA	Completed, but flooding of the Camp 2 Unit from Sonoma Creek will necessitate rehabilitation of the restoration sites.
Tolay Creek Unit	This project will connect Tolay Creek to Sonoma Creek (historical channel) (Huffman 2008a)	None	Planned

Table 2-2. NSMWA restoration and enhancement projects.

Management Unit	Restoration Project	Collaborators/ Funding Source	Status
Tolay Creek Unit	The Tolay Creek Restoration Project, managed by DFG and USFWS, was initiated in 1997 to increase tidal flow to 435 acres of the channelized lower Tolay Creek and improve habitat for endemic tidal marsh species (Takekawa et al. 2002). The restoration project included rehabilitation of tidal flow to four areas: the Mouth, Lower Lagoon (South Tolay), Mid Channel, and Upper Lagoon (Central Tolay). Biophysical monitoring was conducted at the project site before and after the restoration activities. Flows have been restored at Tolay Creek from San Pablo Bay to SR 37, but tidal flow remains restricted between the Lower Lagoon and Upper Lagoon.	U.S. Fish and Wildlife, DFG	Construction complete; ongoing monitoring
Green Island Unit	Restoration of tidal action to the former wash ponds at the Napa Plant Site is scheduled for 2009. Design package preparation for restoring tidal action to the south unit of the Green Island Unit is scheduled for 2009, but construction funding sources are not currently identified. A habitat continuum would be created including: subtidal channels, intertidal marsh, ecotone, and grassland to benefit estuarine biota such as birds, fishes, and small mammals. It would re-establish wildlife corridors and connectivity of habitats at the landscape scale.	Wildlife Conservation Board	Planned; levees to be breached in 2009
Napa River Unit	To reduce the risk of catastrophic levee failure caused by strong wind and sustained rainfall, Pond 2A was restored to limited tidal action by a small controlled emergency breach on South Slough in January, 1995 (MEC Analytical Systems 1998; Wyckoff 2000). A team of hydrologists, biologists, and botanists monitored post-breach pond conditions. In September 1997, a second breach was established on China Slough by DFG, to enhance tidal flows in Pond 2A and increase tidal flow in China Slough. The increased tidal flows improved the marsh habitat for native vegetation, fish, and wildlife species. Since Pond 2A was never in agricultural production it has a higher bottom elevation than the adjacent ponds, creating an ideal situation for quick tidal restoration. Monitoring of the pond performed between 1996 and 2000 revealed that overall vegetation cover increased dramatically from 10% coverage to 90% coverage within five years (Jones & Stokes 2004a, 2004b).	Wildlife Conservation Board	Complete
Napa River Unit	An unauthorized breach (<0.45-meter wide) was excavated by unknown individuals in the levee between Pond 3 and South Slough on the north side of the pond in Aug. 2002 (Takekawa et al. 2004; Jones and Stokes 2004a, 2004b). While this breach provided some water exchange in Pond 3, it also is located very close to the siphon leading from Pond 3 to Pond 4, and it was feared that as it widen, it could undermine the siphon, leading to a possible release from Pond 4. In September 2002, DFG obtained an emergency exemption to create a small 2-foot-wide ditch on the southeast side of Pond 3 to take the pressure off the ditch on South Slough, by facilitating some circulation of water in and out of Pond 3 to Dutchman Slough.	DFG	Complete

Table 2-2. NSMWA restoration and enhancement projects.

Management Unit	Restoration Project	Collaborators/ Funding Source	Status
Napa River Unit	Tidal exchange at Little Island Farm, a muted tidal marsh, was enhanced by replacing existing water control structures (Huffman 2007a).	NAWCA	Complete
Napa River Unit, Huichica Creek Unit	The Napa River Marsh Restoration Project is comprised of three phases (CSCC 2006). In Phase 1 levees were breached to restore tidal action to Ponds 3, 4, and 5 in 2006. Enhancement of managed Ponds 1, 1A, and 2 (Phase 2) was implemented in 2007. The last phase of the project will consist of the restoration of Ponds 6, 6A, 7, 7A, and 8 to well-functioning managed ponds. The work for Ponds 6–8 will consist of infrastructure features, primarily water control structures, for salinity reduction and long-term water management. Ponds 7, 7A, and 8 are accessible by land and will remain managed ponds in the long term. Ponds 6 and 6A are island ponds surrounded by sloughs, and as part of the overall adaptive management strategy for the project, may be converted to tidal wetlands in 10 to 20 years.	California Coastal Conservancy, DFG, USACE	Environmental Impact Report (EIR) / Environmental Impact Statement (EIS) complete; restoration in progress

[1] NAWCA: North American Wetland Conservation Act partners include: Wildlife Conservation Board (Applicant), Shell Oil Spill Litigation Settlement Trust, U.S. Fish and Wildlife Service, CALFED, California Department of Fish and Game, Ducks Unlimited, United Heckathorn Trustee Council, Sonoma Land Trust, Save the Bay, Bureau of Reclamation, Marin/Sonoma Mosquito Abatement District, Pacific Gas and Electric, Natural Resource Conservation District, Sonoma community Foundation and Sonoma County Fish and Wildlife Board.

2.1.1 Green Island Unit (Napa Plant Site)

The Green Island Unit (formerly Napa Plant Site) on the east side of the Napa River is a 1,190-acre former salt production facility that was added to the NSMWA in 2003. The Green Island Unit is situated in the floodplain of the Napa River approximately 5 miles north of the confluence with San Pablo Bay (URS 2006a). South and west of the site is the Napa River, which is used for commerce and recreation. The riverine habitat is flanked in various locations by intertidal mudflat, emergent marsh and armored levees. A closed municipal landfill (American Canyon Sanitary Landfill) and a State Lands Commission ponded parcel at the historic mouth of North Slough are located south of the site. East of the site is a mixture of wetlands; agriculture, including the Green Island Vineyard, an apiary (also known as a bee yard), and grazing; open space; residential homes; Napa County Airport; Napa County Airport Industrial Park; City of American Canyon wastewater treatment facilities; and industrial wrecking yards. To the north of the site is Fagan Marsh Ecological Reserve, a large wetland owned by DFG. The Cuttings Wharf Marina, located northwest of the site, contains a park and allows public access to the west side of the Napa River. The Milton Road residential community is located in Napa County, on the western bank of the river opposite the Green Island Unit.

Existing conditions of the site are largely a function of the contemporary land use regime. Salt ponds, levees, and water conveyance channels occupy over 90% of the site. Other habitats and land uses include relatively small areas of tidal marsh, seasonal wetland, and uplands with commercial and residential facilities. As part of the purchase agreement, Cargill Salt Company (Cargill) is currently removing residual salt in the ponds. Restoration of tidal action to approximately 83 acres, the former wash ponds (North Unit), began in 2008. Levee breaching at the wash ponds occurred in September of 2009. The South Unit received Federal Stimulus Funds for construction to restore tidal action that is scheduled for 2010.

Acquisition History: In March 2003, the 1,460-acre Napa Plant Site, a former salt production facility, was acquired from Cargill Salt, as part of the larger State of California, federal, and privately sponsored purchase of 16,500 acres of salt ponds in the San Francisco Bay Estuary (URS 2006a). It is anticipated that the 219 acres of Ponds 9 and 10 of the former Napa Plant Site (breached in 2009) will be managed as a part the Fagan Slough Ecological Reserve once the Napa Plant Site Restoration Project monitoring is complete (about 2022). A small parcel totaling 9 acres was donated by Cargill in 2004.

2.1.2 Coon Island Unit

Coon Island Unit, formerly known as Coon Island Ecological Reserve, is located approximately 4.5 miles south of the City of Napa on the west bank of Napa River, between Napa Slough and Mud Slough. It is surrounded by the former salt ponds on the west, northeast and southwest, and Fly Bay (Huichica Creek Unit) on the north. It is a 216-acre natural island formed from centuries of sedimentation (CDFG 1975). It is high marsh, inundated by tides of 5.5 feet or higher. This Unit preserves the natural distribution of plant associations once found throughout the NSMWA

and provides habitat for the endangered California clapper rail (*Laterallus jamaicensis obsoletus)* and salt marsh harvest mouse (*Reithrodontomys raviventris*). Both fresh and salt marsh plant species are found here, characteristic of the cyclical salinities typical under estuarine conditions. It supports the best stand of Pacific cordgrass (*Spartina foliosa*) in the Bay Area (Jones & Stokes 2004a, 2004b). Other common species at the site include pickleweed (*Salicornia* spp.), alkali bulrush (*Schoenoplectus robustus),* common three-square (*Schoenoplectus pungens)*, California tule (*Schoenoplectus californicus*), and cattail (*Typha* spp.). Coon Island is fairly flat and uniform except for seven potholes created along the west side of the island in the 1940s and 1950s to facilitate waterfowl hunting (CDFG 1975; Wyckoff 2000; Huffman 2007b).

Acquisition History: The Coon Island Unit, also known as the Dutchman Slough Unit, consists of one 216-acre parcel managed under a 66-year lease from the State Lands Commission granted on September 29, 1975 (Lease # 5052.9).

2.1.3 American Canyon Unit

American Canyon Unit is approximately 451.6 acres bordered by the Napa River on the west, American Canyon Landfill on the north, the City of American Canyon on the east, and the White Slough Unit on the south. Within the last decade, natural breaches have hydrologically connected the Unit to the Napa River (CDFG 2008) diversifying plant and wildlife communities. Currently, tidal wetland comprised of shallow subtidal habitat, intertidal mudflat, and emergent marsh are the dominant habitats, but the southeastern portion of the site also contains freshwater marsh fed by flows diverted from American Canyon Creek, riparian, upland and seasonal wetland habitats.

Acquisition History: The American Canyon Unit was formed from three land acquisitions:

- On November 22, 1983, two of the parcels (90.17 acres and 37.94 acres) were acquired as mitigation for the American Canyon Landfill.
- On October 10, 1989, the third parcel (323.49 acres) in this unit was obtained on a 49-year lease from the State Lands Commission (Lease #7194).

The former Port of Oakland property adjacent to the American Canyon Unit and currently owned by the City of American Canyon is anticipated to become a part of the American Canyon Unit in the future.

2.1.4 Napa River Unit

The approximately 8,149-acre Napa River Unit is the largest Management Unit in the NSMWA and is divided into seven distinct areas. Little Island Farms, Ponds 2/2A, 3, 4, 5, 6/6A are islands while Pond 1/1A is accessible by land. The Napa River Unit is located immediately west of the Napa River, between Dutchman Slough and the Huichica Creek Unit and is comprised of former salt evaporation ponds and levees, with fringing marsh and sloughs. To the west are grasslands and seasonal wetlands at Skaggs Island. The U.S. Fish and Wildlife Service (USFWS) owned

tidal lands and seasonal wetlands (Cullinan Ranch) lie to the South. Major waterways between the islands include the following USFWS-owned or USFWS-leased tidal lands: Dutchman, South, Napa, and Devil's sloughs.

Ponds 1, 1A, 2, 6, and 6A (former Cargill numbers) are currently operated as managed ponds. Ponds 6 and 6A are hydrologically connected via a siphon to Pond 5 of the Huichica Creek Unit. The Little Island subunit is tidally fed via water control structures to adjoining sloughs. An intake canal at the San Pablo Bay conveys water under State Route 37 into Ponds 1, 1A, and 2. The intake canal has not been dredged since the early 1970's and is continuing to collect silt. Ponds 3, 4, and 5 breached to the Napa River in 2006 and 2007 (SFBJV 2007). Tidal marsh vegetation has colonized Pond 2A since it was breached in two places in 1995 and 1997. Over the next ten years (from 2008), Ponds 1, 1A, 6, and 6A will remain managed ponds.

Acquisition History: This unit was established through four land purchases. In 1994, three parcels were purchased from Cargill Salt with funding from The Shell Oil Spill Litigation Settlement Trustee Committee, The State Lands Commission, The California Wildlife Conservation Board (CWCB), and the California State Coastal Conservancy (CSCC). These purchases included the Fly Bay parcel, which is a part of the Huichica Creek Unit (see **Section 2.1.9**). The Little Island Farms subunit, 335 acres (also known as South Slough), was acquired in 2002 with funding from Proposition 12.

2.1.5 White Slough Unit

The White Slough Unit comprises 21 parcels, totaling approximately 383 acres. The unit is comprised of two distinct sections separated by private land. The northern area of the unit is located immediately south of the American Canyon Unit, along the east shore of Napa River. Residential development forms the parcel's eastern boundary. A majority of the site is tidal brackish marsh, and seasonal wetland and upland grassland situated adjacent to Meadows Drive, Vallejo. The southern portion of the unit is located about a mile south of the northern portion, immediately north of SR 37 and east of the Vallejo Flood Control and Sanitation District Pump Station.

The White Slough area was "reclaimed," i.e., separated from the Napa River by a levee at the turn of the century and occupied by upland uses until high flow events triggered repeated levee breaches in the 1960s and 1970s. The levee failures led to the reestablishment of emergent marsh vegetation and a tidal slough network tributary to the Napa River. The main slough channel also provides tidal exchange to the tidal area south of SR 37, outside the White Slough Unit.

Acquisition History: The approximately 383-acre White Slough Unit comprises 21 land parcels. The first parcel of 38.02 acres was donated by the Napa County Land Trust on March 16, 1979. Additional parcels comprising this unit were obtained as mitigation from the City of Vallejo and mitigation from the California Department of Transportation (Caltrans) for the widening of SR 37. The first of these parcels was acquired on May 29, 1980, followed by one parcel on February 8, 1983; December 12, 1984; and two parcels on May 13, 1988. Several additional

parcels of this unit, including Slaughterhouse Point, are leased from the State Lands Commission (Lease #7164.A).

2.1.6 Ringstrom Bay Unit

Ringstrom Bay Unit is approximately 396 acres and located on the northwestern corner of the NSMWA. It is bordered by vineyards on the north and northeast, seasonal wetlands or diked farmlands on the southeast and northwest, and the Wingo Unit on the southwest. The unit consists of diked saline seasonal wetlands, muted tidal, brackish marshes, moist grasslands, and seasonal marsh. Ringstrom Unit is managed with both reclaimed water and muted tidal flushing from Steamboat Slough through operation of a tide gate. Ringstrom Bay typically receives reclaimed water from September through November 1 (Parson and Martini-Lamb 2003). Oat, barley and vetch has been farmed on small strips throughout the unit by DFG to enhance foraging and breeding habitats for upland game birds and waterfowl (Huffman 2007b).

Acquisition History: The 396-acre Ringstrom Bay Unit was formed from the acquisition of four land parcels. The unit was initiated with the acquisition of a 187.73 acre plot purchased from the Buena Vista Winery using Proposition 19 funds (Fish and Wildlife Enhancement Bond Act of 1984). Two parcels were purchased from the Millerick Family using Proposition 70 funds: 106.47 acres on May 31, 1989, and 11.60 acres on February 6, 1990. The final acquisition in the Ringstrom Bay Unit was a 102.20-acre expansion on April 24, 1996, purchased from Herold Masnada using Proposition 70 funding.

2.1.7 Sonoma Creek Unit (West End)

Sonoma Creek Unit, also known as West End, is bordered by Sonoma Creek on the west, Napa Slough on the north, SR 37 and San Pablo Bay National Wildlife Refuge on the south, and privately held wetland on the east. This approximately 474-acre unit was formerly the West End Duck Club, and it is currently a muted tidal marsh, operated with tide gates fully open to allow tidal exchange.

Acquisition History: The 1994 State Lands Commission transaction purchasing the Napa River Unit included the purchase of the Sonoma Creek Unit. The Sonoma Creek Unit is leased by DFG from the State Lands Commission (Lease #8082.9) (Woodward-Clyde 1997; Huffman 2007b).

2.1.8 Southern Crossing Unit (Stanly Ranch)

Southern Crossing Unit, also known as Stanly Ranch, is approximately 260 acres composed of pasture, seasonal wetland, and drainage channels. It is bordered by the Napa River on the east and south, vineyards on the west, and SR 29/12 on the north. The property encompasses wetlands and historic tidal wetlands along the Napa River south of the Maxwell Bridge on SR 29 (SFBJV 2004). The current management includes grazing with an anticipated plan to restore seasonal and tidal wetland habitat.

Acquisition History: The Southern Crossing Unit was formed from five parcels (totaling 260 acres) acquired from Stanly Ranch Vineyard, LLC, with Proposition 50 funding in 2004.

2.1.9 Huichica Creek Unit

Huichica Creek Unit is approximately 1,091 acres bounded on the north by the Southern Pacific Railroad and vineyards; on the east by Milton Road along the Napa River; on the south by the Napa Slough and the former salt ponds of the Napa River Unit; and on the west by vineyards and grazed and farmed baylands.

The Huichica Creek Unit consists of a wide range of habitats, including saline seasonal wetland, tidal marsh, moist grassland, managed ponds, riparian and freshwater pond. Managed seasonal wetlands providing habitat for migrating and over-wintering waterbirds are the most abundant habitat type within the unit. The seasonal wetlands are actively managed using tide gates to allow tidal flooding during the fall and early winter.

Pond 8 of Huichica Creek Unit

Two ponds were excavated to enhance wildlife habitat in the upland areas bordering the managed seasonal wetlands. Pond vegetation is dominated by cattails and rushes. A seasonal pond, flooded principally with precipitation, some upland run-off, and tidal overflow from a nearby creek, also occurs within the unit. The ponded area contains a variety of seasonal wetland vegetation communities depending on the depth and duration of inundation (Parson and Martini-Lamb 2003).

The Fly Bay subunit, a 230-acre remnant tidal marsh in the southeastern portion of the unit, provides valuable habitat for the endangered California clapper rail and salt marsh harvest mouse. The 246-acre parcel north of Fly Bay consists of a managed tidal marsh and a small area of predominantly non-native annual grassland on and adjacent to levees. Water reaches the parcel through flooding from Fly Bay or runoff from the adjacent lands to the north.

Several former salt ponds are included in the Huichica Creek Unit, including Ponds 7, 7A, and 8. All ponds are north of the Napa Slough. Pond 7 contains an unbalanced salt similar to bittern, which remains after sodium chloride is harvested. Pond 7A originally contained highly saline

pickle water, but now contains water from the Napa River. Ponds 7, 7A, and 8 are managed ponds and will remain so in the foreseeable future. Salinity in Ponds 7A and 8 varies seasonally. Pond 8 salinities are similar to the salinity in the Napa River. Pond 7 salinities may reach 300 parts per thousand during late summer when evaporation concentrates the salt. Restoration of these ponds will include dilution of the bittern, repair of water control structures, levee repairs and installation of public access features (CSCC 2006).

Acquisition History: The approximately 1,091-acre Huichica Creek Unit was formed from seven land purchases.

- February 4, 1983: The first two parcels of land acquired in this unit were 324.59 acres and 14.10 acres purchased from Manuel Cabral.
- February 16, 1984: An easement was purchased (1.2 acres) from Joseph P. Cabral, Jr., to access the Huichica Creek Unit.
- July 31, 1984: 245.52 acres were purchased from Kratzman Bloom Properties, expanding the Huichica Creek Unit.
- December 10, 1984: 160.96 acres were purchased from George Luiz using funds from the 1984 Fish and Wildlife Enhancement Bond Funds.
- April 30, 1991: 62.45 acres were purchased from Evelyn Cabral using Proposition 70 funding (California Wildlife, Coastal and Parkland Conservation Act of 1988).
- The Hudeman Slough parcel comprising 38.81 acres was purchased from Cargill Salt in 1994.
- Fly Bay, approximately 243 acres, was a part of larger purchase of parcels for the Napa River Unit in 1994 (see **Section 2.1.4**).

2.1.10 Tolay Creek Unit

The Tolay Creek Unit consists of two sections. The northern portion of the Tolay Creek Unit is on the north side of SR 37, while the southern portion of Tolay (Tubbs Island and Midshipman Slough) lies on the south side of the highway. Both sections are along lower Tolay Creek.

The approximately 191-acre Tolay Unit (north section) was constituted between 1990 and 1992. The Unit is bordered on the west by SR 121 and Infineon Raceway, on the south by SR 37, on the east by Tolay Creek, and diked farmlands (vineyards) on the north. A gravel road provides access to the Tolay Creek Unit parking lot. The road easement passes over private land used as overflow parking for the raceway located on the west side of SR 121. Tolay Creek was historically connected to Sonoma Creek to the east by tidal sloughs but is now silted in. DFG is planning to re-establish the connection between the two creeks (Huffman 2007a). Seasonal wetland and moist grasslands are the dominant habitat type in the northern portion of the Unit.

Acquisition History: Tolay Creek Unit (north) covers approximately 191 acres, obtained through three land acquisitions using Proposition 70 funds. One parcel of approximately 99 acres was purchased in 1990 from the Roche Winery. Two other acquisitions of 57.08 acres and 34.68 acres were made from the Roche Winery in 1992. One road easement was granted to the DFG on an adjoining parcel of land owned by Brenda Raceway Corporation (Infineon Raceway) for public access to the Tolay Creek (north of SR 37) parking lot.

The southern portion of the Tolay Creek Unit, approximately 158 acres, is comprised of two subunits, Tubbs Island and Midshipman Slough. Tubbs Island is located immediately south of SR 37 and is an intertidal lagoon. This subunit is bordered by private hay farms on the north, east, and southeast (Huffman 2007b). Midshipman Slough is a tidal lagoon approximately 2 miles south of SR 37. This subunit is surrounded by USFWS land, with Tubbs Island on the south and northeast, Sonoma Land Trust's Sears Point Restoration Project on the west and northwest.

Acquisition History: The southern portion of the Tolay Creek Unit consists of approximately 158 acres obtained in two land acquisitions using Proposition 70 funds. The first acquisition of 105 acres was made from Home Savings of America in 1986. The final purchase of three parcels totaling 53.30 acres were purchased from the Vallejo Sanitation and Flood Control District in 1996. The upland portion of the Sears Point Restoration project may be added to the Tolay Creek Unit. DFG is collaborating with USFWS, Sonoma Land Trust (SLT), CWF, Ducks Unlimited, North Bay Joint Venture, and Southern Sonoma Resource Conservation District to acquire a mosaic of habitat in the area (Huffman 2007a).

2.1.11 Wingo Unit

Wingo Unit is approximately 783 acres located on the northwestern corner of NSMWA, immediately southwest of the Ringstrom Bay Unit. The site is bordered by levees and tidal sloughs including Sonoma Creek to the west and south, Railroad Slough to the north, and Steamboat Slough to the east. Adjacent land use is mostly agricultural, with the exception of the managed marsh along a portion of its western boundary (SSCRCD 1996). Oriented north–south, the Southern Pacific Railroad passes through the center of the Unit along a narrow parcel owned by the railroad. The 174-acre subunit on the east side of the railroad was used for hayfield and/or pastureland for over 150 years. The parcel was flooded in 1998 and is no longer farmed. The site was below sea level due to land subsidence and became a seasonal wetland with pools before being flooded by levee breaches on the northern boundary in 2006 (Huffman 2007b).

The subunit on the west side of the railroad was formerly used to cultivate oat hay (URS 2000) with some seasonal wetland, drainage ditches and grassland/other uplands before the 2006 levee breaches. DFG is currently working with the North Coast Railroad Authority to repair the railroad track that was damaged during the levee breaches, and to dewater the unit. The western subunit will be restored to shallow seasonal wetlands, while the eastern subunit will be restored to tidal marsh as mitigation for wetland impacts associated with railroad repairs (Huffman 2007b).

Wingo Unit is in the lower reaches of the 160-square mile Sonoma Creek Watershed (SSCRCD 1996). The long-term management objective is to use the Wingo Unit as Sonoma Creek floodplain while providing valuable wildlife habitat. This will require collaborative efforts among the different agencies and stakeholders, extensive planning and permitting, sufficient funding, and more in-depth studies (Huffman 2007a). A collaborative study has been conducted by the U.S. Army Corps of Engineers (USACE), San Francisco Estuary Institute (SFEI), and the Sonoma Ecology Center to gather information on the Sonoma Creek Watershed (McKee et al. 2000).

Acquisition History: The approximately 783-acre Wingo Unit was obtained from three land purchases. The first parcel of 174 acres was purchased from Enrico and Barbara Gallo on May 6, 1988. On July 22, 1998, the 528.4 acres of Camp Two were purchased from the James and Pamela Helen Trustees and Gary Kiser. The remaining 80.3 acres of Camp Two were acquired on December 10, 1998, from the Millerick Family Limited Partnership.

2.2 LAND OWNERSHIP AND LEASES

The land comprising the NSMWA is owned by the State of California, either by the DFG or by the State Lands Commission and leased to the DFG. Coon Island, American Canyon, portions of White Slough, and the Sonoma Creek Management Units are under lease to DFG from the State Lands Commission (Lease #5052.9, 7194, 7164.A and 8082.9, respectively) (**Figure 4**). All lands owned by the State Lands Commission are held in trust by the state for all present and future generations. State lands may not be sold for development incompatible with uses covered by the Public Trust Doctrine. The Public Trust Doctrine provides that waterways are used for "commerce, navigation, and fisheries"; later court rulings expanded the definition to include hunting, fishing, swimming and recreation, and "preservation of those lands in their natural state" (State of California 2008). Leases to the DFG in the NSMWA are typically for 50 to 100 years and thereafter are renewable. Lease agreements specify what activities can take place on the lands. However, leases of lands in the American Canyon and the White Slough units do not specify whether the lands should be kept open or closed to hunting. DFG considers the proximity of these units to dense residential development in determining whether to permit hunting.

2.3 EASEMENTS AND RIGHTS-OF-WAY

Easements and rights-of-way (ROWs) are legally recorded documents encumbering a property's deed and are, therefore, transferred with the property from owner to owner. Easements typically preserve the rights of an entity other than the landowner. Within the NSMWA there are easements that exist for the purpose of maintaining, repairing, replacing, and installing roads, railroads, power lines, utility lines, and pipelines needed for regional public works. The major types of easements and the dominant easement owners are described below the listing of each easement and/or ROW provided in **Table 2-3**.

Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 4

Owned and Leased Lands

Management Units
- Owned (DFG)
- Leased (State Lands Commision)

Other
- Ecological Reserve (DFG, current)
- Ecological Reserve (DFG, future)

- Highway
- Paved road
- Closed to public
- Power line
- Railroad

Base imagery: Airphoto USA, 1 April 2007, 0.3-meter cell size

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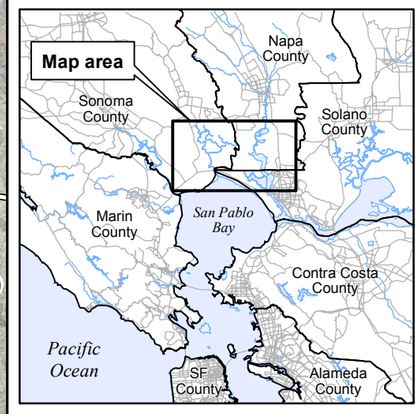

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Table 2-3. Easements and rights-of-way in the NSMWA.

Parcel History #	Easements and Rights-of-Way Present	Location Description of Parcel	Assessor Parcel Number (APN)	County	Notes
Napa River Unit					
821369	PG&E road, pole lines, and boardwalk along power lines, underground phone lines, submarine cable, public access to water for recreation, commerce, navigation and fisheries easement	Ponds 1, 1A, 2A, 3, 4, Knight Island #1	00067-0020-0007 00067-0020-0008 00067-0020-0009 00067-0020-0010 00067-0020-0011 00067-0020-0012 00067-0030-0003 00067-0030-0004 00067-0030-0007 00067-0030-0009 00067-0030-0010 00067-0030-0016 00067-0040-0002	Solano	DFG took title to 32 parcels. The California State Lands Commission (SLC) contributed $500,000 and received title to three parcels. A Memorandum of Understanding (MOU)—not present in the documents—provides for the DFG to enter into an agreement to manage the SLC parcels, easement granted to Sears Point Toll Road Company for toll road, besides public access and above mentioned agreement all easements are granted to PG&E.
822096	Public rights for commerce, navigation, fisheries, water courses, oil and gas leases	Little Island Farms (South Slough)	00067-0020-0050	Solano	Easement in connection with mineral rights recorded on November 16, 1964, American Petrofina Exploration Company leased land from Bank of America National Trust under an oil and gas lease in 1974 and 1975.
Huichica Creek Unit					
820445	PG&E lines	—	00067-0220-0008 00067-0220-0009 00067-0220-0010 00067-0220-0011	Solano	PG&E easement from Albert Ferrari on October 17, 1962
820567	Gas pipelines, pole lines	—	00128-0491-0010	Sonoma	—
820593	Road, pole lines, public utilities	—	00047-0320-0020	Napa	Road easement along Duhig Road at intersection with Ramal Road; provides access to headquarters

Table 2-3. Easements and rights-of-way in the NSMWA.

Parcel History #	Easements and Rights-of-Way Present	Location Description of Parcel	Assessor Parcel Number (APN)	County	Notes
820646	Levee, PG&E utilities, public access for recreation, road	—	00048-0020-0015	Napa	ROW to pole lines by Great Western Power Company, PG&E and Pacific Telephone and Telegraph; ROW for road to the County of Napa; levee and various ROWs to John Henry Wilbur Stuart, et al.; right to slant drill below a depth of 500 feet for various chemicals and minerals, etc., to Krantzman-Bloom Properties.
820647	Levee, road ROW, drainage ditches, flood gates	Expansion #1 (west of Fly Bay)	00048-0010-0003	Napa	No additional details in parcel history files
821102	Road, utility, pipelines, appurtenant rights	Expansion #2: on February 13, 1991, the acquisition of 62.45 acres of land in the Napa Marsh took place for watershed marsh and riparian habitat pre-servation and improved public access to the NSMWA	00047-0320-0025	Napa	In 1991, the State acquired a 62-acre parcel at Duhig Road, subject to a 10-year residential lease, created to cover occupants living in duplex on property
821249	Utilities, public access, ROW, revisionary rights, railroad	—	00048-0010-0008	Napa	—
White Slough Unit					
820466	Sewer pipeline	Sandpiper Point	00067-0050-0050 00067-0050-0046	Solano	Easement granted to Vallejo Sanitation and Flood Control District to locate, relocate, construct, reconstruct, alter, use, maintain, inspect, repair and remove an underground sanitary sewer pipeline, together with appurtenant pump station, fencing and other facilities deemed necessary
820668	Commerce, navigation, fishery, waterlines, pole lines, public utilities, water rights	Sandpiper Point	00067-0050-0063	Solano	Water rights to the City of Vallejo; ROW for pipelines and pole lines to National Oil and Transportation Company

Table 2-3. Easements and rights-of-way in the NSMWA.

Parcel History #	Easements and Rights-of-Way Present	Location Description of Parcel	Assessor Parcel Number (APN)	County	Notes
820782	Public trust over tidelands for fisheries/navigation in river, utilities, storm drain, water supply	Sandpiper Point	00067-0050-0065	Solano	No additional details in parcel history files
820783	Public access to river, storm drain, PG&E access and electrical purposes	Sandpiper Point	00067-0441-0022 00067-0451-0003	Solano	No additional details in parcel history files
821158	Public access	1.5 miles north of Slaughterhouse Point	00058-0050-0036 00058-0050-0037 00058-0050-0038	Napa	No additional details in parcel history files
821159	Public access	1.5 miles north of Slaughterhouse Point	00058-0050-0040	Napa	No additional details in parcel history files
Tolay Creek Unit					
820707	Navigation and fishery in Midshipman Slough, easement for vehicular and pedestrian ingress and egress for levees	Midshipman Slough	00068-0160-0008	Sonoma	Home Savings of America grants an easement to state of California for vehicular and pedestrian ingress and egress for levee repair or other water control devices
820956	Public Access to Tolay Creek	—	00068-01900-0024 00068-01900-0025	Sonoma	
820965	Public trust, flood control	Steamboat Slough Expansion #3	00135-0071-0017	Sonoma	This parcel history transaction addresses a boundary line adjustment for this parcel. More detail on easements for this APN under Parcel History #820801. Landowner took over maintenance of levee.
821129	Land conservation contract	—	00068-0190-0027	Sonoma	No additional details in parcel history files
821167	Land conservation contract	Expansion #2	00068-0190-0028	Sonoma	No additional details in parcel history files
821459	Ingress and egress, public rights for recreation, surrender access rights and abutters rights to SR 37	Expansion #3 Tubbs Island (acquisition of 53 acres of land adjacent to Tolay Creek on November 5, 1996)	00068-0190-0018 00068-0190-0019 00068-0190-0020	Sonoma	No additional details in parcel history files

Table 2-3. Easements and rights-of-way in the NSMWA.

Parcel History #	Easements and Rights-of-Way Present	Location Description of Parcel	Assessor Parcel Number (APN)	County	Notes
821473	Gravel road easement, ingress and egress for property in the County of Sonoma	—	00068-0190-0030	Sonoma	Easement granted by DFG to Department of Transportation for Gravel Road; granted by landowner Brenda Raceway Corporation. The State of California was granted a permanent easement for ingress and egress to their property in the County of Sonoma.
821478	PG&E gas lines and pole lines, disposal of reclaimed water	Steamboat Slough Expansion #4	00135-0071-0012	Sonoma	No additional details in parcel history files.
Ringstrom Bay Unit					
820801	Road, pipelines, incidental purposes, land conservation contract	On Steamboat Slough	00128-0491-0004 00135-0071-0017	Sonoma	Ramal Road within the Ringstrom Bay unit granted to be used as public access. A land conservation contract exists for the property; no details are described in the parcel history file. PG&E pipeline and electrical transmission line easement.
820918	Access, public trust, levee maintenance, repair, sewer easement	Steamboat Slough Expansion #2 (acquisition of 106 acres on November 15, 1988, in the Napa Marsh Complex for restoration and wetland preservation	00135-0071-0015	Sonoma	Easement granted to Sonoma Valley Sanitation District for access to 500+ acres of DFG property for sewer activities

Table 2-3. Easements and rights-of-way in the NSMWA.

Parcel History #	Easements and Rights-of-Way Present	Location Description of Parcel	Assessor Parcel Number (APN)	County	Notes
Southern Crossing Unit					
822097	Vehicle ingress and egress to/from shore of Napa River for load-unload river boats, underground utilities and waterlines, private utilities, septic field, pole lines, gas lines, navigation	Expansion 1 - Stanly Ranch	00047-2400-0017	Napa	Conservation easement granted by Stanly Ranch Vineyards to the State of California.
			00047-0240-0023	Napa	Conservation easement granted by Stanly Ranch Vineyards to the State of California. Stanly Ranch Vineyards granted the State of California vehicular ingress/egress easement in 2004. Flowage easement also for this APN.
			00047-0240-0024	Napa	No additional details in parcel history files
			00047-0240-0025	Napa	No additional details in parcel history files
			00047-0240-0026	Napa	Conservation easement granted by Stanly Ranch Vineyards to the State of California
Wingo Unit					
820777	PG&E pole lines, incidental purposes	Steamboat Slough Expansion #1 (on May 19, 1988, the purchase of 174 acres of agricultural lands within the Napa Marsh Complex)	00128-0491-0003	Sonoma	No additional details in parcel history files
821623	Road easement, public water access easement, public road easement, public trust easement for the purpose of commerce, navigation and fisheries over and across waters of Dutchman and South Sloughs	—	00048-0020-0006	Napa	Permit P.R.C. No. 5052.9 states that the DFG has a Public Agency Permit, to expire in 2041, for wildlife management, public recreation or other public trust activities at Cullinan Ranch. Approved by SLC in September 1975.

Table 2-3. Easements and rights-of-way in the NSMWA.

Parcel History #	Easements and Rights-of-Way Present	Location Description of Parcel	Assessor Parcel Number (APN)	County	Notes
821741	Road ROW, PG&E poles and facilities, levee maintenance (100 feet) along Sonoma Creek	Camp Two	00128-0491-0051	Sonoma	M.B. Skaggs has a road easement granted by the State of California, Sonoma County Flood Control and Water Conservation District has an easement to maintain existing levees, Joseph H. Redding has an easement for road ROW purposes, ingress and egress
821764	Road ROW, ingress and egress, PG&E pole lines, levees	Camp Two North	00128-0491-0050	Sonoma	ROW easement to M.B. Skaggs and heirs; easement granted to the Sonoma County Flood Control and Water Conservation District to reconstruct, repair and maintain existing levee on the westerly side of the centerline of the existing easterly levee of Sonoma Creek; ROW to Joseph Redding and heirs.
822083	Navigation, service facilities, incidental, hazard purposes, county road (Green Island Road)	—	00058-0010-0001 00058-0010-0002 00058-0010-0003 00058-0010-0004 00058-0010-0005 00058-0010-0006	Napa	No additional details in parcel history files

2.3.1 Levee Easements

The Sonoma County Flood Control and Water Conservation District holds easements for levee reconstruction, repair, and maintenance in the Wingo and Ringstrom Bay Units of the NSMWA. There are also easements for levee maintenance in the Huichica Creek and South Tolay Units (**Table 2-3**).

2.3.2 Union Pacific Railroad Right-of-Way

There are no railroad easements in the NSMWA. Railroads do pass through the NSMWA, but the DFG does not own the land where the tracks lie. The railroad passes through Wingo Unit, Tolay Creek Unit, and Huichica Creek Unit.

2.3.3 California Department of Transportation Right-of-Way

Caltrans holds ROWs along SR 37 and SR 121. Projects located in the ROW (Ponds 1, 1A, 2A, and 4 of Napa River Unit, Tolay Creek Unit, Sonoma Creek Unit, and White Slough Unit) may require Caltrans approval and/or an encroachment permit.

2.3.4 PG&E Easement

PG&E holds easements through the American Canyon, White Slough, Sonoma Creek, Huichica Creek, Napa River, Ringstrom Bay and Wingo Unit to allow for placement and necessary maintenance of transmission lines. Management activities in the PG&E easements area may require PG&E approval.

2.3.5 Road Easements

DFG holds several road easements on lands adjacent to the NSMWA. These include an easement on a parcel owned by Brenda Raceway Corporation that is used as overflow parking for the raceway on the eastside of SR 121. This road easement provides access to the parking lot at Tolay Creek (Tolay Creek north of SR 37). Another road easement exists along Duhig Road just south of the intersection with Ramal Road.

Road easements granted to private and public entities within the NSMWA are outlined in **Table 2-3**. These ROW easements typically provide farmers and other local landowner access across DFG property to their landholdings.

2.3.6 Other Easements

An easement, to be granted to the Napa County Regional Park and Open Space District, is currently pending for public access across the American Canyon Unit as part of the Bay Trail (**Appendix A**). A list of the other easements within the NSMWA, such as gas pipeline, submarine cables, and underground phone lines, is provided in **Table 2-3**.

2.4 WATER RIGHTS, DELIVERY, AND MANAGEMENT

2.4.1 Water Rights

The primary sources of water for the NSMWA are the Napa River, Sonoma Creek, Tolay Creek, Huichica Creek, and the San Pablo Bay. The NSMWA obtains the majority of its water through two kinds of water rights: riparian and appropriative, with riparian comprising the largest use. There is also limited use of ground water.

2.4.1.1 Riparian Rights

Riparian rights usually come with owning a parcel of land that is adjacent to a source of water and the landowner is entitled to use a correlative share of the water flowing past his or her property . DFG exercises riparian rights throughout much of the NSMWA (Forsberg 2008).

2.4.1.2 Appropriative Rights

DFG has one appropriative water right issued by the State Water Resources Control Board (SWRCB) on April 11, 1996 (Application No. A029407, Permit No. 20836), for diversion of 1,000 acre-feet per year from Huichica Creek between October 1 and June 15. The water is diverted into the Intake Pond NW of Pond 7A through a 36-inch culvert. Flows discharge through a 36-inch culvert into an outlet pond. From here, water either exits the outlet pond to a tidal section of Huichica Creek, or, depending on the tidal cycle, may reverse flow back into Intake Pond NW (inlet) and back into Huichica Creek at the point of diversion.

This appropriative water right is currently permitted, but has not yet been licensed by the SWRCB. In order for a license to be issued, DFG needs to demonstrate that project construction is completed, the terms and conditions of the permit have been met, and the largest volume of water under the permit is put to beneficial use. This license is the final confirmation of the water right and remains effective as long as its conditions are fulfilled and beneficial use continues. Yearly reports of water diverted have been and continue to be sent to SWRCB. DFG is working on pursuing a license for this appropriative water right.

2.4.1.3 Ground Water

In most areas of California, overlying land owners may extract percolating ground water and put it to beneficial use without approval from the SWRCB or a court. California does not have a permit process for regulation of ground water use. DFG utilizes ground water from the following three wells: the Ranch Agricultural Well, the Buchli Well, and the Domestic Ranch Headquarters Well, all in the Huichica Creek Unit (Forsberg 2001).

Groundwater from the Ranch Agricultural Well maintains three freshwater ponds in the Huichica Creek Unit that cooperatively provide water to supply turf sprinklers to generate transpiration data for a Cimas weather station and drip irrigation for a neighboring demonstration vineyard run

by Napa County Resource Conservation District. Production is approximately 6.5 acre-feet per year.

Groundwater drawn from the Buchli Well maintains two freshwater ponds in the Huichica Creek Unit and a 0.75-mile drip line for native shrub and tree propagation. Production is approximately 3 acre-feet per year.

Groundwater from the Domestic Ranch Headquarters Well services the two residences and 1 mile of drip irrigation lines for native trees and shrubs. Production from this well is approximately 1.5 acre-feet per year.

2.4.1.4 Other Water Agreements

In addition to riparian and appropriative water rights and groundwater, the NSMWA also receives reclaimed water from Sonoma County Water Agency (SCWA). When the neighboring SCWA reservoirs of secondary effluent from nearby Sonoma Valley communities are full, Ringstrom Bay Unit receives treated effluent between mid-summer to late-October (Forsberg 2001). The treated effluent is held within the Ringstrom Bay Unit until the Regional Water Quality Control Board determines that slough discharges are acceptable. This water transfer is performed under a 1993 MOU between DFG and Sonoma Valley County Sanitation District. An updated MOU is in process (Taylor 2008b).

2.4.2 Water Delivery and Management

DFG currently uses both San Pablo Bay water and Napa River water to reduce salinities in the ponds of the Napa River Unit on the west side of the Napa River and to ensure appropriate water levels for wildlife (Jones & Stokes 2002). Ongoing operation and maintenance activities in the Napa River Unit include maintenance and replacement of water control structures, levee upgrades and maintenance, and water level/salinity management for wildlife habitat.

Recycled wastewater from the Sonoma Valley County Sanitation District (SVCSD) Wastewater Treatment Plant (WWT) may be used to dilute salts in Ponds 7/7A dependent on securing funds to construct a water delivery pipeline (Jones & Stokes 2004a, 2004b).

Currently, the Green Island Unit (Napa Plant Site) has no potable source on-site. Potable water is delivered to the site by motor vehicle. A new potable water line could be installed to provide a reliable source of potable water to the site. The water line may be installed in the future, connecting to the existing City of American Canyon water line on Green Island Road. The connection would require 4,700 feet of new water line. All of the line will be placed subgrade. Connections at the site would be made for DFG facilities on Green Island, and public access and maintenance buildings.

2.5 EXISTING INFRASTRUCTURE

Existing infrastructure within the NSMWA includes water control and management facilities, roads, levees, utilities, houses and other structures. A discussion of each of these infrastructure components is provided below.

2.5.1 Roads

Access to the interior of the NSMWA is primarily by boat, but land access is also provided through a combination of paved roads, gravel roads, and unimproved dirt roads at several locations in the NSMWA (**Figure 5**). Only a few roads are maintained for public use within the boundaries of the NSMWA, including the gravel access roads to the Tolay Creek Unit parking lot (Tolay Creek north of SR 37) and the Duhig Road Headquarters in the Huichica Creek Unit. The remaining roads within the NSMWA are predominantly gravel and packed earth maintenance roads located atop levees.

2.5.2 Levees

The NSMWA's more than 100 miles of levees are both habitat and water control features (**Figure 5**). In the Napa River Unit and parts of the Huichica Creek Unit, levees form the boundaries of the former salt ponds. They are not engineered flood control levees. The salt pond levees are currently owned by the State of California and are not maintained for flood protection purposes. Several levees in the Napa River Unit have been either intentionally or unintentionally breached. These breaches allow tidal exchange to the ponds and promote wetland habitat restoration.

In the Green Island Unit, broad armored levees were built along the Napa River and narrower levees separate the individual ponds formerly used in the production of salt (URS 2006a). The external levees, constructed primarily from native bay mud material and armored with brick, rebar and concrete, extend for miles and cover an area of over 150 acres. The smaller "internal levees" separating the salt ponds and water conveyance channels are earthen or wooden levees with an earth core. It is anticipated that the internal levees will be lowered and breached during restoration.

In the Wingo and Ringstrom Bay Units, levees were constructed along the sloughs or creeks prior to 1900 to reclaim or convert wetland to agriculture. A rail corridor on a levee traversing the Wingo Unit is owned and maintained by the Union Pacific Railroad. In 1998, during an exceptionally high rainfall year, the levee that borders Sonoma Creek in the Wingo Unit was breached, resulting in the flooding of the unit. This occurred again in 2006. Repairs to the levee and replacement of water control structures is underway in 2007-08. Several breaches and failures of water control structures occurred along levees in the Ringstrom Bay Unit. Failing levees in the Ringstrom Bay Unit is an ongoing maintenance issue.

Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 5

Infrastructure

- NSMWA Management Unit
- Ecological Reserve (DFG, current)
- Ecological Reserve (DFG, future)
- Water control structure
- Fish screen
- Pump
- Guzzler
- Levee breach
- Electrical meter
- Gate
- Parking
- Boat launch
- Highway
- Paved road
- Closed to public
- Huichica Unit service road
- Gravel road
- Unimproved road (driveable)
- Unimproved road or levee (not driveable)
- Power line
- Railroad

N

SCALE 1:57,000

Base imagery:
Airphoto USA, 1 April 2007
0.3-meter cell size

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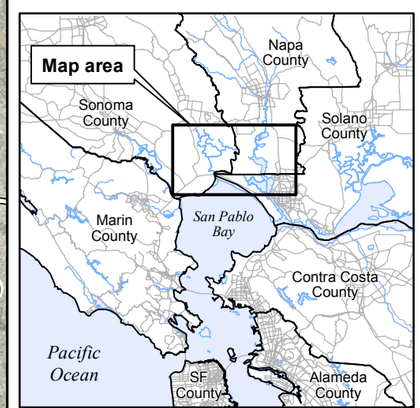
MILES



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A levee on the eastern edge of the Southern Crossing Unit separates it from the Napa River. Levee maintenance and repair is performed by the DFG, Stanly Ranch Vineyards, LLC, and the Land Trust of Napa County and funded through a donation from the Stanly Ranch Vineyards, LLC. In December 2005, this levee was damaged during storm events and was repaired.

Levees border the Napa River in the American Canyon and White Slough Units. Several breaches have occurred along these reaches over the last 20 years, as described in **Section 2.1**. Many of these breaches were not repaired and areas once isolated from tidal action now receive tidal flows.

Levees surround the Sonoma Creek Unit on three sides. A partial levee bisects the unit; however, this levee has a large breach at its southern end that allows exchange between the two halves.

Levees exist around the Tolay Creek Unit. The levees are used as footpaths by visitors.

2.5.3 Water Control Structures

A variety of water control structures are used throughout the NSMWA, including pumps, canals, siphons, "donuts," various types of tide gates, breaches, and borrow ditches. These structures are described below (Jones & Stokes 2004a, 2004b), and their locations are shown on **Figure 5**.

2.5.3.1 Pumps

Pumps are used to move water from one location to another. Pumps were routinely used during salt pond operation; however, most pump use is currently associated with emergency maintenance or repair actions. Habitat restoration construction at the Green Island Unit will demolish two pumps formerly used in the salt production process. Pumps in operation in the NSMWA are located at the DFG Headquarters and at the ponds on Buchli Station Road in the Huichica Creek Unit.

2.5.3.2 Canals and Culverts

Canals and culverts are used to direct, distribute, and control water. In the Napa River Unit, canals allow the distribution to and bypass of some of the salt ponds. In the Ringstrom Bay Unit, structures called "bladders" are installed inside culverts when treated, impounded water is present. Bladders prevent leakage of reclaimed water from the Ringstrom Bay Unit into adjacent sloughs. In the Huichica Creek Unit, canals transport water from Pond 8 to Pond 7/7A to dilute concentrated salts and in the future, to discharge the diluted solution to Napa Slough.

2.5.3.3 Siphons

Siphons are large pipes (ranging from 36 to 72 inches in diameter) that convey pond water under sloughs between adjacent ponds.

2.5.3.4 Donuts

Donuts are circular water control "structures" that have multiple intakes into a common ponded area, generally 50 to 150 feet in diameter. They are used to distribute water through the canal and siphon system. Donuts are located where canals or other waterways and multiple ponds intersect.

Donut at Ponds 7/7A

2.5.3.5 Tide Gates and Other Water Control Structures

Tide gates or water control structures allow flow in one or both directions between ponds and sloughs or other water bodies. Multiple types of gates and weirs are used throughout the system, including: metal flap gates, slide gates, stop log weirs, wooden broad-crested weirs, high-density polyethylene (HDPE) standpipes with weirs, and other gated culverts designs. Other manually operated gates allow the DFG site manager to direct water to specific ponds. These water control gates are located at all donuts and siphons.

Fish screen at Pond 8

2.5.3.6 Borrow Ditches

Internal to each pond, adjacent to the levees, are borrow ditches, where soil was excavated to provide levee construction material. After restoration of tidal action to a pond, the borrow ditches can serve a number of functions. The ditches hold water when pond water levels are low, providing refuge habitat for aquatic organisms. The ditches also can affect pond drainage patterns. They can create preferential drainage routes because they are deeper than the pond bottom. This process is called short circuiting. The ditches can also delay or deter development of a dendritic drainage channel network. When water bypasses physical contact with plants and other organisms that usually act as filters, it alters the distribution of the chemical and biological transformations that typically occur within a wetland.

2.5.3.7 Fish Screens

Fish screens are used to prevent fish from entering Pond 8 in the intake water. The screens are 48 inches in diameter, cone shaped, and self-cleaning. It is anticipated that similar screens will be installed on the Pond 7A intake during future restoration activities.

2.5.4 Utilities

A limited number of utilities are present in the NSMWA. The primary utilities in NSMWA are the Pacific Gas and Electric Company (PG&E) transmission lines. PG&E maintains 12-kilovolt utility lines in a utility easement across the southern portion of Ponds 1A, 1, 2A, and 4 (Jones & Stokes 2004a, 2004b), and the American Canyon, White Slough and Sonoma Creek units.

2.5.5 Houses and Other Structures

The Napa-Sonoma Marshes Wildlife Area Field Headquarters is located on 2148 Duhig Road, north of the railroad tracks. The field headquarters is the former Cabral Dairy Farm. Structures at the headquarters include residences, two barns, one bunkhouse, one shop, one garage, two wells and a restroom facility to accommodate the visitors to the future public education facility. A former wireless communications building, not maintained, exists in the Huichica Creek Unit. At the Green Island Unit, several structures remain that were owned by the Cargill Salt Company, see photo. Structures include one residence, an office, out buildings, and docks.

Equipment storage at the Green Island Unit

2.6 PLANNING INFLUENCES AND CONSIDERATIONS

Planning for the NSMWA encompasses issues that cross regional, local, and project area boundaries. Although the NSMWA is composed of state-owned property and not subject to local jurisdiction, DFG strives to achieve consensus with local agencies. This section identifies the federal, state, county, and local agency policies and planning guidance that affect the function and management of and planning in the NSMWA.

2.6.1 San Francisco Bay Regional Water Quality Control Board

The Regional Water Quality Control Boards (RWQCBs) have primary authority for implementing provisions of the federal Clean Water Act (CWA) and California's Porter-Cologne Water Quality Control Act. These statutes establish the process for developing and implementing

planning, permitting, and enforcement authority for waste discharges to land and water. The *Water Quality Control Plan, San Francisco Bay Region* (Basin Plan) establishes numeric and narrative surface and groundwater water quality objectives designed to protect designated beneficial uses of surface water and groundwater resources.

Under CWA Section 303(d), the RWQCB and the SWRCB list water bodies as impaired when not in compliance with designated water quality objectives and standards (Jones & Stokes 2004a, 2004b). A total maximum daily load (TMDL) program must be prepared for waters identified by the state as impaired. The Napa River is currently identified on the EPA Section 303(d) list for the state as being impaired by nutrients, pathogens, and sedimentation. Sonoma Creek is included on the 303(d) list because of high concentrations of nutrients, pathogens, and sediment from agriculture, development, and urban runoff. San Pablo Bay is listed as impaired for several organochlorine pesticides, the organophosphorus pesticide diazinon, dioxin and furan compounds, polychlorinated biphenyl (PCB) compounds, copper, mercury, nickel, and selenium.

Pursuant to Section 303(d) of the Clean Water Act, the San Francisco Bay RWQCB developed a TMDL for methyl and total mercury in the San Francisco Bay. On September 15, 2004, the San Francisco Bay RWQCB adopted Resolution No. R2-2004-0082 amending the Basin Plan to establish a mercury TMDL and implementation plan for San Francisco Bay (the "Mercury TMDL Amendment"). On September 7, 2005, after a series of workshops and consideration of comments from numerous stakeholders, the SWRCB adopted Resolution No. 2005-0060 ("Remand Order") remanding the Mercury TMDL Amendment to the Water Board for further consideration (SFBRWQCB 2006). On July 17, 2007, the SWRCB approved the Basin Plan amendment adopted by the RWQCB in August 2006, establishing new water quality objectives for mercury in the tissues of bay fish, and a TMDL for mercury in San Francisco Bay (SFBRWQCB 2007).

According to the 2006 Mercury TMDL Amendment, the mercury TMDL for San Francisco Bay is the sum of the load and wasteload allocations outlined in the Basin Plan amendment, 700 kilograms per year (kg/yr) (SFBRWQCB 2006). The Bay will attain applicable water quality standards for mercury when the overall mercury load is reduced to the TMDL and mercury methylation control measures are implemented.

The San Francisco Bay mercury TMDL implementation plan has four objectives:

- Reduce total mercury loads entering San Francisco Bay to achieve load and wasteload allocations
- Reduce methylmercury production and consequent risk to humans and wildlife exposed to methylmercury
- Conduct monitoring and focused studies to track progress and improve the scientific understanding of the system
- Encourage actions that address multiple pollutants

Mercury occurs naturally in the San Francisco Bay environment and has been introduced as a contaminant in various chemical forms from a variety of anthropogenic sources. Ambient total mercury sediment concentrations in San Francisco Bay are elevated relative to other parts of California because of regional mercury mining and rock composition. Although mercury often resides in forms that are not hazardous, it can be methylated by bacterial processes into toxic methylmercury. The methylation process is dependent on numerous variables: salinity, pH, vegetation, sulfur, dissolved organic carbon, nitrogen, redox potential, and seasonal variations in each of the identified variables (SFBRWQCB 2007). Opening new areas to tidal action can create conditions conducive to mercury methylation. Sediments brought in on the tides, creeks, Napa River, or San Pablo Bay may contain mercury and may accrete in newly breached wetland restoration sites. Although models are being developed to address these issues, it is not currently possible to estimate the methylmercury concentrations, bioaccumulation, and biomagnification in the food chain (SFBRWQCB 2007).

The RWQCB issues Waste Discharge Requirements and a Clean Water Act Section 401 Water Quality Certification that regulate discharges to protect waters of the U.S. The goal of the San Francisco Bay Mercury TMDL is implemented in the Waste Discharge Requirements and Section 401 certifications issued for wetland projects requiring pre- and post-restoration monitoring. There is much active research on mercury cycling in wetlands. Information about how to manage wetlands to suppress or minimize mercury methylation will be adaptively incorporated into the Mercury TMDL implementation plan as it becomes available.

2.6.2 San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission (BCDC) was created by the McAteer-Petris Act of the California Legislature in 1965 “to prepare an enforceable plan to guide the future protection and use of San Francisco Bay and its shoreline.” The outcome of that legislation, the San Francisco Bay Plan, adopted by the BCDC in 1969, enables the BCDC to regulate development of certain kinds of land uses adjacent to the Bay (URS 2006a). The purpose of the plan is to protect the Bay, its sloughs, estuaries, salt ponds, tidal marshes, managed wetlands, and other natural resources, and to develop the Bay and the shoreline to the highest potential with the minimum of fill. Besides regulating bay fill, the Bay Plan promotes the development of maritime ports, economically important channel deepening, essential airport expansion, and maintenance of wildlife areas.

The BCDC has jurisdiction over all tidal areas of San Francisco Bay and reviews and issues separate permits for filling or dredging, and for shoreline development. Shoreline development is regulated by the BCDC through its jurisdiction over a 100-foot-wide “Shoreline Band” along the edge of the entire San Francisco Bay and related waters. The “Shoreline Band” extends 100 feet inland from the line of highest tidal action. The shoreline band jurisdiction is not applied to some segments of the NSMWA (e.g., Green Island Unit).

The Bay Plan includes policies on issues critical to the wise use of the bay ranging from ports and public access to design and transportation (SFBCDC 2007). It also contains maps of the entire bay which designate shoreline areas that should be reserved for water-related purposes such as ports, industry, public recreation, airports, and wildlife refuges.

Under the McAteer-Petris Act and the San Francisco Bay Plan, any person or agency proposing to place fill in, to extract materials from, or to make any substantial change in the use of any water, land, or structure in BCDC's jurisdiction in San Francisco Bay is required to secure a San Francisco Bay permit. BCDC grants permits for projects that are (1) necessary to the health, safety, or welfare of the public in the entire Bay Area and or (2) consistent with the provisions of the Bay Plan and implementing regulations.

2.6.3 Regional and Local Planning Documents

2.6.3.1 San Francisco Estuary Project's Comprehensive Conservation Management Plan

The San Francisco Estuary Project (SFEP) was established by EPA in 1987 because of growing public concern related to the health of the bay and the Delta (Jones & Stokes 2004a, 2004b). SFEP is jointly sponsored by EPA and the State of California and is part of the National Estuary Program. The Comprehensive Conservation and Management Plan (CCMP) for San Francisco Bay was developed by the SFEP with input from more than 100 representatives from the public and private sectors, including government, industry, business, and environmental interests, as well as elected officials from all 12 San Francisco Bay/Sacramento–San Joaquin Delta (Bay-Delta) counties. The primary focus of the CCMP is to "restore and maintain the chemical, physical, and biological integrity of the bay and Delta." The CCMP provides a thorough implementation strategy describing various actions to protect the Bay-Delta estuary. The CCMP goals that pertain to the NSMWA include:

- Protect and manage existing wetlands
- Restore and enhance the ecological productivity and habitat values of wetlands
- Expedite a significant increase in the quantity and quality of wetlands
- Educate the public about the values of wetland resources
- Stem and reverse the decline of estuarine plants and animals and the habitats on which they depend
- Ensure the survival and recovery of listed and candidate threatened and endangered species as well as special-status species.
- Optimally manage and monitor the wildlife resources of the Estuary
- Improve the scientific basis for managing natural resources within the Estuary through an effective monitoring and research program

- Stem and reverse the decline in the health and abundance of estuarine biota (indigenous and desirable non-indigenous), with an emphasis on natural production
- Restore healthy estuarine habitat conditions to the Bay-Delta, taking into consideration all beneficial uses of Bay-Delta resources
- Ensure the survival and recovery of listed and candidate threatened and endangered species, as well as other species in decline
- Optimally manage the fish and wildlife resources of the Estuary to achieve the purpose of the goals stated above

2.6.3.2 Baylands Ecosystem Habitat Goals

The Baylands Ecosystem Habitat Goals Report (Habitat Goals Report) presents recommendations for the kinds, amounts, and distribution of wetlands and related habitats needed to sustain diverse and healthy communities of fish and wildlife resources in the San Francisco Bay area (Goals Project 1999). More than 100 participants representing local, state, and federal agencies, academia, and the private sector were involved in the selection of key species and key habitats, assembling and evaluating information, preparing recommendations and integrating them into the goals.

The NSMWA falls within Segment D (Napa River Area) and Segment E (Sonoma Creek Area) of the Goals Project's North Bay Subregion. The overall goal for the North Bay Subregion is to restore large areas of tidal marsh and to enhance seasonal wetlands. Specifically, the Goals Report made the following recommendations for the Napa River Area:

- Restore large areas of tidal marsh along both sides of the Napa River. This will entail restoring about half of the inactive salt ponds and USFWS's Cullinan Ranch to tidal marsh.
- Manage the remaining acreage of inactive salt ponds on both sides of the Napa River as salt pond or shallow open water habitat to support waterfowl.
- Restore a continuous band of tidal marsh along the bayshore, and enhance existing marsh patches by improving tidal circulation.
- Manage diked wetlands and seasonal wetlands in the adjacent uplands to improve seasonal ponding.
- Where possible, enhance riparian vegetation and marsh/upland transitions and provide upland buffers.
- Enhance seasonal wetlands at the Mare Island dredged material disposal ponds to improve habitat for shorebirds.

Recommendations for Sonoma Creek Area include:

- Restore large patches of tidal marsh along the entire shoreline of San Pablo Bay, particularly near the mouths of sloughs and major streams.
- Upstream of SR 37, restore a broad plain of tidal marsh on both sides of Sonoma Creek. There is considerable flexibility in this area regarding the desired location of tidal and diked habitats; seasonal diked wetlands should be located in close proximity to tidal flats to provide high tide roosting habitat for shorebirds.
- Establish managed marsh or enhanced seasonal pond habitat (especially for shorebirds) on agricultural baylands that are not restored to tidal marsh. Landowners who wish to continue farming or grazing practices on the baylands in this segment are encouraged to consider implementing the recommendations on page 157 of the Baylands Ecosystem Habitat Goals Report.
- Enhance riparian habitat along Sonoma Creek in the Schellville area and upstream, and protect and restore Tolay Creek.
- Where possible, enhance marsh/upland transitions and provide buffers.

2.6.3.3 CALFED's Ecosystem Restoration Program Plan

In 1995, the State of California and the federal government initiated a collaborative effort to resolve numerous water-related issues associated with the Sacramento-San Joaquin River Delta and San Francisco Bay. The effort was titled the CALFED Bay-Delta Program and participants included state and federal resource management agencies and representatives from urban, agricultural, and environmental interests. The CALFED mission is to create a long-range, implementable solution for the Bay-Delta that focuses on four major problem areas: drinking water supply, water quality, levee system integrity, and environmental restoration. (CALFED Bay-Delta Program 2000a, 2000b).

In 1996, CALFED and its collaborators released objectives to achieve ecosystem quality, water quality and supply reliability, and levee system integrity in the Bay-Delta and its watersheds. As part of this process, the Ecosystem Restoration Program (ERP) identified a long-range set of specific ecosystem-related objectives and methods for implementation of those objectives called the Ecosystem Restoration Program Plan (ERPP). The ERPP describes a multitude of ecological improvement targets and actions for implementation over the next several decades in an area designated as the CALFED Study Area. The NSMWA is included in the Suisun Marsh/North San Francisco Bay Ecological Management Zone of the CALFED ERP and it is part of the Napa River and Sonoma Creek Ecological Management Units.

The vision of the ERP for the overall Suisun Marsh /North San Francisco Bay Ecological Management Zone includes (CALFED Bay-Delta Program 2000a, 2000b):

- Providing a more natural freshwater outflow pattern from the Delta in dry and normal rainfall years

- Restoring tidal and nontidal wetlands
- Restoring tidal perennial aquatic habitat
- Screening unscreened and poorly screened diversions
- Reducing stressors, such as non-native marine invertebrates in ship ballast water and contaminants in municipal, industrial, and agricultural discharges into the Bay
- Reducing losses of juvenile fish and their food organisms at unscreened diversions

The vision specifically for the Napa River Ecological Management Unit is to restore large areas of tidal marsh to benefit salt marsh harvest mouse and California clapper rail; manage inactive salt ponds to benefit waterfowl; restore a continuous band of tidal marsh along the bayshore to benefit fish species; improve tidal circulation; manage diked wetlands and seasonal wetlands to improve seasonal ponding for shorebirds, wading birds and waterfowl; enhance riparian vegetation and marsh/upland transitional habitats; and provide upland buffers.

The vision for the Sonoma Creek Ecological Management Unit is to restore large patches of tidal marsh along the entire shoreline of San Pablo Bay; restore tidal marsh along Sonoma Creek; establish managed marsh or enhanced seasonal pond habitat for shorebirds; enhance riparian habitat along Sonoma Creek; and enhance marsh/upland transitional habitats.

2.6.3.4 Bay Trail Plan

The Bay Trail is a planned recreation corridor that will provide 400 miles of biking and hiking trails when completed (Jones & Stokes 2004a, 2004b). It will link nine counties, 47 cities, and 130 parks and recreation areas around San Francisco and San Pablo Bays. As mandated under Senate Bill 100, ABAG developed the Bay Trail Plan as a framework to provide guidance in the selection and implementation of the Bay Trail project. The main goal of the Bay Trail Plan is to provide public access to the bay and its surrounding shorelines, specifically to develop a continuous recreational corridor that will extend around the perimeter of the San Francisco and San Pablo Bays.

The Bay Trail Plan identifies the Napa River Unit as a wildlife area and managed wetlands (Jones & Stokes 2004a, 2004b). Two proposed alignments of the Bay Trail surround the northern and eastern boundaries of the project area. The eastern alignment is east of the Napa River. One of the proposed Bay Trail alignments terminates at the Hudeman Slough boat launch off Skaggs Road in Sonoma County. Neither alignment transects the NSMWA.

Two alignments of the Bay Trail are planned in the vicinity of the Napa Plant Site (URS 2006a). One of the proposed Bay Trail alignments is proposed on Green Island Road and adjacent to Napa County Airport. Additional Bay trail segments are planned to parallel SR 29 and SR 121.

2.6.3.5 Solano County General Plan

The Solano County General Plan is currently being updated. This document strives to balance the environment, economy and social equality of Solano County. White Slough, portions of American Canyon, Napa River and Sonoma Creek Units fall within Solano County. The following preliminary goals provide guidance that applies to land within the NSMWA:

- Ensure the continued presence and viability of the County's various natural resources.
- Enhance the natural environment by repairing environmental degradation that has occurred, and by seeking an optimum balance between the economic and social benefits of the County's natural resources.
- Preserve, conserve, and enhance valuable open space lands that provide wildlife habitat, conserve natural and visual resources, convey cultural identity and improve public safety.
- Preserve the visual character and identity of communities by maintaining open space areas between the communities in Solano County.

2.6.3.6 Sonoma County General Plan

The Sonoma County General Plan guides development and protection of lands within Sonoma County. The North Tolay, South Tolay, Wingo and Ringstrom Bay Units are in Sonoma County, California. The Units are within a "scenic landscape unit', "critical habitat", "riparian corridor" and "open space" designation of the Sonoma County General Plan (Zone 9). Goals for lands with these designations include:

- Retain the largely open, scenic character of important scenic landscape units
- Identify critical habitat areas and assure that the quality of these natural resources is maintained and not adversely affected by development activities.
- Provide protective measures for riparian corridors along selected streams which balance the need for agricultural production, urban development, timber and mining operations, and flood control with preservation of riparian values.
- Establish a Bikeways Network that provides a safe and supportive environment for bicyclists in Sonoma County, recognizing that bicycling is a viable mode of transportation and popular form of recreation.

2.6.3.7 Napa County General Plan

The Napa County General Plan is a program for the protection and development of unincorporated areas of Napa County. The Southern Crossing, Green Island, Huichica Creek, and Napa River units lie within lands designated as "agriculture, water, and open space." The following Natural Resource, Open Space, and Agriculture goals in the Napa County General Plan provide guidance for development of these areas:

- Maintain and enhance the existing level of biodiversity.
- Protect the continued presence of special-status species, including special-status plants, special-status wildlife, and their habitats, and comply with all applicable state, federal, or local laws or regulations.
- Conserve, protect, and improve plant, wildlife, and fishery habitats for all native species in Napa County.
- Protect connectivity and continuous habitat areas for wildlife movement.
- Preserve, sustain, and restore forests, woodlands, and commercial timberland for their economic, environmental, recreation, an open space values.
- Identify and conserve areas containing significant mineral deposits for future use and promote the reasonable, safe, and orderly operation of mining and extraction and management activities where environmental, aesthetic, and adjacent land use compatibility impacts can be adequately addressed.
- To ensure an extensive landscape of open spaces in which recreation, the protection of natural, cultural, and archaeological resources, agricultural production, and private property are mutually supportive and complementary.
- Preserve existing agricultural land uses and plan for agriculture and related activities as the primary land uses in Napa County.
- With cities, other governmental units, and the private sector, plan for commercial, industrial, residential, recreational, and public land uses in locations that are compatible with adjacent uses and agriculture.
- Concentrate urban uses in the County's existing cities and urbanized areas.

2.6.4 Partners

2.6.4.1 Napa-Sonoma Marsh Restoration Group

The Napa-Sonoma Marsh Restoration Group (NSMRG) was originally established to exchange data among the various parties conducting studies in the Napa-Sonoma Marsh (Jones & Stokes 2004a). The NSMRG includes a large number of public agencies, as well as researchers, environmental organizations, and other interested stakeholders.

Interaction between NSMRG and the study team can be characterized as outreach and information/opinion gathering. NSMRG has met on at least a quarterly-to-twice-annually basis since the beginning of the Napa-Sonoma Marsh Restoration Project. NSMRG has provided feedback on various aspects of the planning process, such as the project goals and objectives, constraints, issues, and options and alternatives. Two subcommittees of the NSMRG - the Modeling Technical Group and the Restoration Technical Group, provided more detailed review

of the hydrology work conducted by Philip Williams and Associates (PWA), a consultant to the Corps and the non-Federal sponsor.

Participating organizations in the NSMRG are:

Bay Institute
Cargill Salt Company, Inc.
California Department of Fish and Game
Danish Hydrologic Institute
Philip Williams & Associates
Bay Conservation and Development Commission
Wildlife Conservation Board
Napa Resource Conservation District
GAIA Consulting, Inc.
Jones & Stokes
Ducks Unlimited
San Pablo Bay National Wildlife Refuge
US Army Corps of Engineers
US Fish and Wildlife Service
California State Coastal Conservancy
Point Reyes Bird Observatory
University of California, Davis
United States Geologic Survey
Southern Sonoma County Resource Conservation District
Resource Legacy Fund
URS Corporation
Save San Francisco Bay Association
Sonoma County Water Agency
San Francisco Bay Joint Venture
San Francisco Estuary Institute
San Francisco Bay Regional Water Quality Control Board

2.6.4.2 Science Support for Wetland Restoration in the Napa-Sonoma Salt Ponds

In 1999, a group of U.S. Geological Survey (USGS) scientists, collaborating with scientists from Point Reyes Bird Observatory, University of California – Davis, and Humboldt State University, initiated a multi-year interdisciplinary research study on the Napa Salt Ponds. The goal of this research project was to examine the ecological and hydrological functions of the Napa-Sonoma salt ponds and their importance for waterbirds, including integrated studies on primary productivity, macroinvertebrates, plants, and fishes.

2.6.4.3 San Francisco Bay Joint Venture

The San Francisco Bay Joint Venture (SFBJV) is a partnership of public agencies, environmental organizations, the business community, local governments, the agricultural community, and landowners working cooperatively to protect, restore, increase, and enhance wetlands and riparian habitat in San Francisco Bay and adjoining watersheds. The SFBJV shares the following objectives:

- Secure, restore, and improve wetlands, riparian habitat, and associated uplands by applying incentives and using non-regulatory techniques
- Strengthen and promote new sources of funding for such efforts
- Improve habitat management on public and private lands through cooperative agreements and incentives
- Support the monitoring and evaluation of habitat restoration projects and research to improve future restoration projects

The implementation strategy is a blueprint for acquiring, enhancing, and restoring bay habitats, seasonal wetlands, and creeks and lakes. Over the next two decades SFBJV partners plan to

protect 63,000 acres, restore 37,000 acres, and enhance another 35,000 acres of bay habitats that include tidal flats, marshes, and lagoons.

2.6.4.4 Land Trusts

Several land trusts are active in the vicinity of the NSMWA. Some of these organizations, including the Napa Land Trust and the Nature Conservancy, have initially purchased land in the Napa-Sonoma Marshes and later donated it to DFG. SLT will transfer ownership of a portion of their Sears Point property to DFG in the future. There are opportunities for continued partnerships between DFG and these and other land trusts, such as the Solano Land Trust.

2.6.4.5 Diageo Wine and Estates Group (Acacia Winery)

Diageo Wine and Estates Group is a collection of small wineries in the region. DFG has partnered with Acacia Winery, one of the wineries in the group, to obtain habitat restoration funds for the NSMWA (Wyckoff 2002). In fall 2001, Acacia Winery provided DFG with needed labor, equipment, and materials to enhance wildlife habitat at the Huichica Creek Unit (Wyckoff 2002). They planted black walnut, coast live oaks and wild rose bushes; and constructed a wildlife viewing blind in the Huichica Creek Unit. DFG and Acacia are currently planning other joint projects ranging from delivering a dumpster or building a walkway to the wildlife viewing blind, to designing a pamphlet that describes the Marshes. The largest project envisioned is the construction of an environmental educational center.

2.6.4.6 Carneros Land Stewardship Foundation

The Carneros Wine Alliance established the Carneros Land Stewardship Foundation in 2008 to fund small-scale resource management projects within the Los Carneros region. The foundation formed its first partnership in 2008 with DFG to fund wildlife enhancement projects in the NSMWA.

2.6.4.7 Ducks Unlimited

DFG has partnered with Ducks Unlimited to restore habitat for waterfowl and other wildlife in the NSMWA. DFG worked with Ducks Unlimited on restoration and enhancement projects at the following Units: Huichica Creek, Wingo, Ringstrom Bay, and Napa River.

2.6.4.8 Stanly Ranch Vineyard, LLC

Stanly Ranch Vineyard, LLC donated $100,000 to be used for maintenance and repair of the Napa River levee in the Southern Crossing Unit of the NSMWA. Stanly Ranch, LLC, DFG and the Land Trust of Napa County entered into a formal agreement to manage this donation. The funds currently reside with the Land Trust of Napa County.

2.6.4.9 Flood Control Agencies/Projects

Napa County Flood Control and Water District

The Napa County Flood Control and Water District (NCFCWD) and DFG are exploring the possibility of using a portion of the Napa Plant Site as a one-time dredged materials disposal site for the Napa River maintenance dredging project. Placing dredged materials in the salt ponds could raise the elevation and accelerate plant recolonization in the Marshes (URS 2006a).

Sonoma Creek Floodplain and Wetland Enhancement Project

DFG is working in coordination with Southern Sonoma County Resource Conservation District (SSCRCD) to determine if and how DFG land at the Wingo Unit could be used to provide flood plain storage for high flow events on Sonoma Creek.

Sonoma Valley County Sanitation District

The DFG is working with the SVCSD in managing use of reclaimed water in the Ringstrom Bay Unit of the NSMWA (**Appendix A**).

3. ENVIRONMENTAL SETTING

3.1 GEOLOGY

The NSMWA is located in California's geologically active Coast Ranges Geomorphic Province. The province is characterized by a series of northwest trending mountain ranges, valleys, and faults (Jones & Stokes 2004a, 2004b). The dominant geologic processes that have shaped the San Francisco Bay region are active faulting along the San Andreas, Hayward, and other faults; uplift and erosion of the east bay and peninsular hills; and subsidence of the San Francisco Bay basin. The San Francisco Bay region appears to be a pull-apart basin that has been continuously subsiding since late Quaternary time (the past 700,000 years) in response to local crustal subsidence between the San Andreas and Hayward faults. The stratigraphy beneath the San Francisco Bay region records changes in depositional environments resulting from changes in sea level. The primary geological units that underlie a large part of the San Francisco Bay region are the Alameda Formation, Old Bay Mud, San Antonio Formation, Young Bay Mud, and the Temescal Formation.

The Franciscan Formation basement was originally above sea level and exposed to dissection by rivers and streams (Jones & Stokes 2004a, 2004b; URS 2006a). As the basement began to subside between 1,000,000 and 500,000 years ago, the initial unit deposited on its surface was the Alameda Formation. Since the formation of the Sacramento-San Joaquin drainage outlet through San Francisco Bay approximately 400,000 years ago, the environment of deposition has fluctuated between estuarine (periods of high sea level resulting from a warm global climate) and alluvial (periods of low sea level during periods of cold global climate) (Sloan 1992).

The present Bay estuary formed less than 10,000 years ago as the global climate warmed and sea levels rose. Marine water reentered the Bay approximately 10,000 years ago and by about 4,000 years ago had reached its present level. With the establishment of true estuarine conditions, sedimentation in the Bay changed from alluvial sands and silts to dark-colored estuarine clays and silts, commonly called Bay Mud. Deposition of sandier sediment was confined to channels. Since about 1850, human activities have made enormous modifications to the Bay, causing changes in the patterns of circulation and sedimentation. Between 1856 and about 1900, hydraulic mining in the Sierra foothills deposited several feet of sediment throughout the Bay. Starting in the 1800s, the construction of levees and dikes altered the patterns of drainage and annual flooding in the Sacramento River delta. Also, the placement of fill at numerous localities around the Bay margins has dramatically altered the shoreline profile during historic time.

The entire NSMWA is underlain by varying thicknesses of Bay Mud, a soft compressible organic-rich marine deposit of silt and clay with peat and local, thin sand and gravel lenses (Jones & Stokes 2004a, 2004b). San Francisco Bay has two units of Bay Mud: Young Bay Mud is found closest to the surface, and Old Bay Mud (Yerba Buena Formation) is found below the non-marine deposits underlying the Young Bay Mud. Additional non-marine deposits, including alluvial

deposits, underlay the Old Bay Mud and also irregularly flank the margins of the Marshes. The hills that bound the Napa River Unit and the Napa and Sonoma Valleys are underlain by a variety of rock units, the most important of which are the Franciscan Formation (sandstone, shale, serpentine, and other rocks), the Chico Formation (mostly marine sandstone), the Merced Formation (Tertiary marine sands and sandstone), and the Sonoma volcanic (Tertiary volcanic flows and tuffs). The groundwater hydrology in the Napa Marsh area consists of aquifers of alluvial deposits of recent geologic age, supported by volcanic and continental deposits with low water yields.

3.2 SOILS

The soils found within the NSMWA are predominately the Reyes series (Wyckoff 2000), but soils from the Haire, Clear Lake, Cortina, and Rincon series are also found in the upland and transitional areas of NSMWA (**Figure 6**). Reyes soils are distributed throughout the site. Haire soils occur in the Huichica Creek, American Canyon, Southern Crossing, Ringstrom Bay and Napa River Units; Clear Lake soils occur in the Tolay Creek, Huichica Creek and South Crossing Units; Cortina soils occur in the Tolay Creek Unit; Rincon soils occur in American Canyon and White Slough Units. Levees in the Napa River Unit were constructed from the native Bay Muds and peat, and repaired using the same material (CDM 2000).

A brief description of each of soil series is provided below.

3.2.1 Reyes Series

The Reyes series consists of deep, somewhat poorly drained soils that formed in alluvium from mixed sources (NRCS 2004). Reyes soils are in reclaimed and protected marsh areas and have slopes of 0 to 2%. The soils formed in mixed bay and stream alluvium under marsh vegetation such as pickleweed, bulrush, and saltgrass. In the NSMWA, Reyes soils are typically found on tidal flats and marsh areas. These soils are silty clays deposited primarily by sediment-laden Bay waters, but also by tributary freshwater streams (Wyckoff 2000). The soil is acidic in its undeveloped state, its permeability is low, and the erosion hazard of these soils is not considered significant.

3.2.2 Haire Series

The Haire series is a member of the clayey, mixed, thermic family of Typic Haploxerults (NRCS 2004). Typically, Haire soils have gray and grayish brown, neutral or slightly acid, light clay loam A horizons, pale brown, strongly acid, clay B2t horizons, and pale yellow, strongly acid, gravelly clay loam C horizons. Haire soils are on nearly level to moderately steep hills at elevations of 20 to 2,400 feet. They formed in terrace deposits and in part in residuum weathered from arkosic sandstone and granodiorite. Haire soils are moderately well drained, and have slow to rapid runoff and very slow permeability.

Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 6

Soil Types within Management Units

- Alluvial Land, Clayey
- Clear Lake Clay Loam, 0 to 2 percent slopes
- Clear Lake Clay, 0 to 2 percent slopes
- Clear Lake Clay, overwashed
- Cortina Very Gravelly Loam
- Haire Clay Loam, 0 to 2 percent slopes
- Haire Clay Loam, 2 to 9 percent slopes
- Haire Loam, 0 to 2 percent slopes
- Haire Loam, 2 to 9 percent slopes
- Reyes Silty Clay Loam
- Reyes Silty Clay Loam, salt ponds
- Reyes Silty Clay, 0 to 2 percent slopes
- Rincon Clay Loam, 0 to 2 percent slopes
- Tidal Marsh
- Highway
- Paved road
- Closed to public
- Power line
- Railroad

N

SCALE 1:57,000

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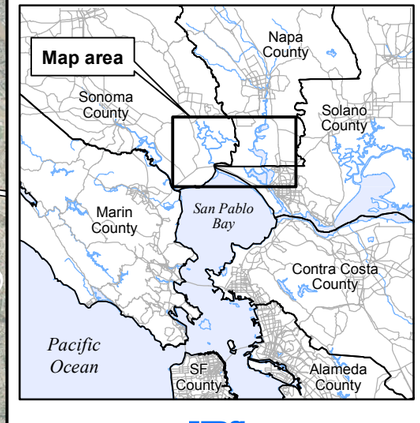
MILES

Base imagery:
Airphoto USA, 1 April 2007
0.3-meter cell size



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3.2.3 Clear Lake Series

The Clear Lake series consists of very deep, poorly drained soils that formed in fine textured alluvium derived from sandstone and shale or other mixed rock sources (NRCS 2004). Clear Lake soils are in basins and in swales of drainages. Slopes are 0 to 2%. The soils have negligible to high runoff and slow to very slow permeability.

3.2.4 Cortina Series

The Cortina series consists of very deep, somewhat excessively drained soils in small valleys and on alluvial fans and floodplains (NRCS 2004). These soils formed in gravelly alluvium from mixed rock sources. Slope ranges from 0 to 15%. They are excessively drained and have negligible to low runoff and rapid permeability.

3.2.5 Rincon Series

The Rincon series consists of deep, well drained soils that formed in alluvium from sedimentary rocks (NRCS 2004). Rincon soils are on old alluvial fans and both stream and marine terraces, and have slopes of 0 to 30%. These soils have slow to rapid runoff and slow permeability.

3.3 TOPOGRAPHY

Much of San Francisco Bay is shallow with an average depth of only 20 feet (USFWS 1998). Depth in San Pablo Bay averages less than 6 feet. Only 15% of the bay is more than 30 feet deep, though a few shipping channels are dredged deeper for ocean-going vessels.

Lands adjacent to the bay were historically tidal marshes interwoven with tidal sloughs, tidal ponds, and uplands. With the influx of Gold Rush fortune hunters and settlers, many of these marshes were drained and used for agriculture or filled for use in urban development. Over 90% of tidal marshes in the San Francisco Bay Estuary have been radically altered or lost due to hydraulic mining, farming, urbanization, salt production, and transportation systems. In the North Bay, 95% of San Pablo Bay tidal marshes have been levied or filled since 1860. The leveed areas include approximately 25,000 acres of seasonal and farmed wetlands. There are also 9,000 acres of former salt ponds.

The San Pablo Bay watershed comprises a series of parallel ridges and narrow valleys that run in a northwestern to southeastern direction (CDM 2000). The watershed's furthest upstream point to the north is Mount St. Helena. To the east, the boundary includes the Howell Mountains in Napa and Solano Counties, the Carquinez Strait and the Berkeley Hills in Contra Costa County. The western border includes a series of small mountain and hilltops including Loma Alta and Red Hill in Marin County, Meacham Hill and Sonoma Mountain in Sonoma County and the Mayacama Mountains in Napa and Sonoma Counties.

3.4 CLIMATE

The San Francisco Bay region has a Mediterranean-type climate, characterized by cool, wet winters and warm, dry summers. The San Pablo Bay and the Pacific Ocean dominate climatic conditions in the NSMWA. The mean annual temperature is 57°F, with a maximum mean of 67°F in September and a minimum mean of 41°F in December. Summer high temperatures rarely exceed 100°F and winter lows that fall below freezing are infrequent. Data collected between 1993 and 2001 indicate that rainfall in the project area averages 23 to 26 inches per year, with July rainfall averaging zero inches and January rainfall averaging between five and six inches.

Fog is a common occurrence in the summer. During periods of fog, visibility in the NSMWA may be reduced to a quarter mile or less. These periods occur from 60 to more than 80 days a year. The area is subject to consistent winds, typically from the southwest (i.e., entering through the Golden Gate), with highest wind speeds typically in the early afternoon, especially during the spring. Wind speeds average four to six miles per hour over the course of a year.

3.5 GLOBAL CLIMATE CHANGE AND IMPLICATIONS

While controversy continues about its magnitude and timing, scientists generally agree that global atmospheric concentration of carbon dioxide and world temperature are increasing and there are associated changes in sea level. During the last 100 years, globally average sea level has risen approximately 10 to 20 centimeters, or 1 to 2 millimeters per year (Scavia et al. 2002). Sea levels along California's coast have risen about 18 centimeters (CCCC 2006a) and Fort Point (San Francisco), the location of one of the longest continuously recording tide gauges in the world has recorded a 20-centimeter rise in the last century (Shellhammer 1989). Over the next 100 years, global warming is expected to accelerate the rate of sea level rise due to the expansion of oceanic water and to melting alpine glaciers and ice sheets. The full range of model projections, from the 2001 Intergovernmental Panel on Climate Change Assessment Report, spans from 9 to 88 centimeters rise in global sea level by 2100 (CCCC 2006b).

The potential impact of an accelerated rise in sea level in the San Francisco Bay was first described in a report to BCDC in 1985 (Shellhammer 1989). The report assumed a rise of 1.2 meters in the sea level of the Bay during the next 100 years. Thermal expansion, partial melting of glacial and polar ice, and tectonic sinking (land subsidence) were identified as attributing factors to the increase. A more extensive investigation commissioned by BCDC in 1987 assumed a lower average estimate of sea level rise but noted that tectonic sinking varies throughout the estuary, causing some areas to be influenced more strongly by sea level rise than others. The concept of relative mean sea level (RMSL) defines the difference between changes in sea level and either tectonic rising or sinking. The BCDC study projected an increase of 6 to 14 centimeters in RMSL in San Pablo Bay over the next 50 years. Model results from a study conducted by Galbraith et al. (2002) predicted a sea level rise in northern San Francisco Bay of 30 centimeters by 2100.

Rising sea level is expected to inundate low-lying coastal areas, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitat. Changes in the frequency of severe storms and increased rainfall intensity could further aggravate flooding and storm damage. Galbraith et al. (2002) projected a 39% loss of tidal flats at northern San Francisco Bay by 2100. This could have important implications for organisms that depend on these sites, especially rare and endangered plant and wildlife species.

Although dramatic changes to the NSMWA associated with sea level rise in the next decade (the time frame of this LMP) are unlikely, sea level rise may be a larger concern over the next century. In addition, some of the NSMWA wetlands are associated with uplands, allowing some wetland expansion and/or providing refugial uplands as sea level rises.

3.6 HYDROLOGY AND WATER QUALITY

3.6.1 Hydrology

The hydrology of the NSMWA includes tidal and fluvial components comprising its estuarine condition. San Pablo Bay is one of three "subestuaries" in the San Francisco Bay-Delta, the largest estuary on the West Coast of North and South America (Jones & Stokes 2004a, 2004b). The tidal influence of San Pablo Bay is a major factor in the NSMWA's hydrological dynamics. (Jones & Stokes 2004a). Twice daily, the waters of the Bay inundate the wetland to varying degrees, elevation dependent. The upstream extent of tidal inundation and estuarine mixing varies seasonally.

San Pablo Bay's drainage area of approximately 587 square miles includes four streams: Napa River, Sonoma, Tolay, and Huichica creeks. Freshwater inputs to the NSMWA come in the form of direct precipitation and freshwater inflows from four streams (Jones & Stokes 2004a; Wyckoff 2000) (**Figure 7)**. The Napa River, the largest and most important freshwater source to this system, flows for over 50 miles and drains a 426-square-mile watershed. Sonoma Creek, with a 143-square-mile watershed is the second largest watershed draining to San Pablo Bay. It flows for 26 miles from its headwaters in northern Sonoma County. Two intermittent streams, Tolay Creek and Huichica Creek, provide smaller freshwater inputs to NSMWA. Tolay Creek drains an area of approximately 18 square miles into the western extremity of NSMWA. Huichica Creek is diverted in several locations into detention reservoirs for use in vineyards, reducing the volume of creek discharge to NSMWA.

3.6.1.1 Groundwater Resources

In the North Bay region, the principal groundwater-bearing aquifer is composed of alluvial deposits, which cover most of the Sonoma and Napa valleys. These aquifers are largely continuous, with general flow toward San Pablo Bay. In the region adjacent to the Bay, however, local flow has been reversed as a result of groundwater extraction, leading to saltwater intrusion.

Groundwater levels in the alluvial deposits vary locally, but are generally 5 to 75 feet below the ground surface.

The most significant natural recharge into alluvial aquifers occurs from rivers and streams. Generally, the alluvial deposits are not permeable enough to allow natural recharge from surface infiltration, although some limited recharge occurs through surface infiltration resulting from precipitation.

As the land elevation ascends into the Huichica mountain range, the groundwater aquifer changes because volcanic deposits are present. The Huichica formation is composed of reworked volcanic sediments that have a low specific groundwater yield. The low specific yield illustrates that this aquifer has lower productivity than alluvial deposits. The same soil conditions that limit productivity also limit recharge. The primary source of recharge is infiltration, usually through outcrops of the formation in the higher mountainous areas.

3.6.2 Water Quality

The hydrologic processes and fate and transport factors for chemical constituents in San Francisco Bay, its tributary rivers, and adjacent estuaries are complex and result in dynamic water quality conditions (URS 2006a). Water quality in the Bay-Delta estuary is largely a function of the mixing of ocean water and freshwater inflows from precipitation, the Delta, and other tributary streams. Water and sediment quality are affected by physical, chemical and biological processes including: heat, light and physical mixing of sediment, nutrients, and salts combined with primary and secondary biological productivity and by-products in the aquatic ecosystem. These ecosystem functions have secondary effects on dissolved oxygen, pH, and organic matter production and decay. In addition, the discharge of anthropogenic sources of conventional inorganic contaminants and trace metal and synthetic organic compounds also play a major role in the quality of bay water and sediments. Examples of anthropogenic sources include treated municipal and industrial point source discharges and non-point source discharges primarily generated by storm water runoff.

The USGS and SFEI Regional Monitoring Program (RMP) conduct extensive water quality monitoring activities in San Francisco Bay and its freshwater tributaries (URS 2006a). Water and sediment contamination from priority trace metal and synthetic organic compounds in the San Francisco Bay area largely reflects the influence of past and present agricultural and mining activities, industrial uses, and urban development. Contaminants known to be present in waters and sediments of the Bay-Delta estuary include heavy metals (lead, copper, aluminum, mercury, nickel, vanadium, chromium, silver, and zinc), PAHs, PCBs, chlorinated hydrocarbon pesticides, and tributyltin.

Within the North Bay region, constituents of concern that routinely exceed numeric guidance levels, human health guidelines, and/or regulatory concentration criteria include copper, mercury, and PCBs (URS 2006a). Copper exceeds applicable criteria on an average basis in Napa River

Lake Berryessa

Napa River watershed

Sonoma Creek watershed

Petaluma River watershed

Santa Rosa

Rohnert Park

Petaluma

Sonoma

Napa

Novato

Vallejo

NSMWA

San Pablo Bay

N

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Watershed boundary

Napa Sonoma Marshes Wildlife Area (NSMWA)

URS

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Napa Sonoma Marshes Wildlife Area

Land Management Plan

FIGURE 7

Watersheds

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and San Pablo Bay, however, individual measurements of mercury, nickel, chromium, lead, and zinc exceed criteria on one or more occasions (URS 2006a). PCBs and dichlorodiphenyldichloroethelene (DDE) were also measured above water quality guidelines at least once in the Napa River and San Pablo Bay. While the concentrations of PCBs have dropped since the 1970s, the RMP monitoring data have shown no clear trends in recent years.

Water quality and sediment monitoring is required pursuant to the RWQCB permit for the restoration of the Napa River Unit (Ponds 1, 1A, 2, 3, 4, and 5) (Order No. R2-2004-0063) and the Green Island Unit (Napa Plant Site) (subsequent amendment R2-2007-0045). Sediment and water quality monitoring at the two units by DFG staff includes measurements of salinity, ammonia and turbidity, temperature, pH, methyl mercury (in water and sediment), and dissolved oxygen. **Appendixes B** and **C** include a summary of the parameters monitored for each site (Ponds 1, 1A, 2, 3, 4, and 5 and the Napa Plant Site, respectively).

3.6.2.1 Contaminant Sources

The sources and magnitude of contaminant loading to San Francisco Bay have been recently characterized as consisting primarily of the following categories: Central Valley via Delta inflows, local rivers, non-point source discharges, point-source discharges to the bay from municipal and industrial facilities, atmospheric deposition, and dredged material disposal (URS 2006a). Total suspended solids and contaminant influxes from the Delta comprise a large majority of the total loading in San Francisco Bay. Atmospheric deposition and dredged material disposal represent relatively small contributions. The relative magnitude of contaminant loading from local watershed sources and point-source discharges is constituent specific. For example, point-source discharges comprise the majority of inorganic nutrient (nitrogen [N] and phosphorus [P]) loading to San Francisco Bay, whereas trace metals inputs are primarily associated with local watershed sources. Relative source contributions of organic compounds have not been determined.

Trash at culvert outlet, White Slough Unit

3.6.2.2 Bittern and High Salinity Materials

High-salinity materials such as bittern, “pickle,” and other concentrated brine solutions are considered toxic waste by the RWQCB. Pond 7 in the Napa River Unit contains residual concentrated salts that remained after the harvest of sodium chloride (table salt). Bittern is not classified as a hazardous material but it is toxic to fish and other aquatic life due to its concentration and unbalanced salt mix. The bittern, pickle and other high salinity waters will need to be diluted and discharged in order to restore the former salt ponds such as Pond 7 and the

Green Island Unit, southern section.

3.6.2.3 Pesticides, Fertilizers, and Non-point Source Discharges

The Napa River, Petaluma River, and Sonoma Creek watersheds were found to contribute a relatively high percentage of the total non-point source load of cadmium, chromium, copper, lead, nickel, and zinc to San Francisco Bay compared to other watersheds (SFEI 2000). Pesticide and fertilizer used on agricultural lands may be discharged to the wetland and aquatic habitats of the NSMWA via small tributaries. Fuel spillage from agricultural sites and pump operation may have also caused local contamination. Streams and channels collect and carry non-point source pollutants and trash from nearby neighborhoods, such as in the adjacent photo of a non-point source discharge to the White Slough Unit.

3.6.2.4 Mercury

The San Francisco Bay Mercury TMDL Project identified mercury sources as historic mines, urban runoff, wastewater discharges, atmospheric deposition, and re-suspension of contaminated sediments. Most of the historic mercury deposits date back to the Gold Rush of the late-1800s, when mercury was mined throughout the Coastal Range and used in the Sierra Nevada to extract gold. The single largest source is Delta outflow from Central Valley rivers.

The Biosentinel Mercury Monitoring Program (BMMP) included sampling sites within NSMWA. BMMP results from 2005-2006 of mercury in fish tissue samples from restored Napa River Unit ponds were generally lower than from upstream (Napa River at Napa) and San Pablo Bay samples (Slotton et al. 2006).

3.7 AGRICULTURAL RESOURCES AND LAND USES

This section describes the agricultural resource and existing land uses at the NSMWA and its surroundings.

The NSMWA is located in the North Bay region of the San Francisco Bay Area. The North Bay region is made up of Solano, Napa, Sonoma, and Marin counties, and includes the cities of American Canyon, Napa, Novato, San Rafael, Sonoma and Vallejo. The two predominant land uses in the North Bay are: extensive and intensive agriculture and rural land (60%), and wildlife and open space (23%). Remaining land uses: residential, commercial and light industry, public facilities, and heavy industry; each comprise less than 10% of the North Bay region (Jones & Stokes 2004a, 2004b). Three major land use trends are identified by BCDC (Jones & Stokes 2004a, 2004b): (1) transition of rangeland and pastureland in southern Napa and Sonoma counties to vineyards, (2) development of urban uses along the SR 101 and SR 29 corridors, and (3) acquisition of large rural areas by federal and state wildlife agencies for wildlife habitat.

Land uses adjacent to the NSMWA are generally as follows:

- East: mixed, ranging from general industrial to land intensive agriculture and residential uses. Immediately east of Pond 8, there is a strip of residential development.
- South: Mare Island has been designated by Solano County for mixed residential, commercial and industrial use, and wildlife habitat in the USFWS San Pablo Bay National Wildlife Refuge. Southwest of NSMWA, in Sonoma County, portions of Tubbs Island are considered farmland of local importance.
- West and northwest of the Napa River Unit across Napa Slough has been designated by Sonoma County as land extensive agriculture, consisting mainly of hay production (Jones & Stokes 2004a, 2004b). Vineyards are approximately 0.25 mile north of Pond 7A and east of the Green Island Unit. West of NSMWA, across Napa Slough, there are farmlands of local importance. The Infineon Raceway is located west of the North Tolay Creek Unit.
- North of NSMWA, in Napa County, there are lands designated as *prime farmland*, *land of local importance*, and *farmland of statewide importance*. The cities of Napa and Sonoma and the community of Schellville are to the north.

3.7.1 Grazing

As of 2008, cattle grazing only occurs in the Southern Crossing and Huichica Creek Units of the NSMWA (Huffman 2007a).

3.7.2 Farming

A mixture of oat, salt tolerant barley, vetch, bell beans and some native perennial bunchgrasses have been farmed on small strips throughout the Ringstrom Bay and Huichica Creek Units by DFG to enhance foraging and breeding habitat for upland game birds and waterfowl (Huffman 2007b).

3.8 BIOLOGICAL RESOURCES

3.8.1 Vegetation Types

A vegetation map of the NMSWA was completed in June of 2008. A detailed description of the methods, analysis and mapped vegetation types in the NSMWA is included in the *Napa & Sonoma Marshes Wildlife Area Vegetation Mapping Report* (AIS 2008). Vegetation units were classified using the latest hierarchy (June 2008) of the National Vegetation Classification Standard (NVCS). The minimum mapping unit used in the vegetation mapping was approximately 1 acre. Vegetation was described at the alliance level (dominant or strong indicator overstory species presence) or at a multiple alliance level (superalliance). Vegetation classification was not based on plot data; instead vegetation classification types were drawn from identical or similar vegetation types described in previous mapping efforts in the vicinity of the NSMWA (AIS 2008). As of August 2008, the vegetation map was not formally assessed for

accuracy. A formal assessment is recommended pending future funding in order to refine, update and improve the accuracy of this vegetation map. This is especially important for the NSMWA, since vegetation signatures, used to extrapolate vegetation classification across the landscape, vary greatly due to the unique land use history, altered hydrology and complex intermixing of the different vegetation over small spatial scales in the NSMWA. Interpretation of this vegetation map should be done with these limitations in mind.

Thirty vegetation types are described for the NSMWA. Of the approximate 14,000 acres in the NSMWA, approximately 64% is open water. The vegetation type with greatest coverage in the NSMWA (1,085 acres) is the alkali bulrush type. Tidal marsh vegetation occurs on 2,865 acres of the NSMWA, representing nearly half of all the vegetation in the NSMWA (**Figure 8**). The following section summarizes vegetation types identified in the NSMWA. **Table 3-1** describes these vegetation types, and **Figure 8** depicts the vegetation within the NSMWA.

3.8.1.1 Forested Vegetation Types

Three forested vegetation types, covering approximately 20 acres, are described in the NSMWA, including: Fremont Cottonwood, Eucalyptus and Undifferentiated Exotic Trees. These vegetation types are described below.

Fremont Cottonwood

Fremont cottonwood vegetation is limited to a narrow, two acre strip along Huichica Creek in the Huichica Creek Unit. Dominant overstory plant species include Fremont cottonwood (*Populus fremontii*), willow (*Salix* spp.) and coast live oak (*Quercus agrifolia*). Understory plants include creeping wildrye (*Leymus triticoides*) and various non-native forbs and annual grasses.

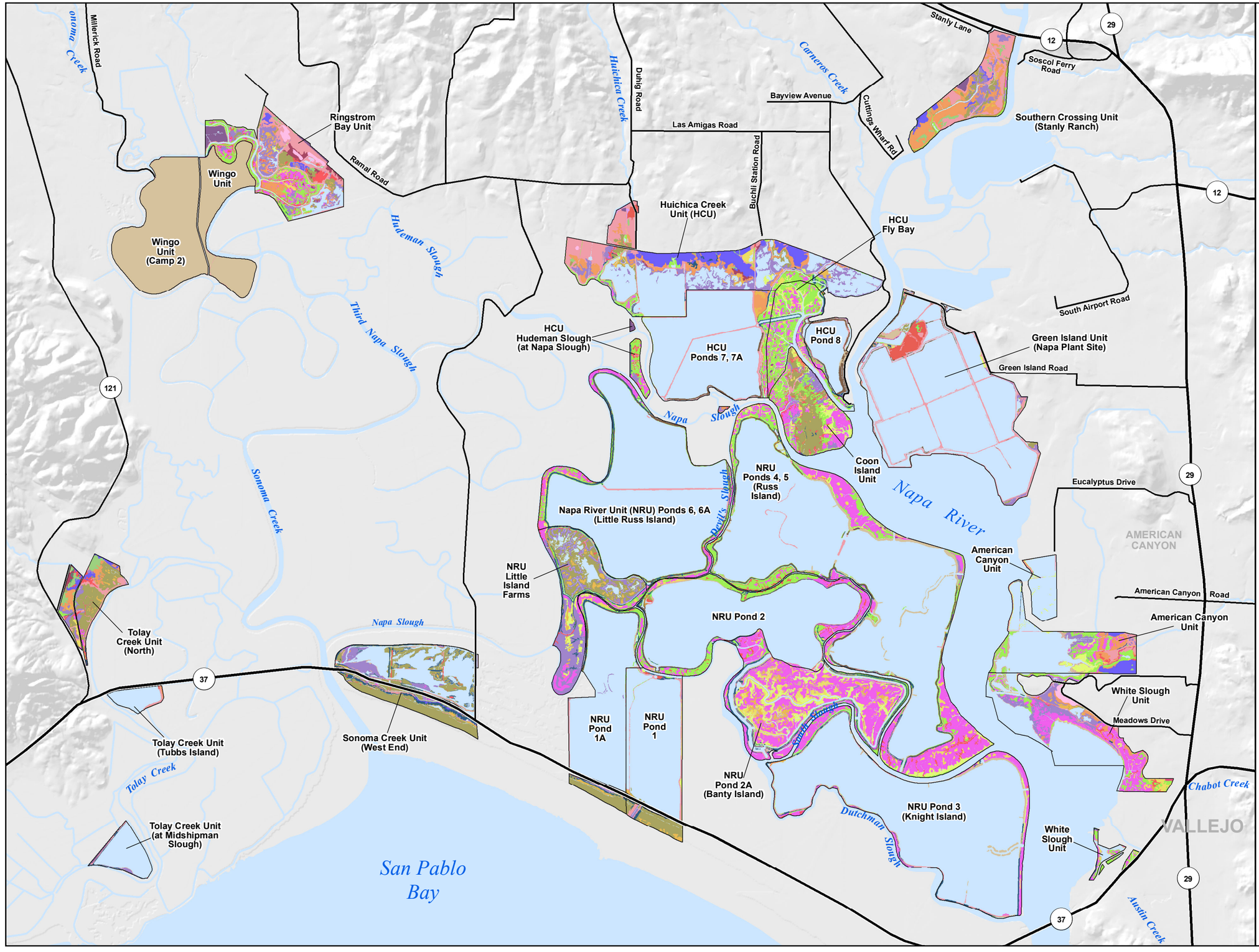
Eucalyptus

Eucalyptus stands most often occur in rows or singly along the levees of the NSMWA. Eucalyptus (*Eucalyptus* spp.) is generally the only species in this vegetation type, with little to no understory vegetation. This vegetation type covers approximately 16 acres in the NSMWA.

Undifferentiated Exotic Trees

The undifferentiated exotic tree vegetation type in the NSMWA occurs along levees and in uplands of the NSMWA. This vegetation, covering 2 acres, has little to no understory vegetation. Dominant tree species include eucalyptus, black locust (*Robinia pseudoacacia*) and acacia (*Acacia* ssp.).

Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 8



Vegetation

Vegetation class (2008 vegetaion map)

Forest
- Eucalyptus (16 acres)
- Fremont Cottonwood Mapping Unit (2 acres)
- Undifferentiated exotic trees (2 acres)

Scrub
- Coyotebrush - gumplant (230 acres)
- French broom (< 1 acre)
- Mixed Willow Mapping Unit (4 acres)
- Tamarix (< 1 acre)

Herbaceous
- Annual grasses (155 acres)
- Annual pickleweed (19 acres)
- California cordgrass (87 acres)
- Creeping wildrye (1 acre)
- Iceplant (115 acres)
- Meadows and swales (spikerush, dock, rushes) (38 acres)
- Mixed cattail (158 acres)
- Mixed salt marsh (saltgrass, pickleweed, alkali heath) (503 acres)
- Mixed salt marsh (undifferentiated) (218 acres)
- Mixed Scirpus (1,037 acres)
- Mixed tule (6 acres)
- Mixed tule and cattail (693 acres)
- Non-native forbs (621 acres)
- Perennial pepperweed (139 acres)
- Pickleweed (550 acres)
- Ryegrass (21 acres)
- Saltgrass - alkali heath (247 acres)
- Teasel (< 1 acre)

Other
- Agriculture (37 acres)
- Built-up and urban disturbance (46 acres)
- Tidal flats and non-tidal salt pans (87 acres)
- Undefined areas with little or no vegetation (828 acres)
- Wetland restoration efforts (22 acres)

Water
- Water (9,057 acres)

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Table 3-1. Vegetation types in the NSMWA.

Vegetation Type	Acreage (approx.)	Dominant Plant Species	Location in the NSMWA (Management Unit)
Forested			
Fremont Cottonwood Mapping Unit	2	Fremont cottonwood (*Populus fremontii*) and willow species (*Salix* spp.)	Huichica Creek Unit
Eucalyptus	16	*Eucalyptus* spp.	Southern Crossing Unit, Huichica Creek Unit, Southern Crossing Unit
Undifferentiated Exotic Trees	2	Black locust (*Robinia pseudoacacia*) and Eucalyptus (*Eucalyptus* sp.)	Huichica Creek Unit, Napa River Unit, Green Island Unit, Wingo Unit
Scrub			
French Broom	<1 acre	French broom (*Genista monspessulana*)	Huichica Creek Unit
Coyotebrush-Gumplant	230	Coyotebrush *(Baccharis pilularis)*, gumplant (*Grindelia* spp.)	All Management Units
Mixed Willow Mapping Unit	4	*Willow* spp. *(Salix lasiolepis*, *S. exigua*, *S. lucida* ssp. *Lasiandra)*	American Canyon, Tolay Creek Unit (north), White Slough Unit
Tamarisk	<1 acre	Tamarisk (*Tamarix* spp.)	Southern Crossing Unit
Herbaceous			
Meadows and Swales (spikerush, rushes and dock)	38	Spikerush (*Eleocharis* spp.), dock (*Rumex* spp.), rush (*Juncus* spp.)	Southern Crossing Unit, Tolay Creek (north) Unit, Ringstrom Bay Unit, American Canyon Unit, Green Island Unit, Huichica Creek, White Slough Unit
Creeping Wildrye	1	Creeping wildrye (*Leymus triticoides)*	Tolay Creek Unit (north)
Annual Grasses	155	Oatgrass *(Avena* spp.), brome (*Bromus* spp.), medusahead (*Taneatherum caput-medusea),* ryegrass (*Lolium* ssp.)	American Canyon Unit, Huichica Creek, Tolay Creek (north) Unit, Ringstrom Bay Unit, Sonoma Creek Unit, Southern Crossing Unit, White Slough Unit
Non-native Forbs	621	Mustard (*Brassica* spp.), radish (*Raphanus* spp.), poison hemlock (*Conium maculatum*), perennial pepperweed (*Lepidium latifolium),* annual grasses	All Management Units
Ryegrass	21	Ryegrass (*Lolium multiflorum, L. perenne*)	Ringstrom Bay, Tolay Creek (north) and Huichica Creek Units.
Teasel	<1 acre	Teasel (*Dipsacus sativus*)	Tolay Creek Unit (north)

Table 3-1. Vegetation types in the NSMWA.

Vegetation Type	Acreage (approx.)	Dominant Plant Species	Location in the NSMWA (Management Unit)
Mixed Tule	6	Hardstem bulrush (*Schoenoplectus acutus*), California bulrush (*Schoenoplectus californicus*)	Coon Island Unit, Green Island Unit, Huichica Creek Unit, Napa River Unit, Ringstrom Bay Unit, Wingo Unit
Mixed Tule and Cattail	693	Hardstem bulrush (*Schoenoplectus acutus)*, California bulrush (*Schoenoplectus californicus*), cattails (*Typha latifolia*)	Southern Crossing Unit, Tolay Creek Unit, Ringstrom Bay Unit, American Canyon Unit, Napa River Unit, Wingo Unit, Green Island Unit, Huichica Creek, White Slough Unit, Coon Island Unit
Mixed Cattail	158	Broad-leaf cattail (*Typha latifolia*), narrow-leaf cattail (*Typha angustifolia*)	American Canyon Unit, Coon Island unit, Green Island Unit, Huichica Creek Unit, Tolay Creek (north) Unit, White Slough Unit, Ringstrom Bay Unit, Napa River Unit
Perennial Pepperweed	139	Perennial pepperweed (*Lepidium latifolium*)	American Canyon Unit, Coon Island Unit, Green Island unit, Huichica Creek Unit, Napa River Unit, Tolay Creek Unit, Ringstrom Bay Unit, Sonoma Creek Unit, White Slough Unit, Wingo Unit
Mixed Salt Marsh (saltgrass, pickleweed and alkali heath)	503	Saltgrass *(Distichlis spicata*), pickleweed (*Salicornia* spp.), alkali heath (*Frankenia salina*)	American Canyon Unit, Coon Island Unit, Green Island Unit, Huichica Creek Unit, Napa River Unit, Tolay Creek Unit, Ringstrom Bay Unit, Sonoma Creek Unit, Southern Crossing Unit, White Slough Unit
Mixed Salt Marsh (undifferentiated)	218	Saltgrass (*Distichlis spicata*), pickleweed (*Salicornia* spp.), alkali bulrush (*Scirpus maritimus*), Olneyi's bulrush (*Scirpus americanus*)	American Canyon Unit, Coon Island Unit, Green Island Unit, Huichica Creek Unit, Napa River Unit, Ringstrom Bay Unit, White Slough Unit
Saltgrass-Alkali Heath	247	Saltgrass (*Distichlis spicata*) and alkali heath *(Frankenia salina*)	American Canyon Unit, Coon Island Unit, Green Island Unit, Huichica Creek Unit, Napa River Unit, Tolay Creek Unit, Ringstrom Bay Unit, Sonoma Creek Unit, Southern Crossing Unit, White Slough Unit
Pickleweed	550	Pickleweed (*Salicornia* spp.)	American Canyon Unit, Coon Island Unit, Green Island Unit, Huichica Creek Unit, Napa River Unit, Tolay Creek Unit, Ringstrom Bay Unit, Sonoma Creek Unit, Southern Crossing Unit, White Slough Unit
Mixed Scirpus	1037	Alkali bulrush (*Scirpus maritimus*) Olney's bulrush (*Scirpus americanus*)	American Canyon Unit, Coon Island Unit, Huichica Creek Unit, Napa River Unit, Tolay Creek Unit, Ringstrom Bay Unit, Sonoma Creek Unit, Southern Crossing Unit, White Slough Unit, Wingo Unit

Table 3-1. Vegetation types in the NSMWA.

Vegetation Type	Acreage (approx.)	Dominant Plant Species	Location in the NSMWA (Management Unit)
California Cordgrass	87	California cordgrass (*Spartina foliosa*)	American Canyon Unit, Coon Island Unit, Green Island Unit, Huichica Creek Unit, Napa River Unit, Ringstrom Bay Unit, Sonoma Creek Unit, Tolay Creek Unit, White Slough Unit
Annual Pickleweed	19	Annual pickleweed (*Salicornia* spp.)	Sonoma Creek Unit
Iceplant	115	Iceplant (*Carpobrotus edulis*, *Mesembryantherum* spp.)	Huichica Creek Unit (Pond 8), Napa River Unit, Green Island Unit, Sonoma Creek Unit
Other			
Agriculture	37	None	American Canyon Unit, Green Island Unit, Huichica Creek Unit, Tolay Creek Unit, Ringstrom Bay Unit
Built-up and Urban Disturbance	46	None	American Canyon Unit, Coon Island Unit, Green Island Unit, Huichica Creek Unit, Napa River Unit, Ringstrom Bay Unit, Sonoma Creek Unit, White Slough Unit, Wingo Unit
Tidal Flats and Non-tidal Salt Pans	87	None	Coon Island Unit, Huichica Creek Unit, Napa River Unit, Tolay Creek Unit, Ringstrom Bay Unit, Sonoma Creek Unit, Southern Crossing Unit, White Slough unit
Undefined Areas with Little or No Vegetation	828	None	Green Island Unit, Huichica Creek Unit, Napa River Unit, Tolay Creek Unit, Ringstrom Bay Unit, Southern Crossing Unit, White Slough Unit
Wetland Restoration Efforts	22	None defined	Ringstrom Bay, Huichica Creek Unit, White Slough Unit

3.8.1.2 Scrub Vegetation Types

Scrub vegetation types in the NSMWA include French Broom, Coyotebrush-Gumplant, Mixed Willow and Tamarisk. Total acreage of scrub vegetation in the NSMWA is approximately 230 acres; the majority of which is the Coyotebrush-Gumplant vegetation type.

French Broom

The French Broom vegetation type was mapped at only one location on the southern levee of Pond 8 in the NSMWA. The dominant plant species at this location is French broom (*Genista monspessulana*), with a small component of coyotebrush (*Baccharis pilularis*). It covers less than one acre.

Coyotebrush-Gumplant

The Coyotebrush-Gumplant vegetation type, covering 230 acres, is widespread along levees of the NSMWA. Dominant species include coyotebrush and gumplant (*Grindelia* spp.). This vegetation type often interfaces with non-native annual grasses and forbs with gumplant dominating at lower positions on levees adjacent to tidal wetlands.

Mixed Willow

The Mixed Willow vegetation type occurs in the American Canyon and White Slough Units of the NSMWA. Dominant overstory species include various willow species including arroyo willow (*Salix lasiolepis*), yellow willow (*Salix lucida* ssp. *lasiandra*) and sandbar willow (*Salix exigua*). Understory vegetation include sapling Fremont cottonwood and both native and non-native annual grasses and forbs. This vegetation type covers approximately 4 acres in the NSMWA.

Tamarisk

The Tamarisk vegetation type was mapped at one location in a tidal marsh in the Southern Crossing Unit. The tidal marsh is located along the outboard side of the levee that parallels the Napa River. This vegetation type covers less than one acre, and is dominated by tamarisk (*Tamarix* spp.).

3.8.1.3 Herbaceous Vegetation

Herbaceous vegetation, covering approximately 4,639 acres, is the dominant vegetation in the NSMWA. Herbaceous vegetation types include Meadows and Swales, Creeping Wildrye, Annual Grasses, Non-native Forbs, Ryegrass, Teasel, Mixed Tule, Mixed Tule-Cattail, Mixed Cattail, Perennial Pepperweed, Mixed Salt Marsh (saltgrass, pickleweed, and alkali heath), Mixed Salt Marsh (undifferentiated), Saltgrass-Alkali heath, Pickleweed, Mixed Scirpus, California Cordgrass, Annual Pickleweed and Iceplant.

Meadows and Swales

Meadows and Swales cover approximately 38 acres in the NSMWA, primarily occurring at the Ringstrom Bay, Southern Crossing, Huichica Creek, Tolay Creek (north) and the American Canyon Units. Meadows and Swales are found in temporarily to seasonally flooded settings away from tidal influence. They are often found adjacent to upland grasses in depressions or in drainages where water collects. Spikerush (*Eleocharis* sp.) and/or rush (*Juncus* sp.) dominate; often with a component of mesic grasses and forbs. Saltgrass (*Disticlis spicata*) may be a minor component to meadows with saline soils. Upland annuals may be a component to drier stands.

Creeping Wildrye

The Creeping Wildrye vegetation type occurs on one acre in the Tolay Creek (north) in the NSMWA. Creeping wildrye is the dominant species, but can co-occur with rushes and giant wildrye (*Leymus condensatus*). This vegetation type in the NSMWA occurs in a seasonally flooded landscape in an area that was once within the floodplain of Tolay Creek.

Annual Grasses

The Annual Grasses vegetation type is composed of annual grasses, often with a component of annual forbs and introduced perennial grasses. Within the NSMWA, this vegetation type covers 155 acres. Fairly extensive stands are mapped in upland settings, especially along the northern fringes of the Huichica Creek and Tolay Creek Unit (north). Small patches of native creeping wildrye or non-native perennials grasses such as Harding grass may occur in these polygons.

Non-native Forbs

This vegetation type is similar to Annual Grasses vegetation type; however forbs are the dominant species. Examples include stands dominated with any number of non-native species such as mustard, radish and poison hemlock; annual grasses also are a significant component to the stand. The Non-native Forbs vegetation type is mapped primarily along levees and along marginally tidal zones (where perennial pepperweed may dominate), covering approximately 621 acres.

Ryegrass

The Ryegrass vegetation type is dominated by the non-native ryegrass (*Lolium* spp.), occurring with other non-native annual grasses and forbs. It is limited to a few areas, covering 21 acres, in the Ringstrom Bay, Tolay Creek (north) and Huichica Creek Units.

Teasel

The Teasel vegetation type is mapped in only one small location (< 1 acre) in the Tolay Creek (north). This vegetation type is dominated by teasel (*Dipsacus sativus*).

Mixed Tule

The Mixed Tule vegetation type, covering 6 acres, occurs where hardstem bulrush or California bulrush strongly dominates or co-dominates. Other freshwater or brackish water vegetation species may be a minor component of this vegetation type. Mixed Tule occurs primarily in fresh or brackish water environments along the margins of former salt ponds, especially along the larger sloughs.

Mixed Tule-Cattail

This vegetation type occurs where bulrushes dominate, co-dominate or are subordinate to broad-leaf cattail (*Typha latifolia*). Narrowleaf cattail (*Typha angustifolia*) can also occur in the stand. Most freshwater or brackish marshes are mapped to this vegetation type, and occur on nearly all of the management units. The most extensive stands were mapped on the northern portions of the Coon Island Unit and along the edges of many of the larger sloughs throughout the NSMWA. This vegetation type covers 693 acres in the NSMWA.

Mixed Cattail

Mixed Cattail vegetation type, covering 158 acres in the NSMWA, is dominated by broad-leaf cattail, and is generally found in fresh or brackish water settings. In more saline water, narrow-leaf cattail often replaces broad-leaf cattail as a dominant. The most extensive stands of this vegetation type occur at Pond 2A of the Napa River Unit.

Perennial Pepperweed

This vegetation type, covering approximately 139 acres in the NSMWA, is dominated by perennial pepperweed, and occurs in upland and partial to fully tidal settings. It frequently occurs on levees lining smaller sloughs at slightly higher elevations then the adjacent tidal wetlands. Extensive stands of this vegetation type occur at the Ringstrom Bay Unit.

Mixed Salt Marsh (saltgrass, pickleweed, and alkali heath)

This vegetation type describes areas where pickleweed and saltgrass form complex patterns, often with a minor component of alkali health and jaumea (*Jamea carnosa*). Vegetative cover varies considerably, especially where stands are adjacent to salt pans. Many stands have a component of perennial pepperweed when adjacent to tidal sloughs. Mixed Salt Marsh is found in hyper-saline environments in a range of tidally flooded regimes and adjacent to salt pans. This vegetation type covers approximately 503 acres in the NSMWA.

Mixed Salt Marsh (undifferentiated)

The Mixed Salt Marsh vegetation type, covering 218 acres in the NSMWA, consists of a complex of three or more species. Complexing happens when individual species dominance occurs in patches too small to delineate or in areas where species mix evenly within the stand. Most areas where it occurs contain components of alkali bulrush, saltgrass, and pickleweed. Mixed Salt Marsh occurs in similar physical setting to the Mixed Salt Marsh (saltgrass,

pickleweed, and alkali heath), but flooding regimes within the mapped areas vary considerably due to the presence of both alkali bulrush and pickleweed.

Saltgrass-Alkali Heath

Saltgrass-Alkali Heath vegetation type is defined in those areas where saltgrass and alkali heath occur together, however saltgrass most often is the dominant. This type occurs over 247 acres, in higher elevations, in upper tidal areas or areas above all tidal influence in saline soils. It is common on the northern properties and also on the Tolay Creek Unit (north) and American Canyon Unit. Saltgrass-Alkali Heath often border Annual Grasses and Non-native Forbs vegetation types; in these area the Saltgrass-Alkali Heath may contain a component of annual grasses or forbs.

Pickleweed

The Pickleweed vegetation type, covering 550 acres in the NSMWA, is dominated by pickleweed. Other species, especially saltgrass, may be a minor component of this type. It generally occurs in more regularly flooded tidal areas than the Saltgrass-Alkali Heath vegetation type; but it is also common in non-tidal salt pans in hyper saline conditions.

Mixed Scirpus

The Mixed Scirpus vegetation type, covering 1,037 acres, occurs primarily where alkali bulrush is the dominant species. In some areas of the NSMWA, three square may be the dominant species. Understory herbaceous vegetation may contain a significant component of pickleweed. This vegetation type is located in areas with more frequent flooding than Pickleweed and Saltgrass-Alkali Heath vegetation types. It is often noted surrounded by Mixed Tule vegetation, where other species of bulrush or cattail may surround the polygon closer to the fringes of former salt ponds. It is rarely noted along the margins of larger sloughs.

California Cordgrass

This vegetation type, covering approximately 87 acres, is dominated by California cordgrass. Scirpus (*Scirpus* spp.) may be in close proximity or complexing within the areas mapped as this vegetation type. Cover varies considerably and overall patterning within the California Cordgrass vegetation type ranges from continuous to patchy. It occurs most frequently along the outer fringes of tidal marshes, except in interior former salt ponds (such as Pond 2A) adjacent to water.

Annual Pickleweed

This vegetation type is composed almost exclusively of annual pickleweed. Vegetative cover of annual pickleweed ranges from sparse (adjacent and within tidal flats) to dense settings (tidal marsh). Pickleweed (perennial) can be a minor component to the stand. This vegetation type covers 19 acres only within the Sonoma Creek Unit, adjacent to tidal mudflats where annual pickleweed is a sparse component and increasing in density to where it often grades into pickleweed (perennial).

Iceplant

The Iceplant vegetation type is composed of any one of several species of iceplant as a dominant, with annual non-forbs and annual grasses. It occurs exclusively on levees in the NSMWA; especially in Huichica Creek Unit (Pond 8) and on levees of the Napa River Unit. This vegetation type covers 115 acres in the NSMWA.

3.8.1.4 Other

Other vegetation types in the NSMWA describe those areas with little to no vegetation, including areas with buildings and other structures, as well as areas used for agriculture (vineyards and dry-land farming). Other vegetation types also include wetland restoration sites with no vegetation, as well as barren areas and mudflats. Total acreage of these vegetation types in the NSMWA is approximately 1021 acres.

Agriculture

Most examples of this type are vineyards, as well as small areas along the edges of management units that are dry-land farmed. It occurs in the Ringstrom Bay, Huichica Creek, Green Island and Southern Crossing Units of the NSMWA. Total cover of Agriculture in the NSMWA is 37 acres.

Tidal Flats and Non-tidal Salt Pans

Tidal Flats and Non-tidal Salt Pans vegetation type describes areas where vegetative cover is generally below 5%; often containing a small component of pickleweed along the fringes. This vegetation type is scattered throughout the NSMWA. This vegetation type covers 87 acres in the NSMWA.

Built-up and Urban Disturbance

Built-up and Urban Disturbance, covering 46 acres, describes areas covered in man-made structures. These are relatively small areas in the NSMWA; the largest example is located on the northern portion of the Green Island Unit, north of the salt evaporators.

Undefined Areas with Little or No Vegetation

This vegetation type includes unvegetated, non-urban areas in the NSMWA. The majority of this type is mapped in the Wingo Unit, and along levees and scattered throughout the NSMWA. This vegetation type covers 828 acres in the NSMWA.

Wetland Restoration Efforts

While some restoration sites in the NSMWA are classified to a specific vegetation type, this type lacked established vegetation at the time of classification (2008). It is mapped in the Ringstrom Bay, Huichica Creek and White Slough Units of the NSMWA. This vegetation type covers 22 acres in the NSMWA.

3.8.1.5 Non-Native Plants

Non-native plants occur throughout the NSMWA (**Table 3-2**). Many non-native plants were introduced to North America after European arrival, accidentally and purposefully for agriculture, grazing landscaping and other uses. Many of these introduced, non-native plants disrupt California ecosystems in which they are introduced, displacing native plants and wildlife, and in some cases, changing ecosystem processes such as hydrology, fire regime, and soil chemistry (Cal-IPC 2008). Non-native plants observed in the NSMWA that pose the greatest threat to the integrity of the biota of the NSMWA include Pacific bentgrass (*Agrostis avenacea*), lance-leaf water plantain (*Alisma lanceolata*), giant reed (*Arundo donax*), yellow star thistle (*Centaurea solstisialis*), Scotch broom (*Cytisus scoparius)* and French broom, perennial pepperweed (*Lepidium latifolium*), common reed (*Phragmites australis*), tamarisk, medusahead (*Taneatherum caput-medusea*), and Himalayan blackberry (*Rubus discolor*). As of 2008, there are no maps of the location or extent of these species or other non-native plants in the NSMWA.

In addition to non-native species observed in the NSMWA, non-native cordgrass (*Spartina* sp.) was observed in the immediate vicinity of the NSMWA. High priority non-native species (including non-native cordgrass) are discussed in detail below.

Table 3-2. Non-native plants of the NSMWA.

Scientific Name	Common Name	Cal-IPC Rating[1]
Polypogon monspeliensis	Annual beard grass	Limited
Asparagus officinalis ssp. *officinalis*	Asparagus	None
Atriplex semibaccata	Australian saltbush	Moderate
Cynodon dactylon	Bermuda grass	Moderate
Convolvulus arvensis	Bindweed	Eval. not listed
Lotus corniculatus	Birdfoot trefoil	Eval. not listed
Brassica nigra	Black mustard	Moderate
Acacia melanoxylon	Blackwood acacia	Limited
Eucalyptus globulus	Blue gum	Moderate
Cotula coronopifolia	Brass-buttons	Limited
Picris echioides	Bristly ox-tongue	Limited
Malva nicaensis	Bull mallow	No rating
Cirsium vulgare	Bull thistle	Moderate
Anthriscus caucalis	Bur-chervil	None
Medicago polymorpha	California burclover	Limited
Daucus carota	Carrot	Eval. not listed
Apium graveolens	Celery	None
Malva parviflora	Cheeseweed	No rating
Cichorium intybus	Chicory	No rating
Xanthium strumarium	Cocklebur	No rating
Phragmites australis	Common reed	No listing

Table 3-2. Non-native plants of the NSMWA.

Scientific Name	Common Name	Cal-IPC Rating[1]
Sonchus oleraceus	Common sow thistle	No rating
Avena sativa	Cultivated oat	None
Rumex crispus	Curly dock	Limited
Ruppia maritima	Ditch-grass	No rating
Plantago lanceolata	English plantain	Limited
Hordeum murinum	Farmer's foxtail	No rating
Rumex pulcher	fiddle dock	No rating
Carpobrotus edulis	Fig marigold	High
Erodium botrys	Filaree	Eval. not listed
Genista monspessulana	French broom	High
Dipsacus sativus	Fuller's teasel	Moderate
Geranium dissectum	Geranium	Moderate
Arundo donax	Giant reed	High
Acacia decurrens	Green wattle	None
Spergularia villosa	Hairy sandspurry	No rating
Phalaris aquatica	Harding grass	Moderate
Rubus discolor	Himalayan blackberry	High
Lythrum hyssopifolium	Hyssop loosestrife	Moderate
Lolium multiflorum	Italian ryegrass	Moderate
Carduus pycnocephalus	Italian thistle	Moderate
Sorghum halepense	Johnsongrass	No rating
Chenopodium album	Lamb's quarters	No rating
Alisma lanceolatum	Lance-leaf water plantain	None
Robina pseudoacacia	Locust	Limited
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	Moderate
Taeniatherum caput-medusae	Medusahead	High
Silybum marianum	Milk thistle	Limited
Tetragonia tetragonioides	New Zealand spinach	No rating
Solanum americanum	Nightshade	No rating
Agrostis avenacea	Pacific bentgrass	Limited
Cortaderia selloana	Pampas grass	High
Lepidium latifolium	Perennial pepperweed	High
Lolium perenne	Perennial ryegrass	No rating
Schinus molle	Peruvian pepper tree	Limited
Amaranthus sp.	Pigweed	None
Chenopodium macrospermum var. *halophilum*	Pigweed	No rating
Conium maculatum	Poison hemlock	Moderate
Ranunculus muricatus	Prickle-fruited buttercup	No rating

Table 3-2. Non-native plants of the NSMWA.

Scientific Name	Common Name	Cal-IPC Rating[1]
Lactuca serriola	Prickly lettuce	Eval not listed
Sonchus asper	Prickly sow thistle	Eval. not listed
Polygonum arenastrum	Prostrate knotweed	No rating
Raphanus sativus	Radish	Limited
Spergularia rubra	Red sandspurry	No rating
Bromus diandrus	Ripgut grass	Moderate
Hypochaeris radicata	Rough cat's-ear	Limited
Tragopogon porrifolius	Salsify	No rating
Spergularia media	Sandspurrey	No rating
Cytisus scoparius	Scotch broom	High
Carpobrotus chilensis	Sea fig	Moderate
Rumex acetosella	Sheep sorrel	Moderate
Avena barbata	Slender wild oat	Moderate
Mesembryanthemum nodiflorum	Slender-leaved iceplant	No listing
Bromus hordeaceus	Soft chess	Limited
Meliotus indica	Sourclover	No rating
Crypsis schoenoides	Swamp timothy	No rating
Lobularia maritima	Sweet alyssum	Limited
Festuca arundinacea	Tall fescue	Moderate
Tamarix sp.	Tamarisk	High
Scandix pecten-veneris	Venus' needle	No rating
Echinochloa crus-galli	Watergrass	No rating
Meliotus alba	White sweetclover	No rating
Avena fatua	Wild oat	Moderate
Brassica rapa	Wild turnip	Limited
Sisymbrium orentale	Yellow mustard	No rating
Centaurea solstitialis	Yellow star-thistle	High

[1]California Invasive Plant Council (Cal-IPC) Weed Ratings:

High: These species have severe ecological impacts on ecosystems, plant and animal communities, and vegetational structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. These species are usually widely distributed ecologically, both among and within ecosystems.

Medium: These species have substantial and apparent - but generally not severe - ecological impacts on ecosystems, plant and animal communities, and vegetational 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.

Low: The ecological impacts of these species are minor. Their reproductive biology and other invasiveness attributes result in low to moderate rates of invasion. Ecological amplitude and distribution are generally limited (these species may be locally persistent and problematic).

Alert: This is an additional designation for some species in either the high or medium category whose current ecological amplitude and distribution are limited. The designation alerts managers to species that are capable of rapidly invading unexploited ecosystems, based on initial, localized observations, and on observed ecological behavior in similar ecosystems elsewhere.

Table 3-2. Non-native plants of the NSMWA.

Scientific Name	Common Name	Cal-IPC Rating[1]

Evaluation Not Listed: In general, this designation is for species for which information is currently inadequate to respond with certainty to the minimum number of criteria questions (i.e., too many "U" responses), or for which the sum effects of ecological impacts, invasiveness, and ecological amplitude and distribution fall below the threshold for ranking (i.e., the overall rank falls below Low). Many such species are widespread but are not known to have substantial ecological impacts (though such evidence may appear in the future). All species receiving a "D" score for ecological impact, regardless of what other section scores they receive, are by default placed into this category.

Pacific Bentgrass

Pacific bentgrass is a perennial grass in the grass family (Poaceae) from Australia that is a recent invader of the San Francisco Bay. In the NSMWA, it occurs in the mesic grasslands of the Huichica Creek Unit. This species reproduces by seed and occurs throughout the Napa-Sonoma Marshes, including Cullinan Ranch (Baye 2008). This species is broadly tolerant of different hydroperiods and spreads widely through 'tumbleweed' dispersal, often clogging drainage ditches in the Napa-Sonoma Marshes (Zedler and Kercher 2004).

Lance-leaf Water Plantain

Lance-leaf water plantain is a robust, emergent aquatic plant in the water plantain family (Alismataceae). This plant very closely resembles the native water plantain (*Alisma plantago-aquatica*); however, lance-leaf plantain differs from the native plantain morphologically, having lanceolate-shaped leaves and pink flowers. Lance-leaf water plantain grows vigorously in ditches, canals and wetlands in the NSMWA. A large, dense infestation of this species occurs in ditches and diked baylands of the Tolay Creek Unit (north). This species likely reproduces from underground root structures, as well as through water and wildlife dispersal of seeds. This species appears to be expanding its range in tidal and diked baylands of the Napa-Sonoma and Petaluma marshes (Baye 2008). Extensive suitable habitat occurs throughout the NSMWA.

Giant Reed

Giant reed, also known as arundo, is a large, robust perennial grass (Poaceae) that grows up to 30 feet tall. It primarily spreads via underground tubers, occurring most often in areas with ample fresh or brackish water along riparian areas, floodplains, estuaries and drainage ditches. Large infestations of giant reed can result in alteration of hydrology, vegetation structure and function, fire frequency and loss of wildlife habitat. Giant reed occurs in a few small clumps along Napa Slough, American Canyon Unit, Tolay Creek Unit and along Catalina Circle in the White Slough Unit.

Iceplant

Iceplant (*Carpobrotus* spp.) is a succulent plant in the fig-marigold family (Azioaceae). Several species of iceplant occur in the NSMWA, almost exclusively on levees surrounding former salt

ponds, most notably at the Green Island and Huichica Creek Units. Iceplant forms thick, low growing mats with stems that root at aboveground nodes. This plant is found close to the coast in dunes, coastal scrub, coastal prairie and disturbed areas. It reproduces vegetatively as well as by seed. Iceplant is a strong competitor with native plants, and provides little structural diversity for wildlife.

Yellow Star Thistle

Yellow star thistle is a winter annual forb in the aster family (Asteraceae). Yellow star thistle propagates rapidly by seed; a large plant can produce nearly 75,000 seeds (Cal-IPC 2008). Yellow star thistle grows primarily in grasslands and woodlands of California. Yellow star thistle is known to deplete soil moisture, reduce wildlife forage and habitat, displace native plants, and decrease native plant and wildlife diversity (Cal-IPC 2008).

In the NSMWA, yellow star thistle potentially grows in the upland grasslands and levees of the NSMWA including the Ringstrom Bay Unit, Tolay Creek Unit (north of SR 37), American Canyon Unit, and the Huichica Creek Unit.

Slender Iceplant

Slender leaved iceplant is a perennial succulent in the fig-marigold family. This plant grows in spreading clumps on the edges of former salt ponds in saline soils. Elsewhere in California it grows in alkaline flats in the San Joaquin Valley, where it can invade and become the dominant plant species (Cooley 2008). This species is poorly documented in California, and the ecology is not well understood.

Scotch and French Broom

Scotch and French broom are perennial shrubs in the pea family (Fabaceae) that invade and thrive in sunny, disturbed areas of California. They are strong competitors for sunlight and nutrients. Along the coast of California, Scotch broom flowers and produces seed from May through June, and young plants take two to three years to produce seed. The most rapid growth occurs in May. French broom in coastal California flowers from March through July, and seeds mature in June-July on plants that are two to three years of age.

Scotch and French broom are limited in the NSMWA, only known to occur on a levee along Pond 8 of the Huichica Creek Unit.

Perennial pepperweed stand at Tolay Creek Unit

Perennial Pepperweed

Perennial pepperweed is a perennial forb in the mustard family (Brassicaceae). It grows vigorously in moist or seasonally wet sites, forming dense colonies that exclude native species. It reproduces by seed and vegetatively by an extensive root system (Cal-IPC 2008). Populations expand clonally at rates of several yards per year in seasonal wetlands (Rentz and Blank 2004). It appears to grow lower in the intertidal zone in fresher parts of the San Francisco estuary and higher in more saline areas, though in saline areas it is still associated with freshwater flows (SFEI 1998). Perennial pepperweed may alter soil salinity, acting as a "salt pump" as it removes salts from deep in the soil profile and leaves salt deposits on soil surface. Old stems of this plant take several years to degrade and can form a layer impenetrable to light (Cal-IPC 2008).

In the Napa-Sonoma Marshes, perennial pepperweed is abundant in the tidal marshes associated with Tolay Creek, Huichica Creek, Fagan Marsh and Bull Island Ecological Reserves, Mare Island, as well as along most levees and in the seasonal wetlands of former salt ponds.

Common Reed

Common reed is a large perennial grass in the grass family. It is a clonal species that reproduces both vegetatively through rhizomes and by seed dispersal. It is typically found in wetlands, ditches and canals. There is some controversy associated with the taxonomy and potential impacts to ecosystems from common reed in North America (USEPA 2002). Further studies are needed in order to determine what management actions, if any, are necessary for common reed in the NSMWA.

Tamarisk

Tamarisk, or saltcedar, is a perennial shrub in the salt cedar family (Tamaricaceae). There are several species of salt cedar that occur in California, all of which are non-native. Tamarisk grows in abundance where the surface or subsurface water is abundant, and can thrive in saline soils. It spreads by both by seed and vegetatively. One dense grove of tamarisk shrubs occurs on the eastern levee of the Southern Crossing Unit of the NSMWA along the Napa River.

Medusahead

Medusahead is an annual grass (Poaceae) that is widespread in grasslands and oak woodlands of California. Medusahead reproduces by seed, and is dispersed by wind, water, wildlife and livestock. It is a very strong competitor with native plants, often prohibiting the growth of other species through the dense litter produced after plant senescence. The high silica content of the plant makes it unpalatable to livestock and wildlife except early in the growing season. This species occurs in grasslands of the NSMWA, most notably in the uplands of the Tolay Creek Unit (north).

Cordgrass

Several non-native cordgrass species (Poaceae) occur in the San Francisco Bay, including *S. angelica*, *S. alterniflora*, *S. densiflora* and *S. patens*. The native California cordgrass (*Spartina foliosa* occurs throughout the sloughs and fringes of former salt ponds of the NSMWA. A single *S. densiflora* plant was found in Pond 2A in 2001. The plant was removed and follow-up monitoring has shown no recurrence. It was also found in White Slough on property owned by the California Department of Transportation (Wyckoff 2008). The non-native cordgrass spreads rapidly both vegetatively and by seed, hybridizing with the native species; if left unchecked infestations can alter tidal marsh structure and function.

Himalayan Blackberry

Himalayan blackberry is a sprawling viney shrub composed of thick canes with sharply hooked thorns. This member of the rose family (Rosaceae) prefers wet or moist disturbed areas. Himalayan blackberry reproduces by seed, which spread readily by birds and other wildlife, attracted to its fruit, as well as by streams and rivers. It also spreads rapidly vegetatively by rooting canes, and quickly displaces native plant species (Cal-IPC 2008). This species has a high potential to occur along the riparian corridors and upland grasslands of the NSMWA.

3.8.2 Wildlife and Habitats

The following section discusses NSMWA wildlife habitat types, including wetlands (seasonal wetlands, tidal marsh, perennial wetlands and mudflats), uplands (grasslands, levees, stands of non-native trees), riparian habitat, other habitat types (open water including rivers, sloughs and bays and managed former salt ponds). A brief description of wildlife habitat types and the associated wildlife are discussed below, followed by a more detailed description of these habitat types in each Management Unit of the NSMWA. Wildlife habitats correspond to vegetation types described in **Section 3.8.1**. A crosswalk between NSMWA vegetation types (i.e., NVCS) and NSMWA wildlife habitats is provided in **Table 3-3**.

3.8.2.1 Wildlife Habitat Descriptions

Wetland Habitats

Wetland habitats in the NSMWA vary greatly by salinity, soil type, topography and vegetation, dramatically altering the wildlife communities that utilize them. Wetlands provide habitat to some of the most complex and dynamic communities of invertebrates, which in turn act as prey to a variety of larger vertebrates.

The seasonal wetlands, mudflats, tidal marshes, levees, and open water of the NSMWA provide important wintering grounds for thousands of waterfowl and shorebirds that migrate through California every year, acting as a key stopover along the Pacific Flyway (**Figure 9**). The waterfowl population in the NSMWA dramatically increases from November to March during winter migration, decreasing in the warmer months from April to October (CDFG 1977).

Waterfowl in the NSMWA includes both diving and dabbling ducks. A diverse group of shorebirds and wading birds migrate through, reside, winter and/or breed in the NSMWA. These birds utilize seasonal wetlands, upland grassland, levees, tidal wetlands, channels, shallow open water and mudflats of the NSMWA. In addition to waterfowl and shorebirds, a variety of other water-associated birds breed and/or visit the NSMWA. Flocks of American white pelicans (*Pelecanus erythrorhynchos*) and gulls (*Larus* sp.) visit the Marshes in the winter. Double-crested cormorants (*Phalacrocorax auritus*) and Caspian terns (*Sterna caspia*) have been known to nest in the NSMWA. Flamingo sightings occur on occasion in the NSMWA.

Table 3-3. Crosswalk between NSMWA vegetation types and NSMWA wildlife habitats.

National Vegetation Classification System Vegetation Type	NSMWA Wildlife Habitat
Fremont Cottonwood Mapping Unit	Riparian
Eucalyptus	Non-native trees, levee
Undifferentiated Exotic Trees	Non-native trees
French Broom	Levee
Coyotebrush and Gumplant	Levee
Mixed Willow Mapping Unit	Riparian, levee
Tamarisk	Levee
Meadows and Swales (spikerush, rushes and dock)	Grassland, seasonal wetland
Creeping Wildrye	Grassland, seasonal wetland
Annual grasses	Grassland
Non-native forbs	Grassland, seasonal wetland
Ryegrass	Grassland, seasonal wetland
Teasel	Grassland
Mixed Tule	Tidal marsh, perennial wetland
Mixed Tule and Cattail	Tidal marsh, perennial wetland
Mixed Cattail	Tidal marsh, perennial wetland
Perennial Pepperweed	Tidal marsh, levees, seasonal wetland, grassland
Mixed Salt Marsh (saltgrass, pickleweed, and alkali heath)	Perennial wetland, seasonal wetland
Mixed Salt Marsh (undifferentiated)	Tidal marsh
Saltgrass and Alkali Heath	Tidal marsh, seasonal wetland
Pickleweed	Tidal marsh, seasonal wetland
Mixed Scirpus	Tidal marsh
California Cordgrass	Tidal marsh
Annual Pickleweed	Tidal marsh
Iceplant	Levees

Table 3-3. Crosswalk between NSMWA vegetation types and NSMWA wildlife habitats.

National Vegetation Classification System Vegetation Type	NSMWA Wildlife Habitat
Agriculture	Grassland
Built-up and Urban Disturbance	None
Tidal Flats and Non-tidal Salt Pans	Managed former salt ponds, mudflats, open water; rivers sloughs and bays
Undefined Areas with Little or No Vegetation	Managed former salt pond, seasonal wetland
Wetland Restoration Efforts	Managed former salt ponds, seasonal wetland

Figure 9. Pacific Flyway Route

White tailed kites (*Elanus leucurus*), northern harriers (*Circus cyaneus*), peregrine falcons (*Falco peregrinus*), golden eagles (*Aquila chrysaetos*) and turkey vultures (*Cathartes aura*) hunt throughout the NSMWA for most of the year. Ferruginous hawk (*Buteo regalis*) and Swainson's hawk (*Buteo swainsoni*) are known to breed in proximity to and likely forage in the NSMWA (CDFG 2008). Bald eagles (*Haliaeetus leucocephalus*) are infrequent visitors to the Marshes. During migration, hawks tend to follow prominent geographic features, such as the ocean shore and coast range, and the location of the NSMWA makes it attractive to these birds as they pass through (CDFG 1977).

Mudflats. Intertidal mudflats are associated with tidal sloughs and tidal marsh throughout the entire NSMWA. The mudflat extent varies daily with the tidal amplitude (elevation difference between low and high tide). Damping of the tidal signal between San Pablo Bay and the inland

extremity of sloughs creates a stage lag between the time when the intertidal mudflats are exposed in each area. This lag is exploited by foraging shorebirds that move in large flocks from one mudflat to another. Shorebirds range from small to large, with bills of varying lengths and shapes, utilizing differing techniques for acquiring food. These differences make it possible for several species of shorebirds to forage in the same area.

The mudflats are by definition devoid of emergent vegetation but support an extensive algal community as well as diatoms and myriad invertebrate species such as polychaetes (marine worms), amphipods, and mollusks that provide shorebird forage. Shorebirds of NSMWA mudflats include American avocets (*Recurvirostra americana*), dunlins (*Calidris alpine*), sanderlings (*Calidris alba*), plovers (*Pluvialis* sp.), dowichers (*Limnodromus* sp.), yellowlegs (*Tringa* sp.), whimbrels (*Numenius phaeopus*), willets (*Catoptrophorus semipalmatus*), godwits (*Limosa* sp.), black-necked stilts (*Himantopus mexicanus*), and phalaropes (*Phalaropus* sp.).

At high tide, shallowly flooded areas of the NSMWA mudflats are habitat for a wide diversity of wading birds such as snowy egrets (*Egretta thula*), great egrets (*Casmerodius albus*), great blue herons (*Ardea herodias*), and black crowned night herons (*Nycticorax nycticorax*). These birds often feed on fish (piscivorous) and invertebrates in shallow water, and also forage on small vertebrates and insects in the upland areas. Of these species, great blue heron are known to nest in the NSWMA (Wyckoff 2000).

Tidal Marsh. Tidal marshes are wetlands characterized by intermittent tidal inundation and the presence of emergent vegetation such as Pacific cordgrass and pickleweed. Tidal wetlands in the NSMWA are generally brackish and found between the elevations of approximately mean tide and the higher high water. Low tidal marshes are distinguished from high tidal marshes by longer periods of inundation and differing plant communities (USACE 1999) (see **Figure 10)**. The majority of tidal marshes in the NSMWA are experiencing a cyclical progression from tidal wetland in the 1800s to diking, draining, and either salt production or agriculture in the past to the recent restoration of tidal action. Others, such as Coon Island, were restored over 50 years ago or were never diked, such as Fly Bay.

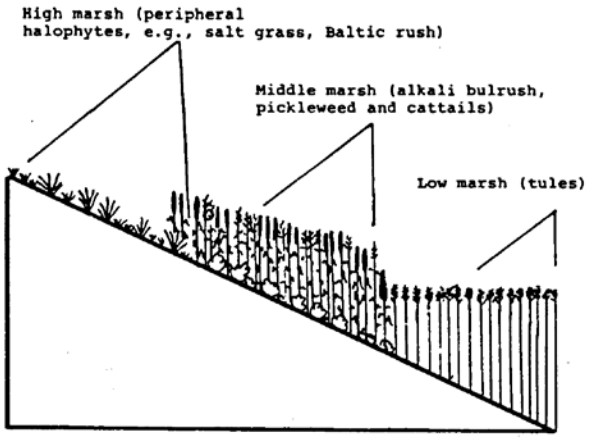

Figure 10. Representation of Brackish Tidal Marsh Zones (USFWS 1984)

Due to their tidal elevation, and typical plant cover, tidal marshes often maintain complex assemblages of invertebrates, such as amphipods, insects, and mollusks. These invertebrates provide a food source for a number of shorebirds and wading birds. Some of the most conspicuous residents of the Marshes are the rails, the most well-known of which is the American coot. At one point, the number of American coot was calculated at as many as 15,505 individuals in the NSMWA (CDFG 1977). Although less well-known than the coot, several rail species are known to breed and nest in wetland vegetation in the NSMWA, including California clapper rails, Virginia rails (*Rallus limicola*), Sora rails (*Porzana carolina*), and black rails (*Laterallus jamaicensis coturniculus*). Studies of black rails in the San Francisco Bay showed that the majority of the population (>80%) was confined to the San Pablo Bay and associated rivers (Evens et al. 1991).

One of the few endemic species to the San Francisco Bay, the salt marsh harvest mouse, occurs in tidal marshes in the NSMWA. The salt marsh harvest mouse is generally found in the upper regions of pickleweed beds along the high tide level. It has been observed and trapped at several locations in the Marshes, including 42 mice caught over 345 trap nights at Ponds 4 and 5 of the Napa River Unit (Takekawa et al. 2005). Salt marsh harvest mice are also documented at Tubbs Island, Fly Bay, Dutchman, and South Sloughs (CDFG 1977).

Perennial Wetlands. The few scattered perennial wetlands that are not subject to tidal inundation occur in uplands of the NSMWA. These marshes typically occur along the edges of ponds**.** Perennial marshes in NSMWA are usually brackish, due to salts retained in the soils as well as the brackish nature of the groundwater. Perennial wetlands are present at American Canyon, Huichica Creek and at Wingo. The Wingo ponds were recently flooded when Sonoma Creek overtopped a levee, but will be restored once the area is dewatered and the levee repaired. Another type of perennial wetland occurs in diked baylands that are wet year round due to groundwater seepage and rainwater (Wyckoff 2000). These diked perennial marshes, such as

those at the Huichica Creek unit, are dominated by saltgrass meadows. If sufficient water exists, cattails, tules, and alkali bulrush can be found.

Several of the seasonal and perennial freshwater ponds above were created to provide habitat for wintering migratory waterfowl – particularly the dabbling ducks, such as gadwalls (*Anas strepera*), pintails (*Anas acuta)*, American wigeons (*Anas americana*), shovelers (*Anas clypeata*), and cinnamon teals (*Anas cyanoptera*), which feed on algae, submerged macrophytes, and aquatic invertebrates. Diked marshes provide habitat for small mammals, terrestrial birds such as the white-crowned sparrow, and, occasionally, reptiles, such as the western fence lizard, which, in turn provide food for hawks and owls (CDFG 1977).

Seasonal Wetlands. Seasonal wetlands form in shallow topographic depressions that pond rainwater for a prolonged period of time, usually between one and six months, and behind dikes or levees in areas once subject to tidal inundation. The position that seasonal wetlands occupy in the landscape gives rise to other commonly used names: diked baylands or diked historic tidelands. The seasonal wetland vegetation community depends greatly on soil salinity and the length of seasonal inundation (USACE 1999). Water sources for these wetlands include rainwater, runoff and groundwater seepage. Seasonal wetlands are usually dry at least 3 months of the year. Both small and large mammals, such as brush rabbit, jackrabbit, raccoon, skunk, Norway rat, house mouse, and vole often use these areas, thus birds of prey often exploit these disturbed wetlands. Similar to perennial wetlands, waterfowl—particularly dabbling ducks—are often observed foraging in the seasonal wetlands of the NSMWA.

Upland Habitats

The upland habitats of the NSMWA are comprised of grasslands, levees, non-native tree stands, and riparian zones. They differ from wetlands in that they provide habitat that is not typically inundated with water. As a result, upland plants do not have the physiological mechanisms to process salt or anoxic soils. The differing plant communities of the uplands provide the resources necessary to maintain an abundant prey base that includes small mammals, insects, reptiles and amphibians.

The grassland and levees of the NSMWA provide breeding, hunting and shelter for brush rabbit, black-tailed jackrabbit, muskrat, raccoon, long-tailed weasel, striped skunk, Norway rat, the house mouse, California vole (*Microtus* sp.) and California ground squirrel (CDFG 1977), while red-tailed hawks, kestrels (*Falco sparverius*), and owl hunt for prey in upland areas of the NSMWA (CDFG 1977).

A wide variety of land birds nest and forage on levees, tidal marshes, structures, and upland grasslands of the NSMWA. Species include blackbirds (Icteridae family), sparrows and finches (Fringillidae family), swallows (Hirundinidae family), flycatchers (Tyrannidae family), and horned larks (*Eremophila alpestris*). Upland game birds include ring-necked pheasants (*Phasianus colchicus*), quail (*Callipepla californica*), wild turkeys (*Meleagris* sp.), and mourning

doves (*Zenaida macroura*). San Francisco common yellowthroats (*Geothlypis trichas sinuosa*) and Samuel's song sparrows (*Melospiza melodia samuelis*) both breed in the NSMWA.

Grasslands. Grasslands in the NSMWA were once dominated by native perennial grasses interspersed with native annual and perennial forbs. Intensive agricultural and grazing use of grasslands has altered the species composition of grasslands in the NSMWA, resulting in dominance by introduced European annual and perennial grasses and exotic forbs. A few native grass and forb species remain in the NSMWA grasslands, particularly the uplands of the Huichica Creek Unit. A recent restoration project in the uplands of this Management Unit reintroduced native plant species, which are thriving today (see **Table 2-2**).

A grassland subcategory is moist grasslands, usually occurring along the ecotone between wetlands and upland grasslands. These areas typically have hydric soils and are typically saturated in the upper 12 inches. Dominant plant species are tolerant of moister soils that those of annual grasslands. Grasslands provide important nesting and foraging habitat for many passerine birds and raptors, small and large mammals, reptiles, and amphibians.

Levees. Levees are found throughout the NSMWA. These man-made structures provide important nesting, refuge and resting habitat for numerous birds, reptiles, and small mammals (Jones & Stokes 2004a). Lower elevation levee sections typically support upper marsh plant communities. Higher elevations, above tidal influence, typically support riparian and upland species. Windrows of planted trees occur along some levees in the Napa River, Huichica Creek, and Southern Crossing Unit, and several nonnative plants have invaded some levees in the NSMWA.

Relatively few waterfowl (in proportion to the number migrating) nest in the Marshes, but common nesting species include gadwalls, pintails, mallards (*Anas platyrynchos*), cinnamon teals, and ruddy ducks (*Oxyura jamaicensis*), which nest on the heavily vegetated levees of the NSMWA (Wyckoff 2000). Like waterfowl, most shorebirds are migratory in the NSMWA. Shorebirds that nest on levees in the Marshes include American avocet, black-necked stilt, western snowy plover (*Charadrius alexandrinus nivosu)* and California least tern (*Sterna antillarum browni).*

Non-native Trees. Stands of non-native trees can be found along levees and upland areas in the NSMWA. Eucalyptus are the most common of these trees species; other trees include acacia and black locust.

Some standing dead Eucalyptus trees on levees were killed as preventative levee maintenance, while others have died or are stunted by the Eucalyptus longhorn borer (Brady/LSA 1998). These stands provide roosting habitat for raptors and other birds, including egrets, cormorants, and red-tailed hawks (*Buteo jamaicensis*).

Riparian

Riparian habitat is present along the edges of streams in the NSMWA. Waterways where riparian habitat is present include Huichica Creek, Tolay Creek, Sonoma Creek and American Canyon Creek. The majority of riparian vegetation associated with waterways in the NSMWA was established within the last 15 years through restoration efforts. Vegetation communities in riparian corridors and on levees may comprise multiple strata, providing more complex cover and wildlife habitat. Riparian habitat of the NSMWA provides key nesting opportunities to many land birds such as blackbirds, sparrows, finches, and swallows. Other species found here may include woodpeckers, flycatchers, horned larks, and many other species of songbirds (CDFG 1977).

Other Habitat Types

Open Water; Rivers, Sloughs and Bays. Open water habitat is present in the NSMWA in the form of ponds, creeks, sloughs, bays, and rivers. These features are void of emergent vegetation but may contain submerged vegetation that provides crucial food sources for fish, waterbirds, and aquatic invertebrates. Open waters are utilized by juvenile fish as a nursery grounds and resting place for both dabbling and diving ducks. Species distributions in open water habitats are strongly tied to salinity gradients.

Diving ducks, including scaups (*Aythya* spp.), canvasbacks (*Aythya* sp.), and other diving waterbirds, such as Western grebes (*Aechmophorus occidentalis*), feed in deep water on benthic invertebrates. Canvasbacks in particular are an important species in the area, because a substantial portion of their population winters in San Francisco Bay. Approximately 25% of all canvasbacks in North America are found along the Pacific Flyway in January, and the majority of these are found in San Francisco Bay and its associated marshes and estuaries (Jones & Stokes 2003a). In addition, dabbling ducks, such as gadwalls, pintails, American wigeons, shovelers and cinnamon teal feed on algae, submerged macrophytes, and aquatic invertebrates in shallower waters.

North American river otters (*Lontra canadensis*) are found occasionally in creeks and upper reaches of sloughs. Harbor seals (*Phoca vitulina*) have been observed in Tolay Creek, at Tubbs Island, as well as the mouth of Napa Slough at the Napa River and south of Coon Island. DFG staff has observed numerous harbor seals associated with recently breached ponds of the Green Island Unit. A rare occurrence of the California sea lion (*Zapholus californianus*) was observed in Sonoma Creek by DFG staff. Sea lions were common at one time in the lower Napa River; they were frequently observed using a haul out near Catalina Circle of the White Slough Unit.

Managed Former Salt Ponds. At one time, there were more than 8,000 acres of salt ponds used for salt production in the North Bay. These salt ponds had extremely high salinities that most vascular plants could not cope with. Wigeon grass was one of the few vascular plants that could withstand this condition, and could thus be observed in several ponds. While not favorable to vascular plants, these salt ponds provided beneficial habitat to phytoplankton, water-boatman, copepods, fairy shrimp, brine shrimp and other invertebrates (CDFG 1977). Today, these former

salt ponds are managed or are slated to be managed for wildlife use. Water levels in the majority of the salt ponds in the NSMWA are controlled through manipulation of tide gates and other water control structures by DFG staff. Managed ponds include Ponds 1/1A, 2, 6/6A, 7/7A, and 8.

The Napa-Sonoma Marshes were designated as a "Globally Important Bird Area" by the American Bird Conservancy because a large proportion of the shorebirds and waterfowl in the greater San Francisco estuary are found in the former salt pond habitats of that region (Takekawa et al. 2000). The types of birds that utilize the ponds are correlated with water depth, salinity, and size of ponds (Jones & Stokes 2004a). During recent surveys of several of the former salt ponds in the NSMWA, 80 species of birds were recorded and over 900,000 individual birds were estimated to have used the ponds over a three-year period (Takekawa et al. 2005).

3.8.2.2 Habitat Descriptions by Management Unit

American Canyon Unit

Tidal Marsh. The Napa River flows into the American Canyon Unit through several levee breaches on the east boundary of the unit. Fragments of tidal marsh occur along the outboard side of the Napa River levees. The tidal marshes of the American Canyon Unit were once diked, isolating them from tidal action. Several accidental and purposeful breaches in the levee along the Napa River have occurred in the last 20 years, partially restoring tidal action and facilitating tidal marsh establishment. In addition, a restoration project was implemented in 1990 in this Unit, in part to restore topography to encourage the reestablishment of tidal marsh vegetation. This area, on the north side of American Canyon Creek, is now dominated by tidal marsh vegetation. Plant species of the American Canyon Unit tidal marsh include Pacific cordgrass, hardstem bulrush, Alkali bulrush, narrow-leafed cattail, pickleweed, and gumplant.

Perennial Wetland. As part of the restoration project mentioned above, a freshwater perennial wetland was created that is maintained with water from American Canyon Creek. This perennial wetland consists of an open water pond surrounded by dense cattails and tule. A berm across American Canyon Creek with an open culvert directs creek flow to the pond and marsh and water is retained and the discharge elevation controlled using four standpipes with weir boards.

Perennial wetland at American Canyon Unit (photo by: URS)

Grassland. Annual mesic and moist grassland (e.g., creeping wild rye) occur along the east side of the American Canyon Unit. Moist

grasslands occur in the transition zone between wetlands and upland annual grasslands. Scattered shrubs and small trees are scattered in the annual grasslands of this unit.

Riparian. Riparian habitat occurs along American Canyon Creek in this unit. Vegetation along the creek includes willow, oak, elderberry, toyon, and cottonwood (*Populus* sp.). Most of the vegetation that is present today is a result of a large scale restoration project implemented as mitigation in 1990. Along the creek a large floodplain was excavated as part of restoration efforts.

Open Water, Rivers, Sloughs, and Bays. Approximately half of the American Canyon Unit is the open water of the Napa River. Open water is also present along American Canyon Creek.

Coon Island Unit

Tidal Marsh and Mudflats. The mature tidal marshes of Coon Island have been relatively undisturbed for the past 50 years. Coon Island has low, middle, and high elevation marsh. Low-elevation marshes at Coon Island support cordgrass along the Napa Slough. Mid-elevation vegetation includes tules. Cattails and tule border the sloughs of the north and west sides of the island where the channels are too steep-sided to support cordgrass (CDFG 1975). The higher elevation marsh supports patches of alkali bulrush, three-square bulrush, Baltic rush (*Juncus balticus*), saltgrass, Pacific silverweed (*Potentilla anserina* ssp. *pacifica*), arrow grass, and brass buttons (*Cotula coronopifolia*) (CDFG 1975).

Grassland. Several small mounds of land seldom subject to tidal inundation occur on the Island. Vegetation of these areas includes gumplant, coyotebrush, saltbush (*Atriple* sp.) dock and upland grasslands (CDFG 1975).

Huichica Creek Unit

Seasonal Wetland. Seasonal marshes occur in diked, former salt ponds in the Huichica Creek Unit. Water in the seasonal marshes comes primarily from rainwater and runoff. The seasonal marshes are very disturbed, typically dominated by non-native plant species with little differentiation in plant communities due to lack of topographic variation resulting from past land use. Non-native plants include perennial pepperweed and mustard.

Tidal Marsh. Tidal marsh in the Huichica Creek Unit is present in the Fly Bay subunit, along Hudeman Slough, and on the outboard side of levees of the former salt ponds along tidal sloughs.

Perennial Wetland. Several freshwater ponds are scattered in the uplands of the Huichica Creek Unit, surrounded by perennial wetland vegetation. These ponds are brackish due to the high salinity of the groundwater and soils. Vegetation includes dense tule and cattail.

Mudflats. Mudflats are present in portions of the Huichica Creek Unit during low tide.

Grassland. Annual grasslands occur in the uplands of the Huichica Creek Unit. The grasslands are primarily dominated by non-native annual grasses and forbs. Perennial invasive, non-native grasses occur in scattered patches in the annual grasslands, including Pacific bentgrass and Harding grass (*Phalaris aquatica*). A 25-acre grassland restoration was completed in 2003 in the uplands of Huichica Creek, and such natives as purple needlegrass, California oatgrass (*Danthonia californica*) and lupine (*Lupinus* sp.) persist.

Restored grasslands at Huichica Creek Unit (photo by: Greg Green)

Levees. There are extensive levees in the Huichica Creek Unit, surrounding and bisecting former salt ponds and along the edges of the diked seasonal and perennial wetlands. Iceplant and scrub vegetation is common on former pond levees. Levees of diked seasonal and perennial wetlands contain dense infestations of perennial pepperweed and other invasive weeds.

Open Water; Rivers, Sloughs, and Bays. Open water of rivers, sloughs, and bays exist in Huichica Creek, Fly Bay, Hudeman Slough, and diked managed ponds of the Huichica Creek Unit.

Managed Former Salt Ponds. Several former salt ponds fall within the Huichica Creek Unit, including Ponds 7, 7A, and 8. Currently, Pond 7 contains bittern with little to no vegetation. Water depth is dependent on precipitation and operation of water control structures in Ponds 7 and 8, but levels were historically maintained by Cargill at 0.5 to 4.5 feet deep (Jones & Stokes 2003a).

Green Island Unit

Seasonal Wetlands. Seasonal wetlands occur within the Green Island Unit along the railroad corridor where adjacent swales and drainage ditches were created to aid in controlling storm water runoff, in drainage channels, and in former tidal wetlands (diked marsh) that have not been drastically disturbed by salt-making activities (URS 2006b). In addition, two seasonal wetland areas are located outside the eastern salt pond levees.

Tidal Wetlands. Tidal wetlands in the Green Island Unit are limited to the margins of the barge channel in the Napa Plant Site, and the outboard side of riverfront levees (URS 2006b).

Mudflats. A large mudflat (approximately 190 acres) exists immediately southwest of the Green Island Unit in the intertidal zone between the salt pond levees and the subtidal channel of the Napa River (URS 2006b).

Levees. Levees extend for miles and cover an area of over 150 acres in the Green Island unit. The largest levees form the perimeter of the unit. Smaller "internal levees" form the boundaries of the salt ponds and water conveyance channels. The levees are constructed primarily from native bay mud material. The outboard face of the perimeter levee is armored with concrete and other structural debris. The vegetation type on the levees varies with elevation. The highest and driest portions of the perimeter levee are dominated by non-native, ruderal species, especially wild radish. Lower, mesic portions of the levees are dominated by nonnative, iceplant species (*Carpobrotus* sp. and *Mesembryanthemum nodiflorum*). A Eucalyptus tree corridor lines some reaches of the toe drain outboard of the eastern perimeter levee.

Former Salt Ponds. The Green Island Unit, acquired in 2003, is comprised of 1,290 acres of former salt ponds that were restored to tidal action in three consecutive years as follows: North in 2008, Central in 2009 and South in 2010. Tidal channels were excavated and levees lowered to facilitate tidal marsh restoration on the majority of the site which also includes upland Green Island itself, and public access features (e.g., parking lot, restroom, interpretive signs and trails).

Native cordgrass along Napa Slough

Napa River Unit

Tidal Marsh. Tidal marsh vegetation is present in Pond 2A and on the on the outboard sides of levees, largely on accreted sediments (Jones & Stokes 2003a). Outboard levee tidal wetland vegetation is up to 100 feet wide and well established. Tidal marshes in Pond 2A have quickly become established since its breaching in 1995 and 1997. Of particular note is the Napa Centennial tidal marsh located on the outboard side of the levee of Pond 4 of the Napa River Unit along the Napa River. This small ancient tidal wetland was never diked nor used for farming or salt making.

Mudflats. Mudflats are exposed during low tide in tidal sloughs of the unit, as well as in the managed former salt ponds when water is drawn down by DFG staff.

Levees. Extensive levees rim the former salt ponds of the unit. In some areas the levees are heavily vegetated, dominated by ruderal species and scrub. Coyotebrush, toyon, Himalayan blackberry, Eucalyptus, perennial pepperweed, iceplant, and yellow star thistle are present on levees in this unit (Jones & Stokes 2003a).

Open Water; Rivers, Sloughs and Bays. Sloughs of the Napa River Unit provide open water habitat during higher tides.

Managed Former Salt Ponds. The water levels of Ponds 6, 6A, Little Island Farms subunit, 1, 1A, and 2 are currently managed by DFG staff to control salinity levels and to optimize wildlife habitat. Salinities of each pond vary according to the water year, distance from the San Pablo Bay and depth.

Tidal slough in Ringstrom Bay

Ringstrom Bay Unit

Tidal Marsh. Water flows within the tidal marshes at Ringstrom Bay are controlled via water control structures by DFG staff. Reclaimed water from the Sonoma Valley County Water Agency is also pumped into the tidal marshes during emergencies or when storage problems arise. Tidal marsh is the dominant habitat type in this unit, interspersed with open water of sloughs and mudflats.

Mudflats. Mudflats occur in association with tidal sloughs and tidal wetlands in this unit.

Seasonal Wetland. Seasonal wetlands in this unit are separated from tidal wetlands by levees. A recent restoration project enhanced seasonal freshwater wetlands through excavation, recontouring, and levee repair.

Grassland. Annual mesic and moist grasslands are present along the northwestern boundary of this unit. These grasslands are highly disturbed; they were likely used for oat hay farming in the past and are now seeded with crop species by DFG for wildlife forage.

Levees. Levees of this unit are vegetated with annual and perennial non-native forbs, grasses and coyotebrush. Low, middle and high marsh vegetation are present. The tidal wetlands and open water of this unit support a wide diversity of birds and wildlife, including ducks, raptors, beavers, and otters.

Open Water; Rivers, Sloughs and Bays. Open water occurs interspersed with tidal marsh and mudflats in the Ringstrom Bay Unit.

Tidal marsh dominated by annual pickleweed species at Sonoma Creek Unit (photo by: URS)

Sonoma Creek Unit

Tidal Marsh. The Sonoma Creek Unit, also known as West End, in part, contains tidal marsh vegetation interspersed with open water. Tidal waters enter this unit through a gate that is left fully open at all times to allow tidal exchange (Huffman 2008a). A levee separates the west and

east sides of West End, however, a breach in the levee allows mixing of water between the two sections (Huffman 2008a). Sediment is rapidly accreting in this unit. A notable characteristic of these tidal wetlands is the dominance of annual pickleweed, a species not common to the rest of the NSMWA.

Mudflats. Mudflats are present along the southern boundary where the Sonoma Creek Unit borders San Pablo Bay. Mudflats area relatively extensive in this unit, in part due to the rapid siltation rate (Huffman 2008a)

Levees. Levees of this unit are vegetated with annual and perennial non-native forbs, grasses and extensive coyotebrush.

View of northern edge of Southern Crossing Unit

Southern Crossing Unit

Seasonal Wetland. Seasonal wetlands occur in areas of diked historic tidelands with salty soils at the Southern Crossing Unit. Dominant species include pickleweed (perennial), alkali heath (*Frankenia salina*), salt grass, and brass buttons. Other species present include fat hen (*Atriplex triangularis*), rabbit's foot grass (*Polypogon monspeliensis*) and bird's foot trefoil. The vegetation occurs in a mosaic of patches with bare ground or in stands of 100% cover (Brady/LSA 1998).

Tidal Marsh. Tidal marsh vegetation within the Southern Crossing Unit occurs along the Napa River mostly outboard of the levee but also in a few places inboard of the levee. Dominant species include alkali bulrush, California bulrush, fat hen, gum plant, and salt grass. Areas that are not inundated as frequently support bird's foot trefoil, Italian rye grass (*Lolium multiflorum*), and rabbit's foot grass (Brady/LSA 1998). Salt marsh harvest mouse and Mason's lilaeopsis (*Lilaeopsis masonii*) are known to occur in the Southern Crossing Unit in tidal marsh habitat (Brady/LSA 1998).

Grassland. Mesic grasslands occur in Southern Crossing Unit, in a mosaic with seasonal salt marsh and bare ground. Dominant species include meadow barley (*Hordeum brachyantherum*), Mediterranean barley, Italian ryegrass, Harding grass, hair grass (*Deschampsia danthonioides*) and California semaphore grass (*Pleuropogon californicus*). The grass species occur in either single species stands or mixed with other species of grasses or forbs. Forbs present include alkali mallow (*Malvella leprosa*), knotweed (*Polygonum arenastrum*), brass buttons, hyssop loosestrife (*Lythrum hyssopifolium*), and birdsfoot trefoil (*Lotis corniculatus*) (Brady/LSA 1998).

Levees. The levees of the Southern Crossing Unit are both unvegetated and vegetated; the levee along the Napa River is vegetated with Eucalyptus trees.

Non-native Trees. Eucalyptus stands occur along the Napa River levee of the Southern Crossing Unit. The trees of this stand appear to be stunted and exhibit dieback on the branches. Understory vegetation is dominated by nonnative grasses and forbs (Brady/LSA 1998).

Tolay Creek Unit

Seasonal Wetlands. Seasonal wetlands occur in the northern portion of the Tolay Creek Unit. These areas were once exposed to tidal action but now are isolated from the tide. These seasonal wetlands are highly saline due to remnant soil salts. Vegetation includes pickleweed, saltgrass, and perennial pepperweed. Small ponds occur in the eastern portion of the northern section of the Tolay Creek Unit; water is supplied largely from one of the small Tolay Creek tributaries that enters the unit directly across from the Infineon Raceway.

Tidal Marsh. Tidal marsh habitat in Tolay Creek Unit is limited to the outboard side of a levee that runs along the former Tolay Creek alignment. Tidal wetland likely was more extensive when Tolay Creek was connected to Sonoma Creek. These areas of former tidal marsh are now seasonal wetlands that are salty due to remnant saline soils. The outboard side of the eastern levee that borders the unit receives very little tidal input due to heavy channel siltation.

Tidal marsh at White Slough Unit

Grassland. Highly disturbed moist grassland occurs adjacent to seasonal wetlands in the northern portion of the Tolay Creek Unit. These grasslands are interspersed with seasonal wetlands.

Riparian. A limited amount of riparian habitat occurs in the Tolay Creek Unit along Tolay Creek north of SR 37. Willow scrub lines the small freshwater side channel of Tolay Creek. Beavers are active in the area (Huffman 2008a).

Open Water; Rivers, Sloughs and Bays, Levees and Mudflats. The southern portion of the Tolay Creek Unit is predominantly open water and intertidal mudflat. A few levees fall within the unit, but the majority the levees are managed by the USFWS. Tidal marsh vegetation also exists along the inboard side of levees, but these areas are also managed by the USFWS.

White Slough Unit

Seasonal Wetland. Seasonal wetlands are limited in the White Slough Unit. A seasonal wetland pond was created in the uplands of the White Slough Unit in 1989 as a part of a mitigation project funded by the City of Vallejo. In the past, this seasonal wetland supported species

typically associated with vernal pools, including flatface downingia (*Downingia pulchella*) and California eryngo (*Eryngium aristulatum*) (Demgen 2008).

Tidal Marsh and Levees. Tidal marsh and associated tidal channel is the dominant habitat type in the White Slough Unit, occurring north of SR 37. The primary tidal channel leads to multiple large-diameter culverts under SR 37 that supply water to the southern White Slough area that is not owned by DFG but is noteworthy because the tidal prism flowing into the southern area will minimize siltation in this channel.

Grassland. Grasslands are interspersed with the tidal wetland vegetation and bare ground in the higher marsh plain on the White Slough Unit. Dominant species include ryegrass and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*).

Wingo Unit

Seasonal Wetland (planned). Sonoma Creek overtopped a levee of the Wingo Unit in 1998 and again in 2006, causing flooding of the entire Unit. The levee was repaired and the Unit dewatered in 2008. Seasonal wetlands associated with ponds in the Wingo Unit were present prior to flooding. These ponds were created in uplands to increase habitat diversity for a variety of bird species. The seasonal wetlands and ponds will be restored once the water is pumped out of the Wingo Unit and the levee is repaired.

Open Water; Rivers, Sloughs and Bays and Levees. Levees surrounding and bisecting the Wingo Unit are vegetated by typical ruderal vegetation and scrub species.

3.8.3 Fisheries and Aquatic Invertebrates

3.8.3.1 Fisheries

This section summarizes the current conditions for fisheries resources in the NSMWA. It discusses native and nonnative fish use of marshes, aquatic habitats, and special-status fish species.

NSMWA supports a wide variety of fisheries resources and provides vital fish spawning, rearing, and/or migratory habitat for a diverse assemblage of native and non-native fish species. Due to its location and the variety of habitats present, many species can be expected to occur in NSMWA during one or more life stages. The fisheries habitat within the NSMWA consists of a series of sloughs adjacent and connecting to San Pablo Bay, as well as a series of managed ponds. These areas provide habitat for a variety of fish species. In particular, the sloughs provide nursery habitat for many estuarine fish species (e.g., striped bass). Some species, such as shiner perch, would be expected to occur in portions of NSMWA that are located along San Pablo Bay that provide open water and mudflat habitat. Several perennial stream systems flow through NSMWA (Napa River, Sonoma, and Tolay creeks). Anadromous fish species, such as steelhead (*Oncorhynchus mykiss*), Chinook salmon (*O. tshawytscha*), and striped bass (*Morone saxatilis*), can be expected to migrate through the project area. Some freshwater fish species not normally

expected to occur within the Marshes (e.g., California roach [*Hesperoleucus symmetricus*]) may be carried downstream during high flows from upstream freshwater habitats such as the upper Napa River. Other uncommon fish species to the NSMWA include the bat ray (*Myliobatis californica*), observed in the Napa River as well as the intake pond area of the Napa River Unit.

Fish species can be separated into five broad types: nondependent marine, dependent marine, true estuarine, diadromous, and freshwater (Moyle and Cech 1982). Examples of fish species within each of these categories that could be found in the NSMWA are described below (Jones & Stokes 2004b).

Nondependent marine fishes are those species, commonly found near the oceanic mouth of the estuary, that are not dependent on the estuary to complete their life cycles. Examples of such species in San Pablo Bay are shiner perch (*Cymatogaster aggregata*) and starry flounder (*Platichthys stellatus*).

Dependent marine species need the estuary to complete at least one of their life stages. This need can be for spawning, for rearing of young, or for feeding grounds for adults. An example of a dependent marine species is Pacific herring (*Clupea harengus*), which uses San Pablo Bay for spawning and rearing its young.

True estuarine species complete their entire life cycles in the estuary. In the Napa-Sonoma Marsh, delta smelt (*Hypomesus transpacificus*) are a true estuarine species.

Diadromous fishes are those that migrate through estuaries on their way either to freshwater or to saltwater. There are two types: anadromous species that migrate from saltwater to spawn in freshwater and catadromous species that migrate from freshwater to spawn in the ocean. Young of both types may spend considerable time in estuaries, taking advantage of abundant food (Moyle 2002 in Jones & Stokes 2004b). The most well-known species in San Pablo Bay and the surrounding estuarine habitats grow to maturity in the ocean and spawn in freshwater. Examples are chinook salmon, steelhead, and striped bass. There are no catadromous species.

Freshwater species are those that complete their entire life cycles in the upper, tidally influenced reaches of the estuary. An important example in NSMWA is the Sacramento sucker (*Catostomus occidentalis)*.

Numerous biological and abiotic factors influence the presence, abundance, and distribution of fish species within the San Francisco Bay-Delta estuary (Moyle and Cech 1982). Physical and chemical properties, including temperature, salinity and dissolved oxygen levels, are important factors that determine the special and temporal distribution of fish species within the estuary. The Sacramento-San Joaquin River system, as well as flow from the Petaluma and Napa Rivers and Sonoma and Tolay Creeks, provides essential nutrients and freshwater input that causes the spatial and temporal variation in salinity and temperature that allows for such an abundance of species within San Pablo Bay. Freshwater input from the Napa River, and Sonoma and Tolay

Creeks provides upstream freshwater spawning and rearing habitat for anadromous fish. These complexities result in a high number of species expected to occur within the NSMWA.

Fisheries Assemblage

The fisheries assemblage within the NSMWA can be effectively broken into three general habitat types: San Pablo Bay, the internal sloughs and ponds, and riverine habitat contained within Napa River, and Sonoma and Tolay Creeks. The fisheries assemblage of each is discussed in detail below.

San Pablo Bay

San Pablo Bay is a shallow estuarine bay at the north end of San Francisco Bay. Habitat in San Pablo Bay within the Napa-Sonoma Marshes Wildlife Area includes open bay, mud flats, and tidal marshes. Many fish species utilize these habitats for foraging, rearing, and migration corridors.

DFG has conducted annual fish sampling within San Pablo Bay for over 20 years, beginning in 1980 (CDFG 1999). Thirty-one species accounted for 98.9% of the total catch. They are presented in **Table 3-4** in order of decreasing total catch.

Although the 31 species described in **Table 3-4** represented 98.9% of the total catch of DFG surveys, other species are known to occur within San Pablo Bay (e.g., white sturgeon) and would be expected within NSMWA.

The Management Units along San Pablo Bay include the Sonoma Creek (West End) and Ponds 1 and 1A of the Napa River Unit and South Tolay Unit. These units abut San Pablo Bay, containing both mudflat and tidal marsh habitats. The Sonoma Creek Unit contains some open water and mudflat habitat along San Pablo Bay.

Internal Sloughs and Ponds

The internal sloughs (tidal channels) and ponds provide important spawning and nursery habitat for a variety of species. Nearly all of the Management Units contain some interior slough and pond habitat. Several species, including Sacramento splittail and several goby species, spawn within the tidal channels of the NSMWA while also utilizing these habitats for rearing. Other species occur within these habitats for refuge but spawn elsewhere (e.g., striped bass).

During a one-year study of Ponds 1, 2, 3, 4, and 7 within NSMWA, 16 species were collected, including 9 native and 7 non-native species (Takekawa et al. 2000) (**Table 3-5)**.

Table 3-4. Fish commonly collected in San Pablo Bay between 1980 and 2002.

Common Name	Scientific Name	Native or Introduced
Northern anchovy	*Engraulis mordax*	Native
Longfin smelt	*Spirinchus thaleichthys*	Native
Pacific herring	*Clupea pallasii*	Native
White croaker	*Genyonemus lineatus*	Native
English sole	*Parophrys vetulus*	Native
Yellowfin goby	*Acanthogobius flavimanus*	Introduced
Pacific staghorn sculpin	*Leptocottus armatus armatus*	Native
Striped bass	*Morone saxatilis*	Introduced
Bay goby	*Lepidogobius lepidus*	Native
Jacksmelt	*Atherinopsis californiensis*	Native
Plainfin midshipman	*Porichtus notatus*	Native
Shiner perch	*Cymatogaster aggregata*	Native
Speckled sanddab	*Citharichthys stigmaeus*	Native
Starry flounder	*Platichthys stellatus*	Native
Topsmelt	*Atherinops affinis*	Native
Arrow goby	*Clevelandia ios*	Native
Chinook salmon	*Oncorhynchus tshawystcha*	Native
American shad	*Alosa sapidissima*	Introduced
Threespine stickleback	*Gasterosteus aculeatus*	Native
Brown smoothhound	*Mustelus henlei*	Native
Dwarf surfperch	*Micrometrus minimus*	Native
Cheekspot goby	*Ilypnus gilberti*	Native
Surf smelt	*Hypomesus pretiosus*	Native
Bay pipefish	*Sygnathus leptorhynchus*	Native
Walleye surfperch	*Stizostedion vitreum*	Native
Inland silverside	*Menidia beryllina*	Introduced
Threadfin shad	*Dorosoma petenense*	Introduced
Delta smelt	*Hypomesus transpacificus*	Native
Brown rockfish	*Sebastes auriculatus*	Native
California halibut	*Paralichthys californicus*	Native
California tonguefish	*Symphurus atricauda*	Native

Table 3-5. Fish collected in former salt ponds and associated internal sloughs at the NSMWA.

Common Name	Scientific Name	Native or Introduced
American shad	*Engraulis mordax*	Introduced
Delta smelt	*Hypomesus transpacificus*	Native
Inland silverside	*Menidia beryllina*	Introduced
Longjaw mudsucker	*Gillichthys mirabilis*	Native
Northern anchovy	*Engraulis mordax*	Native
Pacific staghorn sculpin	*Leptocottus armatus armatus*	Native
Rainwater killifish	*Lucania parva*	Introduced
Sacramento splittail	*Pogonichthys macrolepidotus*	Native
Starry flounder	*Platichthys stellatus*	Native
Striped bass	*Morone saxatilis*	Introduced
Striped mullet	*Mugil cephalus*	Native
Threadfin shad	*Dorosoma petenense*	Introduced
Threespine stickleback	*Gasterosteus aculeatus*	Native
Tridentiger goby sp.	*Tridentiger* sp.	Introduced
Tule perch	*Hysterocarpus traski*	Native
Yellowfin goby	*Acanthogobius flavimanus*	Introduced

The species listed in **Table 3-5** are not inclusive and many other fish species would be expected to occur within the internal sloughs and pond habitat within NSMWA. These include species that may be moving through these habitats, as well as resident species or those utilizing the habitat for rearing.

Riverine Habitat

Riverine habitat within the NSMWA is present within the Napa River and the Sonoma, Tolay, Huichica, and American Canyon creeks. These streams include freshwater habitat in their upper reaches used for steelhead spawning in the larger watersheds, and estuarine species in the lower reaches. Management units with riverine habitat include the Tolay Creek Unit, Sonoma Creek Unit (West End), Wingo Unit, Napa River Units [Pond 3 (Knights Island), Ponds 4, 5 (Russ Island)], Huichica Creek Unit, Coon Island Unit, Southern Crossing Unit, American Canyon Unit, White Slough Unit, and adjacent to the Green Island Unit. The five stream systems are discussed in detail below.

Napa River. The Napa River watershed provides habitat for a variety of fish species. A total of 42 fish species were reported in DFG and U.S. Environmental Protection Agency (USEPA) documents, as well as the Napa River Monitoring database (Napa County 2005). Twenty-two

native fish species have been collected in the Napa River watershed, including the following species of interest: steelhead, fall-run Chinook salmon, Pacific lamprey, delta smelt, and Sacramento splittail (**Table 3-6**). No fish population data are available for Huichica Creek or American Canyon Creek; therefore, these creeks are not included in **Table 3-6**. Several freshwater reservoirs are located upstream. Historically, the Napa River supported a run estimated to be between 6,000 and 8,000 steelhead and between 2,000 and 4,000 coho salmon (USFWS 1968). Coho have been extirpated from the watershed (USFWS 1968), and the steelhead population has declined to an estimated run of less than a few hundred spawning adults (Stillwater Sciences 2002). The historical status of Chinook salmon in the Napa River is not as well-known. However, hydrologic and habitat conditions in the Napa River suggest that Chinook were present historically. Furthermore, recent collections of juvenile Chinook salmon in the Napa River suggest that successful reproduction occurs under present conditions (USACE 2004). Fall-run Chinook salmon were historically present in Sonoma Creek, which is adjacent to the Napa River and contains similar habitat and hydrology to the Napa River (Sonoma Ecology Center 2002). This further suggests that Chinook were historically present in the Napa River. In addition, the Napa River supports runs of anadromous striped bass, white sturgeon, and American shad.

The reason for the decline in the number and diversity of native fish is complex and includes competition from nonnative species and anthropogenic changes in the watersheds. Twenty species of non-native fish have been collected in the Napa River. Exotic fish introductions have impacted most freshwater ecosystems in California and have dramatically altered food web dynamics and the species composition of many fish communities (Moyle 2002). Human induced changes to habitat and stream hydrology often result in changes to existing fish communities. For example, the shift of a river system from a pool-riffle morphology to a morphology dominated by large, deep pools with increased water temperatures and slow-moving water often provide the preferred habitat of predatory fish species, many of which are exotic, such as largemouth bass (Stillwater Sciences 2002).

Sonoma Creek. Sonoma Creek flows through the NSMWA before entering San Pablo Bay. A run of steelhead are known to occur in Sonoma Creek and was estimated to be approximately 1,200 spawning adults in 1965. There is conflicting evidence as to whether coho salmon were historically present within Sonoma Creek. However, there is no evidence to suggest that they currently utilize this stream, and therefore are not likely to occur in Sonoma Creek (Jones & Stokes 2004a).

During fish surveys of Sonoma Creek between 1992 and 1998, 15 fish species were collected (**Table 3-6**), consisting of 10 native species and 5 non-natives (Leidy 1999). These surveys are not inclusive and it is expected that many of the fish species found within the San Pablo Bay and interior sloughs and pond habitats would be found within portions of Sonoma Creek.

Table 3-6. Fish species collected in the Napa River, Sonoma Creek, and Tolay Creek watersheds.

Common Name	Scientific Name	Napa River	Sonoma Creek	Tolay Creek
Native Species				
Arrow goby	*Clevelandia ios*	—	—	X
Bay goby	*Lepidogobius Lepidus*	—	—	X
Bay pipefish	*Sygnathus leptorhynchus*	—	—	X
California roach	*Hesperoleucus symmetricus*	X	X	—
Chinook salmon	*Oncorhynchus tshawystcha*	X	—	—
Chum salmon	*Oncorhynchus keta*	X	—	—
Delta smelt	*Hypomesus transpacificus*	X	—	—
Hardhead	*Mylopharodon conocephalus*	X	—	—
Longjaw mudsucker	*Gillichthys mirabilis*	X	X	—
Pacific herring	*Clupea pallasi*	—	—	X
Pacific lamprey	*Lampetra tridentata*	X	X	—
Pacific staghorn sculpin	*Leptocottus armatus*	X	—	X
Prickly sculpin	*Cottus asper*	X	X	—
Riffle sculpin	*Cottus gulosus*	X	X	—
Sacramento pikeminnow	*Ptychocheilus grandis*	X	X	—
Sacramento splittail	*Pogonichthys macrolepidotus*	X	—	—
Sacramento sucker	*Catostomus occidentalis*	X	X	—
Speckled sanddab	*Citharichthys stigmaeus*	—	—	X
Steelhead/ rainbow trout	*Oncorhynchus mykiss*	X	X	—
Threespine stickleback	*Gasterosteus aculeatus*	X	X	X
Topsmelt	*Atherinops affinis*	—	—	X
Tule perch	*Hysterocarpus traski*	X	X	—
White sturgeon	*Acipenser transmontanus*	X	—	—
Introduced Species				
American shad	*Alosa sapidissima*	X	—	—
Black crappie	*Pomoxis nigromaculatus*	X	—	—
Bluegill	*Lepomis macrochirus*	X	X	—
Carp	*Cyprinus carpio*	X	—	—
Chameleon goby	*Tridentiger trigonocephalus*	—	X	—
Channel catfish	*Ictalurus punctatus*	X	—	—
Golden shiner	*Notemigonus crysoleucas*	X	—	—
Goldfish	*Carassius auratus*	X	—	—
Green sunfish	*Lepomis cyanellus*	X	—	—

Table 3-6. Fish species collected in the Napa River, Sonoma Creek, and Tolay Creek watersheds.

Common Name	Scientific Name	Napa River	Sonoma Creek	Tolay Creek
Inland silverside	*Menidia beryllina*	X	–	X
Largemouth bass	*Micropterus salmoides*	X	–	–
Mosquitofish	*Gambusia affinis*	X	X	X
Rainwater killifish	*Lucania parva*	X	–	X
Shimofuri goby	*Tridentiger bifasciatus*	X	–	–
Smallmouth bass	*Micopterus dolomieui*	X	–	–
Striped bass	*Morone saxatilis*	X	X	X
Threadfin shad	*Dorosoma petenense*	X	–	–
Wakasagi	*Hypomesus nipponensis*	X	–	–
White catfish	*Ameiurus catus*	X	–	–
White crappie	*Pomoxis annularis*	X	–	–
Yellowfin goby	*Acanthogobius flavimanus*	X	X	X

Tolay Creek. Tolay Creek is a smaller stream system than either Sonoma Creek or the Napa River. It flows through the NSMWA prior to entering the San Pablo Bay to the west of Sonoma Creek. Many of the species found in Sonoma Creek, as well as in San Pablo Bay and the interior sloughs and ponds would be expected to occur in Tolay Creek.

During fish surveys in lower Tolay Creek conducted between 1999 and 2002, 13 fish species were collected, consisting of 8 native and 5 non-native species (Takekawa et al. 2000). These results are provided in **Table 3-6**.

Huichica Creek. Huichica Creek flows in a generally southern direction for approximately 8 miles before entering Hudeman Slough. Hudeman Slough flows through the Napa Slough into the Napa River. Steelhead and rainbow trout are currently found within Huichica Creek, and it is known to have supported a historical run of steelhead (Rich 2007). The lower reaches of Huichica Creek (below SR 121) are considered to have low habitat values for steelhead but serve as a migration corridor to more suitable upstream habitat (Leidy et al. 2005). A 10- to 12-foot-high culvert at the SR 121 crossing is considered to be a barrier to upstream migration. A waterfall approximately 1.75 miles upstream of SR 121 has been identified as a barrier to migration; however, the waterfall may not actually be a barrier at all or may only be a partial barrier (Rich 2007). Fish population data are lacking for Huichica Creek, though several surveys found steelhead within the portion of the creek below the falls. The lower portions of Huichica Creek and Hudeman Slough can be expected to contain many of the fish found in the lower reaches of other streams within the NSMWA (e.g., mosquitofish, striped bass, yellowfin goby).

American Canyon Creek. American Canyon Creek drains the area immediately north of the City of Vallejo and enters the Napa River tidal slough. No anadromous fish have been found in American Canyon Creek during numerous surveys (Rich 2007; Leidy et al. 2005). Fish expected to occur in American Canyon Creek include common species found within intermittent, low-level streams in this area (e.g., threespine stickleback, mosquitofish).

3.8.3.2 Invertebrates

Aquatic invertebrates, including insects, amphipods, copepods, cladocera, marine (polychaetes) and freshwater worms (oligochaetes) and small mollusks are a primary food source for fish, including striped bass, delta smelt, and catfish, as well as waterfowl, including redhead, bufflehead, scaup, and canvasback ducks (CDFG 1977). A variety of benthic and pelagic invertebrates occur within the NSMWA.

Recent surveys of benthic invertebrates within the Napa River Unit documented 50 taxonomic groups represented by nematodes, polychaetes, bivalves, crustaceans, insects, and other various groups (Miles et al. 2004). Other surveys of invertebrates in the greater Napa-Sonoma Marshes include the Napa Sanitation District study on the effects of effluent on the benthic and invertebrate fauna of the Napa Marsh area (Gustafson and Carter 1976). This study documented polychaete worms, copepods, amphipods and opossum shrimps, bentnose and soft-shell crabs. The results of this study showed that the benthic biota of the Napa River is a continually changing one, primarily because of seasonal changes in salinity (CDFG 1977).

The opossum shrimp (*Neomysis mercedis*) is a primary food source of juvenile striped bass. During their early growth striped bass feed on the opossum shrimp. By mid-summer, the bass have grown to a size that fish become their primary food source. This seasonal diet change of the striped bass coincides closely with the July–August peak in the opossum shrimp population and the December–February decline (CDFG 1977).

Several of the former salt ponds in the NSMWA contain salinity levels that support brine shrimp (*Artemia franciscana*) and brine flies (*Ephydra millbrae*), important food sources for some species of waterbirds, such as American avocets and black-necked stilts and phalaropes.

San Francisco Bay supports the largest Dungeness crab (*Cancer magister*) nursery in the world, but it is illegal to harvest Dungeness crab in the bay (Jones & Stokes 2004a). Larval crabs are carried by currents into San Pablo and Suisun Bays, becoming widely distributed by July (CDFG 2008). By the spring of the following year, most of these crabs have returned to the ocean. A recent study conducted by DFG showed that crabs reared within San Francisco Bay grew approximately twice the rate of ocean-reared crabs (CDFG 2008).

A significant decrease in benthic invertebrate fauna in San Francisco Bay has been documented over the last several decades (URS 2001 in Jones & Stokes 2004a). The introduction of invasive nonnative species that compete with or feed on the native invertebrates, as well as habitat loss, has led to this decline. It is estimated that 40 to 100% of the benthic invertebrate fauna in any

area of the bay are nonnative species (Carlton 1979; URS 2001). Asian clam (*Potamocorbula amurensis*), Chinese mitten crab (*Eriocheir sinenise*), and green crab (*Carcinus maenas*) are some of the invasive nonnative species of particular concern that have become well established in the bay (Jones & Stokes 2004a).

3.8.4 Special-Status Plants

Several special-status plant species have been observed or are expected to occur within the NSMWA. **Figure 11** shows the locations of occurrences of known special-status plant species in and around the NSMWA. The special-status plant species addressed in this section include:

- Species listed as threatened, endangered or rare under the state or federal Endangered Species Acts
- Species listed as species of special concern by the DFG
- Species listed as rare by the California Native Plant Society (CNPS)

Twelve special-status plants occur or have the potential to occur in the NSMWA**.** These species are summarized in **Table 3-7** and discussed in detail below.

San Joaquin Spearscale

San Joaquin spearscale (*Atriplex joaquiniana*), a CNPS List 1B.2 species, is an annual herb in the Goosefoot family (Chenopodiaceae). It occurs in meadows and seeps, playas and grasslands (alkaline). It was recorded in the American Canyon Unit in alkaline seasonal wetlands (CDFG 2008). It was also recorded in American Canyon Unit in seasonal alkaline wetlands; however, this location is now underwater. Suitable habitat for this species is present throughout the NSMWA.

Alkali Milk Vetch

Alkali milk vetch (*Astragalus tener* var. *tener*), a CNPS List 1B.2 species, is an annual herb in the goosefoot family. Its preferred habitat includes alkali flats and moist grasslands. An occurrence was recorded in 1993 on the north side of American Canyon Creek near the end of

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Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 11

Special-Status Occurrences: Plant Species

dwarf downingia
Delta tule pea
pappose tarplant
saline clover
dwarf downingia
Delta tule pea
soft bird's-beak
Delta tule pea
Delta tule pea
Suisun Marsh aster
two-fork clover
Delta tule pea
Marin knotweed
soft bird's-beak
Mason's lilaeopsis
Delta tule pea
Delta tule pea
Delta tule pea
legenere
Contra Costa goldfields
dwarf downingia
Delta tule pea
Suisun Marsh aster
Delta tule pea
soft bird's-beak
Delta tule pea
Marin knotweed
two-fork clover
Flat-faced downingia
Delta tule pea
San Joaquin spearscale
Flat-faced downingia
San Joaquin spearscale
soft bird's-beak
Mason's lilaeopsis
alkali milk-vetch
Marin knotweed

NSMWA Management Unit boundary

Base imagery: Airphoto USA, 1 April 2007, 0.3-meter cell size

N

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MILES

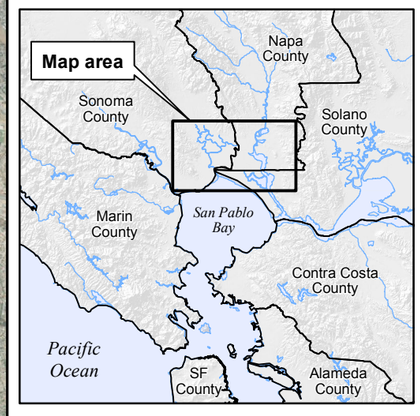

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Table 3-7. Special-status plant species occurring or with potential to occur in the NSMWA.

Scientific Name **Common Name**	**Federal[1]**	**State[2]**	**CNPS[3]**	**Preferred habitat**	**Potential to occur in the project area**
Atriplex joaquiniana San Joaquin Spearscale	—	—	1B.2	Alkali grassland, alkali scrub, alkali meadows, saltbush scrub, 1–320 m. Occurs with salt grass and alkali heath above pickleweed habitat. Blooms April–October.	**Present.** Occurrence recorded within the NSMWA on the north bank of American Canyon Creek. However, record is incomplete and location needs verification.
Astragalus tener var. *tener* Alkali Milk Vetch	—	—	1B.2	Playas, valley and foothill grasslands (adobe clay), alkaline vernal pools, 1-60 m. Blooms March-June	**Present.** Recorded along American Canyon Creek in the American Canyon Unit of the NSMWA.
Centromadia parryi ssp. *parryi* Pappose Tarplant	—	—	1B.2	Chaparral, coastal prairie, meadows and seeps, coastal salt marshes and swamps, valley and foothill grasslands (vernally mesic, often alkaline), 2-420 m. Blooms May-November.	**High.** Recorded near SR 121 in the vicinity of the NSMWA.
Cordylanthus mollis spp. *moll* Soft Bird's-Beak	FE	Rare	1B.2	Tidal salt marsh, 0–3 m. An annual, hemiparasitic herb that with fluctuating population levels. Occurs in upper tidal marsh near the limits of tidal action with pickleweed, salt grass, fleshy jaumea (*Jaumea carnosa*), alkali heath, perennial ryegrass (*Lolium perenne)*, arrow grass (*Triglochin* sp.), and Suisun marsh aster. Blooms July–November.	**High.** A population on degraded, marginal habitat on the south levee at the confluence of Dutchman and South Sloughs near Pond 3 had 50 individuals in 1982, but was not seen in 3 subsequent searches. This population may be extirpated. A population at Bentley Wharf 0.25 mile west of Pond 7A is considered extirpated. A 3-acre population occurs on Fagan Slough on the Napa River 2 miles northeast of Pond 8. Regular surveys by DWR at the Napa River Unit have not identified new populations (Jones & Stokes 2003a).
Downingia pusilla Dwarf Downingia	—	—	2.2	Valley and foothill grasslands (mesic), vernal pools, 1-455 m. Blooms March-May.	**Moderate.** Two non-specific occurrences are recorded in the vicinity of the Wingo and Ringstrom Bay Units of the NSMWA, as well as in association with a vernal pool on east side of the Napa River.
Lathyrus jepsonii var. *jepsonii* Delta Tule Pea	—	—	1B.2	Coastal and estuarine marshes, 0–4 m. Occurs with salt grass, pickleweed, arrow grass, bulrush, fleshy jaumea, Suisun marsh aster, and soft bird's-beak. Blooms May–September.	**Present.** Several populations are reported in the NSMWA and vicinity including South Slough, and along the Napa River at Coon Island and Pond 8, along Fagan Slough and in the Huichica Creek Unit.

Table 3-7. Special-status plant species occurring or with potential to occur in the NSMWA.

Scientific Name **Common Name**	**Federal[1]**	**State[2]**	**CNPS[3]**	**Preferred habitat**	**Potential to occur in the project area**
Legenere limosa Legenere	—	—	1B.1	Freshwater marshes and vernal pools, 1-880 m. Blooms April-June.	**Low.** No occurrences in the NSMWA. Closest occurrence 1 mile east of Southern Crossing Unit in association with vernal pool. Species may occur in freshwater ponds of the NSMWA. However, ponds in the NSMWA are likely brackish due to slightly saline groundwater and saline soils.
Mason's Lilaeopsis	—	Rare	1B.1	Freshwater and brackish intertidal marshes, streambanks in riparian scrub, silty areas generally at mean sea level. Occurs with arrow grass, fleshy jaumea, brass buttons, and pickleweed. Blooms April–November.	**Present.** Populations are reported from the banks of the Napa River in the Southern Crossing Unit and Green Island Unit.
Polygonum marinense Marin Knotweed	—	—	3.1	Coastal salt marsh and higher elevation coastal brackish marsh, 0–10 m. Occurs with pickleweed, salt grass, and gum plant. Blooms April–October.	**High**. Three populations are reported from the project vicinity, including Fagan Marsh about 2 miles northeast of Pond 8, and about 1 mile east of Pond 3 across the Napa River.
Symphyotrichum lentus Suisun Marsh Aster	—	—	1B.2	Brackish and freshwater marsh, silty areas, 0–3 meters [m]. Occurs with pickleweed, arrow grass, salt bush, bulrush, soft bird's beak, and Delta tule pea. Blooms May– November.	**High.** Several populations recorded at Fagan Marsh Ecological Reserve on the Napa River.
Trifolium amoenum Showy Indian Clover	FE	—	1B.1	Coastal bluff scrub, valley and foothill grasslands, 5–415 m. Blooms April–June.	**Low**. Old occurrence recorded in vicinity of NSMWA; however, species was not relocated in subsequent surveys.
Trifolium depauperatum var. *hydrophilum* Saline Clover	—	—	1B.2	Marshes and swamps, valley and foothill grasslands, vernal pools. Alkaline, mesic sites.	**Moderate**. Recorded adjacent to the Wingo Unit of the NSMWA in the Viansa Wetlands.

Table 3-7. Special-status plant species occurring or with potential to occur in the NSMWA.

[1] United States Fish and Wildlife Service classifications:

FE = Federally Endangered. Species in danger of extinction throughout all or significant portion of its range.

FT = Federally Threatened. Species likely to become endangered within foreseeable future throughout all or significant.

[2] California Department of Fish and Game classifications:

CE = State endangered. Species who's continued existence in California is jeopardized.

CT = State threatened. Species, although not presently threatened with extinction, may become endangered in the foreseeable future.

CR = State listed as rare. Plant species, although not presently threatened with extinction, may become endangered in the foreseeable future.

CP = Fully protected by the State of California under Sections 3511 and 4700 of the Fish and Game Code.

[3] California Native Plant Society classifications:

List 1A = Plants that are presumed extinct in California.

List 1B = Plants that are Rare, Threatened, or Endangered in California and elsewhere.

List 2 = Plants that are Rare, Threatened or Endangered in California but more common elsewhere.

List 3 = Plants for which more information is needed.

List 4 = Plants of limited distribution.

.1 = Seriously endangered in California

.2 = Fairly endangered in California

.3 = Not very endangered in California

Mini Drive in the NSMWA (CDFG 2008). Suitable habitat for this species occurs throughout the NSMWA.

Pappose Tarplant

Pappose tarplant (*Centromadia parryi* ssp. *parryi*), a CNPS List 1B.2 species, is an annual herb in the aster family (Asteraceae). It occurs in coastal prairies, chaparral, meadows and seeps, coastal salt marshes and vernally mesic (often alkaline) grasslands. The only recorded occurrence in the vicinity of the NSMWA exists at an unspecific location along SR 121 (CDFG 2008). Suitable habitat for this species is present in moist grasslands of the NSMWA.

Soft Bird's Beak

Soft bird's beak (*Cordylanthus mollis* spp. *mollis*) is a federally endangered, state listed rare and CNPS List 1B.2 species. It is as annual herb in the snapdragon family (Scophulariaceae). It is found along the upper reaches of tidally influenced saltgrass pickleweed marshes at or near the limits of tidal action (USFWS 1997). Two historic locations in the Napa-Sonoma Marshes are considered extirpated due to habitat loss/conversion (occurrences at Bentley Wharf and Mare Island). An occurrence at Fagan Marsh Ecological Reserve, adjacent to the NSMWA is considered extant. Suitable habitat for this species is present in the upland tidal marshes of the Napa River, Huichica Creek, America Canyon, and Tolay Creek units.

Dwarf Downingia

Dwarf downingia (*Downingia pusilla*), a CNPS List 2.2 species, is a small annual herb in the bellflower family (Campanulaceae). It occurs in vernal pools as well as mesic sites in grasslands and along streams. There are three recorded occurrences of this species in the vicinity of the NSMWA. Two of the occurrences recorded near Ringstrom Bay and Wingo are unspecific and need verification. Another is recorded in association with vernal pools on the east side of the Napa River (CDFG 2008). Suitable habitat for this species is present in mesic, non-saline mesic grasslands and freshwater creeks and wetlands in all Management Units of the NSMWA.

Delta Tule Pea

Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), a CNPS List 1B.2 species, is an annual herb in the pea family (Fabaceae). It occurs in freshwater and brackish freshwater marshes. Occurrences are known from Pond 8, Coon Island, Ringstrom Bay, Huichica Creek, Southern Crossing, and nearby the NSMWA in Cullinan Ranch and Fagan Marsh Ecological Preserve (CDFG 2008). Suitable habitat is present in all Management Units of the NSMWA.

Delta tule pea (photo by Mark Foigel)

Flat-faced Downingia

Flat-faced Downingia is a locally rare, but not formally listed annual species known to occur at the Tolay Creek Unit (north) and historically in the White Slough Unit of the NSMWA (Demgen 2008). This species was once widespread along tidal marsh edges in the San Francisco Bay (Baye 2008), as well as vernal pools. However, loss of habitat is virtually extirpated this species from this habitat. At White Slough, this species occurs in low numbers in association with a created seasonal wetland. At Tolay Creek, flat-faced downingia occurs in dense patches in the historic floodplain of Tolay Creek, in bare areas among pickleweed and spike rush.

Flat-faced downingia (*Downingia pulchella*) at the Tolay Creek Unit (photo by: Dina Robertson, URS)

Legenere

Legenere (*Legenere limosa)* is a small, nondescript annual herb in the bellflower family. Legenere is a CNPS List 1B.1 species. It is found in freshwater wetlands and vernal pools. The nearest recorded occurrence of this species to the NSMWA is on the east side of the Napa river at Suscol Ridge. Suitable habitat is limited to absent in the NSMWA; this species is possible, but unlikely to occur at restored freshwater ponds in the NSMWA.

Mason's Lilaeopsis

Mason's lilaeopsis, a CNPS List 1B.1 species, is a small herb in the aster family. This species is found in freshwater and brackish marshes in the low marsh zone, often along eroding shores and earthen levees. There is a known occurrence of this species within the Southern Crossing and Green Island Units in the NSMWA along the Napa River (CDFG 2008). Suitable habitat is present in all Management Units of the NSMWA.

Marin Knotweed

Marin knotweed (*Polygonum marinense*), a CNPS List 3.1 species, is an annual herb in the knotweed family (Polygoneaceae). It occurs in coastal salt and brackish marshes. It is recorded in

the pickleweed salt marshes of Fagan Marsh, as well as at non-specific location in the vicinity of Southern Crossing Unit. It was also recorded in 1995 in the White Slough Unit (CDFG 2008). Suitable habitat is present in all Management Units of the NSMWA.

Suisun Marsh Aster

The Suisun marsh aster (*Symphyotrichum lentus*), a CNPS List 1B.2 species, is a perennial herb in the aster family. It is found along sloughs of brackish and freshwater marshes. An occurrence is recorded near NSMWA at Fagan Marsh Ecological Reserve (CDFG 2008). Suitable habitat for this species occurs throughout the NSMWA.

Showy Indian Clover

Showy Indian clover (*Trifolium amoenum*) is a federally endangered and CNPS List 1B.1 species. It is an annual herb in the pea family. It occurs in valley and foothill grasslands and coastal bluff scrub. Many of the recorded occurrences in California have been lost to development, and very few known occurrences therefore remain. This species was recorded in the vicinity of Buchli Station Road in 1952, and the species was not relocated during subsequent surveys in 1987. Suitable habitat is present in grasslands in the NSMWA.

Saline Clover

Saline clover (*Trifolium depauperatum* var. *hydrophilum*), a CNPS List 1B.2 species, is an annual herb in the pea family. It is found in low lying, poorly drained alkaline soils in valley and foothill grasslands. It was recorded in 1996 adjacent to Wingo Unit in the Viansa Wetlands, a former hayfield that was restored to wetlands in 1992 (CDFG 2008). It is also known from Sears Point (owned by Solano Land Trust) (Baye 2008.) It is very likely this species occurs in the NSMWA, specifically in association with flat-faced Downingia at the Tolay Creek Unit (north).

3.8.5 Special-Status Wildlife

Several special-status wildlife species have been observed or are expected to occur within the NSMWA. Special-status wildlife species addressed in this section include:

- Species listed as threatened, endangered, or rare under the state or federal Endangered Species Acts
- Species listed as species of special concern by the DFG
- Fully Protected Species under the California Fish and Game Code

Species that occur or have potential to occur in the NSMWA are summarized in **Table 3-8** and discussed in detail below.

Figure 12 shows the locations of special-status wildlife, fisheries, and invertebrate species recorded in and adjacent to the NSMWA.

Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 12

Special-Status Occurrences: Wildlife, Fisheries, and Invertebrate Species

Samuel's song sparrow
pallid bat
pallid bat
golden eagle
tricolored blackbird
salt-marsh harvest mouse
Swainson's hawk
salt-marsh harvest mouse
burrowing owl
ferruginous hawk
burrowing owl
tricolored blackbird
Samuel's song sparrow
San Francisco common yellowthroat
burrowing owl
San Francisco common yellowthroat
Samuel's song sparrow
San Francisco common yellowthroat
short-eared owl
California black rail
California clapper rail
salt-marsh harvest mouse
California clapper rail
western snowy plover
California least tern
western snowy plover
tricolored blackbird
vernal pool fairy shrimp
San Francisco common yellowthroat
Samuel's song sparrow
San Francisco common yellowthroat
California black rail
California black rail
Samuel's song sparrow
San Francisco common yellowthroat
Samuel's song sparrow
San Francisco common yellowthroat
salt-marsh harvest mouse
San Francisco common yellowthroat
California clapper rail
California clapper rail
western snowy plover
California clapper rail
California clapper rail
San Francisco common yellowthroat
California clapper rail
burrowing owl
San Francisco common yellowthroat
California clapper rail
San Francisco common yellowthroat
California clapper rail
Suisun shrew
California clapper rail
San Francisco common yellowthroat
San Francisco common yellowthroat
monarch butterfly
California black rail
California clapper rail
California black rail
Sacramento splittail
salt-marsh harvest mouse
Samuel's song sparrow
California black rail
Suisun shrew
Delta smelt
Sacramento splittail
California red-legged frog
salt-marsh harvest mouse
San Francisco common yellowthroat
Samuel's song sparrow
Suisun shrew
San Francisco common yellowthroat
California black rail
California clapper rail
Sacramento splittail
Samuel's song sparrow
San Francisco common yellowthroat
Caspian tern
California black rail
salt-marsh harvest mouse
San Francisco common yellowthroat
San Francisco common yellowthroat
Delta smelt
California clapper rail
Suisun shrew
Delta smelt
San Pablo song sparrow
Samuel's song sparrow
Sacramento splittail
salt-marsh harvest mouse
California clapper rail
California black rail
Sacramento splittail
salt-marsh harvest mouse
San Francisco common yellowthroat
Samuel's song sparrow
California clapper rail
California red-legged frog
steelhead - Central California Coast ESU
northwestern pond turtle
steelhead - Central California Coast ESU
northwestern pond turtle
northwestern pond turtle
salt-marsh harvest mouse
California black rail
burrowing owl
Samuel's song sparrow
salt-marsh harvest mouse
California clapper rail
Delta smelt
Sacramento splittail
San Francisco common yellowthroat
Alameda County
SF County
Contra Costa County
Marin County
San Pablo Bay
Napa County
Sonoma County
Solano County
Pacific Ocean
Map area

NSMWA Management Unit boundary

Base imagery: Airphoto USA, 1 April 2007, 0.3-meter cell size

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Table 3-8. Special-status wildlife species occurring or with potential to occur in the NSMWA.

Scientific Name Common name	Federal[1]	State[2]	Preferred Habitat	Potential to Occur in the Project Area
Amphibians				
Rana aurora draytonii California red-legged frog	FT	SC	Permanent and semi-permanent aquatic habitats, such as creeks and cold-water ponds, with emergent and submergent vegetation and riparian species along the edges; may aestivate in rodent burrows or cracks during dry periods.	**Moderate.** The brackish and saline waters of the NSMWA are generally unsuitable for this species. Potential habitat along Huichica, American Canyon and Tolay Creek (north of SR 37).
Birds				
Agelaius tricolor Tricolored Blackbird	—	SC	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland; probably requires water at or near the nesting colony; requires large foraging areas, including marshes, pastures, agricultural wetlands, dairies, and feedlots, where insect prey is abundant.	**Present.** Recorded nesting colony in upland pond of the Huichica Creek Unit. Potential habitat in American Canyon Unit freshwater pond surrounded by tall emergent marsh.
Asio flammeus Short-eared Owl	—	SC	Freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and daytime roosts.	**Moderate.** Suitable foraging and breeding habitat present. Observed at pond along Buchli Station Rd. in the Huichica Creek Unit.
Aquila chrysaetos Golden Eagle	FD	FP	Typically frequents rolling foothills, mountain areas, sage-juniper flats, and desert. Breeds on cliffs or in large trees or electrical towers, forages in open areas.	**Present**. No recorded breeding occurrences in the NSMWA, however, this species has been observed foraging on several occasions in the NSMWA at Huichica Creek Unit around Huichica Creek. Extensive foraging and some nesting habitat present in and around NSMWA.
Athene cunicularia hypugea Western Burrowing Owl	—	SC	Level, open, dry, heavily grazed, or low-stature grassland or desert vegetation with available burrows.	**Moderate.** Species observed in the Huichica Creek, Green Island, and Wingo units (incidental, non-breeding) of the NSWMA.
Buteo swainsoni Swainson's Hawk	—	CT	Breeds in stands with few trees in juniper-sage flats, riparian areas, and oak savannah; forages in adjacent livestock pasture, grassland, or grain fields.	**Medium**. Known nesting occurrence in vicinity of the NSMWA. Suitable nesting and foraging habitat in the NSMWA
Charadrius alexandrinus nivosus Western Snowy Plover	FT	SC	Coastal beaches above the normal high-tide limit in flat, open areas with sandy or saline substrates; vegetation and driftwood are usually sparse or absent.	**Present.** Known to breed and forage in the Huichica Creek Unit and the Green Island Unit.
Circus cyaneus Northern Harrier	—	SC	Grasslands, meadows, marshes, and seasonal and agricultural wetlands providing tall cover.	**Present**. Known to breed and forage in the NSMWA.
Elanus leucurus White-tailed Kite	—	FP	Low foothills or valley areas with valley (*Quercus lobata*) or live oaks (*Quercus agrifolia* and *Q. wislizenii*), riparian areas, and marshes near open grasslands for foraging.	**Present.** Known recent and historic occurrences in association with former salt ponds, American Canyon Creek and other habitats in the NSMWA.

Table 3-8. Special-status wildlife species occurring or with potential to occur in the NSMWA.

Scientific Name **Common name**	**Federal[1]**	**State[2]**	**Preferred Habitat**	**Potential to Occur in the Project Area**
Falco peregrinus Peregrine Falcon	FD	SE, FP	Breeds in woodland, forest, and coastal habitats; requires a scrape or depression on ledges and cliffs to nest, or occasionally tree or snag cavities. Hunts ducks, mammals, insects and fish.	**Present.** This species observed (fly over) in 2007-2008 over the Napa River Unit, as well as perching on electrical towers in the Tolay Creek Unit (lower) in 2006. Presumably falcons use the towers as a vantage point to hunt pheasant.
Geothlypis trichas sinuosa San Francisco Common Yellow Throat	—	SC	Breeds in woody swamps, brackish marshes and freshwater marsh; requires tall grasses, tules, and willow thickets for nesting and cover.	**Present**. This species is recorded at several locations in and around the NSMWA.
Laterallus jamaicensis obsoletus California Clapper Rail	FE	SE, FP	Restricted to salt marshes and tidal sloughs; usually associated with heavy growth of pickleweed; feeds on mollusks removed from the mud in sloughs.	**Present**. This species is recorded at several locations in and around the NSMWA.
Laterallus jamaicensis coturniculus Black Rail	—	FP, ST	Tidal salt marshes associated with heavy growth of pickleweed; also occurs in brackish marshes or freshwater marshes at low elevations.	**Present**. This species is recorded at several locations in and around the NSMWA.
Melospiza melodia samuelis Samuel's Song Sparrow	—	SC	Uses tidal sloughs in pickleweed marshes; requires tall bushes (usually grindelia) along sloughs for cover, nesting, and song-posts; forages over mud banks and in the pickleweed.	**Present**. This species is recorded at several locations in and around the NSMWA.
Pelecanus erythrorhynchos American White Pelican	—	—	The American white pelican is a piscivore that frequents shallow water. It nests exclusively on islands within large saline lakes in Western North America.	**High**. This species is a common visitor to the NSMWA, but this species does not breed in the NSMWA.
Sternula antillarum brown California Least Tern	FE	SE	Nests in open areas on coastal beaches and estuaries near shallow water, usually on sand or fine gravel. Successful breeding birds observed in 2008 in the NSMWA.	**Present.** Species observed breeding in the Green Island Unit in 2008.
Mammals				
Antrozous pallidus Pallid Bat	—	SC	Occurs in a variety of habitats from desert to coniferous forest. Most closely associated with oak (*Quercus* sp.), yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California. Relies heavily on trees for roosts, but also nests in structures such as barns and bridges.	**High.** Many known occurrences in the vicinity of the NSMWA. One historic location at Huichica Creek.
Sorex ornatus sinuosus Suisun Shrew	—	SC	Tidal, salt, and brackish marshes containing pickleweed, grindelia, bulrushes, or cattails; requires driftwood or other objects for nesting cover.	**Present**. Species was trapped at several locations in and around the NSMWA.

Table 3-8. Special-status wildlife species occurring or with potential to occur in the NSMWA.

Scientific Name **Common name**	**Federal[1]**	**State[2]**	**Preferred Habitat**	**Potential to Occur in the Project Area**
Reithrodontomys raviventris Salt Marsh Harvest Mouse	FE	SE	Utilizes both pickleweed dominated and mixed-halophyte dominated vegetation of diked and tidal wetland systems; uplands used to a lesser extent.	**Present.** Several known occurrences in and adjacent to the NSMWA.
Reptiles				
Clemmys marmorata marmorata Western Pond Turtle	—	SC	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation.	**Present.** Known to occur in the NSMWA along American Canyon Creek and Huichica Creek in the NSMWA.

[1] United States Fish and Wildlife Service classifications:

FE = Federally Endangered. Species in danger of extinction throughout all or significant portion of its range.

FT = Federally Threatened. Species likely to become endangered within foreseeable future throughout all or significant

FD = Federally Delisted.

[2] California Department of Fish and Game classifications:

SE = State endangered. Species who's continued existence in California is jeopardized.

ST = State threatened. Species, although not presently threatened with extinction, may become endangered in the foreseeable future.

SC = California species of special concern. Animal species with California breeding populations that may face extinction in the near future.

FP = Fully protected by the State of California under Sections 3511 and 4700 of the Fish and Game Code.

3.8.5.1 Special-Status Amphibians

California Red-legged Frog

California red-legged frog (CRLF) (*Rana aurora draytonii*) is a federally threatened and state species of concern. It inhabits freshwater pools and streams, marshes, and occasionally ponds. CRLF deposits eggs in permanent pools attached to freshwater vegetation.

This species was recorded at two locations in 1998 in the immediate vicinity of the NSMWA on lands owned by the Brenda Raceway Corporation along SR 121, across from the Tolay Creek Unit (CDFG 2008). Habitat at those locations consists of stock ponds with emergent vegetation. This species was also recorded in a tributary to American Canyon Creek in 2007 (CDFG 2008). Suitable habitat for this species is present along Sonoma Creek (upper), Tolay Creek (upper), Huichica Creek, and American Canyon Creek in the NSMWA. Upland ponds and marshes of the NSMWA are typically too saline for this species (Wyckoff 2007); however, adult CRLF can handle fairly saline water. Dispersing adults and sub-adults have been found in salinities of up to 36 parts per thousand. CRLF are less likely to breed in these locations because eggs and larval stages are much more sensitive to salinity.

3.8.5.2 Special-Status Birds

Tricolored Blackbird

The tricolored blackbird (*Agelaius tricolor*) is a state species of special concern. This species breeds in freshwater, preferably in emergent vegetation with tall, dense cattails and tule, but also thickets of willow, blackberry, wild rose, and tall herbs (CDFG 2005). It is also known to feed is grasslands and croplands, flooded lands and edges of ponds. It is a colonial nester and yearlong resident in California. Approximately 200+ adults were observed nesting in 1992 and 1993 in a created pond at Huichica Creek Unit in uplands. Several other breeding colonies are known from the vicinity of the NSMWA (CDFG 2007a).

Short-Eared Owl

Short-eared owl (*Asio flammeus*) is a state species of concern. This species usually occurs in open areas with few trees, such as grasslands, dunes, meadows, saline and fresh emergent wetlands (CDFG 2005). It feeds primarily on voles and other small mammals, reptiles and amphibians. It nests in dense vegetation on dry ground in a depression lined with sticks, feathers, grasses, etc. This species was observed in association with a created pond near Buchli Station Road in the NSMWA (Wyckoff 2008). Suitable breeding and foraging habitat exists in the grasslands of the NSMWA.

Golden Eagle

Golden eagle is a state fully protected species. This species foraged over open terrain of grasslands, deserts, savannahs, and shrub habitats. Prey includes small mammals, fish, reptiles

and amphibians. Golden eagles nest in secluded overhanging ledges and large trees (CDFG 2007a). No breeding occurrences of this species have been recorded in the NSMWA or vicinity. The nearest breeding occurrence is north of the project area along the Napa River (CDFG 2008). Suitable foraging habitat exists throughout the NSMWA. Golden eagles have been observed by DFG staff foraging in the Marshes. Limited nesting habitat exists in large trees in the NSMWA, such as Eucalyptus trees along the levees of the Marshes.

Western Burrowing Owl

The western burrowing owl (*Athene cunicularia hypugea)* is a state species of special concern. "Huichica" is the Wappo Indian name for the burrowing owl, which was once abundant in the Huichica Creek Area. Burrowing owls inhabit flat, dry, open grasslands in prairie and arid habitats throughout California, exclusive of the humid, northwest coastal areas and the forested and shrub-covered mountains. These owls can be found adjacent to the San Francisco Bay on levees next to salt ponds, open unmanicured grasslands, or manicured fields near the Bay's edge where ground squirrel numbers and foraging area are adequate. These birds are primarily terrestrial predators and in these locations still focus on mice and insects. However, they are opportunistic and will eat species associated with wetlands, including amphibians and crustaceans (Goals Project 2000.). Burrowing owls were observed nesting in 1988 at Upper Tubbs Island and Skaggs Island, as well as on private lands at Sears Point in 2003 (CDFG 2008). A wintering site was recorded in 2006 within the city of American Canyon on the side of Devlin Road (CDFG 2008). This species was also observed in 2001 at the "burn unit" of the Huichica Creek Unit and perching on the Union Pacific Railroad tracks in the Wingo Unit (Wyckoff 2008). Western burrowing owl was frequently seen along degraded levee sides on Huichica Creek in the early to mid 1990s. This species was also observed in the Green Island Unit in 2009. Several surveys of the owls at the Green Island Unit were conducted in 2009; however, no nesting was observed (Taylor 2009).

Burrowing owl at the Green Island Unit (photo by: Karen Taylor, DFG)

Swainson's Hawk

Swainson's hawk is a state threatened species. In California, breeding populations of Swainson's hawks occur in desert, shrub steppe, grassland, and agricultural habitats, however, the overwhelming majority of the state's breeding sites are in two disjunct populations in the Great Basin and Central Valley (PRBO 2007). It roosts in large trees, however, these hawks will nest on the ground of no trees are available (CDFG 2005). Prey includes mice, gophers, rabbits,

arthropods, reptiles, birds, and rarely, fish (CDFG 2005). Swainson's hawk typically use grasslands and agricultural fields for hunting.

There is a recorded breeding Swainson's hawk from 2005 in close proximity to the NSMWA. This occurrence is along Suscol Creek less than a mile east of the Southern Crossing unit of the NSWMA (CDFG 2008). It is likely that this species forages in the grasslands and upper tidal marshes of the NSMWA. Suitable nesting habitat is also present in the NSMWA.

Western Snowy Plover

The western snowy plover is a federally threatened and state species of special concern. Dry salt ponds and unvegetated salt pond levees are used as plover nesting habitat. Salt ponds with shallow water provide important foraging habitat for plovers. Nesting plovers can be attracted to an area when ponds are drained during the breeding season, but flooding can then destroy the nests when the ponds are refilled (USFWS 2001). Breeding snowy plovers were recorded at Little Island Farms of the Napa River Unit in 1990, on small islands within the Huichica Creek Unit in 2002, and on levees of Fly Bay (Huichica Creek Unit) in 1992 (CDFG 2008). Snowy plovers were observed in the Napa River Unit in April of 2002 at Pond 7 (Jones & Stokes 2003a) and at the Green Island Unit. More current observations of this species in the NSMWA include breeding pairs on the internal levee between Ponds 7 and 7A in 2008 and 2009 and sightings of individual plovers at the Green Island Unit in 2008 (Taylor 2008c).

Northern Harrier

Northern harrier is a state species of special concern. It winters in and forages over marshes and grassland. Harriers nest on the ground in shrubby vegetation usually at the marsh edge. Nests are composed of a mound of sticks in wet areas. It feeds on small mammals, birds, reptiles, fish and insects (CDFG 2005). Breeding northern harriers are known from the NSMWA at Coon Island, the northern White Slough Unit and Pond 2A (CDFG 2007a).

White-tailed Kite

White-tailed kite is a state fully protected species. The white-tailed kite forages over grasslands, meadows and farmlands. This species nests in trees near foraging grounds. The prey base of the white-tailed kite includes voles, and other small mammals, birds, insects, reptiles, and amphibians (CDFG 2005).Occupied nests were observed at Pond 8 in the NSMWA (Burner et al. 2003). Communal winter roots were observed on Knight Island in 1958 on dead Eucalyptus trees along the levee (45 birds) (Longhurst 1959).

San Francisco Common Yellow Throat

The San Francisco common yellowthroat (formerly known as saltmarsh common yellowthroat) is a state and federal species of concern. It is believed to be a resident of coastal salt marsh habitats from San Francisco Bay south to San Diego (Goals Project 2000). In the bay region, approximately 60% of San Francisco common yellowthroats breed in brackish marsh, 20% in

riparian woodland, 10% in freshwater marsh, 5% in salt marsh, and 5% in upland vegetation (Jones & Stokes 2003a). These birds are insectivorous, gleaning insects from low herbaceous vegetation, bushes, and small trees in the Marshes and from the surface of the mud along associated channels (Goals Project 2000). In the San Francisco Bay area, the San Francisco common yellowthroat winters in pickleweed marshes on the Skaggs Island complex and breeds in adjacent brackish marshes (Jones & Stokes 2003a). Surveys by Hobson et al. (1986) and Foster (1977a, 1977b) indicate that the Napa River Unit has some of the highest breeding densities of San Francisco common yellowthroats in the Bay Area (Jones & Stokes 2003a). The majority of the San Francisco common yellowthroat territories are in brackish marsh habitat. Territories included vegetation characterized by dense mixtures of salt-tolerant plants intermixed with freshwater plants. This species is known from several locations in and around the NSMWA (CDFG 2008).

California Clapper Rail

California clapper rail

The California clapper rail is both federally and state listed endangered. It occurs in marshes from Humboldt to San Luis Obispo Counties. In San Pablo Bay, they are a fairly new resident species. The suitability of the Napa-Sonoma Marshes has increased for this rail due to the reduction of freshwater input from the Sacramento-San Joaquin delta over time, causing the marsh to become more brackish (USFWS 1984). They occur within a wide range of brackish and saltwater marshes, using a network of tidal sloughs as foraging and nesting habitat (USFWS 1984). The preferred habitat is comprised of tidal sloughs with a dominant cover of pickleweed and cordgrass (Burner et al. 2003). The California clapper rail was documented during recent surveys at Coon Island and White Slough in the NSMWA (Takekawa et al. 2005). These surveys were part of a larger, multi-year study of California clapper rails in the San Francisco Estuary. Survey results for California clapper rails in the San Pablo Bay show a great degree of variability, and more information is needed to determine if overall the population of clapper rails has changed (PRBO 2005). Historic and current occurrences are known from many locations in and around the NSMWA, including Coon Island Unit, Ringstrom Bay Unit, Fly Bay of the Huichica Creek Unit, Napa River Unit, Tolay Creek Unit (north of SR 37) and White Slough Unit, and the Fagan Marsh Ecological Reserve (CDFG 2006b, 2008).

California Black Rail

The California black rail is a state listed threatened species. This species prefers pickleweed-dominated marsh habitat but also occurs in freshwater and brackish marshes (Jones & Stokes 2003a). Preferred breeding habitat includes areas of mature, higher-elevation marshes dominated by bulrush and pickleweed. California black rail occurs at a number of sites in the San Francisco Bay area, perhaps more concentrated in the northern part of the bay. The species will nest in higher areas of freshwater marshes, wet meadows, and salt marshes (Jones & Stokes 2003a). Surveys conducted in 1976 (Manolis 1978), 1988 (Evens et al. 1991), and 2005 (Takekawa et al. 2005) indicate that California black rails occur in the Napa River Unit. Indices of rail abundance (rails per census station) ranged from 0.11 in the area to the east of the intake channel along San Pablo Bay to 2.09 at the north mouth of South Slough. The area in and adjacent to the Napa River Unit has the highest relative density of black rails as well as the largest contiguous population in the San Francisco Bay area (Jones & Stokes 2004a, 2004b; Takekawa et al. 2005).

California black rail
(photo by: Isa Woo, USGS)

Samuel's Song Sparrow

Samuel's song sparrow (formerly known as San Pablo song sparrow) is a state species of concern that is restricted to the salt marshes of San Pablo Bay (Goals Project 2000). These birds generally inhabit regions of the salt marshes characterized by mixed pickleweed/cordgrass vegetation along channels and grindelia sub-shrub bushes that provide nesting sites and song perches (Goals Project 2000). Samuel's song sparrow is omnivorous, subsisting primarily on detritus feeding insects, other invertebrates from intertidal mud, the maturing heads of grindelia flowers, and the fleshy fruits and tiny seeds of pickleweed (Goals Project 2000). Records of occurrence for this species have been documented throughout the San Pablo Bay area, primarily in marsh vegetation along agricultural ditches and tidal channels (Goals Project 2000). There are several documented occurrences of this species in the NSMWA and immediate vicinity at Pond 2A, Coon Island Unit, White Slough Unit, Cullinan Ranch, Fagan Marsh Ecological Reserve, Tolay Creek, and in the vicinity of the Huichica Creek, Ringstrom and Wingo Units of the NSMWA.

American White Pelican

The American white pelican is a state species of special concern. It nests exclusively on islands within large saline lakes in Western North America. Occurrence in the San Francisco Bay Area are very localized and confined to the non-breeding season, generally from June through December (Goals Project 2000). The American white pelican is a piscivore that frequents shallow water and is seen (rarely) in the open parts of the Bay only in transit. They are almost exclusively gregarious and roost in flocks on dikes (Goals Project 2000). They feed in varying water depths, diving for its prey from the surface and scooping them up in pouch (CDFG 2005).

The American white pelican is frequently observed in the White Slough, Huichica Creek, and Napa River units of the NSMWA.

California Least Tern

California least tern chicks at the NSMWA (photo by: Karen Taylor, DFG)

USFWS listed the California least tern as endangered in 1970 due primarily to a loss of foraging habitat or coastal nesting habitat (USFWS 1985). It is a migratory bird that nests along the Pacific coast from southern Baja Mexico to the San Francisco Bay in lagoons, mouths of bays, and shallow estuaries. This bird is thought to winter in Latin America, but the winter range and habitat are largely unknown. Least terns typically arrive at California breeding areas in mid- to late-April and depart in August. They nest in colonies on bare or sparsely vegetated flat substrates near open water. Least tern nests are ground depressions called "scrapes" (Goals Project 2000), which they readily abandon when disturbed. This species can sometimes be found nesting in single pairs. These birds can be opportunistic nesters in such areas as newly graded or filled lands. Least terns forage over shallow to deep waters. They have been known to consume a wide variety of fish species, though they appear to prefer northern anchovy (*Engraulis mordax*) and silversides (*Atherinops* sp.) (Goals Project 2000).

DFG staff observed successful breeding of California least tern pairs in 2008 in the Green Island Unit of the NSMWA. In 2009, DFG staff observed numerous successful nests at the Green Island Unit and Ponds 7/7A of the Huichica Creek Unit (Taylor 2009). These observations are the most-northern breeding occurrences on record.

3.8.5.3 Special-Status Mammals

Pallid Bat

Pallid bat (*Antrozous pallidus*) is a state species of special concern. This species occurs in grasslands, shrublands, deserts, woodlands, and forests. Pallid bat roosts in rocky habitat such as caves, crevices and mines, as well as in structures such as buildings and bridges (CDFG 2005). There are several recorded occurrences of this species in the vicinity of the NSMWA (CDFG 2008). These occurrences are of roosts associated with bridges and buildings. Suitable breeding and foraging habitat is present throughout the NSMWA.

Suisun Shrew

The Suisun shrew (*Sorex ornatus sinuosus*) is a state species of special concern. The current distribution of this shrew is limited to the scattered, isolated remnants of natural tidal salt and brackish marshes surrounding the northern borders of Suisun and San Pablo bays (Goals Project 2000). Suisun shrews typically inhabit saline and brackish tidal marshes characterized by Pacific cordgrass, pickleweed, gumplant, California bulrush, and common cattail. However, shrew occurrence appears to be more strongly associated with vegetation structure rather than species composition. Suisun shrews prefer dense, low-lying vegetation which provides protective cover and suitable nesting sites, as well as abundant invertebrate prey species (Goals Project 2000). It feeds on insects, slugs, snails, centipedes, and occasionally on amphibians. Driftwood, planks, and other debris found above the high-tide line also affords shrew with valuable foraging and nesting sites. In addition, adjacent upland habitats provide essential refuge areas for Suisun shrews and other terrestrial animals during periods of prolonged flooding (Goals Project 2000). This species was recently trapped at several locations in and around the NSMWA including South Slough and Dutchman Slough, White Slough and along Tolay Creek (CDFG 2008).

Salt Marsh Harvest Mouse

The salt marsh harvest mouse is listed both state and federally endangered. Salt marsh harvest mice are small, native rodents which are endemic to the salt marshes and adjacent diked wetlands of San Francisco Bay (Goals Project 2000). It is a federal and state listed endangered species. They are dependent on thick, perennial cover of salt marshes and move into adjacent grasslands only in the spring and summer when the grasslands provide maximum cover (Goals Project 2000). Historically, optimal vegetation composition for the mice was shown to include a high percentage of pickleweed (greater than 60 percent), with complexity in the form of fat hen and alkali heath or other halophytes (plants adapted to living in saline environment). In addition, the amount of saltgrass, brass buttons, alkali bulrush or other bulrush or cattail species should be low (USFWS 1984). However, recent studies have shown that mixed-halophyte and pickleweed dominated vegetation types support roughly equal salt marsh harvest mouse population densities, reproductive potential, and survivorship. In addition, demographic performance appears to be similar in both diked and tidal wetland systems (Sustaita et al. 2004). The salt marsh harvest mouse does not burrow, but rather build nests of loose balls of grasses on the surface of the ground, something that may be abandoned at the next high tide (USFWS 1984). This species has been trapped at several locations in and around the NSMWA including Fagan Marsh Ecological Reserve, Coon Island Unit and Fly Bay subunit, along South Slough and Dutchman Slough, at White Slough Unit, along Tolay Creek , on the west side of Sonoma Creek Bridge, and the south edge of Pond 1 (CDFG 2008).

Salt Marsh Harvest Mouse (photo by: Karen Taylor, DFG)

3.8.5.4 Special-Status Reptiles

Western Pond Turtle

The western pond turtle (*Clemmys marmorata marmorata*) is a state species of special concern. The pond turtle is most often associated with permanent ponds, lakes, streams and irrigation ditches. This species eats aquatic plant material including pond lilies, beetles and a variety of aquatic invertebrates as well as fishes and frogs (CDFG 2005). For reproduction, western pond turtle lays eggs on the ground in grasslands and riparian areas (CDFG 2005). One occurrence (three adults and one juvenile) of the western pond turtle was recorded in the NSMWA in 2002 along American Canyon Creek (CDFG 2008). It is a regular visitor to Huichica Creek in the Huichica Creek Unit. Suitable habitat for this species is present along American Canyon, Huichica Creek, and Tolay (upper) Creek.

3.8.6 Special-Status Fish and Invertebrates

3.8.6.1 Special-Status Fish

Several special-status fish and invertebrate species have been collected or are expected to occur within the NSMWA. Special-status fish species addressed in this section include:

- Species listed as threatened or endangered under the state or federal Endangered Species Acts
- Species identified by NMFS or DFG as species of special concern
- Species fully protected in California under the California Fish and Game Code

Special-status fish and invertebrate species that occur or have potential to occur in the NSMWA include Sacramento River winter-run Evolutionarily Significant Unit (ESU) chinook salmon, Central California Coast Distinct Population Segment (DPS) steelhead, delta smelt, Sacramento splittail, hardhead, longfin smelt (*Spirinichus thaleichthys*), river lamprey (*Lampetra ayresi*), green sturgeon, and the freshwater shrimp. **Table 3-9** summarizes special-status fish and invertebrate species that occur or have the potential to occur in the NSMWA. **Figure 12** shows the locations of recorded special-status fisheries, invertebrates, and wildlife in the NSMWA.

Sacramento River Winter-Run ESU Chinook Salmon

The Central Valley Winter-run Chinook salmon was listed as endangered on January 4, 1994 (NOAA 1994). Winter-run Chinook salmon are unique to the Sacramento River. They migrate upstream as immature fish during winter and spring and then spawn several months later in early summer (Moyle 2002). Incubation, hatching, and emergence occur in freshwater, followed by migration to the ocean, at which time smoltification occurs. Maturation is initiated and completed upon return to freshwater habitats. Once maturation is complete, spawning occurs in natal streams. Adults spawn only once and then die.

Critical habitat has been designated for this ESU and includes the Sacramento River from Keswick Dam, Shasta County (River Mile 302) to Chipps Island (River Mile 0) at the westward margin of the Sacramento-San Joaquin Delta; all water from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of San Francisco Bay (north of the San Francisco–Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. In addition, the critical habitat designation identifies those physical and biological features of the habitat that are essential to the conservation of the species and that may require special management consideration or protection.

Chinook salmon are not likely to occur within Sonoma Creek (Jones & Stokes 2004a, 2004b) or Tolay Creek due to the small size of these streams, as well as other attributes. However, they have been collected in the Napa River and are known to successfully spawn within that system (Jones & Stokes 2004b).

Central California Coast DPS Steelhead

Steelhead trout have been divided into DPSs. Steelhead trout within the Central California Coast DPS were listed as a federally threatened species on August 18, 1997; threatened status was reaffirmed on January 5, 2006. Adult steelhead trout return to rivers and creeks in the region from October to April. Spawning takes place in the rivers from December to April with most spawning activity occurring between January and March. Juvenile steelhead trout remain in freshwater for 1 to 4 years before they out-migrate into the open ocean during spring and early summer (Goals Project 2000). However, juveniles can spend up to 7 years in freshwater before moving downstream (Busby et al. 1996). Steelhead trout can spend up to 3 years in saltwater before returning to freshwater to spawn (Barnhardt 1986). Because juvenile steelhead trout remain in the creeks year-round, adequate flows, suitable water temperatures, and an abundant food supply are necessary throughout the year in order to sustain steelhead trout populations. The most critical period is in the summer and early fall when these conditions become limiting.

Critical habitat has been designated for this DPS has been designated and includes stream channels within designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line (NOAA 2005). The NSMWA is within designated critical habitat for the Central California Coast DPS steelhead. They have been collected from the Napa River and Sonoma Creek.

Table 3-9. Special-status fish and invertebrate species that occur or have the potential to occur in the NSMWA.

Scientific Name Common Name	Federal[1]	State[2]	Preferred habitat	Potential to occur in the project area
Syncaris pacifica California freshwater shrimp	FE	SE	Pool areas of low elevation, low-gradient streams, among exposed live tree roots of undercut banks, overhanging woody debris, or overhanging vegetation. It inhabits only 17 stream segments in Marin, Napa, and Sonoma Counties.	Medium. Documented in 1981 in Huichica Creek above Neuschwander Rd. Huichica Creek within the NSMWA may be too saline for this species.
Oncorhynchus mykiss Central California coast DPS Steelhead	FT	None	Anadromous. Inhabits cold headwaters, creeks, and small to large rivers and lakes with swift, shallow water and clean, loose gravel for spawning. Requires large pools during summer months. Spawns in spring.	Present. Documented in Napa River.
Hypomesus transpacificus Delta smelt	FT	ST	Brackish water. Found only in the Sacramento-San Joaquin Estuary, as far upstream as the mouth of the American River on the Sacramento River and Mossdale on the San Joaquin River. Downstream as far as San Pablo Bay.	Present. Documented in Pond 3 and San Pablo Bay.
Pogonichthys macrolepidotus Sacramento splittail	None	SC	Freshwater fish that are tolerant of moderate salinities. Found in lower portions of freshwater streams in the Central Valley, Suisun Bay and San Pablo Bay.	Present. Collected in the Napa River.
Mylopharodon conocephalus Hardhead	None	SC	Found in undisturbed areas of larger middle- and low- elevation streams. They are bottom feeders that forage for benthic invertebrates and aquatic plant material in quiet water.	Present. Collected in the Napa River.
Longfin smelt	None	C	Found in upper portion of the water column throughout Suisun and San Pablo bays.	Present. Collected in high numbers in San Pablo Bay.
Green sturgeon	FT	None	Benthic fish that spawn in freshwater and return to sea to rear. Found in brackish to seawater. Little is known about their life history.	Moderate. Some adults and juveniles may occur within the NSMWA.
Lampetra ayresi River lamprey	None	SC	The adults need clean, gravelly riffles in permanent streams for spawning, while the ammocoetes require sandy backwaters or stream edges in which to bury themselves, where water quality is continuously high and temperatures do not exceed 25ºC.	Present. Known to occur upstream in Sonoma Creek and observed in water diversion canal of Green Island Unit. It is unclear if spawning adults occur within the system.

[1] United States Fish and Wildlife Service classifications:

FE = Federally Endangered. Species in danger of extinction throughout all or significant portion of its range.

FT = Federally Threatened. Species likely to become endangered within foreseeable future throughout all or significant

FD = Federally Delisted.

[2] California Department of Fish and Game classifications:

SE = State endangered. Species who's continued existence in California is jeopardized.

ST = State threatened. Species, although not presently threatened with extinction, may become endangered in the foreseeable future.

SC = California species of special concern. Animal species with California breeding populations that may face extinction in the near future.

FP = Fully protected by the State of California under Sections 3511 and 4700 of the Fish and Game Code.

Delta Smelt

Delta smelt were listed as a federally threatened species on March 5, 1993. Delta smelt are small (typically less than 80 mm fork length), slender-bodied fish that are endemic to the San Francisco Estuary. This euryhaline species primarily inhabits the open, surface waters of the Delta and Suisun Bay (USFWS 1995). Although research interest has increased substantially since the species was listed, many aspects of delta smelt biology are still not well understood.

Critical habitat has been designated for this species and includes water and submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker bays); the length of Montezuma Slough, and the existing contiguous waters contained within the Delta.

The NSMWA is not within designated critical habitat (USFWS 1994). However, delta smelt has been collected in San Pablo Bay, the Napa River and the internal sloughs and ponds within NSMWA. Three individuals were collected over a 4-year period at the Pond 2A restoration project (Jones & Stokes 2004a, 2004b).

Sacramento Splittail

The Sacramento splittail was listed as federally threatened on February 8, 1999. It was removed from listing on September 22, 2003 (USFWS 2003). However, it remains a state-listed species of special concern (CDFG 1995a). Splittail are relatively long-lived (about 5 to 7 years) freshwater fish that are tolerant of moderate salinities (Moyle 1976). Sacramento splittail were once distributed in lakes and rivers throughout the Central Valley (CDFG 1995a). They are now largely confined to the Delta, Suisun Bay, Suisun Marsh, Napa River, Petaluma River, and other parts of the Sacramento-San Joaquin estuary (Caywood 1974, Moyle 1976).

Sacramento splittail have been collected in the Napa River (USACE 2004), Pond 2A (Jones & Stokes 2004b) and in Pond 1 within NSMWA (Takekawa et al. 2000). They are expected to occur within riverine habitat, as well as within the interior ponds and sloughs. During spring high flows, splittail may be found spawning on submerged vegetation within the Marshes.

Hardhead

Hardhead is listed as a state species of special concern (CDFG 1995b). Hardhead are large cyprinids, similar to Sacramento pikeminnow, with which they co-occur. Hardhead are bottom feeders that forage for benthic invertebrates and aquatic plant material in quiet water. Hardhead mature following their second year and presumably spawn in the spring (Reeves 1964), judging by the upstream migrations of adults into smaller tributary streams during this time of the year (Wales 1946). Hardhead are typically found in undisturbed areas of larger middle- and low-elevation streams (Moyle and Nichols 1973; Moyle and Daniels 1982). In the Sacramento River drainage, hardhead are present in most of the larger tributary streams as well as in the Sacramento River. They are present in the Russian River and in the Napa River, although the Napa River population is very restricted in its distribution (CDFG 1995b).

Hardhead were collected in the Napa River during 2008 fish surveys (Napa County RCD 2008) 2006). They are expected to occur with riverine habitat present in NSMWA, the Napa River in particular. They are most likely to occur in freshwater portions of the river, upstream of NSMWA.

Longfin Smelt

Longfin smelt is a candidate for listing under the California Endangered Species Act. In the Sacramento-San Joaquin estuary adults and juveniles can be found in water ranging from nearly pure seawater to completely freshwater. The preference of larval smelt for the upper part of the water column is an adaptation that allows them to be swept quickly into food-rich nursery areas downstream, mainly Suisun and San Pablo bays. During years when periods of high outflows coincide with the presence of the larval smelt (e.g., 1980, 1982, 1983, 1984, 1986), the larvae are mostly transported to Suisun and San Pablo bays while in years of lower outflow, they are transported to the western Delta and Suisun Bay (CDFG 1995c). Adults occur seasonally as far downstream as South Bay but they are concentrated in Suisun, San Pablo, and North San Francisco bays.

Longfin smelt has been collected in San Pablo Bay and is one of the most abundant species collected during the DFG surveys (CDFG 1999). However longfin smelt have declined in rank abundance from first or second in most trawl surveys during the 1960s and 1970s to seventh or eighth at present (CDFG 1995c). They can be expected to occur within the open water habitat present in San Pablo Bay.

River Lamprey

The river lamprey is listed as a state species of special concern (CDFG 1995d). The biology of river lampreys has not been studied in California so the information in this account is based on studies in British Columbia (CDFG 1995d). The ammocoetes begin their transformation into adults during the summer. The process of metamorphosis may take 9 to 10 months, the longest known for any lamprey. Lampreys in the final stages of metamorphosis congregate immediately upriver from saltwater and enter the ocean in late-spring. Adults apparently only spend three to four months in saltwater, where they grow rapidly, reaching 25-31 centimeters TL. The habitat requirements of spawning adults and ammocoetes have not been studied in California. Presumably, the adults need clean, gravelly riffles in permanent streams for spawning, while the ammocoetes require sandy backwaters or stream edges in which to bury themselves, where water quality is continuously high and temperatures do not exceed 25ºC.

A landlocked population of river lamprey may occur in Sonoma Creek (Wang 1986). Spawning has been recorded in Sonoma Creek in the past. River lamprey were seen in the Green Island Unit river water diversion canal in the late-1990’s and early-2000’s (Huffman, T. 2011).

Southern DPS Green Sturgeon

The southern DPS green sturgeon was listed as federally threatened on April 6, 2006, by NMFS. This DPS of green sturgeon consists of all coastal and Central Valley populations south of the Eel River, with the only known spawning population in the Sacramento River (NOAA 2006).

Sturgeon

Green sturgeon are a long-lived, slow-growing species, as are all sturgeon species. They are an anadromous species and the most marine species of sturgeon, coming into rivers only to spawn and juveniles rear in freshwater for as long as two years. They are found throughout the San Francisco Bay and Delta. Adults feed on benthic invertebrates and to a lesser extent, small fish. Juveniles feed on opossum shrimp and amphipods in the San Francisco Estuary. Green Sturgeon are thought to spawn every three to five years in deep pools with turbulent water velocities and prefer cobble substrates, but can range from clean sand to bedrock. Females produce 60,000 to 140,000 eggs and are broadcast to settle into the spaces in between cobbles. Spawning in the Sacramento River in late spring and early summer (March to July). San Francisco Bay and its associated river systems contain the southern-most spawning population of green sturgeon. Green sturgeon spawning occurs predominately in the upper Sacramento River. Once green sturgeon out-migrate from freshwater they disperse widely. They occur in the coastal waters of the Pacific Ocean off California and in coastal rivers. Sturgeon tagged in the Sacramento River are primarily captured in coastal and estuarine waters to the north. The principal factor for decline of the Southern DPS is the reduction of the spawning area to a limited area of the Sacramento River. A number of presumed spawning populations (the Eel River, South Fork Trinity River, and San Joaquin River populations) have been lost in the past 25 to 30 years.

Portions of the NSMWA along San Pablo Bay may contain green sturgeon. Open water habitats adjacent to tidal marshes are important habitats for both green and white sturgeon (Goals Project 2000). Several sturgeon carcasses were observed during surveys of lower Tolay Creek. These were not definitively identified and were recorded as sturgeon sp. (Takekawa et al. 2002).

3.8.6.2 Special-Status Invertebrates

Freshwater Shrimp

The California freshwater shrimp (*Syncaris pacifica*) is a state-listed and federally listed endangered species. It can be found in pool areas of low elevation, low-gradient streams, among exposed live tree roots of undercut banks, overhanging woody debris, or overhanging vegetation. It inhabits only 17 stream segments in Marin, Napa, and Sonoma Counties. The species is known to occur in Huichica Creek and portions of Sonoma Creek (Jones & Stokes 2004a, 2004b).

3.9 CULTURAL RESOURCES

This section describes the prehistoric and historic uses of the NSMWA, as well as the results of the background literature review and reconnaissance level inspection.

3.9.1 Prehistory

Lillard et al. (1939) developed an early systematic cultural chronology for Central California. The Central California Taxonomic System (CCTS), as their culture chronology came to be known, identified three broad divisions, or Horizons, among sites in the Sacramento Valley, based primarily upon analyses of burials and associated artifacts. The Early, Transitional (later known as Middle), and Late Horizons were viewed as both cultural and chronological. These Horizons framed much of the cultural chronological thinking about archaeological sites in Central California for several decades.

By the late-1940s, the need for refinement in this scheme as applied to the San Francisco Bay region was established. Analysis of assemblages from deep, well-stratified sites such as ALA-309 (the Emeryville Shellmound) offered opportunities for this kind of refinement. Notable in this regard is Beardsley's typological examination of mortuary data in the Bay Region (Beardsley 1954). Beardsley examined burial lots from several shellmound sites throughout the Bay Region and characterized each burial as to stratigraphic position, burial position and orientation, and types and numbers of grave associations. Based on these analyses, Beardsley identified two distinctive components in assemblages from the Emeryville cone: the Ellis Landing Facies, lying in the lower portion of the deposit, which he associated with the Middle Horizon in the CCTS, and an upper component that he described as the Emeryville Facies of the CCTS early Late Horizon. Beardsley noted that a third component, described as the Fernandez Facies, is weakly represented in the uppermost levels of the mound. Distinctive artifacts and other identifiable traits are associated with each of these Facies, such that it is possible to identify similar components, presumably chronologically related, among other archaeological sites in the region.

Beardsley's analyses were hindered by two major factors: his work was undertaken before the advent of radiocarbon assay, so he lacked the means of obtaining absolute dates for archaeological components. Further, he sought to tie his analyses in many respects to the CCTS, the applicability of which has since been questioned. Nonetheless, the components Beardsley defined have stood up very well under more recent analyses, although discussion continues regarding the appropriate relationship between the Facies Beardsley defined and larger chronological and cultural units. There has been some difficulty in correlating absolute dates obtained through radiocarbon assays with the relative dates tied to Facies linked to the CCTS.

Fredrickson (1973, 1974) reexamined the CCTS and proposed a cultural classification scheme to address early cultures of the North Coast range. Expanding on his earlier work at sites, such as CCO-30 south of the city of Walnut Creek, Fredrickson introduced the concept of "Pattern" in his 1974 article, "Cultural Diversity in Early Central California: A View from the North Coast Range" (Fredrickson 1974). "Pattern" is a term for a chronological era. Fredrickson defined three

major cultural patterns: the Windmiller, the Berkeley, and the Augustine (West and Welch 1996). Windmiller Pattern refers to earlier prehistoric sites and is restricted to the eastern Delta, the area around the Camanche Reservoir, and adjacent areas of the lower Sacramento Valley from the middle of the Cosumnes River to Stockton. Windmiller relates to the Early Horizon of the CCTS, while the Berkeley Pattern can be equated with the Middle Horizon in the lower Sacramento Valley. However, some early phases could relate to the early period in the San Francisco Bay Area. The Augustine Pattern refers to sites occupied late in the prehistoric (West and Welch 1996). Patterns are subdivided into "Periods," with the Berkeley Pattern extending from the Lower through the Middle and Upper Archaic periods, and the Augustine Pattern represented by the Lower and Upper Emergent periods.

The prehistory of the San Francisco Bay Region is not as well known as other areas due to its history of intensive urban development. However, over the past few years, perception of this region's history has changed rapidly, partly as a result of intensive fieldwork performed to comply with environmental laws (Jones & Stokes 2003b). Recent investigations have led researchers to believe that this part of California was inhabited in the early Holocene times, emphasizing that older archaeological sites may exist on the submerged continental shelf or below the waters and sediments of the San Francisco Bay (Jones & Stokes 2003b). By examining and comparing the archaeological finds from sites in the Central Valley of California, the Monterey Coastal region, and the San Francisco Bay Area itself, a few generalizations can be made about the people who inhabited this region.

Typically, sites are found in settings adjacent to water resources, which would have placed humans in close proximity to a wide variety of plant and animal resources. Subsistence focused on hunting and gathering, and the typical diet most likely included fish, shellfish, deer, and gathered seeds. Based on the numerous grave goods found with human burials from this early period (typically found in a prone position and facing west), some archaeologists have concluded that trade networks with other groups had already been established and ceremonialism was an important aspect of daily life. Artifacts that might be found in association with a burial might include large projectile (spear or dart) points, fishing weights, hooks, animal bone, seed grinding implements, and shell beads.

About 4,000 BP, the archaeological sites from the San Francisco Bay Area and surrounding regions begin to suggest a greater specialization. It has been suggested that this period, referred to as Windmiller, is associated with an influx of peoples from outside of California. The archaeological evidence suggests these early populations employed technologies adapted to river-wetland environments (Moratto 1984). Typical Windmiller sites are often situated in riverine, marshland, and valley floors, settings that offered a variety of plants and animal resources. These sites often contain burials that are extended ventrally and oriented to the west. Burial artifacts include a variety of fishing paraphernalia (net weights, spear points, and bone hooks), large projectile points, as well as faunal and large and small mammal remains.

The subsequent Middle Horizon or Berkeley Pattern covers a period from 2,500 to 1,500 years ago in the Northern California Delta area. Sites from this period are more numerous and are better documented in the region. This development is thought to represent utilitarian cultural developments and geographic spread from the valley throughout the Bay Area (Jones & Stokes 2003b). As described by Allan et al. (1997), sites from this period include deeply stratified midden deposits, containing large assemblages of milling and grinding stones for the processing of vegetal resources, as well as smaller and lighter projectile points. The ratio of grinding implements and large shellmounds to projectile points indicates that gathering was emphasized, and hunting played a lesser role in subsistence strategy (Jones & Stokes 2003b). Further distinguishing traits from earlier patterns include artifacts such as slate pendants, steatite beads, stone tubes, and ear ornaments. A shift in burial patterning is also evident with variable directional orientation, flexed body positioning, and a general reduction in mortuary goods (Fredrickson 1973; Moratto 1984).

By AD 500, the Berkeley Pattern had developed into the Augustine Pattern. This development does not appear to represent a population replacement, but rather, a diffusion of new traits into the Bay Area (Jones & Stokes 2003b). The pattern is characterized by intensive hunting, fishing, and gathering, a focus on acorn processing, large population increases, intensified trade and exchange networks, more complex ceremonial and social attributes, and the practice of cremation in addition to flexed burials. Moratto (1984) adds that grave goods were often burned in the burial pit before interment of the body. As pointed out by Allan et al. (1997), certain artifacts also typify the pattern: bone awls for use in basketry manufacture, small notched and serrated projectile points, the introduction of the bow and arrow, occasional pottery, clay effigies, bone whistles, and stone pipes. Significant variation in grave wealth suggests discrepancies in wealth and status. The archaeological record continues to suggest reliance on the littoral and estuarine environment afforded by the Bay Area (Jones & Stokes 2003b).

3.9.2 Ethnography

The majority of the project area is the traditional ethnographic territory of the Patwin. However, the Coast Miwok also inhabited the lands of northern San Pablo Bay, in the western project areas in Sonoma County.

3.9.2.1 Patwin

Patwin territory included the Southern portion of the Sacramento River Valley to the west of the river, from the town of Princeton south to San Pablo and Suisun bays. From north to south, it extended 90 miles, and from east to west, it extended 40 miles, covering the banks of the Sacramento River, the flat, open grassland plains with occasional oak groves, and the lower hills of the eastern Coast Range mountain slope, rising to an elevation of 1400 feet (Johnson 1978).

“Patwin” is a native word that means “people” and was used by several tribelets in reference to themselves. It does not denote a political unity. The term was suggested initially by Powers

(1877) as a convenient name for those groups who displayed a close linguistic and cultural resemblance, but were distinguishable from, those Wintuans inhabiting the northern half of the western valley. The Wintuan language has been further divided into North, Central, and South Wintuan; the Patwin are classified as Southern Wintuan.

The maximum political unit for the Patwin was the tribelet, which consisted of one primary and several satellite villages. Each tribelet had a definite sense of territoriality and autonomy, and each tribelet sustained brief cultural differences from the others. Within the tribelet were several political and social distinctions, including a chief who oversaw village activities; this position was often determined by inheritance from father to son (Johnson 1978).

Patwin villages contained four main types of permanent structures: the dwelling or family house; the ceremonial dance house, which was usually built at a short distance to the north or south end of a village; the sudatory (sweat house), which was positioned at either the east or the west of the dance house; and the menstrual hut, which was placed on the edge of the village, farthest from the dance house. All of these were earth-covered, semi-subterranean structures with either an elliptical or circular shape (Johnson 1978).

The principal subsistence activities of the Patwin were hunting, fishing, and the gathering of wild plants. As among many other California cultures, a primary staple was the acorn. Hill, mountain, and occasionally live oak were gathered. Pulverized acorns were leached by pouring cold water over the meal spread in a sand basin. After processing, it was made into soup or bread. In addition to acorns, buckeye, pine nuts, juniper berries, Manzanita berries, blackberries, wild grapes, and other plants were collected at various times of the year. Each village had its own location for these food sources, and the village chief oversaw the procurement of food for the village (Johnson 1978).

Population estimates for Patwin groups, from pre-contact until 1833, are over 15,000 (Kroeber and Heizer 1932; Cook 1955). The Patwin were in contact with the Spanish missions by the late-eighteenth century, and some of the earliest historic records of the Patwin are found among mission registers of baptisms, marriage, and deaths of Indian neophytes. Mission San José, established in 1797, along with Mission Dolores, actively proselytized Patwin from their southern villages, and Mission Sonoma, built in 1823, also baptized neophytes, until the secularization of all missions by the Mexican government from 1832 to 1836. Afterwards, many tribal territories were divided into individual land grants (Johnson 1978).

The U.S. conquest of California (1846 to 1848) was followed by a massive influx of American settlers into Patwin territory, increasing pressure on the indigenous population. To facilitate the development of ranching, agriculture, mining, and large settlements, American policy toward the Patwin was generally one of removal to reservations. However, some Patwin were able to assimilate themselves, at least partially, into White culture through working as ranch laborers (Johnson 1978).

A decline in Patwin population continued into the 20th century, whereby in 1923 to 1924, Kroeber could find only approximately 200 Patwin, all living in the northern half of Patwin territory. As of 1972, the Bureau of Indian Affairs census listed only 11 Patwins for the entire territory. However, such estimates often include only Patwin with one-quarter or more descent (as in Kroeber and Heizer 1932), excluding those persons with less than one-quarter Patwin descent (Jones & Stokes 2003b). Three reservations (Colusa, Cortina, and Rumsey Rancherias) remain today; however, these three are often described as "Wintun" and were mostly occupied by descendants of other groups (Johnson 1978). Elements of Patwin culture may be, however, preserved in contemporary Indian cultures by way of pan-Indian organizations and living descendants of the Patwin (Castillo 1978).

3.9.2.2 Coast Miwok

Coast Miwok territory centered in Marin and adjacent Sonoma County, extending from Duncan's Point on the Sonoma County Coast to the end of the Marin County Peninsula (Kroeber 1925). To the east Coast Miwok territory extended east as far as midway between the Napa and Sonoma Rivers (Jones & Stokes 2003b).

The Coast Miwok language, a member of the Miwokian subfamily of the Utian family, is divided into two dialect groups: Western (Bodega) and Southern (Marin), with the Southern dialect further divided into valley and coast (Kelly 1978).

There appears to have been little overall tribal organization within Coast Miwok villages. Larger villages had a chief, who along with four elderly women, tutored an incipient headman and when the successor was ready to take over, the incumbent withdrew, or a poisoner was hired to liquidate him (Kelly 1978). Many villages had two important female leaders. One coordinated the Acorn Dance (a dance performed to bring good luck to the collection of acorns and other fruits), dominated the Sunwele Dance (a dance involving spirit impersonation), and was deeply involved in the Bird Cult (an aspect of the special attitudes towards birds) (Kelly 1978). The second female leader was the head of the women's ceremonial house, oversaw construction of the dance house, and coordinated many festivals and dances for the entire village (Kelly 1978).

Coast Miwok villages all contained dwellings, or family houses, and larger villages had circular sweathouses dug four or five feet into the ground. In populous settlements, the so-called secret societies had a ceremonial chamber, or dance house, as well (Kelly 1978).

The principal subsistence activities of the Coast Miwok, like the Patwin, were hunting, fishing, and the gathering of wild plants. Various fish and fowl were acquired based on seasonal availability. Villages were adjacent to shores, lagoons, or sloughs, but the Coast Miwok sought game and plants in the hills during the summer (Kelly 1978).

Spanish explorers made contact with the Coast Miwok in the late-1700s. By 1776, the Franciscan fathers of the San Francisco mission began forced conversions of Native Americans to Christianity and brought Coast Miwok to mission lands, causing a partial abandonment of native

settlements. Subsequent ranching and settlement by Mexicans and Americans further displaced Coast Miwok from their homes; many Miwok died from epidemic diseases and the consequences of resistance of the new settlers (Bean and Rawls 1983). However, during the early years of the American period in California, some Coast Miwoks were able to find work in sawmills and in the fields (Kelly 1978).

Cook estimated that the Coast Miwok population declined from approximately 2,000 persons prior to European contact to only five individuals by 1920 (Cook 1976). The National Park Service, the Miwok Archaeological Preserve, and individuals of at least partial Coast Miwok descent have recreated the village of Kule Loklo (Bear Valley) on the Point Reyes National Seashore. Dances and local festivals reflecting Coast Miwok traditions are now held at Kule Loklo (Eargle 1986).

3.9.3 History

The majority of the project area lies with Napa County, with some parcels located in Sonoma County to the west, and Solano County to the south.

3.9.3.1 Napa County

The Napa Valley was once part of "Alta California," which was claimed by the Spanish Empire. Spain gave up Alta California to Mexico in 1821, when Mexico separated from its mother country. The newly independent Mexican government sent Padre Jose Altimira and Don Francisco Castro to select a site suitable for a new mission north of Yerba Buena (San Francisco), because the native population that was brought to Yerba Buena from inland areas was used to warm, dry weather and was having great difficulty adapting to the San Francisco climate. After traveling through the Napa and Sonoma region, the Spaniards decided that Sonoma would be the best place for the new mission, as there was abundant timber and water, and Napa was determined to be more suitable for cattle tending (Weber 1998).

In 1836, Governor Mariano Chico signed the first land grant in the valley, Rancho Caymus, to the ownership of George Yount. Later that year, Chico granted Rancho Entre Napa, west of the Napa River, to Nicolas Higuerra, one-time solider at San Francisco and the deputy mayor of Sonoma. In 1848, Nathan Coombs bought the northeast corner of the rancho from Higuerra, surveyed the land, and laid out the plans for the city of Napa. Following Statehood in 1850, Napa became one of California's original 27 counties, established on February 8 of that year (Coy 1973; Kyle 1990).

3.9.3.2 Solano County

Solano County is also one of California's original 27 counties and has retained its original boundaries over time. The first county seat was the City of Benicia.

In 1839, Jose Francisco Armijo petitioned for three square leagues of land in the Suisun Valley in northern California. The following year, he received the grant to Rancho Tolenas from Governor Alvarado. Armijo acquired the title to a 13,315-acre rancho upon his father's death in 1850. In 1858, Captain R.H. Waterman acquired land in the Armijo grant. Shortly after getting title to the land, he offered Solano County 16 acres for use as a new county seat. The majority of citizens preferred that the county seat be in a more centralized location than Benicia, so the voters accepted Waterman's offer, making the new town of Fairfield (named after Waterman's hometown in Connecticut) the new county seat, where it has remained to the present (Wood Allen & Company 1879; Hunt 1926; Coy 1973; Kyle 1990).

3.9.3.3 Sonoma County

Sonoma County was one of the original 27 counties of California, created in 1850 at the time of statehood. The Russians, who had moved south from Alaska in search of otters, built the first permanent, non-native settlement in Sonoma County. In 1812, a group landed at Bodega Bay and founded a settlement to the north. They named the fort "Ross," an old name for Russia.

The Spanish, who were making their way up from Mexico along Coastal California, were inspired by the Russian settlement to complete the development of their missions. Father Jose Altimira, a priest at Mission San Francisco, built the Francisco Solano Mission, also known as the Sonoma Mission, in present-day town of Sonoma. By that time, Mexico had declared its independence from Spain. Shortly after, the Mexican government secularized the mission system, making the Sonoma Mission the last and northernmost one built, and the only one built under Mexican rule (Wood 2005).

General Mariano Guadalupe Vallejo was sent to Sonoma in 1835 to oversee the secularization of the Sonoma Mission. Over the next 11 years, he settled much of Sonoma County, taking 66,000 acres in Petaluma for himself, developing ranchos, and parceling out land to his extended family. Much of the livestock and Indian laborers from the secularized missions were absorbed by Vallejo's ranchos.

In the summer of 1846, a group of American settlers rode into Sonoma to confront General Vallejo, kidnapping and detaining him and others for several months. This group of pioneers proclaimed a new republic, creating a flag with the words "California Republic" and an image of a grizzly bear. For 22 days, the bear flag flew over Sonoma as the settlers declared California an independent republic. As the conflict became part of the larger Mexican-American war, Mexico eventually lost the war and ceded California to the United States (Wood 2005).

3.9.3.4 History of the San Pablo Bay Tidelands

The tidelands of the northeast part of San Pablo Bay comprise about 94 square miles of marsh and extend into parts of Napa, Solano, and Sonoma Counties. A Spanish expedition in 1823, led by Francisco Castro, was the first recorded non-native exploration into the area. Following

California statehood in 1850, these lands became part of the state holdings, and remained mostly undeveloped through the 1850s and 1860s. During this time, they were used primarily for hunting duck and other waterfowl for San Francisco markets (Hayes 1995).

In 1861, the California legislature passed a law which allowed the formation of swampland reclamation districts, and created a state board of swampland commissioners to supervise private reclamation projects. By the end of 1862, the state contained 38 swampland districts covering over 485,000 acres of land. Under pressure from land speculators and wheat farmers, however, the 1866 legislature decommissioned the board and passed the responsibility of overseeing reclamation projects to the various counties. In 1868, when the legislature dropped a 640-acre limit on the amount of "swampland" an individual could acquire (known as the Green Act), an immediate boom in private land acquisitions spread across the state (Jones & Stokes 2003b).

Between 1868 and 1871, most of the state's swampland holdings were privately owned, as a result of the Green Act, which also allowed the formation of local reclamation districts authorized to purchase state swampland and tidelands. In 1872, the newly incorporated Pacific Reclamation Company reclaimed some 12,000 acres of San Pablo Bay marsh west of Sonoma Creek with a system of levees, dams, ditches, and sluice gates. By 1877, the San Pablo Land Company had reclaimed 5,000 acres in the area (Kelley 1989; Hayes 1995). Reclamation continued from the 1880s to around 1910. The first crop grown in reclaimed marsh land was barley; and from the 1890s to the 1920s, oat hay and oats as grain were also grown in this area (CDFG 1977).

The largest of California's sales of the islands east of Sonoma Creek and within the project area was "Survey No. 569" to Jacob Hinckley, which generally included the lands of (modern) Island No. 1 and Knight Island. The second largest parcel, known as "Survey No. 115," covered Little Island, Island No. 2, and a portion of Russ Island. Vast landholdings within the project area were acquired by William S. Chapman, John W. Pearson, and George A. Nourse through a series of deals by 1872. During the 1870s, they continued business enterprises in other areas of the state, and gradually sold off their San Pablo Bay tidelands holdings by the mid-1890s (Jones & Stokes 2003b).

By the late-1800s, most marshland in the project area was diked, drained, and being used for livestock grazing and farmland. In 1904, Frank E. Knight acquired 7,000 acres of tidelands near Vallejo and constructed a series of levees and dykes to reclaim the land, which he did successfully, in 1926.

Although most of the marshland was eventually reclaimed, the soil along San Pablo Bay was unsuitable for most orchard-type agriculture. In general, the ranches in this area adapted to the rich peat soil of the region and grew grain crops, mostly alfalfa hay for the dairy markets in the San Pablo and San Francisco Bay area (Hayes 1995). The transition to automobiles during the 1920s caused a decrease in hay shipments, and the subsequent conversion of many ranches to more intensive crops led to the division of some of the larger holdings (Jones & Stokes 2003b).

3.9.3.5 Duck Hunting and Duck Clubs

For centuries, parts of California, including the tidal marshes near the San Francisco Bay, have served as the main wintering duck quarters for migratory waterfowl in the Pacific Flyway. As early as the 1850s, duck hunters traveled to the area to shoot waterfowl commercially for the San Francisco markets (Jones & Stokes 2003b).

Duck hunters typically relied on a variety of duck blinds, which were either temporary or permanent structures, based on their location in the water. In deep, large marshes covering a large area, duck blinds were elevated structures that varied in size and were supported by platforms resting on piles flush with the surface of the water. Many allowed the hunter to move with the ducks as they traveled in search of food. Small blinds, typically three to five feet, were partially hidden by netting or tules and rushes and often included a rail to support the gun and the shooter. Shallow marshes generally featured sunken blinds. Hunters also converted boats into blinds by anchoring the vessel and covering it with marsh vegetation. As these structures were abandoned or destroyed in response to the changing marshland (through silt deposits and flooding), new blinds were constructed to take their place (Jones & Stokes 2003b).

Duck clubs were an outgrowth of duck hunting and were first established in California as a result of unregulated game fowl hunting. By the 1870s, the number of waterfowl in California had drastically decreased due to over-hunting by sportsmen and market hunters. Urban sport hunters purchased tidelands that were generally considered unfit for agriculture, and modified these lands to attract waterfowl. Over the years, the original founders or their descendants maintained many of these early duck clubs. The need to build dikes and levees to create the ponds for blinds, planks, and clubhouses, and to have many small boats, rendered duck clubs expensive to own and operate, and therefore, were primarily a sport for the well-to-do. In addition, hunting was often restricted to certain days of the week and even to specific hours, restrictions that were necessary to allow the duck population to reproduce.

One of the early-20th-century duck clubs in the San Pablo Bay tidelands was the Fleishacker Club, also known as the Detjen Duck Club. It is the only remaining duck club adjacent to Route 37 in an area that once contained many duck clubs (the other clubs were purchased, and/or flooded by activities related to other developments and/or restoration (Wyckoff 2008). This duck club was located to the west of Island No. 1, just south of the Napa/Solano County line. It was established by the Field and Tule Land Company, and by the 1930s, the complex included a large clubhouse and other facilities. The name came from a short-term property owner during the 1940s. However, the name was changed to the Detjen Duck Club after H. Louis Detjen purchased the property in the 1950s. See **Appendix D**, Primary Record P-48-212/P-28-1324 for more details.

Other historic duck clubs in the project area include the West End Club, a turn-of-the-century duck club that was located on Sonoma Creek near SR 37 (CERES 1996); and the Little Island Farms Club (also known as the Pale Ale Club), which was located south of pond 6A. Club holdings included a lodge, outbuildings, and 300 acres of property. The club was most likely

established during World War II, as prior use of the land was for farming on reclaimed marshland (Huffman 2008a).

Another duck club in the San Pablo Bay tidelands was the Can Duck Club. This club was established in 1898 at Pond 2 and was known as the Hanneberry Duck Club, after the ranch of the same name (Hart 2007). From 1898 to 1955, the Hanneberry Duck Club and its successors consisted of members and owners primarily from the upper class, which would have represented the typical socioeconomic status of other duck clubs of that era (Allen 2007).

Leslie Salt bought and flooded the former Hanneberry Ranch in 1952, inheriting the hunting establishment as well. The club was renamed the Can Duck Club in July 1955 (after the Canvasback) and was organized as a non-profit corporation. During this time, the Club was converted to deep water and became a diving waterfowl habitat, incorporating such changes as disallowing wading and requiring the use of large boats and motors; heavy elevated blind construction (and continual re-construction); and the necessity of handling three-pound weights with 200 bird decoy spreads (Hart 2007). Membership in the Club, restricted to fifty members per year, consisted of individuals of various skills and trades, who were often former "unattached slough shooters;" that is, individuals who did not belong to any established club, but were looking for a more stable, less rugged environment than the one often encountered by a freelance duck hunter (Allen 2007).

DFG acquired the land in 1994. The Club received two five-year lease extensions; the last of which expired in July 2007 (Hart 2007). Now the property is currently open to public access.

Duck hunting continues to this day on the Giovannoni property, which is located on Napa Slough/Devils Slough, north of pond 6A (Huffman 2008a; Giovannoni 2008). It was purchased by the Giovannoni family in the early 1950s, and remains in their care. The Giovannoni land consists of seasonal marshland which is dry for most of the year, but is flooded in October, and remains as such, throughout duck-hunting season. The Giovannoni family also performs some maintenance of the land in the form of vegetation management. The property is privately-owned and not open to the public (Giovannoni 2008).

3.9.3.6 The Salt Industry

The manufacture and processing of salt as an industry in the San Francisco Bay Area began in the mid-1850s. Prior to that time, salt was gathered from natural salt pans or "hot ponds" in the marshes at the bay edge. In 1854, the bay's first artificial salt pond was created from 73 acres of marsh in Alameda County (Jones & Stokes 2003b).

The discovery of the Comstock Lode in Virginia City, Nevada in 1859 was the first major spur to the California salt industry, as salt was used in the industrial mining process of treating silver ore. The meat and fish curing industry of San Francisco used imported salt due to its superior quality (Ver Plank 1958).

The Leslie Salt Refining Company was established in 1901 and was one of the first to operate on the west side of San Francisco Bay. Two other salt companies were in operation at this time: the California Salt Company and the Continental Salt and Chemical Company. The companies began merging with smaller salt farms and buying production companies. In 1924, the three companies merged to form the Leslie-California Salt Company, and in 1936, the company was incorporated, and acquired the assets of both the Leslie-California Salt Company and the Arden Salt Company (Ver Plank 1958).

Until the early-1950s, Bay Area salt production was concentrated in Alameda, San Mateo, and Santa Clara Counties. In 1952 to 1953, the Leslie Salt Company acquired more than 10,000 acres in the vicinity of the Napa River and Sonoma Creek. To create the salt ponds, the company raised several of the existing levees, built cross levees, and created intake channels to flood much of the property (Jones & Stokes 2003b).

In 1978 to 1979, the Minnesota-based Cargill Salt Company (Cargill), an agricultural products corporation, acquired the company, maintaining its existing facility, buildings, internal systems, and river levees. In 1994, Cargill sold or donated their San Pablo Bay holdings to the state of California (Hayes 1995). The DFG acquired the Napa Plant Site from Cargill in March 2003 as part of the larger State of California, federal, and private sponsored purchase of 16,500 acres of salt ponds in the San Francisco Bay estuary.

3.9.4 Cultural Resources Literature Search

In compliance with CEQA Section 15126.4 and Federal Section 106 of the National Historic Preservation Act compliance for cultural resources, an archaeological investigation was performed for the proposed LMP. The archaeological investigation consisted of a literature review to identify any prior surveys conducted in or adjacent to the project units; any previously recorded archaeological sites that could be impacted by the undertaking, and a reconnaissance level inspection to locate and ascertain the current state of previously recorded sites and to locate sites that have not been previously recorded.

The literature review was conducted at the Northwest Information Center (NWIC), which is located at Sonoma State University in Rohnert Park. The NWIC is the CHRIS center for 16 counties, including Napa, Solano, and Sonoma. The record search included the following sources:

- Sites in the NSMWA or within 0.25-mile radius of the project units
- Previous investigations in or within 0.25-mile radius of the project units
- Office of Historic Properties Directory
- California Inventory of Historical Resources
- Historic maps

The NWIC record search resulted in the identification of 11 prehistoric sites and 9 historic sites in the NSMWA or within a ¼-mile radius of the project units.

Table 3-10 lists the previously recorded sites within the vicinity of the NSMWA project units as identified by the NWIC. **Table 3-11** lists the previous cultural investigations within the vicinity of the project units. **Appendix D** contains the site records and survey report information provided by the NWIC.

In addition to the formal literature review noted above, Tom Huffman, Wildlife Habitat Supervisor 1 of the Napa-Sonoma Marshes and the Petaluma Marshes Wildlife Area, stated that in the 1990s, he found a "charmstone on the eastern pond 1a levee, which an anthropologist from Sonoma State roughly dated at 3,000 BC." He also noted that, "A few years later, I found an obsidian spear point on the western pond 5 levee" (Huffman 2008b). Mr. Huffman did not report any further findings or associations with these isolated artifacts. Due to the fact that they were discovered on artificial landforms [levees], the provenience (location) of these isolates is compromised, and is not likely an indicator of additional cultural material in the Napa Salt Ponds.

3.9.5 Results of the Reconnaissance Level Inspection

The reconnaissance level inspection for the NSMWA LMP was undertaken on December 10, 2007. The inspection consisted of an effort to locate and record previously unidentified archaeological sites through cursory inspection of likely environmental locations and to relocate previously identified sites to evaluate their current condition. However, this survey was not intended to, nor was it undertaken in a manner that would constitute an intensive pedestrian survey, to inventory all visible and apparent cultural resource manifestations.

The majority of previously recorded cultural resources identified by the NWIC are located within a 0.25-mile radius of the project units, but outside of the LMP limits. This LMP is not expected to result in any ground-disturbing activities and will avoid any effect to the built environment. For these reasons, the inspection focused primarily on attempting to relocate previously recorded prehistoric resources within the project units.

Table 3-10. Previously recorded cultural resources in the vicinity of the NSMWA.

County	Quad	Site Number(s)	Site Type	Description	Within Project Footprint?
Napa	Cuttings Wharf	P-28-197 CA-NAP-230	Prehistoric	A shellmound originally recorded in 1907 by N.C. Nelson. Artifacts included shell and obsidian flakes. Revisited and relocated in 2005- area partially covered in a gravel driveway.	Yes
Napa	Cuttings Wharf	P-28-1284	Historic	The burned remains of a residence that may have been the original 1870s homestead structure; a distinct area of burnt materials include glass, ceramic sherds, and metal. Recorded in 2005.	Yes
Napa	Cuttings Wharf	CA-NAP-585H	Historic	The probable remains of Thompson's (Suscol) wharf, built in the late-1850s. The site is composed of at least 36 pilings remaining in the river, some with metal stakes protruding from the top of the piling. Recorded in 1980.	No; within the 0.25-mile search radius
Napa	Cuttings Wharf	P-28-1186	Historic	Stanly Ranch; the former ranch complex of Judge John Stanly; property contains a ranch house & several barns. The resource includes a 1.5-mile section of Stanly Lane that is lined on both sides with Eucalyptus trees and several small bridges over culverts.	Partially
Napa	Cuttings Wharf	CA-NAP-598H	Historic	An earthen ditch, 40-45" wide, 9" deep; appears to slope slightly downhill from apparent source at drainage to present terminus at Hwy 29 fill. Recorded in 1981.	No; within the 0.25-mile search radius
Solano	Cuttings Wharf	P-48-110 CA-SOL-269	Prehistoric	A sparse collection of lithic artifacts (flakes) at Slaughterhouse Point originally recorded by N.C. Nelson in 1907, but not field-checked by him. Re-recorded in 1960 and again in 1977 prior to residential development in the area.	Partially
Solano	Sears Point/ Cuttings Wharf	P-48-212/ P-28-1324	Historic	The "Fleishhacker Club," a ca. 1900 two-story gabled structure with wood frame construction, located on 357.87 acres of reclaimed marshland, defined by four levees. Other structures include three sheds, one with a gabled roof; a windmill, and a footbridge. The main structure has modern additions. The Club is also known as the Detjen Duck Club. Site was recorded in 1995.	No; within the 0.25-mile search radius
Solano	Cuttings Wharf	P-48-213	Historic	"Camp" structures associated with ranch and farming operations on Island No. 1, built mid-1920s. Structures include a large barn, a bunkhouse, a milk barn, lean-to sheds, corrugated shelters, and a pumphouse. Some buildings were destroyed in the 1980s.	No; within the 0.25-mile search radius
Solano	Cuttings Wharf/ Mare Island	P-48-462 P-28-1021 CA-SOL-408	Historic	The Cullinan Ranch North Levee; a dirt structure built to assist in the drainage of a tidal marsh to create suitable agricultural fields, probably constructed in the 1920s.	No; within the 0.25-mile search radius
Sonoma	Sears Point	C-164	Prehistoric	A shellmound site originally recorded by N.C. Nelson.	No; within the 0.25-mile search radius
Sonoma	Sears Point	CA-SON-207	Prehistoric	A shellheap located near Sears Point, originally recorded by Nelson in 1907. The site was revisited in 1983; only shell fragments & fire cracked rock were observed. Site noted as disturbed by animals & cattle trails.	No; within the 0.25-mile search radius
Sonoma	Sears Point	CA-SON-208	Prehistoric	A "shellheap" located near Sears Point, originally recorded by Nelson in 1907. Artifacts found include obsidian flakes.	No; within the 0.25-mile search radius

Table 3-10. Previously recorded cultural resources in the vicinity of the NSMWA.

County	Quad	Site Number(s)	Site Type	Description	Within Project Footprint?
Sonoma	Sears Point	CA-SON-209	Prehistoric	A campsite with shell fragments; originally recorded by Nelson in 1907, located near Tubb's Island.	No; within the 0.25-mile search radius
Sonoma	Sears Point	CA-SON-217	Prehistoric	A "shellheap" originally recorded by Nelson in 1907; consisted mainly of "black earth and rock with a very little shell- among which oyster".	No; within the 0.25-mile search radius
Sonoma	Sears Point	CA-SON-225	Prehistoric	Two burial mounds originally recorded by Nelson in 1907.	No. Within the 0.25-mile search radius
Sonoma	Sears Point	CA-SON-226	Prehistoric	A campsite originally recorded by Nelson in 1907: "a large, circular knoll a little west of Merazo, but no good evidence of its genuineness to be had".	No; within the 0.25-mile search radius
Sonoma	Sears Point	P-49-199/ CA-SON-227	Prehistoric	A "shellheap" originally recorded by Nelson in 1907; revisited in 1997 by the Anthropological Studies Center at Sonoma State Univ.	No; within the 0.25-mile search radius
Sonoma	Sears Point	P-49-1862 CA-SON-2226	Prehistoric	A prehistoric site consisting of a lithic scatter adjacent to a natural spring which has been capped with concrete housing.	No; within the 0.25-mile search radius
Sonoma	Sears Point	P-49-2834 CA-SON-2322H	Historic	A 1.9-mi. segment of the present-day Northwestern Pacific Railroad and the remains of the Greenwood Station. The former Marin & Napa RR Company built the line in the late-19th c. The Greenwood Station is on the former Monroe Greenwood property; remains include railroad ties, glass & ceramic fragments; construction debris, & slag deposits.	No; within the 0.25-mile search radius
Sonoma	Sears Point	P-49-3278	Historic	The Dickson Ranch Complex- a 19th-c. house and several associated buildings, dating as early as 1887. Structures include barns, bunkhouses, and outbuildings.	No; within the 0.25-mile search radius

Table 3-11. Previously recorded cultural investigations in the vicinity of the NSMWA.

Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
Survey Reports within the Project Area			
An Archaeological Survey of Possible Dredge Spoil Disposal Sites for the Napa River Channel Improvement Project	89	Moratto (1974)	Huichica Creek Unit; Southern Crossing Unit
Archaeological Assessment of the Sonoma Valley Reclamation Project, Sonoma County, California	278	French and Frederickson (1976)	Ringstrom Bay Unit
Cultural Resource Assessment of the Napa-American Canyon Wastewater Reuse Program	1200	Peak & Associates (1978)	Huichica Creek
A Preliminary Cultural Resources Study of the Lakeville-Sobrante 230 KV T/L Project Area	1834	Eisenman, Gerike, and Goodrich (1979)	White Slough Unit, Sonoma Creek Unit/American Canyon Unit
A Cultural Resources Survey of Five Napa River Disposal Sites	1908	Rudeo (1980)	Southern Crossing Unit and Bull Island (not in project area)
An Ethnographic Survey of Native American Cultural Resources along Pacific Gas & Electric's Proposed Lakeville-Sobrante 230 KV Transmission Line in Sonoma, Marin, Napa, Solano, & Contra Costa Counties	1980	Patterson, Goodrich, and Peri (1980)	Not plotted
Lakeville-Sobrante 230 KV Transmission Line Archaeological Sensitivity Map (letter report)	2663	Damon (1980)	White Slough Unit, American Canyon Unit, Tolay Creek Unit
Vallejo Freeway, Napa River Bridge to Route 80, 10-Sol-37 P.M. 8.0/11.4, 10204-028241	5063	Soule (1974)	White Slough Unit
Slaughterhouse Point Development, Environmental Evaluation and Impact Assessment-Cultural Features	5092	Davis (1977)	Slaughterhouse Point/American Canyon Unit, White Slough Unit
An Archaeological Survey of the Milleric/Larson Property, 27000 Burndale Road, Sonoma County, California (MS 7835)	5739	Haney (1982)	Wingo Unit, Ringstrom Bay Unit
Archaeological Survey of the Milleric/Larson Property, 27000 Burndale Road, Sonoma County, CA (letter report)	5774	Haney (1983)	Wingo Unit, Ringstrom Bay Unit
A Cultural Resources Study of Previously Unsurveyed Portions of the P.G. & E Lakeville-Sobrante 230 KV Transmission Line	6250	Roper and Frederickson (1983)	Tolay Creek Unit
Archaeological Survey Report for Upgrading a section of Route 37, 10-SOL-37 P.M. R8.0/R11.2, 10101-327000	6813	Adams (1984)	White Slough Unit
An Amended Cultural Resources Study for the Sonoma Valley County Sanitation District Partial Reclamation	6969	Stewart (1984)	Wingo Unit, Ringstrom Bay Unit
Projects Near Schellville, Sonoma County, CA			
Supplemental Archaeological Survey for the Proposed Sonoma Valley CSD Wastewater Reclamation Project, Sonoma Valley, CA	7364	Quinn (1985)	Ringstrom Bay Unit
An Archaeological Survey for Two Proposed Guardrail and Bridge Approachment Projects in Marin, Sonoma, & Napa Counties, CA	7484	Offermann (1985)	Tolay Creek Unit

Table 3-11. Previously recorded cultural investigations in the vicinity of the NSMWA.

Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
An Archaeological Study for a Reservoir and Irrigation Project on a Portion of the Lands of Buena Vista Winery Inc., Southeast of Schellville, Sonoma County, CA	7518	Gerike (1985)	Ringstrom Bay Unit
A Subsequent Archaeological Study for Sonoma Valley County Sanitation District Wastewater Processing Facilities, Sonoma Valley, Sonoma County, CA	7878	Gerike (1986)	Ringstrom Bay Unit
Archaeological Survey Report, Route 37 between the Napa River Bridge and Diablo Street in Vallejo, 10-SOL-37, P.M. R8.0/10.4	9110	Adams (1987)	White Slough Unit
An Archaeological Field Investigation of the Proposed Tolay Creek Winery Location; Sears Point, Sonoma County, CA	9156	Hayes (1987)	Tolay Creek Unit
An Archaeological Investigation of the Proposed Parking Area for Sears Point International Raceway, a Parcel of Approximately 55 acres on the East side of SR 121, Sonoma, CA	11121	Peron (1989)	Tolay Creek Unit
Archaeological Survey Report for a Portion of Route 121, from Sears Point to near Schellville, Sonoma County, CA, 04-SON-121, P.M. 0.0/9.2 04-12980G	12038	Dondero (1990)	Tolay Creek Unit
Archaeological Evaluation of the Vallejo Municipal Marina Mitigation Area, Napa County, California (89-45)	12058	Flynn (1989)	White Slough Unit, American Canyon Unit
First Addendum Archaeological Survey Report for a Portion of Route 121 near Schellville, Sonoma County, CA	17543	Dowdall (1995)	Tolay Creek Unit
Archaeological Reconnaissance, Napa River and Oat Hill Sanitary Landfill Area, Napa County, California	17582	Archaeological Consulting & Research Serv. (n.d.)	White Slough Unit, American Canyon Unit
Historic Properties Survey Report for the Proposed Widening and Placement of Concrete Median Barriers along State SR 37 between Tolay Creek and Mare Island, CA-Son/Sol-37	18369	Hayes, Morton, and Reynolds (1995)	Sonoma Creek Unit, Tolay Creek Unit
CA Dept. of Transportation Negative Archaeological Survey Report, Proposed Rehabilitation of Portions of the San Pablo Bay National Wildlife Refuge, south of SR 37 in Solano County.	18449	Hayes (1996)	Sonoma Creek Unit
Cultural Resource Report for the Tolay Creek Restoration Project, San Pablo Bay National Wildlife Refuge, Sonoma County, CA	19539	Valentine (1996)	Tolay Creek Unit
Vols. I, II, & III: Final Cultural Resources Inventory Report for the Williams Communications, Inc. Fiber Optic Cable System Install. Project, Pt. Arena to Robbins & Pt. Arena to Sacramento, CA	22736	Jones and Stokes (2000)	Southern Crossing Unit
Archival Literature Search and On-Site Archaeological Surface Reconnaissance of the Napa Meadows Property, Units 7 + 8: Two Adjacent Parcels of Land Totaling Approx. 81 Acres, Located to the West of State SR 29	23528	Pastron (1999)	White Slough Unit, American Canyon Unit
Historic Properties Inventory for the Proposed City of American Canyon, S Napa River Tidal Slough + Floodplain Restoration Project	23924	Jordan and Carrico (2001)	White Slough Unit, American Canyon Unit
A Cultural Resources Survey of the Dickson Ranch Property near Sears Point, Sonoma County, CA	30485	Beard (2005)	Tolay Creek Unit

Table 3-11. Previously recorded cultural investigations in the vicinity of the NSMWA.

Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
Records Search Results for T-Mobile Project, BA-10924: Across from 726 Catalina Circle, Vallejo, Solano County, CA 94589 (letter report)	33118	Losee (2007)	White Slough Unit, American Canyon Unit
Survey Reports within 1/4-mile of the Project Area			
Appraisal of the Archaeological Resources of the Napa River (Trancas Road to Edgerley Island) and Three Potential Reservoir Areas in the Napa River Basin	4	Fredrickson (1967)	Huichica Creek Unit
Archaeological Impact Evaluations, Rts 29 & 121, Slough Bridge, Napa County, CA	8	King, T. (1973)	Southern Crossing Unit
An Evaluation of the Archaeological Potential of the Area to be Modified by the Expansion of the Napa County Airport	41	Fredrickson (1974)	Green Island Unit
An Archaeological Reconnaissance of Buena Vista Winery Properties, Ramal Road, Sonoma and Napa Counties, CA	186	Fredrickson (1975)	Huichica Creek Unit
Archaeological Impact Evaluation: Proposed Sewage Pipeline, Napa to American Canyon, Napa County, CA	326	King, T. (1974)	White Slough Unit, American Canyon Unit
Preliminary Archaeological Reconnaissance of the Proposed Napa Meadows Subdivision, American Canyon, Napa County (letter rpt)	1144	Jackson (1977)	White Slough Unit, American Canyon Unit
Cultural Resources Field Report, App. 24395, Huichica Creek, Beaulieu Vineyards, Rutherford, CA	1406	Sheeders (1979)	Huichica Creek Unit
A Cultural Resources Survey of Five Napa River Disposal Sites	1908	Rudo (1980)	Southern Crossing Unit, /Bull Island (not in project area)
Cultural Resources Investigation of Operating Projects, Napa River Basin	2154	Brandt (1980)	Huichica Creek Unit, Green Island Unit
An Archaeological Assessment of the Sonoma Valley County Sanitation District Disposal Alternatives, Sonoma County, CA	2407	Eisenman (1981)	Ringstrom Bay Unit
Cultural Resources Overview of the Airport North Industrial Area, Napa County, CA	2435	Baker (1980)	Southern Crossing Unit
Archaeological Recon. of the Napa Industrial Park Project, Airport No. Industrial Area	2547	Salzman (1981)	Southern Crossing Unit
An Archaeological Survey of a Proposed Subdivision, A.P. #68-160-01, 243+/- Acres near Sears Point, Sonoma County, CA (letter report)	5803	Flaherty and Werner (1983)	Tolay Creek Unit
Archaeological Element of the Environmental Assessment of the United States Navy Homeporting Study, Mare Island, CA	6559	Roop (1984)	Mare Island (naval shipyard) (not in project area)
Archaeological Reconnaissance of the Zunino Property & the Dept. of Fish and Game Tract near American Canyon, Napa County, CA	8851	Baker (1986)	White Slough Unit, American Canyon Unit
An Archaeological Invest. of a 9.18 Acre Parcel at 2480&2500 Green Isl. Rd, Napa, CA	10579	Peron (1989)	Green Island Unit
An Archaeological Investigation of the Proposed Parking Area for Sears Pt Inter-national Raceway, a Parcel of Approx. 35 Acres at Hwys 37 & 121, Sonoma, CA.	11057	Peron (1989)	Tolay Creek Unit

Table 3-11. Previously recorded cultural investigations in the vicinity of the NSMWA.

Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
Archaeological Archival Study for the City of Santa Rosa Wastewater Project Alternatives: Bloomfield Reservoir Site, Laguna Wetland Restoration Study Areas, Ocean Pipeline Alignment, & the South County Alternative/Lakeville Pipeline…	12123	Jordan (1990)	Tolay Creek Unit
Archaeological Survey and Evaluation for the Napa Sanitation District Master Plan Update, Napa County, CA	12429	Mikkelsen, Berg, and Bouey (1991)	Green Island Unit, Southern Crossing Unit
Cultural Resources Invest. for the Port of Oakland Phase I Dredging, CR Evaluation	12439	Chavez (1990)	Green Island Unit
A Cultural Resources Evaluation of the Cline Cellars Property, Sonoma County, CA (letter report)	12671	Roop (1991)	Wingo Unit
An Archaeological Investigation of a Portion of a Los Carneros Irrigation Conveyance Project near Cuttings Wharf, Napa County, CA	13560	Psota (1992)	Huichica Creek Unit
Archaeological Survey Report, Application 29852, C. Mondavi and Sons, a Limited Partnership, Napa County	13622	Soule (1992)	Huichica Creek Unit
Archaeological Survey of 2 Sites for Proposed Solid Waste Transfer Sta., Napa County, CA	14137	Loyd (1992)	Southern Crossing Unit
An Archaeological Study for a 94.14-acre Portion (APN 060-100-24) of Sears Point Raceway, Sonoma County, CA	15781	Jablonowski (1994)	Tolay Creek Unit
Mare Island Conceptual Reuse Plan, Historic and Prehistoric Resources Element	16059	Dept of Defense (1994)	Mare Island (naval shipyard) (not in project area)
Cultural Resources Study for the Napa Carneros Pipeline Project, Napa County, CA	16063	Origer (1994)	Southern Crossing Unit
Historic Resource Evaluation Report on Former Napa Valley Railroad Line, 04-NAP-29 P.M. 22.2-28.4 04226-111330	16849	King, G. (1986)	Southern Crossing Unit
Archaeological Recon. of the Proposed American Canyon Sanitary Landfill Site (letter report)	17581	Jackson (1978)	White Slough Unit, American Canyon Unit
Historic Survey of Mare Island Naval Complex, Final Rpt	17786	Cardwell (1985)	Mare Island (naval shipyard) (not in project area)
Mare Island Archaeological Resources Inventory, First Complete Draft	17792	Roop and Flynn (1986)	Mare Island (naval shipyard) (not in project area)
Prehistoric Archaeological Context Statement and Site Prediction Model, Mare Island Naval Shipyard, Vallejo, CA	18036	Allan and Self (1996)	Mare Island (naval shipyard) (not in project area)
Predictive Historic Archaeological Sites Model for Mare Isl. Naval Shipyard, Vallejo, CA	18112	Maniery and Baker (1995)	Mare Island (naval shipyard) (not in project area)
A Cultural Resources Study for the Sears Point Raceway, Sonoma County, CA	19455	Ferneau (1997)	Tolay Creek Unit
Archaeological Survey Rpt, 10-SOL-37, PM 8.89/8.94 CU 10-168, Retrofit of Bridge	19753	Levy (1995)	White Slough Unit
Archaeological Survey Rpt, 10-SOL-37, PM R7.073/ 7.352 CU 10-168, Retrofit of Brig.	19754	Levy (1995)	Mare Island (naval shipyard) (not in project area)

Table 3-11. Previously recorded cultural investigations in the vicinity of the NSMWA.

Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
Archaeological Survey Rpt, 10-SOL-37, PM R7.388/8.012 CU 10-168, Retrofit of Bridge	19755	Levy (1995)	Mare Island (naval shipyard) (not in project area)
Cultural Resources Report for the Napa Marsh Unit (Cullinan Ranch) Tidal Restoration Project, San Pablo Bay National Wildlife Refuge, Solano County, CA	19760	Valentine (1997)	Napa River Unit
Cultural Resource Survey Report, Application 30252 & 30253, Beckstoffer Vineyards	20790	Soule (1994)	Huichica Creek Unit
Cultural Resource Survey Report, Application 29593, Dr. Joseph G. Roche	20802	Soule (1998)	Tolay Creek Unit
Archaeological Investigations at CA-SON-227&CA-SON-2226, Sears Pt Raceway, Sonoma County, CA	21688	Origer and Beard (1998)	Tolay Creek Unit
A Cultural Resources Inventory of the Napa Airport Master Environmental Assessment Area, Napa County, CA	22041	Flynn, Roop, and Melander (1983)	Green Island Unit, Southern Crossing Unit
A Cultural Resources Evaluation of the Proposed Viansa Master Plan, Sonoma County, CA	22894	Chattan (2000)	Wingo Unit
A Cultural Resources Evaluation of the Lands of Buena Vista Winery, 24500 & 24600 Ramal Rd, Near Schellville, Sonoma County, CA	23794	Chattan (2001)	Ringstrom Bay Unit
Cultural Resources Assessment for Sears Point Cell Tower Site (letter report)	24603	Reutter (2002)	Tolay Creek Unit
Revised Predictive Archaeological Model for Mare Island, Vallejo, Solano County, CA	24604	Maniery (2000)	Mare Island (naval shipyard) (not in project area)
Historic Property Survey Report for the SR 37/Mare Island Inter-change Project, Vallejo, Solano County, CA SR 37/KP R11.4 to 13.4	27319	Beard (2002)	Mare Island (naval shipyard) (not in project area)
A Cultural Resources Survey of the Proposed Cross-Country and Downhill Bike Tracks at Infineon Raceway, Sonoma County, CA	29816	Quinn and Origer (2004)	Tolay Creek Unit
Final EIS/EIR, White Slough Flood Control Project, State Clearinghouse #2001072029	32342	U.S. ACOE (2001)	White Slough Unit
Survey Reports within the Project Area			
An Archaeological Survey of Possible Dredge Spoil Disposal Sites for the Napa River Channel Improvement Project	89	Moratto (1974)	Huichica Creek Unit, Southern Crossing Unit
Archaeological Assessment of the Sonoma Valley Reclamation Project, Sonoma County, California	278	French and Frederickson (1976)	Ringstrom Bay Unit
Cultural Resource Assessment of the Napa-American Canyon Wastewater Reuse Program	1200	Peak & Associates (1978)	Huichica Creek Unit
A Preliminary Cultural Resources Study of the Lakeville-Sobrante 230 KV T/L Project Area	1834	Eisenman, Gerike, and Goodrich (1979)	White Slough Unit, Sonoma Creek Unit, American Canyon Unit
A Cultural Resources Survey of Five Napa River Disposal Sites	1908	Rudeo (1980)	Southern Crossing Unit, Bull Island

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Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
An Ethnographic Survey of Native American Cultural Resources along Pacific Gas & Electric's Proposed Lakeville-Sobrante 230 KV Transmission Line in Sonoma, Marin, Napa, Solano, & Contra Costa Counties	1980	Patterson, Goodrich, and Peri (1980)	not plotted
Lakeville-Sobrante 230 KV Transmission Line Archaeological Sensitivity Map (letter report)	2663	Damon (1980)	White Slough Unit, American Canyon Unit, Tolay Creek Unit
Vallejo Freeway, Napa River Bridge to Route 80, 10-Sol-37 P.M. 8.0/11.4, 10204-028241	5063	Soule (1974)	White Slough Unit
Slaughterhouse Point Development, Environmental Evaluation and Impact Assessment-Cultural Features	5092	Davis (1977)	American Canyon Unit, White Slough Unit
An Archaeological Survey of the Milleric/Larson Property, 27000 Burndale Road, Sonoma County, California (MS 7835)	5739	Haney (1982)	Wingo Unit, Ringstrom Bay Unit
Archaeological Survey of the Milleric/Larson Property, 27000 Burndale Road, Sonoma County, CA (letter report)	5774	Haney (1983)	Wingo Unit, Ringstrom Bay Unit
A Cultural Resources Study of Previously Unsurveyed Portions of the P.G. & E Lakeville-Sobrante 230 KV Transmission Line	6250	Roper and Frederickson (1983)	Tolay Creek Unit
Archaeological Survey Report for Upgrading a section of Route 37, 10-SOL-37 P.M. R8.0/R11.2, 10101-327000	6813	Adams (1984)	White Slough Unit
An Amended Cultural Resources Study for the Sonoma Valley County Sanitation District Partial Reclamation Project near Schellville, Sonoma County, CA	6969	Stewart (1984)	Wingo Unit, Ringstrom Bay Unit
Supplemental Archaeological Survey for the Proposed Sonoma Valley CSD Wastewater Reclamation Project, Sonoma Valley, CA	7364	Quinn (1985)	Ringstrom Bay Unit
An Archaeological Survey for Two Proposed Guardrail and Bridge Approachment Projects in Marin, Sonoma, & Napa Counties, CA	7484	Offermann (1985)	Tolay Creek Unit
An Archaeological Study for a Reservoir and Irrigation Project on a Portion of the Lands of Buena Vista Winery Inc., Southeast of Schellville, Sonoma County, CA	7518	Gerike (1985)	Ringstrom Bay Unit
A Subsequent Archaeological Study for Sonoma Valley County Sanitation District Wastewater Processing Facilities, Sonoma Valley, Sonoma County, CA	7878	Gerike (1986)	Ringstrom Bay Unit
Archaeological Survey Report, Route 37 between the Napa River Bridge and Diablo Street in Vallejo, 10-SOL-37, P.M. R8.0/10.4	9110	Adams (1987)	White Slough Unit
An Archaeological Field Investigation of the Proposed Tolay Creek Winery Location; Sears Point, Sonoma County, CA	9156	Hayes (1987)	Tolay Creek Unit
An Archaeological Investigation of the Proposed Parking Area for Sears Point International Raceway, a Parcel of Approximately 55 acres on the East side of SR 121, Sonoma, CA	11121	Peron (1989)	Tolay Creek Unit
Archaeological Survey Report for a Portion of Route 121, from Sears Point to near Schellville, Sonoma County, CA, 04-SON-121, P.M. 0.0/9.2 04-12980G	12038	Dondero (1990)	Tolay Creek Unit

Table 3-11. Previously recorded cultural investigations in the vicinity of the NSMWA.

Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
Archaeological Evaluation of the Vallejo Municipal Marina Mitigation Area, Napa County, California (89-45)	12058	Flynn (1989)	White Slough Unit, American Canyon Unit
First Addendum Archaeological Survey Report for a Portion of Route 121 near Schellville, Sonoma County, CA	17543	Dowdall (1995)	Tolay Creek Unit
Archaeological Reconnaissance, Napa River and Oat Hill Sanitary Landfill Area, Napa County, California	17582	Archaeological Consulting & Research Serv. (n.d.)	White Slough Unit, American Canyon Unit
Historic Properties Survey Report for the Proposed Widening and Placement of Concrete Median Barriers along State SR 37 between Tolay Creek and Mare Island, CA-Son/Sol-37	18369	Hayes, Morton, & Reynolds (1995)	Sonoma Creek Unit, Tolay Creek Unit
CA Dept. of Transportation Negative Archaeological Survey Report, Proposed Rehabilitation of Portions of the San Pablo Bay National Wildlife Refuge, south of SR 37 in Solano County.	18449	Hayes (1996)	Sonoma Creek Unit
Cultural Resource Report for the Tolay Creek Restoration Project, San Pablo Bay National Wildlife Refuge, Sonoma County, CA	19539	Valentine (1996)	Tolay Creek Unit
Vols. I, II, & III: Final Cultural Resources Inventory Report for the Williams Communications, Inc. Fiber Optic Cable System Install. Project, Pt Arena to Robbins & Pt Arena to Sacramento, CA	22736	Jones and Stokes (2000)	Southern Crossing Unit
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Historic Properties Inventory for the Proposed City of American Canyon, S Napa River Tidal Slough + Floodplain Restoration Project	23924	Jordan and Carrico (2001)	White Slough Unit, American Canyon Unit
A Cultural Resources Survey of the Dickson Ranch Property near Sears Point, Sonoma County, CA	30485	Beard (2005)	Tolay Creek Unit
Records Search Results for T-Mobile Project, BA-10924: Across from 726 Catalina Circle, Vallejo, Solano County, CA 94589 (letter report)	33118	Losee (2007)	White Slough Unit, American Canyon Unit
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Archaeological Impact Evaluations, Rts 29 & 121, Slough Bridge, Napa County, CA	8	King, T. (1973)	Southern Crossing Unit
An Evaluation of the Archaeological Potential of the Area to be Modified by the Expansion of the Napa County Airport	41	Fredrickson (1974)	Green Island Unit
An Archaeological Reconnaissance of Buena Vista Winery Properties, Ramal Road, Sonoma and Napa Counties, CA	186	Fredrickson (1975)	Huichica Creek Unit
Archaeological Impact Evaluation: Proposed Sewage Pipeline, Napa to American Canyon, Napa County, CA	326	King, T. (1974)	White Slough Unit, American Canyon Unit
Preliminary Archaeological Reconnaissance of the Proposed Napa Meadows Subdivision, American Canyon, Napa County (letter rpt)	1144	Jackson (1977)	White Slough Unit, American Canyon Unit

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Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
Cultural Resources Field Report, App. 24395, Huichica Creek, Beaulieu Vineyards, Rutherford, CA	1406	Sheeders (1979)	Huichica Creek Unit
A Cultural Resources Survey of Five Napa River Disposal Sites	1908	Rudo (1980)	Southern Crossing Unit, Bull Island
Cultural Resources Investigation of Operating Projects, Napa River Basin	2154	Brandt (1980)	Huichica Creek Unit, Green Island Unit
An Archaeological Assessment of the Sonoma Valley County Sanitation District Disposal Alternatives, Sonoma County, CA	2407	Eisenman (1981)	Ringstrom Bay Unit
Cultural Resources Overview of the Airport North Industrial Area, Napa County, CA	2435	Baker (1980)	Southern Crossing Unit
Archaeological Recon. of the Napa Industrial Park Project, Airport No. Industrial Area	2547	Salzman (1981)	Southern Crossing Unit
An Archaeological Survey of a Proposed Subdivision, A.P. #68-160-01, 243+/- Acres near Sears Point, Sonoma County, CA (letter report)	5803	Flaherty and Werner (1983)	Tolay Creek Unit
Archaeological Element of the Environmental Assessment of the United States Navy Homeporting Study, Mare Island, CA	6559	Roop (1984)	Mare Island (naval shipyard) (not in project area)
Archaeological Reconnaissance of the Zunino Property & the Dept. of Fish and Game Tract near American Canyon, Napa County, CA	8851	Baker (1986)	White Slough Unit, American Canyon Unit
An Archaeological Invest. of a 9.18 Acre Parcel at 2480&2500 Green Isl. Rd, Napa, CA	10579	Peron (1989)	Green Island Unit
An Archaeological Investigation of the Proposed Parking Area for Sears Pt Inter-national Raceway, a Parcel of Approx. 35 Acres at Hwys 37 & 121, Sonoma, CA.	11057	Peron (1989)	Tolay Creek Unit
Archaeological Archival Study for the City of Santa Rosa Wastewater Project Alternatives: Bloomfield Reservoir Site, Laguna Wetland Restoration Study Areas, Ocean Pipeline Alignment, & the South County Alternative/Lakeville Pipeline…	12123	Jordan (1990)	Tolay Creek Unit
Archaeological Survey and Evaluation for the Napa Sanitation District Master Plan Update, Napa County, CA	12429	Mikkelsen, Berg, and Bouey (1991)	Green Island Unit, Southern Crossing Unit,
Cultural Resources Invest. for the Port of Oakland Phase I Dredging, CR Evaluation	12439	Chavez (1990)	Green Island Unit
A Cultural Resources Evaluation of the Cline Cellars Property, Sonoma County, CA (letter report)	12671	Roop (1991)	Wingo Unit
An Archaeological Investigation of a Portion of a Los Carneros Irrigation Conveyance Project near Cuttings Wharf, Napa County, CA	13560	Psota (1992)	Huichica Creek Unit
Archaeological Survey Report, Application 29852, C. Mondavi and Sons, a Limited Partnership, Napa County	13622	Soule (1992)	Huichica Creek Unit
Archaeological Survey of 2 Sites for Proposed Solid Waste Transfer Sta., Napa County, CA	14137	Loyd (1992)	Southern Crossing Unit
An Archaeological Study for a 94.14-acre Portion (APN 060-100-24) of Sears Point Raceway, Sonoma County, CA	15781	Jablonowski (1994)	Tolay Creek Unit

Table 3-11. Previously recorded cultural investigations in the vicinity of the NSMWA.

Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
Mare Island Conceptual Reuse Plan, Historic and Prehistoric Resources Element	16059	Dept of Defense (1994)	Mare Island (naval shipyard) (not in project area)
Cultural Resources Study for the Napa Carneros Pipeline Project, Napa County, CA	16063	Origer (1994)	Southern Crossing Unit
Historic Resource Evaluation Report on Former Napa Valley Railroad Line, 04-NAP-29 P.M. 22.2-28.4 04226-111330	16849	King, G. (1986)	Southern Crossing Unit
Archaeological Recon. of the Proposed American Canyon Sanitary Landfill Site (letter report)	17581	Jackson (1978)	White Slough Unit, American Canyon Unit
Historic Survey of Mare Island Naval Complex, Final Rpt	17786	Cardwell (1985)	Mare Island (naval shipyard) (not in project area)
Mare Island Archaeological Resources Inventory, First Complete Draft	17792	Roop and Flynn (1986)	Mare Island (naval shipyard) (not in project area)
Prehistoric Archaeological Context Statement and Site Prediction Model, Mare Island Naval Shipyard, Vallejo, CA	18036	Allan and Self (1996)	Mare Island (naval shipyard) (not in project area)
Predictive Historic Archaeological Sites Model for Mare Isl. Naval Shipyard, Vallejo, CA	18112	Maniery and Baker (1995)	Mare Island (naval shipyard) (not in project area)
A Cultural Resources Study for the Sears Point Raceway, Sonoma County, CA	19455	Ferneau (1997)	Tolay Creek Unit
Archaeological Survey Rpt, 10-SOL-37, PM 8.89/8.94 CU 10-168, Retrofit of Bridge	19753	Levy (1995)	White Slough Unit
Archaeological Survey Rpt, 10-SOL-37, PM R7.073/ 7.352 CU 10-168, Retrofit of Brig.	19754	Levy (1995)	Mare Island (naval shipyard) (not in project area)
Archaeological Survey Rpt, 10-SOL-37, PM R7.388/8.012 CU 10-168, Retrofit of Bridge	19755	Levy (1995)	Mare Island (naval shipyard) (not in project area)
Cultural Resources Report for the Napa Marsh Unit (Cullinan Ranch) Tidal Restoration Project, San Pablo Bay National Wildlife Refuge, Solano County, CA	19760	Valentine (1997)	Napa River Unit
Cultural Resource Survey Report, Application 30252 & 30253, Beckstoffer Vineyards	20790	Soule (1994)	Huichica Creek Unit
Cultural Resource Survey Report, Application 29593, Dr. Joseph G. Roche	20802	Soule (1998)	Tolay Creek Unit
Archaeological Investigations at CA-SON-227&CA-SON-2226, Sears Pt Raceway, Sonoma County, CA	21688	Origer and Beard (1998)	Tolay Creek Unit
A Cultural Resources Inventory of the Napa Airport Master Environmental Assessment Area, Napa County, CA	22041	Flynn, Roop, and Melander (1983)	Green Island Unit, Southern Crossing Unit
A Cultural Resources Evaluation of the Proposed Viansa Master Plan, Sonoma County, CA	22894	Chattan (2000)	Wingo Unit
A Cultural Resources Evaluation of the Lands of Buena Vista Winery, 24500 & 24600 Ramal Rd, Near Schellville, Sonoma County, CA	23794	Chattan (2001)	Ringstrom Bay Unit
Cultural Resources Assessment for Sears Point Cell Tower Site (letter report)	24603	Reutter (2002)	Tolay Creek Unit

Table 3-11. Previously recorded cultural investigations in the vicinity of the NSMWA.

Report Title	NWIC File #	Author (Date)[1]	Area(s) Covered by the Study
Revised Predictive Archaeological Model for Mare Island, Vallejo, Solano County, CA	24604	Maniery (2000)	Mare Island (naval shipyard) (not in project area)
Historic Property Survey Report for the SR 37/Mare Island Inter-change Project, Vallejo, Solano County, CA SR 37/KP R11.4 to 13.4	27319	Beard (2002)	Mare Island (naval shipyard) (not in project area)
A Cultural Resources Survey of the Proposed Cross-Country and Downhill Bike Tracks at Infineon Raceway, Sonoma County, CA	29816	Quinn and Origer (2004)	Tolay Creek Unit
Final EIS/EIR, White Slough Flood Control Project, State Clearinghouse #2001072029	32342	USACE (2001)	White Slough Unit

[1] Full references can be found in the Cultural Resources Report for the Napa Sonoma Marshes Wildlife Area Land Management Plan (URS 2008)

During the inspection, DFG personnel accompanied the URS archaeologist to locations where prehistoric resources have been previously recorded. At these locations, a visual spot check was performed, and notes and photographs were taken of the locations where prehistoric resources have been previously recorded. These resources included CA-NAP-230 (the shellmound site originally recorded by Nelson, located on Green Island and relocated in 2005), CA-SOL-269 (a lithic (stone tools and debitage) scatter at Slaughterhouse Point originally recorded by N.C. Nelson in 1907 and re-recorded in 1960 and 1977), and CA-SON-227, a prehistoric site originally recorded by Nelson in 1907 and revisited in 1997 by the Anthropological Studies Center at Sonoma State University.

Based on the reconnaissance level inspection, no archaeological remains were identified and no previously recorded sites were relocated. Although dark, organic soils were observed at the location of previously recorded site CA-NAP-230, no shell, chert, or obsidian flakes (as noted in the 2005 primary record) were observed during the survey. CA-SON-227 is now located within Infineon Raceway grounds and the main raceway office has been built upon the mound. No evidence of CA-SOL-269 was identified on the surface within the project unit; however, the area is now contained within a residential housing development. Over a century of development, topographic features referenced by Nelson appear to have entirely disappeared as the areas have been developed for agricultural and industrial (i.e., salt mining) use. Additional disturbances have come from road and building construction. It does not appear that the LMP has the potential to affect any archaeological resources within the project units. However, if one (or more) of the shellmound sites were encountered as a result of future project activities, it would potentially be eligible for inclusion in the NRHP under Criterion D for its potential to yield important data on shellmounds in the North Bay area.

3.10 RECREATION AND PUBLIC USE

This section describes the recreation and public use activities and opportunities available at the NSMWA. The NSMWA is currently a “Type C” wildlife area that does not require any special permits or fees for general entry (Jones & Stokes 2004a). Recreation and public use of the NSMWA include hunting, fishing, wildlife viewing, boating, environmental, and scientific programs, nature observations, photography, and hiking. DFG estimates from visitor log books that approximately 1,000 people use the site annually, including 600 hunters and 400 visitors engaged in other natural activities (Jones & Stokes 2004a, 2004b). **Figure 13** shows the main publicly accessible land areas and facilities. Camping and trailers are not allowed within NSMWA.

Public access to the NSMWA is relatively limited in the NSMWA and few developed public facilities exist in the wildlife area. **Figure 14** shows potential locations for future established trails in and adjacent to the NSMWA. Established trails are trails that require Americans with Disabilities Act (ADA) accessible substrate and include (but are not limited to) infrastructure such as garbage receptacles and benches along the trail. Because established trails provide (wild

or domestic) predators easier access to the wildlife, DFG is striving to protect certain areas that are not suitable for this type of access. Future additional trails in the NSMWA at the Green Island Unit are depicted in **Appendix E**.

3.10.1 Buildings and Structure for Public Use

3.10.1.1 Headquarters

The DFG maintains limited constructed facilities for the NSMWA. The NSMWA Field Headquarter, as known as the North Bay Field Office, is located at 2148 Duhig Road. It consists of a former Dairy Farm and its associated structures. The main building has employee housing, a conference room, offices, a restroom, and a kitchen. Other buildings include: a bunkhouse used for office space, a garage used as a maintenance shop, a pole barn used for vehicle and equipment storage, and a barn used for storage and special events as needed. The DFG has developed an outdoor amphitheater area with a fire pit and barbecue that can be used for school groups, educational events, etc. Additionally, the DFG has set up a native plant nursery on-site.

Public meetings are held at the headquarters conference room. It is anticipated that educational and interpretative program would be developed as part of NSMWA's management program.

3.10.1.2 Roads and Parking

Highways and local public paved roads provide access to the some areas of the NSMWA. Currently, no gravel roads or unimproved dirt roads are available in the NSMWA for public vehicle access, except for Tolay Creek (northern portion) (**Figure 13**). Tolay Creek Unit (southern portion) and the southern portion of Napa River Unit can be accessed via SR 37 pullouts. Ringstrom Bay Unit can be accessed by taking SR 12 to Ramal Road, then taking Ramal Road to the designated parking area. Access to the Huichica Creek Unit can be gained by taking SR 12 to Duhig Road, then by turning left on Las Amigas and right on Buchli Station Road to its terminus. White Slough Unit can be accessed by taking SR 29 to Meadows Drive and Catalina Circle. The Green Island Unit can be accessed by taking SR 29 to Green Island Road. The remaining areas are accessible by boat via the Napa River, Sonoma Creek, Napa Slough, Hudeman Slough, and other tributary sloughs.

A limited number of parking lots or pullouts are located along various parts of the roads and provide access to the trails, hunting, and fishing sites (**Figure 13**). DFG manages two public parking lots for recreational access at the Huichica Creek Unit and the northern portion of the Napa River Unit, one north of the salt ponds at the end of Buchli Station Road and the other at the end of Milton Road (Jones & Stokes 2004a, 2004b). The Buchli Station Road parking lot has a voluntary check station where visitors can fill out "use cards" related to their activities (Jones & Stokes 2004a). The southern marsh areas can be accessed through the three parking lots off SR 37: a paved parking lot at southeast corner of Pond 1, the Sonoma Creek Unit parking lot on Skaggs Island Road, and the newly created Lower Tubbs Island parking lot that is located

Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 14

Potential locations for established trails*

- NSMWA Management Unit
- Ecological Reserve (DFG, current)
- Ecological Reserve (DFG, future)

Established trail

- Potential established trail on DFG property
- Potential established trail not on DFG property
- Parking
- Trailhead
- Boat launch
- Headquarters
- Dirt road
- Paved road
- Highway
- Closed to public
- Power line
- Railroad

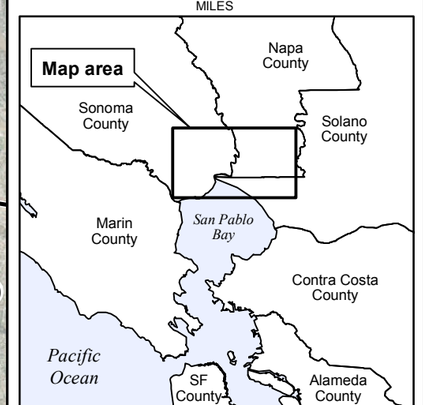
* "Established trail" is defined as trails that require ADA accessible substrate and include (but not limited to) infrastructure such as garbage receptacles and benches along the trail. This map was created to outline areas DFG deemed appropriate for "established trails" in the NSMWA if needed in the future. The purpose of the map is to facilitate the protection of sensitive habitat and ground nesting threatened and endangered species while fulfilling DFG's mission statement and the goals of the NSMWA LMP.

N

SCALE 1:57,000

Base imagery:
Airphoto USA, 1 April 2007
0.3-meter cell size

0 0.5 1 2
MILES



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OCTOBER 2011

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Napa Sonoma Marshes Wildlife Area
Land Management Plan
FIGURE 13

Public Access

Management Units with hunting designations

- Closed to hunting
- Open to hunting

Other

- Ecological Reserve, closed to hunting (DFG, current)
- Ecological Reserve (proposed after restoration monitoring is complete in 2024), closed to hunting (DFG, future)

- Parking
- Trailhead
- Boat launch
- Headquarters
- Dirt road
- Paved road
- Highway
- Closed to public
- Power line
- Railroad

N

SCALE 1:57,000

0 0.5 1 2

MILES

Map area

Napa County
Sonoma County
Solano County
Marin County
San Pablo Bay
Contra Costa County
Pacific Ocean
SF County
Alameda County

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at the northeast corner of the South Tolay Unit. Another parking area available to the public is the South Crossing Unit parking area off Stanley Lane. An access road, a 42-space parking lot, and restrooms are planned for the Green Island Unit.

Currently, most of the parking lots in the NSMWA have no improved facilities. The Buchli Station Road parking lot in Huichica Creek Unit is the only parking lot with pit toilets.

3.10.1.3 Boat Ramps

Two public boat ramps just outside of the Napa River Unit allow reasonably good boat access to the sloughs. One is at Cuttings Wharf, and the other is on Hudeman Slough (**Figure 13**). Green Island Road in the Napa River Unit is open to the public and provides access to the Napa River levee for fishing. When restoration of the southern section of the Green Island Unit is completed then access to a boat ramp for hand launching of watercraft will be available for public use.

Example Regulatory Sign

3.10.1.4 Public Access

The NSMWA provides two sections of unpaved, improved trails (totaling 4.13 miles) for walking and hiking (**Figure 13**): one at the northeast corner of the Ringstrom Bay Unit and one in the Tolay Creek Unit (southern portion), south of SR 37. Approximately 76 miles of non-drivable unimproved roads or levees that were constructed around the former salt ponds and along the sloughs, creeks, and rivers in NSMWA have also been used as trails by visitors participating in activities such as hunting, fishing, and wildlife viewing. When restoration of the southern section of the Green Island Unit is completed, access to additional trails is anticipated (**Appendix E**).

3.10.1.5 Signs

The NSMWA uses four categories of signage to regulate public use and access. The categories are: directional, regulatory, informational, and interpretive signs. Directional signs are located at various intersections inside NSMWA to help visitors navigate within the area. Regulatory signs at parking lots inform visitors of allowable activities and restrictions within the respective area. Signs such as the NSMWA nameplate adjacent to SR 37 and Meadows Drive (White Slough Unit) inform visitors of the existence of the NSMWA. Two interpretive signs/kiosks are located near the Buchli Station Road parking lot in Huichica Creek Unit and provide interpretation of wetland habitats and wildlife at the site. Other interpretive signs are located in the Ringstrom Bay Unit, Wingo Unit, and Sonoma Creek Unit parking lots (Taylor 2008b) and are planned for a future trail along eastern edge of Pond 7/7A.

3.10.2 Existing Recreational and Educational Activities

3.10.2.1 Hunting

Hunting is one of the main forms of recreation currently available within the NSMWA. Designated hunting areas are shown on **Figure 13**. Authorized species include waterfowl, coots and moorhens, quail, snipe, rabbits, pheasants, and doves (CDFG 2007b). September 1 is the traditional beginning of the hunting season and is the opening day of dove season. Waterfowl season usually opens in mid-October and runs until the end of January or early February. Hunt days are Saturdays, Sundays, and Wednesdays during open seasons for authorized species, except that doves and rabbits may be hunted daily during the dove season (Wyckoff 2000). There are no day use charges to the licensed hunter or visitor (CDFG 2007b). An estimate of 600 hunters annually uses the area from September through January for dove, pheasant, rabbit, and waterfowl hunting.

A Waterfowl Hunter Scans a Seasonal Pond for a Place to Set Decoys

Pond 2 was leased to Can Duck Club for waterfowl hunting and fishing until the lease expired in July 2007. Several duck club facilities, including a small clubhouse on the northwestern corner of Pond 2, a caretaker's house in the northwestern portion of Pond 1, and several hunting blinds remain on the property (Jones & Stokes 2004a, 2004b). There are approximately 16 duck blinds scattered on Pond 2. Approximately eight blinds are permanent and made of concrete. The rest of the blinds are wooden and need to be replaced approximately every 5 years. The blinds are located a couple of hundred yards from the edge of the pond. Currently, the hunting blinds are not maintained by DFG and may be torn down in the future if issues associated with improper use of the hunting blinds arise (Huffman 2007b). There is also a privately owned duck club on the northeastern portion of the island on which Pond 6A is located. The property contains a simple structure for club member recreational use.

Ken Border of DFG holds a striped bass caught in Pond 1 of the Napa River Unit (Photo by: Tom Huffman, DFG)

3.10.2.2 Fishing

Fishing is a popular activity throughout the sloughs, Sonoma Creek, Napa River, and ponds within the NSMWA (Wyckoff 2000). Most of NSMWA falls within the Ocean and San Francisco Bay District and is regulated by the Sport Fishing Regulations.

Although the NSMWA has no improved facilities on-site, facilities for public fishing are found at Hudeman Slough Launch Ramp, and Cutting's Wharf fishing access in Napa (Jones & Stokes 2004a). Facilities include parking, launching ramps, docks, and restrooms at some locations. Where bank or levee access is available, fishing takes place along the rivers, creeks, sloughs, and southern Ponds 1 and 1A.

3.10.2.3 Wildlife Viewing

The NSMWA is recognized as one of the better places in the North Bay to observe wildlife because of the variety of habitats and species present. Bird watching and hiking are allowed throughout the site. Many species of birds and mammals may be observed in the NSMWA. Visitor may see a multitude of birds of prey, shorebirds, waterfowl and other migratory birds with over 160 known species have been identified within the area. Mammals that can be seen in NSMWA include river otters, beavers, raccoons, coyotes, deer, squirrels, and rabbits.

Wildlife viewing blind

A wildlife viewing blind was constructed in the Huichica Creek Unit with funding from Acacia Winery. The blind is a cozy, roofed hut overlooking a fresh-water pond that shorebirds, ducks, and geese increasingly use.

3.10.2.4 Environmental Education and Interpretative Programs

The NSMWA Field Headquarters has some facilities for work groups, but there is no regular use (Taylor 2008a). DFG has developed an outdoor amphitheater area with a fire pit and barbecue that can be used for school groups, educational events, etc. Additionally, the DFG has set up a native plant nursery on-site.

A school group led by Americorps plant oaks along Huichica Creek (photo by: Tom Huffman, DFG)

For the past several years, Acorn Soupe, a local school, has been doing restoration projects in the Huichica Creek Unit (Taylor 2008a). They obtain access permission from the DFG every year.

3.10.2.5 Research and Scientific Studies

Several studies have been conducted in the NSMWA. Currently, there is no centralized library or database for tracking this information. A brief description of the major research studies is provided below.

The Integrated Regional Wetland Monitoring (IRWM) Pilot Project is a CALFED-funded interdisciplinary research effort to examine wetland restoration outcomes in the North Bay and Delta and to aid in developing effective and informative monitoring strategies through a comprehensive and real-time approach. Field sites for this project include Coon Island, Pond 2A, and Pond 3 of the NSMWA.

An interdisciplinary research study was conducted by USGS scientists and scientists from the Point Reyes Bird Observatory (PRBO), UC Davis, and Humboldt State University to provide science support for the Napa-Sonoma Marsh Restoration Project (Takekawa et al. 2000; Takekawa et al. 2005).

Warner (2000) conducted a research study in the Napa-Sonoma Marsh complex to determine the physical processes that control the circulation patterns of water and suspend sediment in the tidal slough network.

Coon Island Unit was used by the U.S. Army Corps of Engineers and the DFG for preliminary data gathering to identify marsh vegetation by remote sensing (CDFG 1975).

3.10.3 Proposed Recreational and Public Access Facilities

The Napa Plant Site Restoration (NPSR) Project at the Green Island Unit would utilize upland areas for site access, public access facilities (**Appendix E**), and DFG personnel housing (URS 2006a). The site access road has been realigned and raised. Gates on the site access road would be used to restrict public vehicle access to daylight hours. A DFG employee would reside in the existing residential housing on Green Island. The DFG warden and Napa County sheriffs would patrol the site on a regular basis. Public access and recreation facilities, including a primary staging area for parking, picnicking, restrooms, and boat launching centered on the barge channel, would be constructed at the Napa Plant Site (**Appendix E**). Hand launching of non-motorized watercraft (e.g., canoes, kayaks) would be possible at the existing boat ramp to the barge channel. Connections to bicycle access trails on Green Island Road and future connections to other outlying areas would be facilitated. A perimeter trail would be developed to support both pedestrians and cycling. The trail has the potential to connect with a regional trail network. The NPSR project team is working with the City of American Canyon to coordinate trail connection opportunities near the end of Eucalyptus Road (**Appendix A**). Smaller nature trails with interpretive signage would also be developed. In the long term, DFG is considering creating an environmental interpretive center on the property. The site access road and upland staging area presents a unique opportunity for locating an interpretive center adjacent to the Napa River and its wetlands.

4. CONFLICTS BETWEEN RESOURCES AND PUBLIC USE

DFG manages the NSMWA to protect and enhance aquatic and terrestrial habitats for plant, wildlife, and fish species and to provide the public with compatible recreational and educational uses. Although the mission of the DFG and the function of the NSMWA are focused on natural resource management, potential conflicts between resource protection and public uses as well as conflicts among the different uses can be a challenge for the DFG in managing NSMWA. This chapter examines the current management issues in the NSMWA.

4.1 PUBLIC USE REGULATIONS OF THE NSMWA

The regulations guiding public use of all DFG Wildlife Areas are outlined in Title 14 California Code of Regulations (CCR) Section 550. Additional regulations specific to the NSMWA are outlined in Title 14 Fish and Game Code Section 551. The following Section 551 regulations pertain specifically to the NSMWA:

- Method of Take Restrictions: No rifles or pistols may be used or possessed (CCR 551 [51a]).
- Hunt Days: Saturdays, Sundays, and Wednesdays during open seasons for authorized species, except that doves and rabbits may be hunted daily during the September dove season (CCR 551 [51b]).
- Authorized Species: Waterfowl, coots, moorhens, snipe, rabbits, quail, pheasants, and doves (CCR 551 [51c]).
- Camping and trailers: not allowed (CCR 551 [51d]).
- Special Restrictions (CCR 551 [51e]):
  - White Slough Unit: Closed to all hunting and firearms and archery equipment use.
  - American Canyon Unit: Closed to all hunting and firearms and archery equipment use south of the PG&E power lines.
  - Green Island Unit and Southern Crossing Unit: Closed to the public until restoration activities are near completion.
  - Tolay Creek Unit: Only steel or other nontoxic shot approved by the U.S. Fish and Wildlife Service may be used or possessed south of SR 37.
  - All units: Dogs are not allowed from March 2 through June 30 and must be on a leash at all other times except as follows: holders of a valid hunting license may use dogs during hunting seasons.
  - Campfires are prohibited.
- Hunting regulations for waterfowl, upland game, and state and federal areas that apply to the NSMWA can be obtained from:

California Fish and Game Commission
1416 Ninth Street
Sacramento, California 95814
http://www.fgc.ca.gov/html/regs.html

4.2 DUMPING/ILLEGAL CAMPING/VANDALISM

Dumping and littering is a problem throughout the NSMWA. Vandalism to property of NSMWA such as graffiti, firearm damage, and fence cutting also occurs. Areas where dumping is a particular problem include along Skaggs Island Road adjacent to the Sonoma Creek Unit, the American Canyon Unit, and at the end of Green Island Road adjacent to the Green Island Unit.

4.3 MOSQUITO ABATEMENT

Compared with the historical levels of mosquito-borne diseases in humans, levels of mosquito-borne diseases in California are low (URS 2006a). These diseases, including encephalitis, West Nile virus, and malaria, are still present or could be readily reintroduced (URS 2006a). All species of mosquitoes require standing water to complete their growth cycle. Any body of standing water represents a potential mosquito-breeding site. Areas that pond surface water but are flushed by daily tides are not stagnant for periods sufficient for mosquito larvae to mature; therefore, such areas are not mosquito production sources and are not of concern to mosquito abatement districts.

Mosquitoes are adapted to breed during periods of temporary flooding and can complete their life cycles before water evaporates and predator populations become well established (URS 2006a). Poor drainage conditions that result in ponding water and water management practices associated with the creation of seasonal wetlands for waterfowl use result in the types of flooding that can produce problem numbers of mosquitoes (URS 2006a).

Seasonal wetlands, stagnant pools and ponds exist in the NSMWA and are potential mosquito habitats. DFG has been working with the local Mosquito Abatement Districts to monitor potential mosquito breeding sites and applying treatments as needed.

Mosquitoes were found in the following units of the NSMWA during an inspection conducted by the Napa County Mosquito Abatement District (NCMAD) in 2000: Huichica Creek, Napa River, and American Canyon (NCMAD 2000). Pursuant to Health and Safety Code Sec. 2283.5, a service agreement was signed between the DFG and the NCMAD for mosquito inspection and control services. Although there are no written agreements between DFG and the Sonoma, Solano and Marin County mosquito abatement districts (MADs), DFG is currently working with these MADs to monitor and solve mosquito issues in the Management Units within these two counties (Taylor 2008b). Formal partnerships with these MADs are anticipated to occur in the future.

4.4 HUNTING PROXIMITY TO RESIDENTIAL AREAS

Hunting noise and safety are concerns for residential areas neighboring NSMWA. The presence of existing residences, structures, and railways is one of the main factors in determining whether hunting is appropriate for a given site. Future regulations in the NSMWA may include closing the American Canyon Unit to hunting because of the close proximity of the adjacent residential area to the Unit (Huffman 2007a).

4.5 AIRPORT SAFETY (BIRD STRIKE HAZARDS)

The Napa County Airport is located immediately east of Napa Plant Site (URS 2006a). Bird strike hazards to aircraft using the Napa County Airport were raised as a concern in comment letters responding to the Draft Environmental Impact Report (DEIR) for the Napa Plant Site Restoration Project. Multiple issues were presented in comment letters regarding the relationship between bird use of the Napa Plant Site ponds and bird strike hazards to aircraft using the Napa County Airport (URS 2006c).

FAA Advisory Circular 150/5200-33A provides guidance on certain land uses that have the potential to attract wildlife on or near public use airports. FAA's Advisory Circular number 150/5200-33 recommends locating *airport development projects* 10,000 feet away from wildlife attractants that create hazardous conditions for airports serving turbine-powered aircraft. The FAA recommends the 10,000-foot buffer because wildlife can pose a safety threat to aircraft, particularly during take-off and landing. All the wetland and aquatic area in the Green Island Unit are within a 10,000-foot radius of the end of Runway 6/24 and have been there since the airfield was established.

To address bird strike issues, DFG coordinated with FAA, Caltrans Division of Aeronautics and Napa County Airport to incorporated measures into the design of the Napa Plant Site Restoration project that will reduce the potential for attracting birds with high Relative Hazard Scores (RHSs). DFG will consider bird strike hazards avoidance measures when implementing future restoration within the 10,000-foot buffer of the Napa County Airport.

4.6 URBAN ENCROACHMENT

Threats of residential and industrial encroachment are greatest along the east side of the Napa River between Napa and Vallejo, on the west bank of the Napa River between Cutting's Wharf and Edgerley Island, and in the vicinity of Schellville. These developments may encroach on the buffer zones needed to fully protect the resources of NSMWA. In addition, as urban development increased in adjacent areas, issues may arise between public uses of NSMWA and its neighbors.

4.7 NON-COMPATIBLE USES OF THE WILDLIFE AREA

Several recreational uses are considered incompatible with wildlife and/or management of the NSMWA. These uses include, but are not limited to, landing of hot-air balloons, windsurfing, and horseback riding. DFG would review any activities proposed for the NSMWA to determine if they are compatible with wildlife and management goals in the NSMWA.

5. MANAGEMENT GOALS AND KEY TASKS

The goals presented in this chapter provide broad guidance for long-term natural resource and public-use management of NSMWA. Tasks to implement each goal are also described. Implementation of the management goals and tasks outlined in this section is dependent on the availability of DFG staff and resources. **Chapter 6** identifies the additional resources needed to implement the LMP.

5.1 DEFINITION OF TERMS

This LMP has been developed in accordance with the DFG's *Guide and Annotated Outline for Writing Land Management Plans*, February 2003 (updated 2006) (CDFG 2006a). The guide organizes management information and guidelines into elements, goals, and tasks, establishing a hierarchy of management direction for the NSMWA. Elements relate to the broad categories of consideration, goals define objectives within the elements, and tasks establish specific actions to attain the goals. Goals are based on the Fish and Game Code and policies of the California Fish and Game Commission. In addition, it is the policy of the California Fish and Game Commission to protect and preserve all native species diversity including those species experiencing a significant decline that, if not halted, would lead to their designation as threatened or endangered. Together these elements, goals, and tasks express the policy direction that will guide the management of the NSMWA. Terminology for describing management is part of DFG's standardized format for management plans. The terms defined below are used throughout this LMP to describe the current and planned management of the NSMWA.

ELEMENT: Any biological unit, public-use activity, facility maintenance program, or management coordination program (as defined below) for which goals have been prepared and presented within this LMP.

- **Biological:** Consists of species, habitats, or communities for which specific management goals have been developed within this LMP.
- **Public Use:** Refers to recreational and other public uses. (This element refers to any recreational, scientific, or other use activity appropriate to and compatible with the purposes for which this property was acquired.)
- **Agricultural Resources:** Refers to agricultural activities.
- **Cultural Resources:** Refers to preservation of cultural resources.
- **Facility:** Refers to the program of maintenance and administrative tasks that supports the attainment of goals for the biological and public-use elements.
- **Administration:** Refers to the maintenance and documentation of management actions and activities that supports the attainment of goals for the biological and public-use elements.

- **Scientific Research and Monitoring:** Refers to scientific research and monitoring that supports the attainment of goals for the biological and public-use elements.
- **Management Coordination:** Coordination with management programs that are supportive of and compatible with the activities of other public agencies.

GOALS

- **Biological:** Statement describing management aims and intended long-term results for a biological element.
- **Public Use:** Statement describing management aims and the resulting type and level of public use (which is intended to be compatible with the goals for biological elements).
- **Agricultural Resources:** Statement describing management aims and the resulting type and level of agricultural activities for the agricultural element.
- **Cultural Resource:** Statement describing management aims and its intended results for a cultural resources element.
- **Facility Maintenance**: Statement describing management and the resulting type and level of facility maintenance (which is intended to support attainment of the goals for the biological and public-use elements).
- **Administrative:** Statement describing management aims and its intended results for the administrative element.
- **Scientific Research and Monitoring**: Statement describing management of procedures for or types of scientific research and monitoring conducted at NSMWA.
- **Management Coordination:** Statement describing the desired type and level of management coordination activities that are required to achieve the biological element and public use goals previously specified within this LMP.

TASKS: Individual projects or work elements that implement the goals and are useful in planning operation and maintenance budgets

5.2 GOALS AND TASKS FOR ELEMENTS

5.2.1 Biological Element

The biological sub-elements of the LMP include management for special-status species, non-native invasive species, habitats (wetland, upland, riparian and aquatic).

5.2.1.1 Special-status Species

The special-status species sub-element of the LMP discusses management goals for special-status plants, wildlife, fish and aquatic species. The NSMWA is home to several known occurrences of

sensitive species, including the California clapper rail, the salt marsh harvest mouse, northern harrier, Delta tule pea, and Mason's lilaeopsis. The NSMWA likely supports several additional occurrences that have not previously been recorded.

BIO GOAL 1: ***Maintain, enhance, and increase habitat for endangered, threatened, rare, and sensitive plant, fish, and wildlife species.***

Tasks:

1. Conduct baseline surveys of special-status species with potential to occur in the NSMWA. This task will include conducting surveys for new, previously unrecorded occurrences of special-status species, as well as revisiting known populations of special-status species in the NSMWA to confirm their presence or absence. Where appropriate, DFG should coordinate survey efforts with the USFWS. All occurrences should be reported to the California Natural Diversity Database (CNDDB).
2. Develop a comprehensive monitoring program for known special-status species populations to detect change in distribution and abundance, and to detect effects of management activities, public uses, and non-native species. The monitoring program will make recommendations for protection measures for those special-status species that are threatened by such conditions as non-native species, contaminants or public use.
3. Develop guidelines for protecting special-status bat species habitat in the NSMWA. This includes preservation of existing human made structures to the extent that is feasible. Human made structures, such as pump houses and barns, are often used by bats for roosting. In addition, artificial water sources constructed in the NSMWA should follow the guidelines outlined in Water for Wildlife guidelines (Taylor and Tuttle 2007).
4. Research reintroduction potential for special-status species in suitable habitats in NSMWA.

5.2.1.2 Non-native Invasive Species

The non-native species sub-element includes management goals and tasks for non-native plants and wildlife that occur or could be become established in the NSMWA in the future. While complete eradication of non-native species from the NSMWA would be ideal, it is unlikely that the resources to complete such a task will be available to the DFG. However, identification, monitoring, and control of non-native species are potentially fundable tasks to limit the negative effects from unchecked spread of non-natives in the NSMWA.

BIO GOAL 2: ***Minimize the introduction and spread of non-native invasive species that potentially have negative impacts on native plant or wildlife species.***

Tasks:

1. Inventory habitats for invasive plant infestations and map the infestations (e.g., perennial pepperweed, nonnative cordgrass [*Spartina alterniflora*, *S. densiflora*, and *S. patens*], tall reed, yellow star thistle).
2. Coordinate with existing non-native species monitoring and eradication programs, in particular the:
   a. Invasive Spartina Project for the monitoring and management of non-native invasive cordgrass species.
   b. USFWS for perennial pepperweed control.
3. Prioritize infestations to target for control treatment. Prioritization will be based on such factors as size of infestation, location, condition of habitat, and adjacent land use.
4. Control invasive species through integrated pest management (rotational grazing, prescribed burning, pesticide application, mechanical removal). To integrate pest management, DFG would develop a plan, which in part, would result in protocols for implementing prescribed burns and pesticide application. At minimum, DFG would involve the applicable staff at the Bay Area Air Quality Management District and the applicable fire agencies, (e.g., California Department of Forestry and Fire Prevention) to assist in the development of a protocol for prescribed burns. DFG would follow all rules required under the Open Burning Regulations of the BAQMD. DFG would also include a protocol for pesticide application. This protocol would describe the types and application forms of different pesticides that could be used under the specific environmental conditions present at the NSMWA. This protocol could be developed with the assistance of the applicable county mosquito abatement agency, as well as the DFG Pesticide Investigation Unit and DFG mosquito abatement Best Management Practices (BMPs).

5.2.1.3 Wetland Habitat

The wetland habitat sub-element includes management goals and tasks for wetland habitats in the NSMWA. Wetlands are the dominant habitat type in the NSMWA; they include seasonal wetlands, tidal marsh, perennial wetlands, and mudflats (see **Section 3.8.1.3** for a description of these habitat types).

BIO GOAL 3 (Seasonal and Perennial Wetlands and Tidal Marsh Habitat): ***Maintain and enhance habitat for resident and migratory birds, and mammal, amphibian, and reptile species.***

Tasks:

1. Identify restoration opportunities in the NSMWA. Evaluate the constraints and benefits for each potential project, and prioritize the project list. Example projects are:
   a. Restore tidal circulation to the Green Island Unit when Cargill has completed harvest operations at its former Napa Plant Site, in a manner that is consistent with regulatory requirements.
   b. Develop habitat restoration objectives for the Southern Crossing Unit.
   c. Evaluate the reestablishment of the historical connection of Tolay Creek and associated tidal wetlands to Sonoma Creek.
2. Pursue funding opportunities for identified restoration opportunities in the NSMWA.
3. Provide a diversity of habitats for wildlife species in the NSMWA. A wide variety of wildlife species occur in the NSMWA, including many species of waterfowl, raptors, passerines, shorebirds, and mammals. Maintaining a diversity of wetland habitats, including seasonal and perennial wetlands and tidal wetlands will support the continued occurrence of all of these species, as well as attract new species in the future.
4. When considering restoration sites and designs, maximize synergy with adjacent wetland projects (e.g., City of American Canyon tidal and treatment wetlands, Cullinan Ranch and Napa County Flood Control District lands).
5. Use locally collected native plants in the design of restoration projects. Many seed and propagule sources for native plants are present in the NSMWA.
6. Develop and implement projects that would be consistent and compatible with the applicable Napa County Airport Safety Compatibility Zones and FAA advisory guidelines related to bird-strike hazards.

BIO GOAL 4 (Managed Former Salt Pond Habitat): ***Improve the ability to manage water levels and salinity levels in managed ponds to maximize feeding and resting habitat for migratory bird and resident waterfowl.***

Tasks:

1. Repair or replace water control structures to ensure effective control of water levels and salinity level.
2. Monitor water quality of the managed ponds to insure salinity reduction process is adequate.

Image of the interior of pond 2A in fall 1998. When water and sediment circulated with the tide cycles through the pond for the first time in over 40 years, there was rapid reestablishment of vegetation and a diversification of wildlife use.

BIO GOAL 5 (Managed Former Salt Pond): ***Minimize contaminant risks from salt pond restoration.***

Tasks:

1. Minimize mobilization of potential contaminants, such as methylmercury, in sediments to the extent possible.
2. For the Napa Plant Site, restore tidal circulation when Cargill has completed harvest operations and consistent with the BCDC permit, RWQCB waste discharge requirements, and the USACE permit.

5.2.1.4 Upland and Riparian Habitat

The upland and riparian habitat sub-element addresses management goals and tasks for upland and riparian habitats in the NSMWA. Uplands include grasslands, non-native trees, and levees. The upland areas of the NSMWA are relatively small and limited in extent. These uplands, as well as non-native tree stands and levees, provide an important refugium for wildlife species. Eucalyptus trees provide roosting sites for several unique bird species, such as the double-crested cormorant and herons. Riparian corridors, such as those along American Canyon and Huichica Creek, provide freshwater in the mostly brackish water NSMWA. The vegetation of the riparian corridors provides nesting and foraging opportunities for a variety of wildlife species.

BIO GOAL 6 (Upland Grassland Habitat): ***Restore and enhance grassland and upland communities to conditions that provide desired ecological conditions and support diversity and abundance of plant and wildlife species.***

Tasks:

1. Identify feasible grassland and upland restoration projects. Potential restoration projects should provide a diversity of upland habitats through plantings of native grasses, forbs, shrubs, and tree species, and provide habitat features, such as ponds and trees used by wildlife, where appropriate.
2. Prioritize potential grassland and upland restoration projects.
3. Pursue funding and develop plans for identified grassland and upland projects. Proposals for obtaining funds should include goals, techniques, costs, monitoring, and adaptive management. Pursue funding through partnerships when appropriate.

BIO GOAL 7 (Riparian Habitat): ***Maintain and enhance riparian habitat to conditions that provide desired ecosystem benefits, including improved wildlife habitat and increased bank stability.***

Tasks:

1. Evaluate opportunities, constraints, and potential restoration benefits for riparian restoration in the NSMWA. Restoration designs in riparian areas should provide for structural diversity, increased bank stability and a diversity of plant species. Riparian restoration should include goals for common and sensitive-species, such as the freshwater shrimp, western pond turtle, neotropical birds and steelhead trout, where applicable. Restoration planning should also evaluate the direct and indirect influences of neighboring properties on riparian areas in the NSMWA.
2. Prioritize potential riparian restoration sites in the NSMWA. Based on information collected under Task 1, riparian restoration projects should be prioritized based on the significance of the site and potential loss or degradation of habitat.
3. Pursue funding and develop plans for identified riparian restoration projects. Proposals for obtaining funds should include goals, techniques, costs, monitoring and adaptive management. Pursue funding through partnerships, where appropriate.
4. Maintain previously restored riparian areas at Huichica, American Canyon and Tolay Creeks.

5.2.1.5 Aquatic Ecosystems

The aquatic ecosystems sub-element discusses management goals and tasks related to the aquatic resources in the NSMWA. The aquatic ecosystems of the NSMWA include both native and non-native fish and aquatic invertebrate species.

BIO GOAL 8 (Aquatic Ecosystem): ***Maintain and enhance aquatic ecosystems for diversity and abundance of native and game fish and aquatic invertebrate species.***

Tasks

1. Increase understanding of fisheries and aquatic invertebrates use of the NSMWA through expanded monitoring. When establishing a monitoring design, include methodology that will measure effects of restoration on these species. Add monitoring locations at Ringstrom Bay, Sonoma Creek, Sonoma Creek Unit, White Slough, American Canyon, Little Island Farm, and Huichica Creek Unit.
2. Provide a greater diversity of aquatic habitats and improve existing habitat structure in tidal marshes of the NSMWA.

5.2.2 Public Use Element

The public use element of the LMP addresses both authorized and unauthorized public use of the NSMWA.

5.2.2.1 Authorized Public Use

Authorized public uses in the NSMWA include hunting, angling, wildlife viewing, hiking, walking, boating, kayaking, nature study, and environmental education. The management goals and tasks related to these authorized public uses are described below.

PU GOAL 1: ***Increase existing and provide new opportunities for low impact, wildlife-oriented uses that are compatible with wildlife and habitat goals.***

Tasks for maintaining and improving hunting access:

1. Expand hunting opportunities as habitat and access are improved on restored sites and former duck club sites.
2. Post hunting regulations at appropriate locations.

Tasks for maintaining and improving fishing access:

1. Develop maps and signs that indicate fishing access points.
2. Post fishing regulations at appropriate locations.
3. Create angling access points (e.g., potential for barge docks at Green Island Unit to provide angling access).

Tasks for maintaining and improving wildlife viewing:

1. Improve access roads and levees.
2. Provide access for wildlife viewing at restored sites.

3. Post additional interpretive wildlife signage at strategic locations.
4. Provide opportunities for hand launched water craft (e.g., kayaks, canoes) in appropriate locations.

Tasks applicable to all public uses:

1. Coordinate with Bay Trail, Napa, Solano, and Sonoma Counties and City of American Canyon to evaluate the feasibility to complete an alignment of the Bay Trail surrounding the northern and eastern boundaries of the Napa River and Huichica Creek Units.
2. Create a brochure and updated map for the NSMWA. The map should be made in coordination with the USFWS. The maps should include public access points, parking lots, and allowable uses. Brochures should include information on public use, native plant and wildlife, mission of the DFG and information on volunteering. Brochures and maps should be made available at key access points in the NSMWA, at Regional Headquarters and on the DFG website.
3. Design public access to minimize maintenance and patrolling.

PU GOAL 2*: Support and expand public use of the NSMWA for environmental education and interpretation.*

Tasks:

1. Develop interpretive signage and kiosks.
2. Develop informative DFG website for NSMWA.

3. Coordinate with local schools for classroom field trips and other educational activities.
4. Develop self-guided tours of the NSMWA.
5. Identify area(s) for possible future interpretive/educational facilities.

PU GOAL 3: ***Encourage community partnerships.***

Tasks:

1. Coordinate with local non-profit groups that promote wildlife-dependent education and interpretation (e.g., Save the Bay, Bay Institute).
2. Identify opportunities to partner with groups to implement habitat enhancement projects (e.g., waterfowl hunters, Acacia Winery).
3. Identify opportunities to promote Earth Day activities at NSMWA Management Units.

PU GOAL 4: ***Minimize competition and conflicts among users and facilitate compatibility between public uses.***

Tasks:

1. Maintain and improve access roads, signs, restrooms, and other recreational facilities.
2. Inform the public of NSMWA use designations and use restriction through outreach, signage, and DFG's web site.

PU GOAL 5: Evaluate requests by Native Americans for use of the NSMWA for traditional activities, such as gathering native plant materials for cultural purposes.

Tasks:

1. Work with native peoples requests for access the NSMWA. Determine the purpose and need for access and/or collections within the NSMWA, based on applicable laws and treaties related to tribal use of state properties.

2. Develop access plans and issue permits for native peoples that are compatible with the goals of the LMP. Any authorization for access would identify species, limits, locations, seasons, and include standard liability clauses.

5.2.2.2 Unauthorized Public Use

Unauthorized public uses the NSMWA includes dumping of trash, vandalism, some sporting activities and various illegal activities. The management goals and tasks related to these unauthorized public uses are described below.

UPU GOAL 1: ***Prevent unauthorized use of the NSMWA.***

Tasks:

1. Maintain adequate signage identifying boundaries of NSMWA, particularly at American Canyon, White Slough, and the Sonoma Creek Unit where dumping and vandalism is more common.
2. Increase patrols of the NSMWA and enforce regulations that prohibit unauthorized uses.
3. Prohibit activities that are inconsistent with the NSMWA mission, including ballooning (landing), windsurfing and equestrian use.
4. Remove existing trash and other unwanted materials.
5. Provide additional trash receptacles at strategic locations.
6. Establish a regular monitoring and removal program of trash.
7. Meet with local law enforcement agencies, including County sheriff, California highway patrol, to coordinate law enforcement activities and explore options for cooperative programs.

5.2.3 Agricultural Resources Element

There are currently no agricultural operations in the NSMWA. There are limited opportunities in the NSMWA for using agriculture to enhance wildlife habitat. This element discusses management goals and tasks for using agriculture to enhance wildlife habitat in the NSMWA.

AG GOAL 1: ***Use agricultural techniques to maintain and enhance habitat for native and game wildlife and fish.***

Tasks:

1. Enhance grasslands and uplands through grazing, native grass plantings and other management techniques within upland areas of Huichica Creek, Ringstrom Bay, Wingo, Southern Crossing, and American Canyon Units. Enhancement will increase the heterogeneity of the uplands in order to provide more and/or improved foraging and breeding habitat for wildlife and fish species.

5.2.4 Cultural Resources Element

Cultural resources at the NSMWA are limited. The LMP proposes no specific actions that would cause impacts to cultural resources. However, since future phases of this LMP may result in undertakings that have the potential to impact cultural resources, a more project-specific impact analysis may be required to determine whether future actions will have significant impacts to cultural resources. Potential ground-disturbing activities include levee maintenance and the

restoration and enhancement of marshland that was historically wetlands. **Section 3.9** contains additional information regarding cultural resources of the NSMWA.

CR GOAL 1: ***Catalog and preserve all significant prehistoric, historic-era, or present-day Native American cultural resources that are documented, and/or discovered, through field investigations within the NSMWA.***

Tasks:

1. Maintain library of printed cultural resource reports from the project area and a ¼-mile vicinity.
2. Conduct cultural resource surveys as necessary before significant ground-disturbing activities (e.g., excavations below normal plow depths) at undisturbed sites.
3. Formally record and evaluate historic structures within the project area, such as the Napa-Sonoma Marshes field office complex at 2148 Duhig Road.
4. Complete and submit site records to the State Historic Preservation Officer (SHPO) to establish and submit culturally significant resources that may be eligible for inclusion in the National Register of Historic Places (NRHP) or the California Register of Historical Resources (CRHR).
5. When facility improvements or restoration efforts are proposed and may affect historical or archaeological resources, consult CEQA guidelines for guidance on compliance with regulations.
6. Consult with the Native American Heritage Commission (NAHC) as appropriate.
7. Consult with the local tribe(s) as appropriate.

CR GOAL 2: ***Where appropriate, provide opportunities for on-site public interpretation of significant cultural resources.***

Task:

1. Display NSMWA cultural resources information in interpretive signage at key locations.
2. Coordinate with local tribe(s) for accurate information and input for interpretive signage.

5.2.5 Facilities Maintenance Element

Facilities at NSMWA include the public access roads, hunting blinds/fishing sheds, water conveyance structures, levees, parking lots, restrooms, and other building structures.

FM GOAL 1: ***Maintain or improve existing levels of flood protection.***

Tasks:

1. Identify, evaluate and set priorities for repair and replacement of water control structures and levees.
2. Repair or replace water control structures and levees in order of priority.
3. Coordinate with adjacent landowners and county flood control districts regarding water management.

FM GOAL 2: ***Effectively manage existing facilities and equipment for resource protection, operations, and safe public uses.***

Tasks:

1. Maintain gates, fences and water management infrastructure.
2. Maintain signage that informs the public of the boundaries, laws, and regulations of the NSMWA.
3. Start a monitoring and maintenance schedule for all signage. Replace signage as needed.
4. Regularly monitor the condition and use of existing facilities.
5. Conduct preventative maintenance of facilities and structures.
6. Maintain existing dirt and paved roads in the NSMWA.
7. Obtain funding and upgrade buildings at the field headquarters on Duhig Road.

FM GOAL 3: ***Minimize potential contamination risks from ground disturbing activities.***

Tasks:

1. Prior to implementation of any specific project involving ground disturbance, DFG would assess of potential hazardous materials to be encountered, such as through the preparation of an Initial Site Assessment. During any excavation activities, inspections of exposed soils would occur for visual evidence of contamination. If possible, potentially contaminated areas, identified in the assessment of potential hazardous materials, would be avoided. If visual indicators of contamination are observed during excavation or grading activities, all work would stop and an investigation would be designed and performed to verify the presence and extent of contamination at the site. Results would be reviewed and evaluated by the appropriate county's environmental health agency or the Department of Toxic Substance Control prior to continuing excavation activities. The investigation would include collecting samples for laboratory analysis and quantification of contaminant levels within the proposed excavation and surface disturbance areas. The results of subsurface

investigations would be used to determine appropriate worker protection and hazardous material handling and disposal or disposition appropriate for the subject site. Areas with contaminated soil and groundwater determined to be hazardous waste would be removed by personnel who have been trained through the OSHA-recommended 40-hour safety program (29 Code of Federal Regulations [CFR] 1910.120) with an approved plan for groundwater extractions, soil excavation, control of contaminant releases to the air, and off-site transport or on-site treatment. A health and safety plan, prepared by a qualified and approved industrial hygienist, would be used to protect the general public and all workers in the construction area.

5.2.6 Administrative Element

Administration of the NSMWA includes staff management, data management, purchase of equipment and supplies, operational budget management, obtaining grants and habitat management activities.

ADMIN GOAL 1: ***Maintain current data on the management and resources at NSMWA.***

Tasks:

1. Maintain financial records regarding expenditures, staff, maintenance, and other administrative duties.
2. Consolidate geographic data and develop a geographic information system (GIS).
3. Develop and maintain a database of monitoring data, management activities, permits and MOUs (e.g., weed management actions implemented and outcomes and regulatory permits or MOUs received [old or active] from other resource agencies [e.g., BCDC, RWQCB, ACOE]).

5.2.7 Scientific Research and Monitoring Element

Scientific research and monitoring in the NSMWA is currently conducted both by the DFG and outside entities. Research and monitoring can directly contribute into adaptive management of the NSMWA by providing relevant, timely information on the ecology of species and habitats of the Wildlife Area. The scientific research and monitoring element of the LMP addresses past, current and future research and monitoring in the NSMWA.

SRM GOAL 1: ***Improve understanding of ecosystem processes and trends, and evaluate the implementation, effectiveness and validity of management actions in the NSMWA through an effective monitoring program. Use the information obtained to adjust management strategies as appropriate.***

Tasks:

1. Conduct baseline and follow-up biological monitoring for planned restoration projects in the NSMWA. This may include monitoring fish (see aquatic ecosystem goals), aquatic invertebrates, avian, plant and water quality response to management actions.
2. Define monitoring to support evaluation of project goals and objectives and inform adaptive management.
3. Adopt monitoring design that will include data collection that is self-sustaining when possible (e.g., equipment with automatic data recording) and minimize operations and maintenance as much as possible.
4. Integrate site-specific monitoring efforts with regional monitoring programs using CDF approved/accepted protocols (e.g., California Rapid Assessment Method [CRAM], IRWM).
5. Require researcher to provide electronic version of study results and link to Management Units' GIS.
6. Conduct plant, wildlife, aquatic, invertebrate, and fisheries inventories of the NSMWA.

SRM GOAL 2: ***Encourage and support scientific research that fosters the scientific understanding needed to protect and enhance resources of the NSMWA, and contributes to adaptive management strategies.***

Tasks:

1. Utilize DFG's January 2008 Science Policy in the planning, approval and management of scientific research conducted in the NSMWA by DFG staff and outside entities (includes recommendation for scientific oversight, scientific staff development and classification and data management).
2. Develop a prioritized list of research needs.
3. Coordinate with local education institutes or universities to conduct research studies that would provide needed data for guiding management decisions.
4. Require researchers to provide copies of data and/or published papers, and contact researchers to ensure that this requirement is fulfilled.
5. Create an electronic database of scientific research conducted in the NSMWA.

5.2.8 Management Coordination Element

The management coordination element addresses those aspects of management of the NSMWA that are done in coordination with various local, state and federal agencies.

MC GOAL 1: ***Coordinate with federal, state, and local agencies regarding plans and projects that may affect habitats and/or management at the NSMWA.***

Tasks:

1. Review, coordinate, and provide comments and recommendations on federal, state and local government plans and proposed projects as appropriate for the purpose of determining the consistency of such plans with the goals of this LMP.
2. Work with local mosquito control districts (Napa, Sonoma, and Solano counties) to monitor potential mosquito breeding sites and applying treatments as needed.
3. Apply for grants and matching funds with mosquito abatement district to implement BMPs.

6. OPERATIONS AND MAINTENANCE

Implementation of the tasks identified in **Chapter 5** is dependent upon the availability of additional staff and budget for the NSMWA, and the establishment of an adequate operations and maintenance budget. This chapter addresses staffing and other resources required to perform the operations and maintenance associated with this LMP.

6.1 OPERATIONS AND MAINTENANCE TASKS TO IMPLEMENT PLAN

Table 6-1, at the end of this chapter, summarizes goals and tasks identified in **Chapter 5** and the labor hours (annual) required to implement them. **Table 6-1** does not include hours for seasonal and temporary staff. Hours listed in the table are approximate and subject to change. The table is intended to be a guide for implementation of the LMP.

6.2 EXISTING STAFF AND ADDITIONAL PERSONNEL NEEDS

The NSMWA is currently staffed by three full-time employees dedicated to the NSMWA, with one supervisory staff that oversees the NSMWA and other wildlife areas.

6.2.1 Existing Staff

6.2.1.1 Senior Biologist Supervisor (Wildlife)

The Senior Biologist Supervisor is assigned to multiple wildlife areas. This position serves as the following:

- Representative for the NSMWA with elected officials, local events and media.
- Procurement of funding for future activities.
- Supervision of all NSMWA employees.
- Budget planning and management, grant proposal preparation, contract management.
- Writing articles for newsletter and local media; Presentation of public programs to a variety of audiences.
- Representative of NSMWA working with various governmental agencies and nongovernmental organizations.

6.2.1.2 Associate Wildlife Biologist

This individual serves as the co-manager of the NSMWA, performing technical tasks and assist in providing direction to maintenance staff. The associate wildlife biologist has the principal responsibility for implementation of this Plan.

- Cooperatively manage (with existing NSMWA staff) and coordinate wetland restoration activities and project development efforts on DFG north bay lands including the Napa-Sonoma Marshes, Petaluma Marsh, and San Pablo Bay Wildlife Area, ecological reserves, and future acquisitions within Napa, Sonoma, Solano, and Marin Counties. Responsible for project management for the restoration of former Cargill Salt ponds and plant site and other restoration projects. Represent DFG's interests and projects at meetings.
- Develop area management plans, MOUs with various agencies, and recommendations for changes to the NSMWA management and hunting regulations. Assist in obtaining outside funding and write grant applications. Develop capital outlay and other habitat development projects and RFP's, administer contracts, oversee purchases, and conduct other tasks associated with wildlife area and lands management.
- Write and obtain regulatory permits for restoration and other projects on north bay DFG lands. Develop and review a wide range of environmental documents.
- Develop resource assessment needs, monitoring and biological study plans and adaptive management plans. Assist in collection of biological and GPS data on fish and wildlife populations and habitats. Conduct monitoring and surveys to maintain compliance requirements for adaptive management plans, regulatory permits, and grant stipulations.
- Respond to routine public inquiries about wetlands and wildlife management. Participate in regional wildlife management phone duties and other public contacts. Give talks to and participate in public functions. Participate in, enhance existing, and develop new hunting and other wildlife-dependent opportunities on DFG lands.
- Perform program administrative duties, such as supervising seasonal employees, preparing timesheets and work plans, maintaining vehicles, budgeting, and purchasing of minor equipment.

6.2.1.3 Wildlife Habitat Supervisor 1

One full time Wildlife Habitat Supervisor (1) is assigned to the NSMWA. This position has the following responsibilities:

- Lead person for field staff.
- Oversee operation and maintenance of heavy equipment, facilities, boats, vehicles, structures, pumps, roads, levees and ponds in the NSMWA.
- Procurement of supplies and equipment.
- Planning of field activities.
- Assist in design of restoration projects.
- Coordinate with the Solano, Marin-Sonoma and Napa Mosquito Abatement Districts, PG&E, local utility districts, local and state fire departments, local flood control and

sanitation districts, resource conservation districts and numerous private adjacent landowners and ranchers.

- Contract administration.
- Monitor weeds.
- Assist in posting boundaries, hunting areas and hazards in the NSMWA.

Fish and Wildlife Technician

The Fish and Wildlife Technician is responsible for the following tasks:

- Boat, tractor, and heavy equipment operation and maintenance.
- Assist in maintaining water control structures and pump houses, assisting in posting, erecting fences and maintaining signage in the NSMWA.
- Assists in maintenance of residences and structures, and minor electrical, plumbing and carpentry work.
- Assists in filing and phone work at the direction of the Associate Wildlife Biologist and Wildlife Habitat Supervisor.

Seasonal Scientific Aid

The Seasonal Scientific Aid is responsible for the following tasks:

- Assist with the preparation and writing of: Desalinization plans, restoration plans and permits, updating of management plan.
- Collect and analyze water quality data from salt ponds, sloughs, and surrounding rivers, creeks, and wetlands. Use of electronic instruments and gauges in river/slough environments from boat and land access points.
- Collect biological data on wildlife, fish, and plant populations and habitats within the Marshes. May include:
  - Mapping (Global Positioning System [GPS]), direct observations, trapping, operating check stations, creel census, photo stations, aerial surveys, and other methods as deemed appropriate.
  - Typing memos, letters, reports, tables, and forms; know or able to learn Windows based programs.
- Assist in responding to public information requests received via telephone, written, and in person.
- Filing and organizing of office materials, copying, upkeep of databases and other routine paperwork.
- Maintenance of miscellaneous vehicle and field equipment.

- Assist with minor carpentry, electrical, plumbing, painting, fencing, and cement work projects; posting of wildlife area, litter removal, exotic plant removal, planting native vegetation, and operating water control structures.

6.2.2 Proposed Staff

In addition to the existing staff assigned to the NSMWA, several additional staff will be needed in order to optimally implement the LMP. Additional staff includes a Wildlife Biologist, Tractor Operator/Laborer, Fish and Wildlife Habitat Assistant and an additional Fish and Wildlife Technician. Depending of the funding resources available, additional scientific and seasonal aides may be included as additional staff to assist existing staff toward reaching the wildlife area and LMP goals.The LMP will be implemented to the greatest extent possible with the staff and resources available at any given time.

6.2.2.1 Wildlife Biologist

The Wildlife Biologist would report to the Associate Wildlife Biologist for the NSMWA, and would be primarily responsible for:

- Conducting sensitive plant and wildlife surveys
- Completing an inventory of all plant and wildlife species in the NSMWA
- Mapping invasive plants
- Assist in planning of habitat construction and maintenance activities
- Coordination of scientific research in the NSMWA and tracking of research conducted in the NSMWA by outside entities.

6.2.2.2 Tractor Operator/Laborer

The tractor/operator would be responsible for the following tasks:

- Operate large equipment for disking, mowing, road grading, levee maintenance, pipe installation, ditch excavation, planting crops and building levees.
- Operate commercial vehicles.
- Coordinate and perform routine repair and maintenance of equipment and commercial vehicles.
- Perform water management activities in the Napa-Sonoma Marshes Wildlife Area and Petaluma Marsh Wildlife Area.
- Operate and maintain small tools and equipment such as pumps, motors, hand tools, portable welders, etc.

- Assist other Wildlife Area staff in other duties for the NSMWA and other DFG lands as needed.

6.2.2.3 Fish and Wildlife Habitat Assistant

Under the direction of the Wildlife Area Manager, the Fish and Wildlife Habitat assistant would perform habitat and facilities maintenance and development activities in the NSMWA. The Fish and Wildlife Habitat Assistant would be responsible for the following tasks:

- Perform daily wildlife and habitat management, maintenance, vehicle and equipment operation (including tractors and heavy equipment), construction and public use activities on the NSMWA. This includes such activities as maintenance of ponds, levees, and roads; water management; water quality management; habitat improvement and restoration work; noxious weed species control; surveys; and vehicle and equipment maintenance.
- Coordinate flooding, draining and irrigating of habitats with the County Mosquito Abatement District.
- Direct a field crew of permanent and temporary staff in performing daily management activities.
- Develop annual work plans.
- Direct temporary staff in the hunter checks station operations. Collect public use data and report it in written form.
- Perform daily monitoring, repair and maintenance of water discharge pumps and fish screens.
- Perform tasks such as carpentry, plumbing and painting to maintain buildings, grounds and facilities in the NSMWA.
- Obtain and maintain herbicide applicator license.

6.3 OPERATIONS AND MAINTENANCE

An operations and maintenance budget will be required to provide materials and supplies (e.g., office supplies, fuel) and additional labor (as previously described) to support management. This budget also will need to include costs of vehicle maintenance, small tools and materials for facilities maintenance (e.g., replacement signs), herbicides for control of invasive species, garbage disposal fees, etc. Costs for materials and supplies can be relatively large for some tasks, such as the removal of abandoned structures or eradication of extensive invasive plant infestations; therefore, these tasks may be budgeted separately as capital improvement or habitat restoration projects, and not included in the general materials and supplies budget for the NSMWA.

6.4 FUNDING SOURCES

Several funding sources are available for capital improvements, and restoration and enhancement projects within the NSMWA. These funding sources potentially include:

- USFWS Programs (e.g., State Wildlife Grant Program, Federal Aid in Wildlife Restoration Program)
- State Duck Stamp Program
- Neotropical Migratory Bird Conservation Act Grants Program
- Department of Fish and Game programs (e.g., Comprehensive Wetlands Program)
- Department of Fish and Game Minor/Major Capital Outlay and Deferred Maintenance proposals
- Programs authorized under future bond acts
- NAWCA
- California Coastal Conservancy
- Wildlife Conservation Board
- San Francisco Bay Joint Venture
- U.S. Army Corps of Engineers
- Ducks Unlimited
- Private foundations

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan.

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Biological Element									
Special-status species	Bio Goal 1: Maintain, enhance, and increase habitat for endangered, threatened, rare, and sensitive plant, fish, and wildlife species.	Conduct baseline surveys of special-status species with potential to occur in the NSMWA..	16	120	120	—	120	—	20
		Develop a comprehensive monitoring program for known special-status species populations to detect change in distribution and abundance, and to detect effects of management activities, public uses, and non-native species.	16	80	24	—	60	—	—
		Develop guidelines for protecting special-status bat species habitat in the NSMWA.).	16	60	32	—	24	—	16
		Research reintroduction potential for special-status species in suitable habitats in NSMWA.	4	20	60	—	40	—	—
Non-native Invasive Species	Bio Goal 2: Minimize the introduction and spread of non-native invasive species that potentially have negative impacts on native plant or wildlife species.	Inventory habitats for invasive plant infestations and map the infestations (e.g., perennial pepperweed, cordgrass, tall reed [*Arundo dona*], yellow star thistle).	8	20	40	—	140	—	20
		Coordinate with existing non-native species monitoring and eradication programs, particularly the Invasive Spartina Project for the monitoring and management of non-native invasive cordgrass species, and USFWS for perennial pepperweed control.	4	32	20	—	40	—	8
		Prioritize infestations for control treatment. Prioritization will be based on such factors as size of infestation, location, condition of habitat, and adjacent land use.	8	30	20	—	40	—	—
		Manage and control invasive species through integrate pest management (rotational grazing, prescribed burn, pesticide application, and mechanical removal).	20	30	60	80	100	80	80

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Wetland Habitat	Bio Goal 3 (Seasonal and Perennial Wetlands and Tidal Marsh Habitat): Maintain and enhance habitat for resident and migratory birds, as well as mammal, amphibian, and reptile species.	Identify restoration opportunities in the NSMWA. Evaluate the constraints and benefits for each potential project, and prioritize list.	26	40	30	–	100	—	20
		Pursue funding opportunities for identified restoration opportunities in the NSMWA.	200	60	20	–	–	–	20
		Provide a diversity of habitats for wildlife species in the NSMWA, including many species of waterfowl, raptors, passerines, shorebirds, and mammals.	20	100	32	–	60	–	100
		When considering restoration sites and designs, maximize synergy with adjacent wetland projects (e.g., City of American Canyon tidal and treatment wetlands, Cullinan Ranch and Napa County Flood Control District lands).	**40**	**80**	**32**	**–**	**–**	**I**	**40**
		Use locally collected native plants in the design of restoration projects. Many seed and propagule sources for native plants are present in the NSMWA.	**20**	**40**	**40**	**40**	**20**	**–**	**120**
		Develop and implement projects that would be consistent and compatible with the applicable Napa County Airport Safety Compatibility Zones and FAA advisory guidelines related to bird-strike hazards	**40**	**40**	**20**	**–**	**–**	**–**	**–**

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Wetland Habitat	Bio Goal 4 (Managed Former Salt Pond Habitat): Improve the ability to manage water levels and salinity levels in managed ponds to maximize feeding and resting habitat for migratory bird and resident waterfowl	Repair or replace water control structures to ensure effective control of water levels and salinity level.	**20**	**80**	**100**	**200**	**—**	**200**	**60**
		Monitor water quality of the managed ponds to ensure salinity reduction process is adequate and dissolved oxygen concentrations support aquatic life.	**16**	**40**	**100**	**100**	**—**	**20**	**80**
	Bio Goal 5 (Managed Former Salt Pond): Minimize contaminant risks from salt pond restoration	Minimize mobilization of potential contaminants, such as methylmercury, in sediments to the extent possible.	**16**	**40**	**20**	**40**	**I**	**40**	**60**
		For the Napa Plant Site, restore tidal circulation when Cargill has completed harvest operations and consistent with BCDC permit, RWQCB waste discharge requirements, and the USACE permit.	16	80	60	40	—	20	20
Upland and Riparian Habitat	Bio Goal 6: Restore and enhance grassland and upland communities to conditions that provide desire ecological conditions and support diversity and abundance of plant and wildlife species	Identify feasible grassland and upland restoration projects.	8	60	40	6	40	—	—
		Prioritize potential grassland and upland restoration projects.	8	40	20	—	32	—	—
		Pursue funding and develop plans for identified grassland and upland projects. Proposals for obtaining funds should include goals, techniques, costs, monitoring, and adaptive management. Pursue funding through partnerships when appropriate	100	80	20	—	8	—	—
	Bio Goal 7 (Riparian Habitat): Maintain and enhance riparian habitat to conditions that provide desired ecosystem benefits, including improved wildlife habitat and increased bank stability	Evaluate opportunities, constraints, and potential restoration benefits for riparian restoration in the NSMWA.	8	60	20	—	32	—	—
		Prioritize potential riparian restoration sites in the NSMWA. Based on information collected under Task 1, riparian restoration projects should be prioritized based on the significance of the site and potential loss or degradation of habitat.	8	60	20	—	20	—	—

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Upland and Riparian Habitat	**Bio Goal 7 (cont.)**	Pursue funding and develop plans for identified riparian restoration projects. Proposals for obtaining funds should include goals, techniques, costs, monitoring and adaptive management.	60	100	—	—	—	—	—
		Maintain previously restored riparian areas at Huichica and American Canyon Creeks.	8	20	20	40	40	—	100
Aquatic Ecosystems	Bio Goal 8 (Aquatic Ecosystem): Maintain and enhance aquatic ecosystems for diversity and abundance of native and game fish and aquatic invertebrate species	Increase understanding of fisheries and aquatic invertebrates use of the NSMWA through expanded monitoring.	16	20	60	10	—	—	—
		Provide a greater diversity of aquatic habitats and improve existing habitat structure in tidal marshes of the NSMWA.	32	40	40	—	—	—	—
Public Use Element									
Authorized Public Use	PU Goal 1: Increase existing and provide new opportunities for low impact, wildlife-oriented uses that are compatible with wildlife and habitat goals.	Expand hunting opportunities as habitat and access are improved on restored sites and former duck club sites.	16	20	20	—	—	—	—
		Post hunting regulations at appropriate locations.	20	20	24	48	—	120	60
		Develop maps and signs that indicate fishing access points	32	20	20	48	—	—	60
		Post fishing regulations at appropriate locations.	20	20	24	48	—	60	60
		Create angling access points (e.g., potential for barge docks at Green Island Unit to provide angling access).	20	20	20	20	—	20	—
		Improve access roads and levees.	40	8	50	60	—	100	20
		Provide access for wildlife viewing at restored sites.	8	8	40	40	—	32	8
		Post additional interpretive wildlife sign at strategic locations.	8	8	16	16	—	40	8
		Provide opportunities for hand launched water craft (e.g., kayaks, canoes) in appropriate locations	8	8	16	42	—	40	8

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Authorized Public Use	PU Goal 1 (cont.)	Coordinate with Bay Trail, Napa, Solano and Sonoma Counties and City of American Canyon to evaluate the feasibility to complete an alignment of the Bay Trail surrounding the northern and eastern boundaries of the Napa River and Huichica Creek Units.	32	24	32	24	24	—	—
		Create a brochure and updated map for the NSMWA.	8	8	20	40	60	—	80
		Design public access to minimize maintenance and patrolling.	16	8	12	20	—	—	20
	PU Goal 2: Support and expand public use of the NSMWA for environmental education and interpretation.	Develop interpretive signage and kiosks.	8	—	4	60	2	—	20
		Develop informative DFG website for NSMWA.	8	—	4	60	20	—	20
		Publicize and schedule interpretative walks or guided tours	4	—	4	60	60	—	80
		Coordinate with local schools for classroom field trips and other educational activities	4	—	20	40	40	—	4
		Develop self-guided tours of the NSMWA.	4	—	8	20	60	—	24
		Identify area(s) for a possible future interpretive/educational facility	32	20	20	20	60	—	40
	PU Goal 3: Encourage community partnerships	Coordinate with local non-profit groups that promote wildlife-dependent education and interpretation (e.g., Save the Bay, Bay Institute).	20	20	10	20	30	—	—
		Identify opportunities to partner with groups to implement habitat enhancement projects (e.g., waterfowl hunters, Acacia Winery).	20	16	16	16	20	—	8
		Identify opportunities to promote Earth day activities at NSMWA Management Units.	40	—	20	20	20	—	—
	PU Goal 4: Minimize competition and conflicts among users and facilitate compatibility between public uses.	Maintain and improve access roads, signs, restrooms, and other recreational facilities	8	—	4	40	20	300	32
		Inform the public of NSMWA use designations and use restriction through outreach, signage, and DFG's web site	16	—	4	60	20	40	60

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Authorized Public Use	PU Goal 5: Evaluate requests by Native Americans for use of the NSMWA for traditional activities, such as gathering native plant materials for cultural purposes	Work with native peoples requests for access to the NSMWA. Determine the purpose and need for access and/or collections within the NSMWA, based on applicable laws and treaties related to tribal use of state properties	16	—	4	40	20	—	20
		Develop access plans and issue permits for native peoples that are compatible with the goals of the LMP. Any authorization for access would identify species, limits, locations, seasons, and include standard liability clauses.	16	20	20	20	—	—	20
Unauthorized Public Use	UPU Goal 1: Prevent unauthorized use of the NSMWA	Maintain adequate signage on boundaries of NSMWA, particularly at American Canyon, White Slough, and the Sonoma Creek Unit where dumping and vandalism are more common.	4	4	4	40	20	100	20
		Increase patrols of the NSMWA and enforce regulations that prohibit unauthorized uses.	8	—	—	—	—	120	—
		Prohibit activities that are inconsistent with the NSMWA mission, including ballooning (landing), windsurfing and equestrian use.	8	—	—	—	—	100	8
		Remove existing trash and other unwanted materials.	16	—	—	20	—	120	12
		Provide additional trash receptacles at strategic locations.	4			40		40	20
		Establish a regular monitoring and removal program of trash.	8	4	4	20	40	—	20
		Meet with local law enforcement agencies, including County sheriff, California highway patrol, to coordinate law enforcement activities and explore options for cooperative programs.	60	20	20	—	—	—	20
Agricultural Resources Element									
Agricultural Resources	AG Goal 1: Use agricultural techniques to maintain and enhance habitat for native and game wildlife and fish	Enhance grasslands and uplands through grazing, native grass plantings and other management techniques within upland areas of Huichica Creek, Ringstrom Bay, Wingo, Southern Crossing, and American Canyon Units.	8	4	8	20	120	60	80

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Cultural Resources Element									
Cultural Resources	CR Goal 1: Catalog and preserve all significant prehistoric, historic-era, or present-day Native American cultural resources that are documented, and/or discovered, through field investigations within the NSMWA.	Maintain library of printed cultural resource reports from the project area and a ¼-mile vicinity.	8	—	—	—	40	—	20
		Conduct cultural resource surveys as necessary before significant ground-disturbing activities (e.g., excavations below normal plow depths) at undisturbed sites.	8	—	—	20	40	—	20
		Formally record and evaluate historic structures within the project area, such as the Napa-Sonoma Marshes field office complex at 2148 Duhig Road.	—	—	—	—	—	—	—
		Complete and submit site records to the State Historic Preservation Officer (SHPO) to establish and submit culturally significant resources that may be eligible for inclusion in the National Register of Historic Places (NRHP) or the California Register of Historic Resources (CRHR).	8	—	—	20	20	—	30
		When facility improvements or restoration efforts are proposed and may affect historical or archaeological resources, consult CEQA guidelines for guidance on compliance with regulations.	8	—	—	12	12	—	20
		Consult with the Native American Heritage Commission (NAHC) as appropriate.	8	—	4	—	—	—	20
		consult with the local tribe(s) as appropriate.	8	—	2	8	8	—	8
	CR Goal 2: Where appropriate, provide opportunities for on-site public interpretation of significant cultural resources.	Display NSMWA cultural resources information in interpretive signage at key locations.	4	—	4	20	—	20	—
		Coordinate with local tribe(s) for accurate information and input for interpretive signage	16	—	—	16	—	20	20
Facilities Maintenance Element									
Facilities Maintenance	FM Goal 1: Maintain or improve existing levels of flood protection	Identify, evaluate and set priorities for repair and replacement of water control structures and levees.	8	—	60	20	—	—	30
		Repair or replace water control structures and levees in order of priority	8	—	—	12	—	40	—
		Coordinate with adjacent landowners and county flood control districts regarding water management	60	—	20	8	—	—	—

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Facilities Maintenance	FM Goal 2: Effectively manage existing facilities and equipment for resource protection, operations, and safe public uses.	Maintain gates and fences and water management infrastructure.	8	—	—	64	—	—	—
		Maintain signage that informs the public of the boundaries, laws, and regulations of the NSMWA.	8	—	—	20	—	40	—
		Start a monitoring and maintenance schedule for all signage. Replace signage as needed	8	—	20	—	—	20	—
		Regularly monitor the condition and use of existing facilities.	8	—	—	20	—	32	—
		Conduct preventative maintenance of facilities and structures.	8	—	—	20	—	24	—
		Maintain existing dirt and paved roads in the NSMWA.	8	—	—	20	—	40	—
		Obtain funding and update buildings at field headquarters at Duhig Road.	60	—	40	10	—	32	20
	FM Goal 3: Minimize potential contamination risks from ground disturbing activities.	Prior to implementation of any specific project involving ground disturbance, DFG would assess of potential hazardous materials to be encountered, such as through the preparation of an Initial Site Assessment.	20	12	12	12	16	—	24
Administrative Element									
Adminis-trative	ADMIN Goal 1: Maintain current data on the management and resources at NSMWA	Maintain financial records regarding expenditures, staff, maintenance, and other administrative duties.	20	60	40	—	—	—	—
		Consolidate geographic data and develop a geographic information system (GIS).	8	—	—	20	32	—	20
		Develop and maintain a database of monitoring data, management activities, permits and MOUs (e.g., weed management actions) implemented and outcomes and regulatory permits or MOUs received (old or active) from other resource agencies (e.g., BCDC, RWQCB, ACOE).	8	—	—	20	20	—	12

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Scientific Research and Monitoring Element									
Scientific Research and Monitoring	SRM Goal 1: Improve understanding of ecosystem processes and trends, and evaluate the implementation, effectiveness and validity of management actions in the NSMWA through an effective monitoring program. Use the information obtained to adjust management strategies as appropriate.	Conduct baseline and follow-up biological monitoring for planned restoration projects in the NSMWA. This may include monitoring fish (see aquatic ecosystem goals), aquatic invertebrates, avian, plant and water quality response to management actions.	8	–	16	–	40	–	20
		Define monitoring to support evaluation of project goals and objectives and inform adaptive management.	8	–	8	–	16	–	8
		Adopt monitoring design that will include data collection that is self-sustaining when possible (e.g., equipment with automatic data recording) and minimize operations and maintenance as much as possible.	8	–	8	–	4	–	–
		Integrate site-specific monitoring efforts with regional monitoring programs (e.g., California Rapid Assessment Method [CRAM], Integrated Regional Wetland Monitoring [IRWM]).	16	8	–	–	8	–	–
		Require researcher to provide electronic version of study results and link to Management Units' GIS.	8	–	8	–	–	–	8
		Conduct plant, wildlife, aquatic, invertebrate, and fisheries inventories of the NSMWA	8	20	72	–	80	–	20
	SRM Goal 2: Encourage and support scientific research that fosters the scientific understanding needed to protect and enhance resources of the NSMWA, and contributes to adaptive management strategies.	Utilize DFG's January 2008 Science Policy in the planning, approval and management of scientific research conducted in the NSMWA by DFG staff and outside entities (includes recommendation of scientific oversight, scientific staff development and classification and data management).	32	12	12	–	–	–	8
		Develop a prioritized list of research needs.	16	8	8	–	–	–	–
		Coordinate with local education institutes or universities to conduct research studies that would provide needed data for guiding management decisions.	30	8	8	–	–	–	–
		Require researchers to provide copies of data and/or published papers, and contact researchers to ensure that this requirement is fulfilled.	20	8	8	–	–	–	–
		Create an electronic database of scientific research conducted in the NSMWA.	20	8	8	–	–	–	–

Table 6-1. Operations and maintenance requirements (hours by staff position) to implement plan

Element	Goal	Tasks	Sr Bio Supv WL	Assoc WL Bio	WL Hab Supv	Fish WL Tech	WL Bio	Tract Oper/ Labr	Fish WL Hab Asst
Management Coordination Element									
Manage-ment Coordina-tion	MC Goal 1: Coordinate with federal, state, and local agencies regarding plans and projects that may affect habitats and/or management at the NSMWA	Review, coordinate, and provide comments and recommendations on federal, state and local government plans and proposed projects as appropriate for the purpose of determining the consistency of such plans with the goals of this LMP.	40	8	8	—	16	—	8
		Work with local mosquito control districts (Napa, Sonoma, and Solano counties) to monitor potential mosquito breeding sites and apply treatments as needed.	32	—	—	—	16	—	—
		Apply for grants and matching funds with mosquito abatement district to implement BMPs.	72	16	16	—	—	—	8

Sr Bio Supv WL = Senior Biologist Supervisor (Wildlife)
Assoc WL Abio = Associate Wildlife Biologist
WL Hab Supv = Wildlife Habitat Supervisor
Fish WL Tech = Fish and Wildlife Technician
WL Bio = Wildlife Biologist
Tract Oper/Labr = Tractor Operator/Laborer
Fish WL Hab Asst = Fish and Wildlife Habitat Assistant

7. FUTURE REVISIONS TO PLAN

New information will become available that will affect the operations and management of the NSMWA. This section incorporates a hierarchy of revision procedures in which the level of process and required involvement is proportionate to the level of change that is proposed. This LMP reflects the best information available during the planning process, but it is understood that new information will become available over time and there will be the need to make adjustments to keep this LMP current. Such new information may include any of the following:

- Feedback generated by adaptive management
- New threats to species and habitat in the NSMWA
- New legislation or policy direction
- Scientific research that directs improved management techniques

When the new information dictates a change to this LMP, it is important that there is an appropriate process established. Unless a reasonable and clear revision process exists, this LMP, like plans in many organizations will become outdated and irrelevant.

7.1 MINOR REVISIONS

A process is required to accommodate minor revisions to this plan that may include the addition of new property to the NSMWA or the adoption of limited changes to the goals and tasks that are directed through adaptive management, by other scientific information or by legislative direction. This procedure will be applicable to revisions which meet the following criteria:

- No change is proposed to the overall purposes of this LMP.
- CEQA documentation (if required) is prepared and approved.
- Adjoining neighbors are consulted regarding the revision, if the revision is related to a specific location or the acquisition of additional area.
- Acquisition of new property to be included and managed in the NSMWA.

The minor revision may be prepared by the staff assigned to NSMWA or with other Department resources and requires approval by the Regional Manager.

7.2 MAJOR REVISIONS

Major revisions or a new LMP could occur if new policy direction requires a procedure comparable to the LMP planning process. The procedure for major revisions will meet the following criteria:

- Substantial revision is proposed to this LMP or the adoption of a complete new plan is proposed.
- Appropriate CEQA documentation is prepared and approved.
- Appropriate consultation within the Department occurs.
- Appropriate coordination and consultation with other agencies occurs.
- A public outreach program is conducted proportionate to the level of the proposed revision.

The major revision or new plan may be prepared utilizing available DFG resources. The major revision or new plan requires recommendation by the Regional Manager and approval by the Director of the DFG. If the appropriate procedure for a particular, proposed revision is not apparent, the determination of which of these procedures to use shall be made by the regional manager in consultation with the Department's Wildlife Branch/Lands Program.

7.3 FIVE-YEAR PLAN STATUS REPORTS

Periodic evaluation is important to help ensure that the goals of the LMP are being met. Chapter 5 (Management Goals) contains many specific tasks that include monitoring of the NSMWA and evaluation the adequacy of the management of the area. Cumulatively, these efforts will provide feedback regarding the success of the overall management effort. Periodic and detailed analysis of this feedback data will, however, be necessary to assess the status of this LMP. A comprehensive review of the achievement of the goals of the LMP should be prepared every five years following the date of adoption of this LMP. A status report documenting this review should include the following elements:

- Evaluation of the achievement of the purposes and goals of this LMP.
- Evaluation of the completion or annual completion, as appropriate, of each task contained in this LMP.
- Notation of important, new scientific information that has bearing on the management of the NSMWA.
- Recommendations for revisions to this LMP to incorporate new information and improve its effectiveness.

The status report should be prepared by the NSMWA Associate Wildlife Biologist. It should be submitted to the Department's Wildlife Branch/Lands Program for review and comment, approved by the Regional Manager and submitted to the Director of the Department. This report should serve as a basis for revision of this LMP and appropriate adjustments to ongoing management practices.

8. LIST OF PREPARERS

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Appendix A
Napa River to American Canyon River: Bay Wetland River Parkway Program Grant Application

State of California – The Resources Agency
ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

October 12, 2007

California River Parks Grant Program
The Resources Agency
Attn: Bonds and Grants Unit
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

To Whom It Concern:

Subject: Napa to American Canyon River – Bay Wetlands Trail River Parkway Program Grant Application

This letter serves to confirm the Department of Fish and Game's (Department) willingness to enter into an agreement with the Napa County Regional Park and Open Space District (District) to enable the District to construct and operate a segment of Napa River – San Francisco Bay Trail. The proposed trail would utilize a portion of the levees within the Napa-Sonoma Marshes State Wildlife Area (former Cargill Napa Salt Plant Site), which the Department is currently in the process of restoring to tidal wetlands and other associated wildlife habitat types.

Restoration of the Cargill Napa Plant Site to tidal wetlands habitat is a key component of ongoing efforts to restore approximately 10,000 acres of wetlands in the Napa-Sonoma marshes. While a degree of public access has been, or is planned to be, provided at various locations within the Napa-Sonoma Marshes, the Department and other San Francisco Bay wetland restoration advocates find the Cargill Napa Plant Site to be the best location for public access and environmental education due to its physical proximity to urban areas. Certain public access elements have been included in and evaluated as part of the Department's project and environmental review; however, the Department does not have sufficient funding to either construct or operate anything more than the most minimal of access and interpretation facilities. We are therefore pleased to be able to partner with the Napa County Regional Park and Open Space District so that the District can construct and provide quality trail access and environmental education and interpretation.

The Agreement in the form of a Memorandum of Understanding (MOU) will need to include (but not be limited to) the following elements:

(1) Location of Agreement - The Department will make available to the District a portion of the Cargill Napa Salt Plant's eastern perimeter levee, from Green Island Road to the vicinity of Eucalyptus Drive (adjacent to ponds W2, W3, B-1, B-2 and B-3) to construct, maintain, and operate a packed gravel, non-motorized trail and interpretive signage (meeting Department standards and design criteria). The schedule for constructing the trail will be coordinated with and not interfere with the Department's restoration efforts.

(2) Regulations and Limitations - The Agreement will note that the site is a State Wildlife Area and, as such, is governed by Title 14, California Code of Regulations, and that public access is a secondary use of the Wildlife Area and must be compatible with wildlife resources.

(3) Agreement on Maintenance - The District will agree to take full responsibility for construction, maintenance, and operation of the trail and will seek the Department's consultation in this regard. The Department will maintain the levee under the trail.

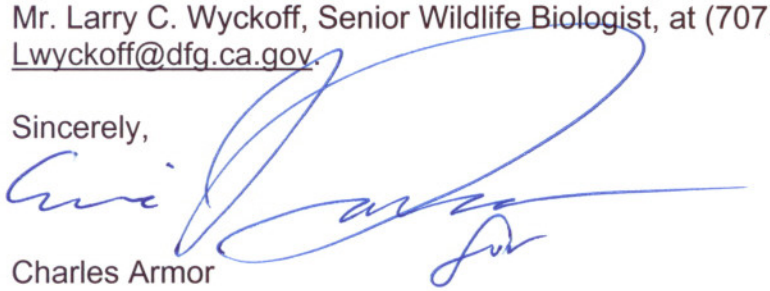
(4) MOU Term - The term will be 25 years, with the option to extend by mutual agreement. The MOU will contain a clause indicating that both parties will work diligently to resolve any problems, but in the event the problems cannot be resolved, it will allow the State to terminate the MOU Agreement at any time by giving a 90 days notice.

(5) Changes in Agreement - Amendments will be permitted as necessary to better achieve the purposes of the Agreement and the enforcement of applicable Title 14 CCR regulations.

(6) Coordination Meetings - Throughout the Agreement, a Bay Trail Oversight Committee shall be formed to regularly meet for the purpose of discussion of issues including, but not limited to management, trail use, maintenance, potential closures, and law enforcement.

If you have any questions or concerns relating to this letter of intent, please contact Mr. Larry C. Wyckoff, Senior Wildlife Biologist, at (707) 944-5542 or by email at Lwyckoff@dfg.ca.gov.

Sincerely,



Charles Armor
Regional Manager
Bay Delta Region

cc: John Woodbury
JWoodbury@co.napa.ca.us

Appendix B
Monitoring Plan for Ponds 1, 1A, 2, 3, 4, and 5

SCHEDULE FOR SAMPLING, MEASUREMENTS, AND ANALYSIS FOR PONDS 1, 1A, 2, 3, 4, and 5

SAMPLE POINT:		3-A	3-B	4-A	4-B	5-A	6-A	6A-A	NR-U	NR-D
	METHOD									
MATRIX: WATER										
Salinity [1]		M	M	D/M	D/M	M	M	M	D/M	D/M
pH [1]		M	M	D/M	D/M	M	M	M	D/M	D/M
Temperature [1]		M	M	D/M	D/M	M	M	M	D/M	D/M
Turbidity [1]		M	M	D/M	D/M	M	M	M	D/M; DC	D/M; DC
Dissolved oxygen [1]		M	M	D/M	D/M	M	M	M	D/M	D/M
Total ammonia	SM 4500	M	M	M	M	M	M	M	M	M
Total mercury [2]	EPA 1631	M	M						M	
Methyl mercury [2]	EPA 1630	M	M						M	

Note: Un-ionized ammonia will be calculated from measurements of pH, temperature, salinity, and total ammonia.

SAMPLE POINT:		3-A	3-B	4-A	4-B	5-A	6-A	6A-A	NR-U	NR-D
	METHOD									
MATRIX: SEDIMENT										
Total mercury [2]	FGS 066	M	M						M	
Methyl mercury [2]	FGS 045	M	M						M	

Notes:

[1] Field test only

[2] Methyl mercury / total mercury monitoring to be conducted for one year, in one pond, contingent on CalFed funding; Pond 3 is tentative choice

D/M	Once during the first and fifth day following breach; weekly during the first month; monthly thereafter
DC	Daily during construction activities conducted in receiving waters
M	Monthly
FGS	Frontier Geosciences

Appendix C
Monitoring Plan for the Napa Plant Site

SCHEDULE FOR SAMPLING, MEASUREMENTS, AND ANALYSIS of the Napa Plant Site (Green Island Unit)

SAMPLE POINT:	METHOD	North Unit breach	Central Unit breach	South Unit @ 2 breaches
MATRIX: WATER				
Salinity [1]	multiparameter probe	D/M	D/M	D/M
pH [1]	multiparameter probe	D/M	D/M	D/M
Temperature [1]	multiparameter probe	D/M	D/M	D/M
Turbidity [1]	multiparameter probe	D/M	D/M	D/M
Dissolved oxygen [1]	multiparameter probe	D/M	D/M	D/M
Methyl mercury [2]	EPA 1630	B	B	B
MATRIX: SEDIMENT				
Methyl mercury [2]	UC Davis method for biosentinel fish; FGS 045 or other appropriate method for sediment and water	B	B	B

Notes:

[1] Field test only

[2] Methyl mercury — Monitoring using analysis of biosentinel fish species developed by UC Davis researchers is preferred, however water and sediment will be tested if inclusion of the Napa Plant Site in the biosentinel regional program is not feasible.

D/M — Once per year

Once within 3 days prior to breach; during the first and fifth day following breach; weekly during the first month;

B — Biennially (every two years)

Appendix D
Initial Study

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Napa Sonoma Marshes Land Management Plan

Lead Agency: Department of Fish and Game — Contact Person: Karen Taylor

Mailing Address: PO Box 47 — Phone: (707) 944- 5567

City: Yountville — Zip: 94599 — County: Napa

Project Location: County: Napa, Sonoma, Solano — City/Nearest Community: Napa, Sonoma

Cross Streets: — Zip Code:

Longitude/Latitude (degrees, minutes and seconds): ____° ____ ' ____ " N / ____° ____ ' ____ " W Total Acres: 14,000

Assessor's Parcel No.: various, see LMP — Section: — Twp.: 4N/5N — Range: 4W/5W — Base: MDBM

Within 2 Miles: State Hwy #: 121/37 — Waterways: Napa River, Sonoma/Tolay/ Huichica Creeks

Airports: Napa Co Airport — Railways: Union Pacific — Schools:

Document Type:

CEQA: ☐ NOP ☐ Draft EIR — NEPA: ☐ NOI — Other: ☐ Joint Document
☐ Early Cons ☐ Supplement/Subsequent EIR ☐ EA ☐ Final Document
☑ Neg Dec (Prior SCH No.) ☐ Draft EIS ☐ Other:
☐ Mit Neg Dec Other: ☐ FONSI

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Local Action Type:

☐ General Plan Update ☐ Specific Plan ☐ Rezone ☐ Annexation
☐ General Plan Amendment ☐ Master Plan ☐ Prezone ☐ Redevelopment
☐ General Plan Element ☐ Planned Unit Development ☐ Use Permit ☐ Coastal Permit
☐ Community Plan ☐ Site Plan ☐ Land Division (Subdivision, etc.) ☑ Other: Mngmt Plan

Development Type:

☐ Residential: Units ____ Acres ____
☐ Office: Sq.ft. ____ Acres ____ Employees ____
☐ Commercial: Sq.ft. ____ Acres ____ Employees ____
☐ Industrial: Sq.ft. ____ Acres ____ Employees ____
☐ Educational:
☐ Recreational:
☐ Water Facilities: Type ____ MGD ____
☐ Transportation: Type
☐ Mining: Mineral
☐ Power: Type ____ MW ____
☐ Waste Treatment: Type ____ MGD ____
☐ Hazardous Waste: Type
☑ Other: Wildlife Area

Project Issues Discussed in Document:

☑ Aesthetic/Visual ☐ Fiscal ☐ Recreation/Parks ☑ Vegetation
☑ Agricultural Land ☑ Flood Plain/Flooding ☐ Schools/Universities ☑ Water Quality
☐ Air Quality ☐ Forest Land/Fire Hazard ☐ Septic Systems ☑ Water Supply/Groundwater
☑ Archeological/Historical ☑ Geologic/Seismic ☐ Sewer Capacity ☑ Wetland/Riparian
☑ Biological Resources ☑ Minerals ☑ Soil Erosion/Compaction/Grading ☐ Growth Inducement
☐ Coastal Zone ☐ Noise ☐ Solid Waste ☑ Land Use
☐ Drainage/Absorption ☐ Population/Housing Balance ☐ Toxic/Hazardous ☐ Cumulative Effects
☐ Economic/Jobs ☐ Public Services/Facilities ☐ Traffic/Circulation ☐ Other:

Present Land Use/Zoning/General Plan Designation:

Land Extensive Agriculture, Watershed, Open Space, Airport Compatibilty Overlay District

Project Description: *(please use a separate page if necessary)*

This draft LMP describes the ecological conditions and managerial goals of the NSMWA. The draft LMP contains a comprehensive description of the NSWA and its environment as well as an evaluation of compatible wildlife-related public uses. The Napa Sonoma Marshes WA is approximately 14,000 acres and composed of predominately former tidelands at the northern edge of San Pablo Bay. It is located on the Cuttings Wharf, Sears Point, and Mare Island USGS 7.5 topo maps.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "X".
If you have already sent your document to the agency please denote that with an "S".

____	Air Resources Board	____	Office of Emergency Services
____	Boating & Waterways, Department of	____	Office of Historic Preservation
____	California Highway Patrol	____	Office of Public School Construction
____	Caltrans District # ____	____	Parks & Recreation, Department of
____	Caltrans Division of Aeronautics	____	Pesticide Regulation, Department of
____	Caltrans Planning	____	Public Utilities Commission
____	Central Valley Flood Protection Board	X	Regional WQCB # SF
____	Coachella Valley Mtns. Conservancy	X	Resources Agency
X	Coastal Commission	X	S.F. Bay Conservation & Development Comm.
____	Colorado River Board	____	San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
____	Conservation, Department of	____	San Joaquin River Conservancy
____	Corrections, Department of	____	Santa Monica Mtns. Conservancy
____	Delta Protection Commission	X	State Lands Commission
____	Education, Department of	____	SWRCB: Clean Water Grants
____	Energy Commission	____	SWRCB: Water Quality
____	Fish & Game Region # ____	____	SWRCB: Water Rights
____	Food & Agriculture, Department of	____	Tahoe Regional Planning Agency
____	Forestry and Fire Protection, Department of	____	Toxic Substances Control, Department of
____	General Services, Department of	____	Water Resources, Department of
____	Health Services, Department of		
____	Housing & Community Development	X	Other: Please see attached list
____	Integrated Waste Management Board	____	Other: ____
X	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date _____ Ending Date _____

Lead Agency (Complete if applicable):

Consulting Firm: URS
Address: 1333 Broadway Suite 800
City/State/Zip: Oakland, CA 94612
Contact: Ms. Dina Robertson
Phone: (510) 874 -1751

Applicant: CA Department of Fish and Game
Address: 7329 Silverado Trail
City/State/Zip: Napa, CA 94558
Phone: 707 944 - 5500

Signature of Lead Agency Representative: _____ **Date:** 7/9/10

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

Additional reviewing agencies for the draft Napa Sonoma Marshes Wildlife Area Land Management Plan and Negative Declaration:

Napa Resources Conservation District
1303 Jefferson Street, Suite 500B
Napa, CA 94559

San Pablo Bay National Wildlife Refuge
c/o San Francisco Bay NWR Complex
PO Box 524
Newark, CA 94560-0524

US Army Corps of Engineers
San Francisco District
1455 Market Street
San Francisco, CA 94103 -1398

California State Coastal Conservancy
1330 Broadway, 13th Floor
Oakland, CA 94612-2530

Pt. Reyes Bird Observatory
San Francisco Bay Research Center
3820 Cypress Drive #11
Petaluma, CA 94954

Southern Sonoma County Resource Conservation District
1301 Redwood Way, Suite 170
Petaluma, CA 94954

Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403

San Francisco Bay Joint Venture
735 B Center Blvd.
Fairfax, CA 94930

San Francisco Estuary Institute
7770 Pardee Lane
Oakland, CA 94621

NOAA Fisheries/NMFS
Attn: Protected Resource Division
777 Sonoma Ave Rm 325
Santa Rosa, CA. 95404

US Geological Survey
US Geological Survey
San Francisco Bay Estuary Field Station
505 Azuar Drive
Vallejo, CA 94592

Marin – Sonoma Mosquito and Vector District
595 Helman Lane
Cotati, CA. 94931 - 9736

Solano County Mosquito Abatement District
2950 Industrial Court
Fairfield, CA 94533

Napa County Mosquito Abatement District
15 Melvin Road
American Canyon, CA 94503-1101

APPENDIX D ENVIRONMENTAL REVIEW

PROJECT INFORMATION

1.	Project Title:	Napa-Sonoma Marshes Wildlife Area, Land Management Plan
2.	Lead Agency Name and Address:	California Department of Fish and Game Region 3 Bay Delta 7329 Silverado Trail Napa, CA 94558
3.	Contact Person and Phone Number:	Karen Taylor, Area Manager 707/944-5567
4.	Project Location:	Sonoma, Napa, and Solano Counties, California
5.	Project Sponsor's Name and Address:	Same as above
6.	General Plan Designation/Zoning:	Land Extensive Agriculture; Agriculture; Watershed; Open Space; Airport Compatibility Overlay District

7. Description of Project:

The project is the Land Management Plan (LMP) for the Napa-Sonoma Marshes Wildlife Area (Wildlife Area). The purposes of the Napa-Sonoma Marshes Wildlife Area Land Management Plan are:

- To guide the adaptive management of habitats, species, and programs described herein by achieving the Department's mission of protecting and enhancing fish, wildlife, and native plant values.
- To serve as a guide for appropriate public uses of the property.
- To serve as a descriptive inventory of fish, wildlife and native plant habitats which occur on or use this property, and to outline appropriate public uses of these resources.
- To provide an overview of the area's operation and maintenance, and personnel requirements to implement management goals and objectives. This plan serves as a budget planning aid for annual budget preparation
- Complete environmental impacts and subsequent mitigation which may occur during management. This plan contains environmental documentation to comply with state and federal statutes and regulations.

This LMP consists of six chapters as follows:

I. Introduction
II. Property Description and Management Setting
III. Environmental Setting
IV. Resource Management and Public Use Issues
V. Management Goals
VI. Operations and Maintenance

This LMP provides a description of the Wildlife Area and its environment. It also includes an evaluation of public uses that are compatible with the purpose of the Wildlife Area.

This Initial Study is intended to consider the whole of the project. As such, this project and this Negative Declaration include the following components:

- The ongoing operation of the Wildlife Area including the public uses incorporated in this LMP.
- Maintenance activities (e.g., habitat management and agricultural) to sustain the biological communities

that provide habitat for wildlife and fisheries resources.

- Installation of minor improvements, such as signs and trails that do not involve substantial physical disruption of the Wildlife Area.
- Restoration and enhancement of seasonal and perennial wetlands, grasslands, managed ponds, and riparian communities.
- Maintenance of improvements to the Wildlife Area.
- Monitoring activities and scientific research.
- Ongoing coordination with public agencies and private entities consistent with the goals of this LMP.
- The provision of public information regarding the Wildlife Area that may include hardcopy and online data as well as other media.
- Update of Wildlife Area regulations.
- Enforcement of duly adopted laws and regulations.

This LMP is a general policy guide to the management of the Wildlife Area. It does not specifically authorize or make a precommitment to any substantive physical changes to the Wildlife Area. With the exception of ongoing restoration and enhancement, and operations and maintenance activities, any substantive physical changes that are not currently approved will require subsequent authorizations and approvals.

Because potential physical changes to the Wildlife Area would be a part of subsequent projects that have not yet been conceived, designed, or funded, it is not possible to reasonably evaluate the impacts of any such projects. Any such subsequent projects will be subject to CEQA review and will be considered in light of the contents of the LMP and this Initial Study. If a subsequent project is not included within the scope of this LMP (i.e., specific goals and tasks), it will require appropriate analysis and documentation pursuant to CEQA when it is conceived and proposed for approval. The type of additional CEQA review completed would be determined based on CEQA Guidelines Sections 15162-15164.

Two specific restoration projects currently under implementation occur within the Wildlife Area, the Napa Plant Site Restoration Project and the Napa River Salt Marsh Restoration Project. The LMP would result in the continued implementation of these two projects as they have been previously proposed. These projects also represent all activities currently planned by DFG to occur within the boundaries of these project sites. For the Napa Plant Site Restoration Project, DFG complied with CEQA through the preparation an Environmental Impact Report and associated documents and filed a Notice of Determination on March 28, 2007. For the Napa River Salt Marsh Restoration Project, the California State Coastal Conservancy complied with CEQA through the preparation an Environmental Impact Report and associated documents and filed a Notice of Determination on June 13, 2006. Implementation of the LMP would not result in any changes in the severity of any environmental impacts or mitigation measures described in the Environmental Impact Reports prepared for the Napa Plant Site Restoration Project and Napa River Salt March Restoration Project. Therefore, the analysis contained in this Initial Study does not include any impacts that would occur at the Napa Plant Restoration Site Project site or Napa River Salt March Restoration Project site, because those environmental impacts, mitigation measures, and findings under CEQA have been previously addressed.

8. Surrounding Land Uses and Setting: (Briefly describe the project's surroundings)	See Chapter 2 – Property Description and Chapter 3 – Environmental Setting
9: Other public agencies whose approval is required:	No other public agency approval is required for the

(e.g., permits, financing approval, or participation agreement)	adoption of the Napa-Sonoma Marshes Wildlife Area LMP.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:		
The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.		
☐ Aesthetics	☐ Agricultural Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities / Service Systems	☐ Mandatory Findings of Significance	☒ None

Determination

On the basis of this initial evaluation:

☒ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier Environmental Impact Report (EIR) or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Carl Wilcox
Signature

10-14-11
Date

CARL WILCOX
Printed Name

REGIONAL MANAGER
Title

FISH AND GAME
Agency

EVALUATION OF ENVIRONMENTAL IMPACTS

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2. All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3. Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4. "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less-Than-Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less-than-significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

    a) Earlier Analysis Used. Identify and state where they are available for review.

    b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

    c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances).

Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8. This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9. The explanation of each issue should identify: the significance criteria or threshold, if any, used to evaluate each question; and the mitigation measure identified, if any, to reduce the impact to less than significance.

I. AESTHETICS

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Have a substantial adverse effect on a scenic vista?				X
b. Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway?				X
c. Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?				X

DISCUSSION

a), b), d) No Impact. Adoption and implementation of the proposed LMP would preserve existing native vegetation, cultural, and natural visual resources, and would not involve the construction of any new buildings or outdoor lighting. Therefore, adoption of the LMP would not adversely affect scenic vistas, views, visual character, or scenic resources, nor would it create light or glare effects.

c) Less-Than-Significant Impact. Implementation of some of the management tasks described in the proposed LMP would involve modifications to the existing landscape (e.g., restoration or enhancement activities, placement of signage, maintenance and improvement of existing structures and facilities, such as water control structures, roads and restrooms, construction of new trail alignments). The primary visual character of the Wildlife Area consists of undeveloped open space, creeks, sloughs, and marshes, which are congruent with natural resource habitats of the area. Activities that would be implemented as a result of adoption of the proposed LMP would improve the visual character and quality in the Napa-Sonoma Marshes Wildlife Area, because they involve protection, management, and enhancement of natural resource habitats.

II. AGRICULTURAL RESOURCES

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and project site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:	**Potentially Significant Impact**	**Less Than Significant With Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?			X	
b. Conflict with existing zoning for agricultural use, or a Williamson Act contract?			X	
c. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?			X	

DISCUSSION

a) Less-Than-Significant Impact. Napa-Sonoma Marshes Wildlife Area does not contain lands designated as Prime Farmland or Unique Farmland. A small parcel of land (4.58 acres) located along the western boundary of Southern Crossing Unit is designated as Farmland of Statewide Importance. Currently the unit functions as grazed pasture and seasonal and permanent wetland. Proposed goals included in the LMP support habitat restoration and enhancement as well as grazing use in the NSMWA as a management tool to enhance wildlife habitat. Adoption of the proposed LMP could result in the continuation of grazing uses in the area. However, grazing practices (e.g. number of animals, timing) might change to accomplish the desired habitat restoration and enhancement goals.

Restoration of habitat would re-establish long-term ecological processes and functions present in natural communities, including the natural formation of soils that gave these sites their original agricultural value. Fully functioning ecosystems are also known to improve groundwater and surface water quality by removing undesirable constituents, such as pesticides (Brown and Wood 2002). Habitat restoration and enhancement activities in portions of the Wildlife Area that are designated as Farmland of Statewide Importance and currently in agriculture uses (grazing) could benefit onsite and adjacent agricultural lands by diminishing the volume and frequency of pesticides applied to the properties, slowing the loss of soils from the sites onto adjacent or downstream locations, and by increasing groundwater levels. Because the agricultural value of the soil is tied directly to the natural conditions and processes that existed before commercial agricultural development of the land, habitat restoration efforts would, in effect, be preserving (and possibly improving over time) the agricultural value of the soil (Cannon 2004, Tilman et al. 1996 and 2002).

While the current mission of DFG is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public, there are no tasks included in the LMP that include the establishment of any facilities, structures, or land uses that would physically or economically preclude returning the land to cultivation in the future, if there were to be such a public policy decision. Implementation of the proposed LMP, which would maintain the land as natural habitats and encourage grazing use as a management tool in the unit, would not be prohibitively costly to return to its present condition. Returning the land to grazing pasture would require no physical change to the environment, and returning the land to cultivation would require removing the native vegetation and implementing some soil preparation, which is similar to the requirements of the original clearing of habitat necessary to create farmed land decades ago.

In contrast, when farmland is converted to urban uses, the resulting construction of urban infrastructure and buildings, and the compaction and paving of soils with cement or petrochemical products makes the conversion irreversible. When farmland is lost because of the encroachment of urban uses, the cost of returning these urban uses to farmed land would be prohibitive, given the necessity to demolish buildings and remove infrastructure, not to mention the consequent loss of resource values that made these soils productive in the first place when urban uses were constructed.

For the reasons provided above, implementation of the proposed LMP would not result in a permanent loss of acreage in Farmlands of Statewide Importance and it would not cause damage to the physical properties of agricultural soils. Continued restoration of portions of the Wildlife Area to habitat would be expected to improve the physical characteristics of these lands within the Wildlife Area and downstream that originally contributed to their value as farmlands. Therefore, this impact is considered less than significant.

b) Less-Than-Significant Impact. Portions of the Napa-Sonoma Marshes Wildlife Area are designated as Agriculture, Watershed and Open Space in Napa County (Napa County 2002), and Land Extensive Agriculture (LEA B6 100z) in Sonoma County (Sonoma County 2007) and Solano County (Solano County 1999). Lands designated as Land Extensive Agriculture are agricultural lands that tend to have low production per acre and are not irrigated. Permitted uses on these lands include: public parks and "management of land for watershed, for fish and wildlife habitat, fish rearing ponds, hunting and fishing, where these uses are incidental to the primary use". In all three counties, land use designations of these areas allow for use as public parks and open space (Sonoma County 2007; Napa County 2002; Solano County 1999), and hence this impact is considered less than significant. There are no Williamson Act contracts in the Wildlife Area.

c) Less-Than-Significant Impact. Implementation of the proposed LMP would not hinder or stop farming operations on adjacent properties. Implementation of the proposed LMP would not involve land development activities (i.e., residential subdivisions, or commercial or industrial land uses) that would directly or indirectly induce changes in the use of surrounding agricultural land, such as the need for schools, public services, etc. Implementation of the LMP would not induce new residential, commercial, or industrial land development activities to occur in the future. Activities would be confined to the Wildlife Area and no substantial new infrastructure would be required off-site. The project would restore the plant and animal communities in keeping with the existing managed facilities in the Wildlife Area. New types of land uses would not be introduced into any areas that are currently rural and would be composed primarily of open space uses.

For the reasons provided above, implementation of the proposed LMP would not involve other changes in the existing environment, which, due to their location or nature, could result in conversion of farmland to nonagricultural use. Therefore, this impact is considered less than significant.

III. AIR QUALITY

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:	**Potentially Significant Impact**	**Less Than Significant With Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a. Conflict with or obstruct implementation of the applicable air quality plan?			X	
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?			X	
c. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?			X	
d. Expose sensitive receptors to substantial pollutant concentrations?			X	
e. Create objectionable odors affecting a substantial number of people?			X	

DISCUSSION

a), b), c), d), e) Less-Than-Significant Impact. Although implementation of some of the management tasks described in the proposed LMP could involve the use of construction equipment (e.g., continued operations and maintenance, restoration or enhancement activities) thus increasing equipment emissions in the immediate vicinity, these would be short term impacts and would not cause a considerable cumulative net increase of air pollutants. Potential restoration projects could include the excavation of wetlands, which could release objectionable odors, but it is not anticipated that these types of odors would be released in large quantities and would not result in a violation of any air quality standards. Prescribed burn is identified in the LMP as one of the potential components in integrated pest management and could temporarily impair air quality in the surrounding area. No specific prescribed burn project is proposed in the LMP. As described in the LMP, DFG would implement a plan to integrate pest management, which in part would result in protocol for implementing prescribed burns. This plan would be developed in conjunction with the Bay Area Air Quality Management District. Development of a protocol for conducting prescribed burns would minimize impacts to the general air quality, would not result in violations of air quality standards, and would not expose sensitive receptors to substantial pollutant concentrations. Additionally, such a plan that would be consistent with the LMP, would be subject to CEQA review in light of the information in this document. The type of additional CEQA review completed would be determined based on CEQA Guidelines Sections 15162-15164. Therefore, this would be a less-than-significant impact.

IV. BIOLOGICAL RESOURCES

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?			X	
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?			X	
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?			X	
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?			X	
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X

DISCUSSION

a), b), c), d) Less-Than-Significant Impact. Although implementation of some of the management tasks described in the proposed LMP would have the potential for temporary construction impacts to plants, wildlife, fish, and sensitive habitats such as wetlands (e.g., restoration or enhancement activities), it is anticipated that these impacts would not be substantial and that these projects would have a net benefit to wildlife and habitat. Any of these types of activities would be implemented in conformance with regulatory requirements such as DFG regulations, USFWS regulations, State Board regulations, BCDC regulations, Section 404 of the CWA, and any applicable plans or ordinances protecting biological resources.

The LMP includes habitat preservation and enhancement as primary goals for the protection of plant, wildlife, and fish species, and their habitat. It also ensures that all actions comply with federal and state Endangered Species Acts and other applicable regulations aimed at the

protection of special-status species and wildlife.

e), f) No Impact. The San Francisco Bay Plan (Bay Plan) identifies the NSMWA as wildlife refuge, tidal marsh, and managed wetlands (SFBCDC 2007). The purpose of the Bay Plan is to protect the Bay, its sloughs, estuaries, salt ponds, tidal marshes, managed wetlands, and other natural resources, and to develop the Bay and the shoreline to the highest potential with the minimum fill. The Bay Plan promotes the maintenance of wildlife areas and its policies focus on preservation of the natural resources of the Bay. The proposed LMP is consistent with the Bay Plan.

No existing adopted Habitat Conservation Plan (HCP) or Natural Community Conservation Plan (NCCP) is currently in place for Napa County. The Santa Rosa Plain Conservation Strategy, often referred to as the Sonoma Plan, is the only regional HCP for Sonoma County, but the NSMWA is not within the plan area in the Sonoma Plan (USFWS 2005). Solano County is currently in the process of preparing an HCP. In the 2007 Draft Solano HCP, the Wildlife Area falls in Zone 3 of the plan area and is classified as Coastal Marsh Natural Community (LSA 2007). Covered activities within this zone relate primarily to "the implementation of the HCP reserve system, including adaptive management and monitoring, habitat enhancement, habitat restoration and construction, scientific collection, and other associated compatible activities on designated reserves/preserves, mitigation sites/banks, and other associated adjacent lands." The proposed LMP is consistent with the provisions of the draft Solano HCP. Hence, adoption of the proposed LMP would not conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan.

V. CULTURAL RESOURCES

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?			X	
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section15064.5?			X	
c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?			X	
d. Disturb any human remains, including those interred outside of formal cemeteries?			X	

DISCUSSION

a), b), c), d) Less-Than-Significant Impact. Although implementation of some of the management tasks described in the proposed LMP would involve ground disturbance (e.g., ongoing operations and maintenance, and restoration or enhancement activities), the LMP includes requirements for cultural resource surveys prior to major ground disturbance (e.g., excavations below normal plow depths) at undisturbed sites, and consultation with the Native American Heritage Commission (NAHC) as appropriate. The LMP also requires that historic structures be formally recorded and evaluated. Site records and culturally significant resources that may be eligible for inclusion in the NRHP or the CRHR would be submitted to the SHPO. In the event that human remains are discovered, the specific protocol, guidelines, and channels of communication outlined by the NAHC, and in accordance with Section 7050.5 of the Health and Safety Code, Section 5097.98 of the Public Resource Code (Chapter 1492, Statutes of 1982, Senate Bill 297), and SB 447 (Chapter 44, Statutes of 1987) will be followed. Pursuant to PRC, Section 7050.5, in the event of the discovery of recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which human remains are discovered has determined the remains are archaeological. If the coroner determines that the remains are not subject to his or her authority, and if he or she recognizes the human remains to be those of a Native American, he or she shall contact, by telephone within 24 hours, the NAHC. In addition, prior to implementation of any projects that are consistent with the LMP, DFG would subject them to CEQA review in light of the information in this document. The type of additional CEQA review completed would be determined based on CEQA Guidelines Sections 15162-15164 and follow the recommendations described in Cultural Resources Technical Report for the Napa Sonoma Marsh Wildlife Area Land Management Plan.

VI. GEOLOGY AND SOILS

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:			X	
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Pub. 42.			X	
ii. Strong seismic ground shaking?			X	
iii. Seismic-related ground failure, including liquefaction?			X	
iv. Landslides?			X	
b. Result in substantial soil erosion or the loss of topsoil?			X	
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?			X	
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?			X	
e. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				X

DISCUSSION

a), b), c), d), Less-Than-Significant Impact. The project area is likely to undergo strong ground shaking from a major earthquake in the Bay Area within the next 30 years (U.S. Geological Survey 1999). Seismic events are also likely to occur during the timeframe of the proposed LMP. Implementation of the LMP would repair old levees and water control structures, and therefore increase the levees' ability to withstand the effects of a major earthquake in the Bay Area. Any new structures would be designed and constructed according to the applicable building code for seismic integrity within this region. The Wildlife Area is on unconsolidated sediments, which are known to amplify and prolong seismic ground shaking, but with ongoing maintenance and upgrades to levees and water control structures and the construction of new structures following the appropriate building code, this impact would be less than significant.

Implementation of some of the management tasks described in the proposed LMP would involve ground disturbance (e.g., maintenance activities, restoration or enhancement activities), but these activities would be implemented using Best Management Practices to minimize soil erosion and/or topsoil loss, and would be conducted in conformance with regulatory requirements under the National Pollutant Discharge Elimination System (33 United States Code 1342) and Section 401 of the Clean Water Act.

e) No Impact. No construction of septic tanks or alternative waste water disposal systems are proposed as part of the LMP nor would any be required as a result of the implementation of any of the LMP goals or tasks; therefore, implementation of the LMP would result in no impact.

VII. HAZARDS AND HAZARDOUS MATERIALS

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?			X	
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			X	
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.				X
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?			X	
f. For a project located within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h. Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?			X	

DISCUSSION

a), b) Less-Than-Significant Impact. Land uses surrounding the NSMWA and previous land uses that occurred within the NSMWA may present potential sources of hazardous materials to the NSMWA. Pesticides from agricultural runoff and those associated with former mosquito abatement activities may affect the area. Cattle grazing, animal husbandry activities, and

agricultural runoff may contribute coliform bacteria, ammonia, nitrate, and phosphorus. Miscellaneous industrial and airport activities on the surrounding lands likely involve the use of hazardous substances and have the potential for environmental contamination due to chemical spills, discharges, and/or leaking storage tanks.

The potential for an accidental release of hazardous materials into the environment would be minimized through the implementation of the LMP. The tasks described to prevent the accidental release of unknown hazardous materials potentially contained within soils would result in the protection of the general public and any workers in an area of excavation activities. Additionally, the use of pesticides would follow a protocol developed by DFG, which would result in the protection of the general public from a hazardous materials release.

Implementation of some of the tasks described in the proposed LMP could involve transporting and using hazardous materials such as fuels. Hazardous materials transport is regulated by numerous federal, state, and local laws and regulations that stipulate minimum standards for transportation requirements, spill prevention procedures, emergency response and contingency plans, risk management, and employee training procedures. All work to occur in the NSMWA would occur under compliance with applicable laws and regulations pertaining to worker safety and health. In the event that a fuel or oil spill was to occur during the transport of this material or during a construction period, these materials would not pose a significant hazard to the public due to these safety guards.

c), d), f), g) No Impact. Implementation of the LMP would not emit hazardous emissions or require handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. The proposed project is not located on a site that is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5. The Wildlife Area is not in the vicinity of a private airstrip. Implementation of the LMP would not interfere with an adopted emergency response plan or emergency evacuation plan.

e) Less-Than-Significant Impact. The Southern Crossing Unit and the eastern portion of the Huichica Creek Unit are located within two miles of the Napa County Airport and overlap with Napa County Airport Land Use Compatibility Plan zones. Adoption of the LMP would not lead to large scale changes in bird habitat. Currently, perennial and seasonal wetlands as well as adjacent uplands are distributed throughout the Wildlife Area and have provided valuable habitats for numerous bird species. With the implementation of the proposed LMP, specific projects would be developed and implemented that would be consistent and compatible with the applicable Napa County Airport Land Use Compatibility Plan zones and FAA advisory guidelines related to bird-strike hazards. By developing and implementing projects under the LMP that would be consistent with these airport planning tools, implementation of the proposed LMP would not result in a safety hazard for people residing or working in the project area. Thus, this would be a less than significant impact.

h) Less-Than-Significant Impact. Prescribed burn is suggested in the LMP as one of the components for invasive species control through integrated pest management and may expose people or structure to wildland fires. No specific prescribed burn project has been identified in the proposed LMP. As described in the LMP, DFG would implement a plan to integrate pest management, which in part would result in protocol for implementing prescribed burns. This plan would be developed in conjunction with the applicable fire agency. Development of a protocol for conducting prescribed burns would result in burns that would minimize risk and hazards, especially in areas that would expose people or structures to a significant risk of loss, injury, or death. Additionally, such a plan that would be consistent with the LMP, would be subject to

CEQA review in light of the information in this document. The type of additional CEQA review completed would be determined based on CEQA Guidelines Sections 15162-15164. Therefore, this would be a less than significant impact.

VIII. HYDROLOGY AND WATER QUALITY

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Violate any water quality standards or waste discharge requirements?			X	
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off-site?			X	
d. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off-site?			X	
e. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?			X	
f. Otherwise substantially degrade water quality?				X
g. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h. Place within a 100-year flood hazard area structures which would impede or redirect flood flows?				X
i. Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?			X	
j. Inundation by seiche, tsunami, or mudflow?				X

DISCUSSION

a), c), d), e), i) Less-Than-Significant Impact. Implementation of some of the management

tasks described in the proposed LMP (e.g. restoration or enhancement activities) would involve a potential for the discharge of sediments or pollutants and alteration of drainage patterns. These project activities would be implemented using Best Management Practices to minimize soil erosion and/or topsoil loss, and would be conducted in conformance with regulatory requirements under the National Pollutant Discharge Elimination System (33 United States Code 1342) and Section 401 of the Clean Water Act. Additionally, these projects would be implemented with a goal of a net improvement in water quality. Also, management tasks call for the repair of old levees and water control structures, and therefore restoration and maintenance of flood protection.

Additionally, during the design phase of any potential projects, DFG would be required to coordinate with local flood control agencies regarding the design and operation of restoration and enhancement projects that have the potential to conflict with necessary flood flow conveyance requirements.

b), g), h), j) No impact. Adoption of the proposed LMP would not substantially deplete groundwater supplies or interfere with groundwater recharge such that a net deficit in aquifer volume or a lowering of the local groundwater table would occur. Adoption of the proposed LMP would not place housing within a 100-year Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, place structures which would impede or redirect flood flows within a 100-year flood hazard area, or alter existing risks of seiche, tsunami, or mudflow.

f) No Impact. The proposed LMP supports habitat restoration and enhancement of natural communities (e.g., seasonal and permanent wetlands, riparian woodlands, and grasslands). Restoration of natural communities and associated physical, chemical, and biological processes generally has beneficial effects on water quality. One water quality variable of concern associated with restoration of wetlands, however, is mercury (Hg).

Mercury contamination is widespread in sediments and waters of the San Francisco Bay area (San Francisco Estuary Institute 2000, San Francisco Bay RWQCB 2000). Mercury is a constituent of particular concern to wetland restoration projects because of its ability to convert to the methylated form of the metal, which is relatively more mobile in aquatic environments than other forms. As explained in more detail below, the sulfate reducing bacteria typically associated with marsh sediments methylate mercury as part of their respiration process, making it more bioavailable to aquatic life.

Long-term RMP monitoring data for total mercury in water and sediment has consistently shown elevated concentrations, primarily in the North and South Bay areas and river tributaries. There is also a strong correlation between total mercury and suspended sediment transport in the water (San Francisco Estuary Institute 2002). Elevated mercury levels are in large part a legacy of the California gold mining era, when mercury was used in the gold refining process. Mines such as South San Francisco Bay's New Almaden Mine are known to be a source of mercury in the South Bay. Mercury can be delivered to the San Pablo Bay system via the Delta.

In aquatic environments, most mercury is chemically bound to suspended particles of soil or sediment; a smaller fraction is bound to dissolved organic carbon. Sediment-bound mercury may be available to aquatic organisms and is thus a pollutant of concern; the potential for adverse environmental effects from sediment-bound mercury depends primarily on transport and depositional characteristics (e.g., particle size) and on the physical and chemical properties of the sediment.

Additionally, sediment-bound mercury may be converted through both biotic and abiotic processes to its more bioavailable methylated form. Factors conducive to methylation of mercury include low-flow or stagnant waters, hypoxic or anoxic conditions in the water or sediment column, low pH (pH<6), and high concentrations of dissolved carbon. Most of these factors are in turn affected by biological processes such as metabolism, growth, and decay. Therefore, upland sediments containing sediment bound mercury can become a source of methyl mercury when exposed to tidal action.

The LMP describes a goal of minimizing ecological risks and minimizing the mobilization of contaminants present in sediments. Implementation of management tasks associated with the LMP would not increase the environment in which mercury can become methylated. Therefore, the impacts to water quality from the implementation of the proposed LMP would result be less than significant.

IX. LAND USE AND PLANNING

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Physically divide an established community?				X
b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.			X	
c. Conflict with any applicable habitat conservation plan or natural community conservation plan?				X

DISCUSSION

a), c) No Impact. The proposed LMP would not require any physical changes to an established community, nor would implementation of any activity following adoption of the LMP physically divide an established community. The goals of the LMP provide for natural resource protection and preservation and require that any projects implemented following adoption of the proposed LMP conform to any habitat conservation plans and natural community conservation plans that may be applicable at that time.

b) Less-Than-Significant Impact. Sonoma, Napa, and Solano counties have designated the project area as Land, Extensive Agriculture, Agriculture, Watershed, Open Space and Airport Compatibility Overlay District. Implementation of the proposed LMP would be consistent with these land use designations. The Southern Crossing Unit and the eastern portion of the Huichica Creek Unit are located within two miles of the Napa County Airport and overlap with Napa County Airport Land Use Compatibility Plan zones. With the implementation of the proposed LMP, specific projects would be developed and implemented that would be consistent and compatible with the applicable Napa County Airport Land Use Compatibility Plan zones. By developing and implementing projects under the LMP that would be consistent with this airport-specific plan overlay, implementation of the proposed LMP would not conflict with any applicable land use plan. Thus, this would be a less-than-significant impact.

X. MINERAL RESOURCES

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?				X

DISCUSSION

a), b) No Impact. Implementation of the LMP would not result in resource extraction. According to the U.S. Geological Survey Mineral Resources Data System (2005), there are no known mineral resources located within the Wildlife Area except for salt at the Napa Plant Site. A separate Environmental Impact Report has been prepared for the Napa Plant Site Restoration Project, and the analysis contained in this Initial Study does not include any impacts that would occur at the Napa Plant Site, therefore the proposed LMP would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or conflict with mineral resource protection plans or result in the loss of a known mineral resource. There would be no impact.

XI. NOISE

Would the project result in:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X	
b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?			X	
c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?			X	
f. For a project located within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

DISCUSSION

a), b), c), d), e) Less-Than-Significant Impact. Although implementation of some of the management tasks described in the proposed LMP could involve the use of construction equipment (e.g., maintenance, and restoration or enhancement activities) thus temporarily increasing ambient noise, these activities would be short-term and temporary and would not be anticipated to result in a substantial increase in ambient noise levels generated by existing hunting activities within the Wildlife Area and airport activities northeast of the Wildlife Area.

f) No Impact. The Napa-Sonoma Marshes Wildlife Area is not located within the vicinity of a private airstrip. Additionally, the proposed LMP would not result in the development of any noise-sensitive receptors, nor would the LMP result in the exposure of people residing or working in the Wildlife Area to excessive noise levels. No impact is anticipated to occur.

XII. POPULATION AND HOUSING

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
b. Displace substantial amounts of existing housing, necessitating the construction of replacement housing elsewhere?				X
c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

DISCUSSION

a), b), c). No Impact. The proposed LMP would not involve any change in housing nor would it induce growth by the provision of new infrastructure or by the removal of any barriers to growth. Implementation of some of the management goals and tasks may require additional staff hours, but this would not be anticipated to induce a population growth that would require additional housing.

XIII. PUBLIC SERVICES

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:	**Potentially Significant Impact**	**Less Than Significant With Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a. Fire Protection?			X	
b. Police Protection?			X	
c. Schools?			X	
d. Parks?			X	
e. Other public facilities?			X	

DISCUSSION

a), b), c), d), e) Less-Than-Significant Impact. Adoption of the proposed LMP would not require substantial changes to existing levels of public services. Implementation of public use and facilities goals could require a minimal increase in staff hours per year by the fire department, the County Sheriff's department, and DFG staff, but these potential minimal increases would not be anticipated to create the need for new or altered facilities.

XIV. RECREATION

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated?			X	
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?			X	

DISCUSSION

a), b) Less-Than-Significant Impact. Adoption and implementation of the proposed LMP would not significantly increase the levels of wildlife-dependent recreational use of the Wildlife Area. The number of these recreational users would not exceed the carrying capacity of the natural resources or degrade existing natural features or recreational facilities.

XV. TRANSPORTATION/TRAFFIC

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?			X	
b. Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?			X	
c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?			X	
d. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?			X	
e. Result in inadequate emergency access?			X	
f. Result in inadequate parking capacity?			X	
g. Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				X

DISCUSSION

a), b), c), d), e), f) Less-Than-Significant Impact. Implementation of the proposed LMP could provide additional access points for angling and improve access for other recreational uses (e.g. improve footpaths and trails). The level of use at the Wildlife Area may increase, but no significant change is anticipated. Therefore, no significant changes are anticipated to automobile, boat, or air traffic levels, emergency access, and parking capacity. The proposed LMP supports public access designs that minimize maintenance and policing.

g) No Impact. Adoption of the LMP would not conflict with adopted policies, plans, or programs supporting alternative transportation.

XVI. UTILITIES AND SERVICE SYSTEMS

Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?			X	
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?			X	
c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?			X	
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?			X	
e. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?			X	
f. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?			X	
g. Comply with federal, state, and local statutes and regulations related to solid waste?			X	

DISCUSSION

a), b), c), d), e), f), g) Less-Than-Significant Impact. The LMP does not include a proposal for additional storm drain facilities, additional water supplies, additional wastewater treatment, or additional solid waste disposal. Existing wastewater treatment systems are currently adequate for public use and department facilities. Adoption of the proposed LMP and implementation of the goals and tasks contained therein would not require the construction of new residences or service-related facilities; therefore, adoption of the proposed LMP would generate no changes to storm drain facilities, additional water supplies, or additional wastewater treatment. Implementation of the LMP would require additional trash receptacles at strategic locations, but mainly to address the current littering issues in the Wildlife Area. Therefore, these impacts would be less than significant.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or wildlife community, reduce the number or restrict the range of an endangered, rare or threatened plant or wildlife, or eliminate important examples of the major periods of California history or prehistory?			X	
b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?			X	
c. Does the project have environmental effects which would cause substantial adverse effects on human beings, either directly or indirectly?			X	

Authority: Public Resources Code Sections 21083 and 21087.
Reference: Public Resources Code Sections 21080(c), 21080.1, 21080.3, 21082.1, 21083, 21083.3, 21093, 21094, 21151; *Sundstrom v. County of Mendocino*, 202 Cal.App.3d 296 (1988); *Leonoff v. Monterey Board of Supervisors*, 222 Cal.App.3d 1337 (1990).

DISCUSSION

a). Less-than-Significant Impact. Adoption of the proposed LMP and implementation of the goals and tasks contained therein would help preserve and enhance natural resources. Some activities that could be implemented as a result of adoption of the proposed LMP would have a potential for impacts to biological and cultural resources (e.g., restoration or enhancement activities), as described in Sections IV and V above. However, because activities would be conducted following all applicable regulatory requirements, because many of the goals and tasks are designed to have a net benefit to these resources, and because no large scale projects are anticipated which could threaten entire populations or communities, adoption of the proposed LMP would not be anticipated to cause a significant impact to these biological or cultural resources. In addition, prior to implementation of any projects that are consistent with the LMP, DFG would subject them to CEQA review in light of the information in this document. The type of additional CEQA review completed would be determined based on CEQA Guidelines Sections 15162-15164.

b) Less-Than-Significant Impact. Adoption of the proposed LMP and implementation of the goals and tasks contained therein would not require any substantial infrastructure improvements or new construction, and any implementation activities would be conducted following all

applicable regulatory requirements. In addition, most of the proposed goals and tasks are encourage a net benefit to environmental conditions. Therefore, although there is a potential for some temporary and less than significant impacts to the environment as described above, none of these impacts are anticipated to be cumulatively considerable. In addition, prior to implementation of any projects that are consistent with the LMP, DFG would subject them to CEQA review in light of the information in this document. The type of additional CEQA review completed would be determined based on CEQA Guidelines Sections 15162-15164.

c) Less-than-Significant Impact. The proposed project is an LMP, with no construction or substantive physical changes proposed. Implementation of the LMP would comply with all applicable laws and regulations. As a result, adoption of the proposed LMP and implementation of the goals and tasks contained therein is not anticipated to have any direct or indirect environmental effects which would cause substantial adverse effects on human beings.

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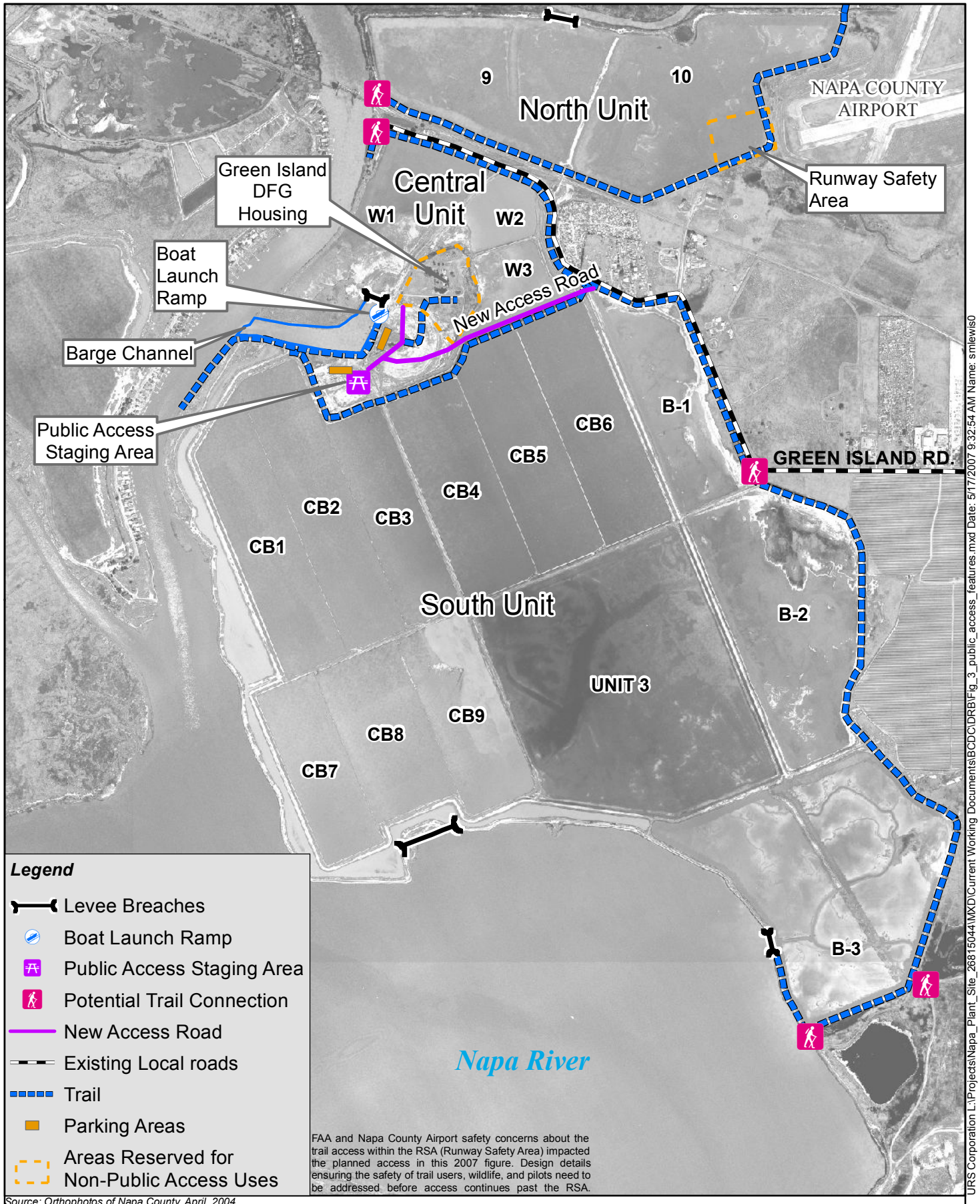
Appendix E
Proposed Public Access for Napa Plant Site


9
10
North Unit
NAPA COUNTY AIRPORT
Green Island DFG Housing
Central Unit
W1
W2
W3
Runway Safety Area
Boat Launch Ramp
New Access Road
Barge Channel
Public Access Staging Area
B-1
CB6
CB5
GREEN ISLAND RD.
CB4
CB2
CB3
CB1
South Unit
B-2
UNIT 3
CB9
CB8
CB7
B-3
Napa River
Legend
Levee Breaches
Boat Launch Ramp
Public Access Staging Area
Potential Trail Connection
New Access Road
Existing Local roads
Trail
Parking Areas
Areas Reserved for Non-Public Access Uses
FAA and Napa County Airport safety concerns about the trail access within the RSA (Runway Safety Area) impacted the planned access in this 2007 figure. Design details ensuring the safety of trail users, wildlife, and pilots need to be addressed before access continues past the RSA.
Source: Orthophotos of Napa County, April, 2004
0 500 1,000 2,000 Feet
N
W
E
S
URS
Napa Plant Site Restoration Project
26815044
Public Access Features (July 12, 2007)
Figure 3
URS Corporation L:\Projects\Napa_Plant_Site_26815044\MXD\Current Working Documents\BCDC\DRB\Fig_3_public_access_features.mxd Date: 5/17/2007 9:32:54 AM Name: smlewis0

APPENDIX F

DFG Response to Public Comments

Napa Sonoma Marshes Wildlife Area

Land Management Plan

DEPARTMENT OF TRANSPORTATION
DIVISION OF AERONAUTICS – M.S.#40
1120 N STREET
P. O. BOX 942874
SACRAMENTO, CA 94274-0001
PHONE (916) 654-4959
FAX (916) 653-9531
TTY 711

Flex your power!
Be energy efficient!

Fish & Game

SEP 15 2010

Yountville

September 8, 2010

Ms. Karen Taylor
Department of Fish and Game
P.O. Box 47
Yountville, CA 94599

Dear Ms. Taylor:

Re: Negative Declaration for the Napa Sonoma Marshes Land Management Plan; SCH# 2010082042

The California Department of Transportation (Caltrans), Division of Aeronautics (Division), reviewed the above-referenced document with respect to airport-related noise and safety impacts and regional aviation land use planning issues pursuant to the California Environmental Quality Act (CEQA). The Division has technical expertise in the areas of airport operations safety and airport land use compatibility. We are a funding agency for airport projects and we have permit authority for public-use and special-use airports and heliports.

The proposal is for the Land Management Plan (LMP) for the Napa-Sonoma Marshes Wildlife Area. According to the Negative Declaration, the LMP will:

- Guide the adaptive management of habitats, species, and programs described herein by achieving the Department's (Fish and Game) mission of protecting and enhancing fish, wildlife, and native plants values.
- Serve as a guide for appropriate public uses of the property.
- Serve as a descriptive inventory of fish, wildlife and native plant habitats which occur on or use this property, and to outline appropriate public uses of these resources.
- Provide an overview of the area's operation and maintenance, and personnel requirements to implement management goals and objectives. This plan serves as a budget planning aid for annual budget preparation.
- Complete environmental impacts and subsequent mitigation which may occur during management. This plan contains environmental documentation to comply with State and federal statutes and regulations.

The Napa-Sonoma Marshes Wildlife Area is located in the vicinity of Napa County Airport.

Land use practices that attract or sustain hazardous wildlife populations on or near airports can significantly increase the potential for wildlife-aircraft collisions. Wildlife habitat management and other land use strategies on and near airports are fundamental to reducing wildlife use of airports. The Federal Aviation Administration (FAA) recommends that landfills, wastewater treatment facilities, surface mining, wetlands and other uses that have the potential to attract wildlife, be restricted in the vicinity of an airport. FAA Advisory Circular 150/5200-33B entitled "Hazardous Wildlife Attractants on or Near Airports" addresses these issues. For further information, please refer to the FAA website http://wildlife-

mitigation.tc.faa.gov/. For additional information concerning wildlife damage management, you may wish to contact the United States Department of Agriculture, Wildlife Services, at (916) 979-2675.

The applicant should coordinate closely with Napa County Airport staff to monitor wildlife activity and to ensure compatibility with future as well as existing airport operations. The LMP should include this coordination as a mitigation measure.

The protection of airports from incompatible land use encroachment is vital to California's economic future. Napa County Airport is an economic asset that should be protected through effective airport land use compatibility planning and awareness. Although the need for compatible and safe land uses near airports is both a local and State issue, airport staff, airport land use commissions (ALUC), and airport land use compatibility plans are key to protecting an airport and the people residing and working in the vicinity of an airport. Consideration given to the issue of compatible land uses in the vicinity of an airport should help to relieve future conflicts between airports and their neighbors.

These comments reflect the areas of concern to the Division with respect to airport-related noise, safety, and regional land use planning issues. We advise you to contact our District 4 office concerning surface transportation issues.

Thank you for the opportunity to review and comment on this proposal. If you have any questions, please call me at (916) 654-5314 or by email at sandy.hesnard@dot.ca.gov.

Sincerely,

Sandy Hesnard

SANDY HESNARD
Aviation Environmental Specialist

c: State Clearinghouse, Napa County Airport, Napa County ALUC, FAA, USDA-Wildlife Services

The Department's response to the California Department of Transportation (CalTrans) concerns:

To address bird strike issues, the Department of Fish and Game coordinated with the Federal Aviation Administration (FAA), Caltrans Aeronautics and Napa County Airport to incorporate measures into the design of the Napa Plant Site Restoration project that twill reduce the potential for attracting birds with High Relative Hazard Scores (RHS's). The Department will consider bird strike hazards when implementing future restoration within the 10,000 foot buffer of the Napa County Airport.

Please refer to page 4-3 in the Final Napa Sonoma Marshes Wildlife Area Land Management Plan as well.