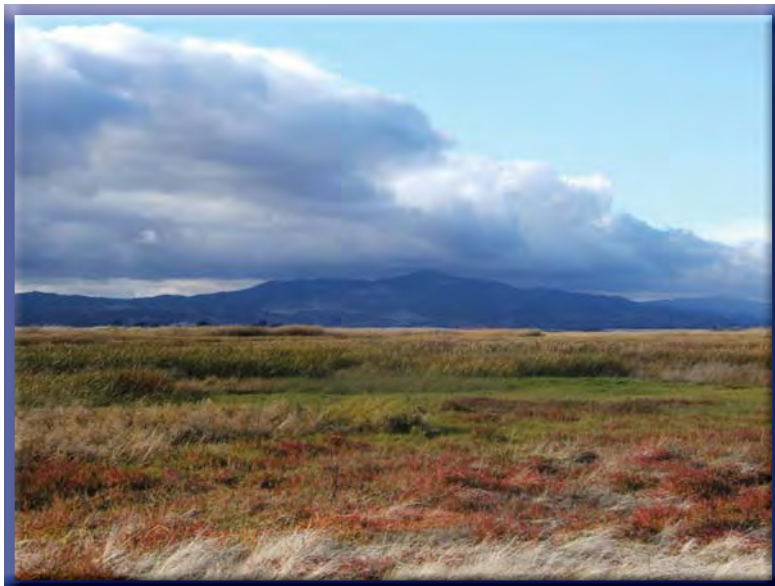


San Francisco Bay National Estuarine Research Reserve Management Plan 2011-2016

December 2010



China Camp



Rush Ranch

San Francisco Bay National Estuarine Research Reserve Management Plan 2011–2016

December 2010

This management plan has been developed in accordance with National Oceanic and Atmospheric Administration regulations, including all provisions for public involvement. It is consistent with the congressional intent of Section 315 of the Coastal Zone Management Act of 1972, as amended, and the provisions of California's Coastal Management Program.

Prepared by:

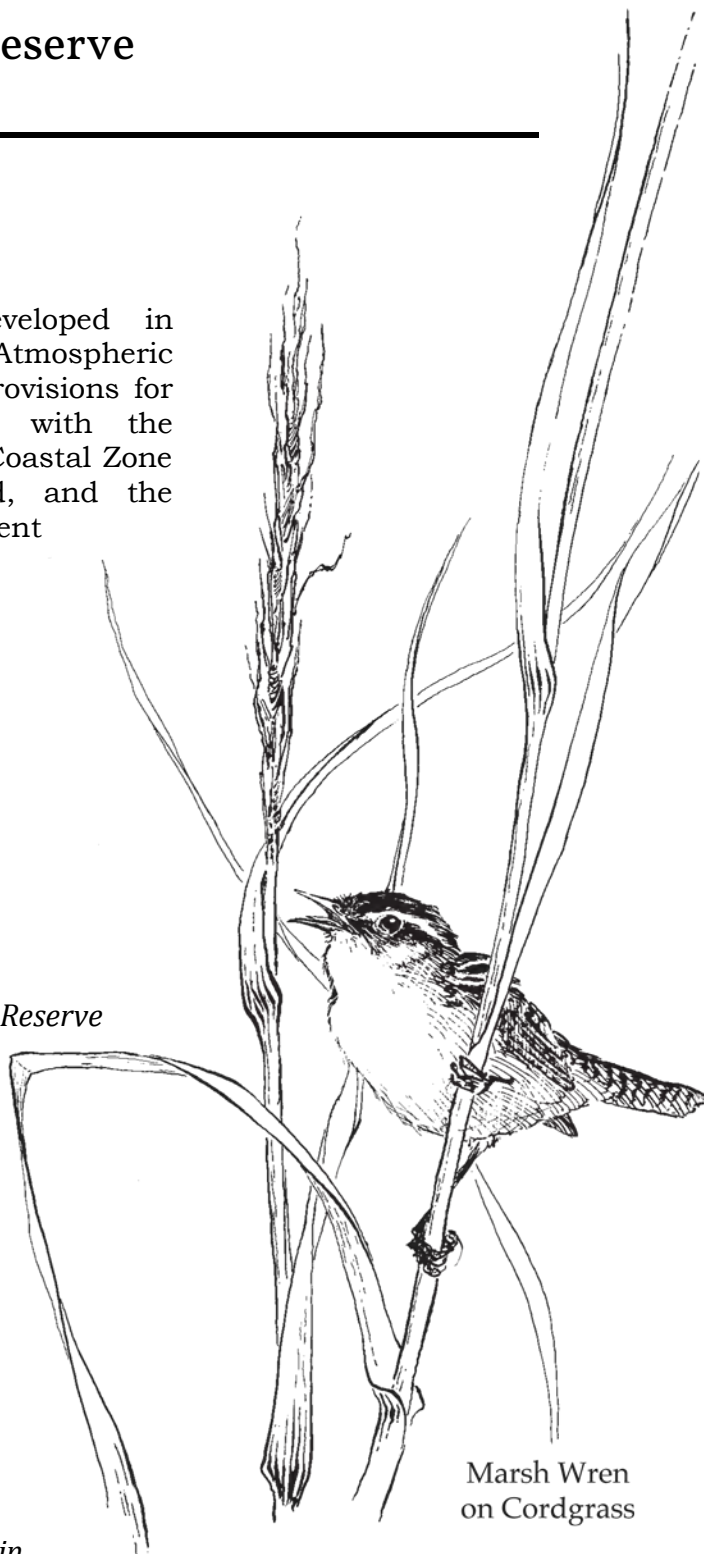


Contact Information:

*San Francisco Bay National Estuarine Research Reserve
San Francisco State University
3152 Paradise Drive
Tiburon, CA 94920
415-338-3703
Website: <http://sfbaynerr.org/>
Email: sfbaynerr@gmail.com*

Cover Photographs:

*China Camp State Park
Photograph courtesy of the San Francisco Bay
National Estuarine Research Reserve Staff
Rush Ranch Open Space Preserve
Photograph courtesy of Jessica Schneider Eckerlin*



Marsh Wren
on Cordgrass

∞ Mission Statement ∞

*The mission of the Reserve is
to improve understanding and stewardship of San Francisco Bay,
with a broader relevance to ecosystems beyond the Golden Gate.*

∞ Vision Statement ∞

*We envision vibrant estuaries cherished
by their communities throughout the nation.*



EXECUTIVE SUMMARY

The San Francisco Bay National Estuarine Research Reserve (SF Bay NERR or Reserve) is a partnership among National Oceanic and Atmospheric Administration (NOAA), San Francisco State University (lead state agency), California State Parks, Solano Land Trust, and the Bay Conservation and Development Commission, and it was established for long-term research, education and stewardship of San Francisco Bay. Two of the tidal wetlands left in the San Francisco Bay estuary are protected as part of the SF Bay NERR: China Camp State Park in Marin County and Rush Ranch Open Space Preserve in Solano County. SF Bay NERR (<http://sfbaynerr.org/>) is part of a network of 28 research reserves nationwide (<http://www.nerrs.noaa.gov/>).

The Management Plan provides focus and guidance for SF Bay NERR's activities over the next five years. The Reserve is a non-regulatory partnership-based program with the flexibility to work at local, regional, state, and national scales. To comprehensively address coastal management needs of the Bay area, the Reserve's program activities include:

- ◆ Guiding and coordinating research within the Reserve sites;
- ◆ Conducting long-term monitoring of water quality, weather, and biological systems;
- ◆ Fostering stewardship activities to enhance the Reserve sites;
- ◆ Offering education programs for science teachers and the public;
- ◆ Providing training for coastal decision makers;
- ◆ Identifying and addressing coastal management needs; and
- ◆ Serving as a bridge to federal resources.

Although many major issues affect Northern California's estuaries and San Francisco Bay in particular, the Management Plan focuses programmatic efforts on four critical issues that affect the Reserve's ability to conserve ecological communities in support of the Bay's growing population: (1) climate change, (2) species interactions, (3) water quality and (4) habitat restoration. Broadly, the goals for each of these issues areas include increasing knowledge, understanding effects, and improving the ability of partners and stakeholders to respond to these issues. These issues, detailed in Section 3, are briefly described here:

CLIMATE CHANGE: Reserve staff will work closely with partners to develop and implement protection, management, and restoration strategies that proactively accommodate the predicted effects of climate change within the Reserve sites and on the Bay and surrounding communities. This includes working together to promote Rush Ranch and China Camp on both regional and national scales as "sentinel sites"—areas that are used for long-term monitoring of environmental conditions (e.g., geodetic elevation, marsh surface elevation, sediment dynamics, water levels, and vegetation conditions), so as to measure changes to ecosystem composition, structure, and function in response to environmental stressors such as sea level rise.

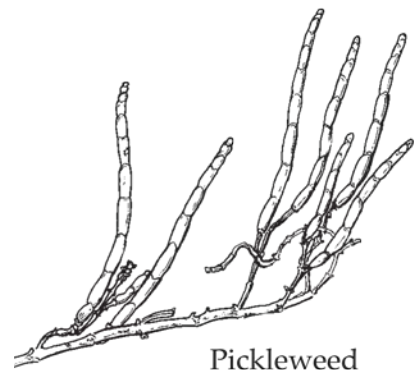
SPECIES INTERACTIONS: Interactions among species, within species, and between species and their environments are of central importance to the structure and

function of estuaries and coastal habitats. Species interactions influence numerous ecological processes including production and consumption, nutrient cycling, and habitat change. SF Bay NERR coordinates research to understand the dynamics of species interactions; educates coastal decision makers, the public, and science teachers about those interactions; and provides tools to help land managers and local governments support species diversity and ecosystem functions.

WATER QUALITY: Accurate, high-frequency, long-term monitoring is essential to detecting and understanding subtle changes in water quality within the estuary. Following protocols established by the National Estuarine Research Reserve System-Wide Monitoring Program, the Reserve maintains a network of water quality monitoring stations within and adjacent to the Reserve sites. These monitoring data, coupled with nutrient, contaminant, and flow studies conducted within the Reserve, can be used by scientists, educators, managers, and commercial and recreational users of the Bay.

HABITAT RESTORATION: The tidal marsh habitats within China Camp and Rush Ranch are used as reference sites to compare 'natural' areas to those that have been restored. SF Bay NERR encourages basic research on remnant habitats, supports applied restoration research, and actively facilitates education about best practices of restoration. Reserve stewardship activities, such as invasive weed control, likewise support habitat restoration.

This Plan has an introductory section that outlines the purpose and scope of the Plan, including the mission and vision of the Reserve, environmental context of China Camp and Rush Ranch (with maps), and standard introductory text about the national Reserve System. Section 2 provides an overview of each of the major programs of the Reserve, including past accomplishments and future directions for research, education, and stewardship. Section 3 details the issue areas, along with the goals, objectives and actions for accomplishing them. Section 4 describes the present boundaries of the Reserve, and the core and buffer areas, then outlines the plan for potential land acquisition and boundary expansion. Section 5 outlines the administrative framework. Section 6 relates information on public access at the Reserve. The Plan concludes with references and appendices that include regulations, various memoranda of understanding, species lists, the resource protection plan, and a description of the management plan process that includes a table of all comments received on the plan and the response to them.



Pickleweed

TABLE OF CONTENTS

Executive Summary	Exec-i
Table of Contents	TOC-i
List of Figures	TOC-iii
List of Plates	TOC-iii
List of Appendices	TOC-iv
Acronyms and Abbreviations.....	TOC-v
Acknowledgments.....	Ack-i
References.....	Ref-1
1 Introduction	1-1
1.1 Purpose and Scope	1-1
1.2 Purpose of the SF Bay NERR	1-3
1.2.1 SF Bay nerr Mission Statement.....	1-3
1.2.2 sf bay nerr Vision Statement	1-3
1.3 The National Estuarine Research Reserve System	1-3
1.3.1 NERRS Mission.....	1-3
1.3.2 NERRS Goals.....	1-3
1.4 Reserve Context.....	1-7
1.4.1 Environmental Setting of the Reserve	1-7
2 Programmatic Descriptions	2-1
2.1 Research and Monitoring Plans	2-2
2.1.1 National Research and Monitoring Plan [§921.50].....	2-2
2.1.2 SF Bay NERR Research and Monitoring Program.....	2-5
2.2 Education Program Plan	2-10
2.2.1 National Education Plan [§921.13(a)(4)]	2-10
2.2.2 SF Bay NERR Education Programs.....	2-11
2.3 Coastal Training Program Plan	2-18
2.3.1 National Coastal Training Program Plan.....	2-18
2.3.2 SF Bay NERR Coastal Training Program.....	2-19
2.4 Stewardship Program Plan.....	2-23
2.4.1 National Stewardship Plan.....	2-23
2.4.2 Science-Based Restoration and Management	2-24

2.4.3	Master Planning.....	2-26
2.4.4	Invasive Species.....	2-26
2.4.5	Managing Visitor Use.....	2-27
2.4.6	Geographic Information Systems and Habitat Mapping.....	2-27
2.4.7	Stewardship Needs.....	2-28
2.4.8	General Use Policies and Authorities.....	2-28
3	Issue Areas and Strategic Actions.....	3-1
3.1	Climate Change.....	3-1
3.1.1	Cross-sector Project.....	3-1
3.2	Species Interactions.....	3-5
3.2.1	Cross-sector Project.....	3-5
3.3	Water Quality.....	3-8
3.3.1	Cross-sector Project.....	3-9
3.4	Habitat Restoration.....	3-11
3.5	Cross-sector Project.....	3-12
4	Land Acquisition and Boundary Expansion Plan.....	4-1
4.1	Rush Ranch Open Space Preserve.....	4-2
4.2	China Camp State Park.....	4-2
4.3	Browns Island Regional Shoreline.....	4-3
4.4	Richardson Bay Audubon Center and Sanctuary.....	4-5
5	Administration Plan.....	5-1
5.1	Overview of Administrative Framework.....	5-1
5.2	Management Advisory Boards.....	5-2
5.2.1	SF Bay NERR Management Advisory Board.....	5-2
5.2.2	Coastal Training Program Advisory Committee.....	5-2
5.2.3	Education Advisory Committee.....	5-3
5.2.4	Research Advisory Committee.....	5-4
5.3	Memoranda of Understanding.....	5-4
5.4	Annual Work Plan.....	5-5
5.5	Financial Management Plan.....	5-5
5.6	Facilities Plan.....	5-6
5.6.1	San Francisco State University.....	5-6
5.6.2	Rush Ranch.....	5-9
5.6.3	China Camp.....	5-11
5.7	Staffing Plan.....	5-12
5.7.1	Current Staff Positions.....	5-12
5.7.2	Future Staff Positions.....	5-15

6 Public Access Plan	6-1
6.1 National Reserve System Priorities for Public Access.....	6-1
6.2 Rush Ranch.....	6-1
6.3 China Camp.....	6-2
6.4 SF Bay NERR Public Access Policy.....	6-4
6.5 Access Needs.....	6-4
6.6 Traditional Uses	6-5

LIST OF FIGURES

Figure 1 National Estuarine Research Reserve System	1-5
Figure 2 Organizational Chart	5-17

LIST OF PLATES

Plate 1 Water Quality/Nutrient Monitoring Stations, Weather Monitoring Stations.....	1-14
Plate 2 China Camp Land Cover Map	1-15
Plate 3 China Camp Ecological Communities Map	1-16
Plate 4 Rush Ranch Land Cover Map	1-17
Plate 5 Rush Ranch Ecological Communities Map.....	1-18
Plate 6 Browns Island.....	4-4
Plate 7 Richardson Bay Audubon Center and Sanctuary.....	4-6
Plate 8 China Camp Trail Map.....	6-6

LIST OF APPENDICES

Appendix A	National Estuarine Research Reserve System Regulations
Appendix B	Agreement Concerning Cooperative Management of the San Francisco Bay National Estuarine Research Reserve
Appendix C	Memorandum of Understanding between San Francisco State University and National Oceanic and Atmospheric Administration
Appendix D	Memorandum of Understanding between San Francisco Bay National Estuarine Research Reserve and Audubon California
Appendix E	Species Lists
Appendix F	San Francisco State University Letter of Commitment on Space
Appendix G	Resource Protection Plan
Appendix H	Management Plan Process
Appendix I	Bay Conservation and Development Commission Approval

ACRONYMS AND ABBREVIATIONS

BCDC	San Francisco Bay Conservation and Development Commission
California State Parks	California Department of Parks and Recreation
CDMO	Centralized Data Management Office
CFR	Code of Federal Regulations
CTP	Coastal Training Program
CZM	Coastal Zone Management
EAC	Education Advisory Committee
EC	Education Coordinator
EPA	Environmental Protection Agency
ERD	Estuarine Reserves Division
GIS	Geographic Information System
IT	Information Technology
KEEP	K-12 Estuarine Education Program
MOU	Memorandum of Understanding
NERR	National Estuarine Research Reserve
NERRS	National Estuarine Research Reserve System
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCRM	Office of Ocean and Coastal Resource Management
Plan	San Francisco Bay National Estuarine Research Reserve Management Plan
RC	Research Coordinator
RCD	Resource Conservation District
Reserve	San Francisco Bay National Estuarine Research Reserve
RTC	Romberg Tiburon Center
Sanctuary	Richardson Bay Audubon Center and Sanctuary
SF Bay NERR	San Francisco Bay National Estuarine Research Reserve
SF State	San Francisco State University
SRCD	Solano Resource Conservation District
SWMP	System-Wide Monitoring Program
SWRCB	State Water Resources Control Board
TOTE	Teachers on the Estuary
USFWS	U.S. Fish and Wildlife Service

ACKNOWLEDGMENTS

Staff of the San Francisco Bay National Estuarine Research Reserve, in collaboration with California State Parks, Solano Land Trust, and the Bay Conservation and Development Commission (Reserve signatory partners), produced this plan:

- ◆ Jaime Kooser, Reserve Manager
- ◆ Matthew Ferner, Research Coordinator
- ◆ Sarah Ferner, Education Coordinator
- ◆ Marina Psaros, Coastal Training Program Coordinator

We thank Reserve staff and Estuarine Reserves Division staff for their comments on the draft plan. Reserve staff comments were provided by: Caitlin Coleman-Hulbert (System-wide Monitoring Program Technician), Carrie Flanders (Administrative and Financial Coordinator), and Lara Martin (Monitoring Technician). Estuarine Reserves Division (ERD) staff includes Laurie McGilvray (Chief), Erica Seiden (Program Coordinator), Atziri Ibanez (Education Coordinator), Marie Bundy (Research Coordinator), Matt Chasse (Coastal Training Program Coordinator), Nina Garfield (Stewardship Coordinator) and Alison Krepp (Program Specialist for the California Reserves).

We are also grateful for the contributions of these reviewers:

- ◆ Nicole Byrd, Solano Land Trust
- ◆ Bree Hardcastle, California State Parks
- ◆ Joe LaClair, Bay Conservation and Development Commission
- ◆ Len Liu, PRBO Conservation Science
- ◆ Nadav Nur, PRBO Conservation Science
- ◆ Brad Olson, East Bay Regional Park District
- ◆ Melissa Pitkin, PRBO Conservation Science
- ◆ Danita Rodriguez, California State Parks
- ◆ Caitlin Sweeney, Bay Conservation and Development Commission
- ◆ Ben Wallace, Solano Land Trust
- ◆ Sue Wickham, Solano Land Trust
- ◆ Julian Wood, PRBO Conservation Science

Portions of this plan were adapted from *312 Evaluation Findings for the San Francisco Bay National Estuarine Research Reserve* (May 2008), *North Carolina National Estuarine Research Reserve Management Plan* (2009–2014), *Elkhorn Slough National Estuarine Research Reserve Management Plan* (2007–2011), *Padilla Bay National Estuarine Research Reserve Management Plan* (2008), and *South Slough National Estuarine Research Reserve Management Plan* (2006–2011). We relied on additional guidance provided by the ERD document *Guidelines for Management Plan Revisions* (December 2006).

The generous assistance of Betsy Blair, Rebecca Ellin, Terry Stevens and Becky Suarez is sincerely appreciated. We thank Grey Hayes, Coastal Training Program Coordinator (Elkhorn Slough National Estuarine Research Reserve), for his invaluable assistance facilitating the partner meetings. We thank Gerry Wheaton, Navigation Manager for

California (NOAA), for his steady assistance in our public process. We thank Timothy Doherty, Coastal Planner (Bay Conservation and Development Commission), for his excellent cartographic assistance. We deeply appreciate the generosity of John Muir “Jack” Laws in granting us permission to use his beautiful line drawings for our illustrations. We thank Stephen Edwards, Botanic Garden Director (Regional Parks Botanic Garden) for kind permission to reprint an article on the vascular plants of China Camp. We are grateful to Sylvia Cantu for her exceptional, expert desktop publishing.



Rat Rock at China Camp
~Lara Martin

1 INTRODUCTION

1.1 PURPOSE AND SCOPE

This Management Plan (Plan) explains the mission of the San Francisco Bay National Estuarine Research Reserve (referred to hereafter as SF Bay NERR or the Reserve); describes the setting of the Reserve; details the programs; defines the issues, goals, objectives, and actions for achieving the Reserve’s mission; and sets out the administrative framework of the Reserve.

This is the second SF Bay NERR Plan. The first was approved by the National Oceanic and Atmospheric Administration (NOAA) on August 27, 2003, as part of the Final Environmental Impact Statement prepared to support Reserve designation. It established the Reserve’s basic management structure and initial research, monitoring, education, and administrative programs.

Management Plans are updated every five years. This Plan is intended to:

- ◆ provide a vision and framework to guide Reserve activities during a five-year period;
- ◆ enable the Reserve and NOAA to track progress and realize opportunities for growth;
- ◆ present Reserve issue areas, goals, objectives and actions to constituents.
- ◆ guide program evaluations under Section 312 of the Coastal Zone Management Act; and
- ◆ enable the Reserve to acquire construction and land acquisition funds.

This plan was written cooperatively by the Reserve's Manager, Education Coordinator, Research Coordinator, and Coastal Training Program Coordinator in consultation with other Reserve staff, the Reserve’s partners, and NOAA.

Section 1 introduces readers to the SF Bay NERR and NOAA’s National Estuarine Research Reserve System, including the mission and vision of the Reserve, environmental context of China Camp and Rush Ranch (with maps), and standard introductory text about the national Reserve System.

Section 2 provides an overview of each of the major programs of the Reserve, including past accomplishments and future directions for research, education, and stewardship.

Section 3 delves into more depth on the goals, objectives, and actions that make up the road map the Reserve staff and partners expect to

follow over the next five years. Although many major issues affect Northern California's estuaries and San Francisco Bay in particular, this important section is focused around four critical issues that affect the Reserve's ability to conserve ecological communities in support of the Bay's growing population: (1) climate change, (2) species interactions, (3) water quality, and (4) habitat restoration. The Reserve staff chose to focus this detailed, action-oriented section of the plan around these issues areas, rather than individual research, education, and stewardship programs, because this more accurately reflects the integrated approach necessary to achieve the Reserve's mission.

Section 4 details the present boundaries of the Reserve, describes core and buffer areas, and outlines the plan for potential land acquisition and boundary expansion.

Section 5 serves as a road map for Reserve staff with a focus on administrative aspects of Reserve management.

Section 6 provides some additional introductory information about public uses of the Reserve sites, including descriptions of trails and picnic areas that may be of interest to visitors to the sites, and outlines the Reserve's general approach to public access.

The Plan concludes with references and appendices that include regulations, various memoranda of understanding, species lists, the Resource Protection Plan, and a description of the management plan process.

SF Bay NERR is justifiably proud of its accomplishments to date. During the Reserve's first federal program evaluation in August 2007, NOAA evaluators found that "the Reserve has made significant progress in operation and management since its designation in August 2003. Much of that progress is, by necessity, related to establishing and securing the Reserve's administrative framework, hiring staff members, and building partnerships—all the steps necessary to build the Reserve's "infrastructure" and move beyond the initial designation and organizational phases..." (NOAA, 2008). To build on this foundation, this Plan describes the goals and objectives for the Reserve and details a plan for full implementation of programs for research, education, coastal training, and stewardship.



This Plan is consistent with NOAA National Estuarine Research Reserve System regulations (15 CFR Part 921; Appendix A) in consideration of information derived from research and public input and with the Congressional intent of Section 315 of the Coastal Zone Management Act of 1972 (as amended).

1.2 PURPOSE OF THE SF BAY NERR

1.2.1 SF BAY NERR MISSION STATEMENT

The mission of the Reserve is to improve understanding and stewardship of San Francisco Bay, with a broader relevance to ecosystems beyond the Golden Gate.

1.2.2 SF BAY NERR VISION STATEMENT

We envision vibrant estuaries cherished by their communities throughout the nation.

1.3 THE NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

The National Estuarine Research Reserve System (NERRS) was created by the Coastal Zone Management Act of 1972, as amended, 16 U.S.C. Section 1461, to augment the Federal Coastal Zone Management (CZM) Program. The CZM Program is dedicated to comprehensive, sustainable management of the nation's coasts.

The Reserve System is a network of protected areas established to promote informed management of the Nation's estuaries and coastal habitats. The Reserve System currently consists of 28 reserves in 23 states and territories, protecting over one million acres of estuarine lands and waters.

1.3.1 NERRS MISSION

As stated in the NERRS regulations, 15 CFR Part 921.1(a), the National Estuarine Research Reserve System mission is:

- ◆ The establishment and management, through Federal-state cooperation, of a national system of Estuarine Research Reserves representative of the various regions and estuarine types in the United States. Estuarine Research Reserves are established to provide opportunities for long-term research, education, and interpretation.

1.3.2 NERRS GOALS

Federal regulations, 15 CFR Part 921.1(b), provide five specific goals for the Reserve System:

1. Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources.

2. Address coastal management issues identified as significant through coordinated estuarine research within the System.
3. Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation.
4. Promote federal, state, public, and private use of one or more Reserves within the System when such entities conduct estuarine research.
5. Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM STRATEGIC GOALS 2005–2010

The Reserve System began a strategic planning process in 1994 in an effort to help NOAA achieve its environmental stewardship mission to “sustain healthy coasts.” In conjunction with the strategic planning process, ERD and reserve staffs have conducted a multi-year, action planning process on an annual basis since 1996. The resulting three-year action plan provides an overall vision and direction for the Reserve System. As part of this process, the Reserve System developed a vision: Healthy estuaries and watersheds where coastal communities and ecosystems thrive; and mission: To practice and promote coastal and estuarine stewardship through innovative research and education using a system of protected areas. The following goals are outlined in the 2005–2010 Strategic Plan:

1. Strengthen the protection and management of representative estuarine ecosystems to advance estuarine conservation, research, and education.
2. Increase the use of reserve science and sites to address priority coastal management issues.
3. Enhance people’s ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

BIOGEOGRAPHIC REGIONS

NOAA has identified 11 distinct biogeographic regions and 29 subregions in the U.S., each of which contains several types of estuarine ecosystems (15 CFR Part 921, Appendices I and II). When complete, the Reserve System will contain examples of estuarine hydrologic and biological types characteristic of each biogeographic region. As of 2010, the Reserve System includes 28 reserves, listed below by biogeographic region and subregion with their designation date denoted in parentheses (Figure 1).

Figure 1 National Estuarine Research Reserve System



Acadian – Southern Gulf of Maine

- Wells Reserve, Maine (1984)
- Great Bay Reserve, New Hampshire (1989)

Virginian – Southern New England

- Waquoit Bay Reserve, Massachusetts (1988)
- Narragansett Bay Reserve, Rhode Island (1980)
- Hudson River Reserve, New York (1982)

Virginian – Middle Atlantic

- Jacques Cousteau Reserve, New Jersey (1998)
- Delaware Reserve (1993)

Virginian – Chesapeake Bay

- Chesapeake Bay Reserve, Maryland (1985, 1990)
- Chesapeake Bay Reserve, Virginia (1991)

Virginian & Carolinian – North Carolina

- North Carolina Reserve (1985, 1991)

Carolinian – South Atlantic

- North Inlet-Winyah Bay Reserve, South Carolina (1992)
- ACE Basin Reserve, South Carolina (1992)
- Sapelo Island, Georgia (1976)

Carolinian – East Florida

- Guana Tolomato Matanzas Reserve, Florida (1999)

West Indian – West Florida

- Rookery Bay Reserve, Florida (1978)

Louisianan – Panhandle Coast

- Apalachicola Reserve, Florida (1979)
- Weeks Bay Reserve, Alabama (1986)

Louisianan – Mississippi Delta

- Grand Bay Reserve, Mississippi (1999)

Louisianan – Western Gulf

- Mission-Aransas Reserve, Texas (2006)

Californian – Southern California

- Tijuana River Reserve, California (1982)

Californian – Central California

- Elkhorn Slough Reserve, California (1979)

Californian – San Francisco Bay

- San Francisco Bay, California (2003)

Columbian – Middle Pacific

- South Slough Reserve, Oregon (1974)

Columbian – Puget Sound

- Padilla Bay Reserve, Washington (1980)

Great Lakes – Lake Superior

- St. Louis River, Wisconsin (2010)

Great Lakes – Lake Erie

- Old Woman Creek, Ohio (1980)

Fjord – Aleutian Islands

- Kachemak Bay Reserve, Alaska (1999)

West Indian – Caribbean

- Jobs Bay Reserve, Puerto Rico (1981)

RESERVE DESIGNATION AND OPERATION

Under federal law (16 U.S.C. Section 1461), a state can nominate an estuarine ecosystem for Research Reserve status so long as the site meets the following conditions:

1. The area is representative of its biogeographic region, is suitable for long-term research, and contributes to the biogeographical and typological balance of the System.
2. The law of the coastal state provides long-term protection for the proposed Reserve's resources to ensure a stable environment for research.
3. Designation of the site as a Reserve will serve to enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation.
4. The coastal State has complied with the requirements of any regulations issued by the Secretary of Commerce.

Reserve boundaries must include an adequate portion of the key land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation.

If the proposed site is accepted into the Reserve System, it is eligible for NOAA financial assistance on a cost-share basis with the state. The state exercises administrative and management control, consistent with its obligations to NOAA, as outlined in a memorandum of understanding. A reserve may apply to NOAA's ERD for funds to help support operations, research, monitoring, education, stewardship, development projects, facility construction, and land acquisition.

NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM ADMINISTRATIVE FRAMEWORK

The Estuarine Reserves Division of the Office of Ocean and Coastal Resource Management (OCRM) administers the Reserve System. The Division establishes standards for designating and operating reserves, provides support for reserve operations and system-wide programming, undertakes projects that benefit the Reserve System, and integrates information from individual reserves to support decision-making at the national level. As required by federal regulation, 15 CFR Part 921.40, OCRM periodically evaluates reserves for compliance with federal requirements and with the individual reserve's federally-approved management plan.

The Estuarine Reserves Division currently provides support for three system-wide programs: the System-Wide Monitoring Program (SWMP), the Graduate Research Fellowship Program, and the Coastal Training Program (CTP). They also provide support for reserve initiatives on restoration science, invasive species, K-12 education, and reserve-specific research, monitoring, education, and resource stewardship initiatives and programs.

SF Bay NERR is managed as a federal-state partnership between OCRM and San Francisco State University (SF State) as the lead state agency. Signatory partners are the California Department of Parks and Recreation (California State Parks) for the China Camp site, the Solano Land Trust for the Rush Ranch site, and the Bay Conservation and Development Commission (BCDC), the Coastal Zone Management agency with jurisdiction for the nine counties of the San Francisco Bay area. Appendix B is the Agreement Concerning Cooperative Management of the SF Bay NERR by SF State, California State Parks, Solano Land Trust and BCDC; Appendix C is the Memorandum of Understanding between NOAA and SF State.

1.4 RESERVE CONTEXT

1.4.1 ENVIRONMENTAL SETTING OF THE RESERVE

SAN FRANCISCO BAY

San Francisco Bay (the “Bay” or “estuary”) is the largest estuary in California. The drainage basin of the estuary’s freshwater sources, the Sacramento and San Joaquin Rivers, encompasses approximately 1,600 square miles, drains more than 40% of the state (60,000 square miles and nearly half of the state’s total runoff), provides drinking water to millions of Californians (approximately two-thirds of the state’s population), and irrigates nearly 5 million acres of farmland. In the early 1800s, the Bay covered almost 700 square miles, and the Sacramento-San Joaquin River Delta was a network of 80 atoll-like islands, hundreds of miles of complex channels, and vast expanses of marsh. Nearly a million fish passed through the estuary each year, and 69 million acre-feet of water ran from mountain headwaters toward the sea. Since that time, more than one billion cubic yards of sediment, deposited from hydraulic mining practices, have plugged the rivers and the Bay. Nearly 750 square miles of tidal marsh have been filled, dams have been built that block runoff, and massive pumps and canals divert water headed towards the estuary to cities and farms around the state (San Francisco Estuary Project 2000). The estuary once supported 190,000 acres of highly productive tidal marsh, but now only 16,000 acres of this historic tidal marsh remain (Goals Project 1999).

SF Bay NERR consists of two of the highest quality remaining historic tidal marshes and adjacent habitats in the estuary occurring in two distinct Bay regions: Suisun Bay and Marsh (Rush Ranch) and San Pablo Bay (China Camp). As historic wetlands, these habitats have been largely protected from development and alteration and are highly utilized as reference sites against which enhanced, restored, or created wetlands are evaluated (Goals Project 1999, May 1999, Simenstad et al. 1999, Simenstad et al. 2000). The two Reserve sites bracket a substantial portion of the salinity gradient within the estuary from predominantly brackish marsh at Rush Ranch to the salt marsh of China Camp. Threatened, endangered, and rare species of plants and animals that occur within the Reserve boundaries include: soft bird’s beak, Suisun marsh aster, Suisun thistle, Delta tule pea, Olympia oyster, California black rail, California clapper rail, Chinook salmon, steelhead trout, Sacramento splittail, Delta smelt, and salt marsh harvest mouse. More site-specific detail on environmental context is provided below.

CHINA CAMP STATE PARK

China Camp is a 1,640-acre State Park managed by California State Parks and located on the southwest shore of San Pablo Bay about 3 miles northeast of San Rafael in Marin County. China Camp was designated as a California State Park in 1978, and a general plan for the property was completed in 1979. The park is bordered on the north by San Pablo Bay and along the northwestern point (Grove Point) by the marsh and flats at the mouth of Gallinas Creek. Along the western and southwestern edges, the park border runs along the ridgeline and is bounded by the San Pedro Mountain Open Space Preserve and the City of San Rafael Harry A. Barbier Memorial Park. The eastern end of the park abuts the McNears Beach County Park.

Physiographic Features

The Park protects 100 acres of wetlands (including tidal mudflats, cobble beach and rocky shoreline, salt marsh, and muted-tidal brackish and freshwater marshes) as well as 1,540 acres of surrounding uplands (including grasslands and oak woodlands). The hills of San Pablo Ridge slope up steeply from the Bay's shore, reaching a maximum elevation of about 1,000 feet. The muted-tidal brackish and freshwater marshes were historically part of the tidal salt marsh. However, North San Pedro Road now divides the marsh. Tidal flow into the marshes is partially restricted, and freshwater flow from the uplands is retained by the road; so the marshes on the landward side of the road are fresher and experience less tidal influence than the truly tidal salt marsh on the Bay-side of the road. The core tidal marshlands are representative transitional wetlands in San Francisco Bay and exhibit a pattern of vertical zonation from tidally-dominated low marsh to older, high-elevation marsh grading into freshwater marshes. The area of tidal marshlands consists of ancient marsh, as well as marsh that formed in the late 1800s due to accumulation of hydraulic mining debris from the Sierra Nevada. Rapid sediment accretion in these newly formed areas resulted in a steeper elevation gradient and straighter channels than in the more ancient, high-elevation marsh.

Climate

The climate of China Camp is controlled in large part by marine influences, as modified by San Pablo Ridge and the larger hills further west. The air temperature tends to be moderate, with typical variation between 40 to 80 degrees Fahrenheit.



China Camp channels
~ Matt Ferner

On average, there are more than 200 sunny days per year. The average annual rainfall is about 26 inches.

Hydrology

The tidal marshlands are mostly above Mean High Water; and, therefore, they are not inundated by every high tide. Runoff from the adjacent hills has not been gauged, but the persistence of small strands of willows and other riparian vegetation at the bottom of some draws suggests perennial surface water or near-surface ground water influences.

Geology

The bedrock of the hills is the Franciscan Melange, which is a complex assemblage of small and large rock types, dominated by silt stones and shales, and separated by zones of seismically sheered and crushed materials. Hard rock components can include sandstone, greenstone, chert, serpentine, and glaucophane schists. No serpentine is known to occur within this site.

Social Setting

Although China Camp is surrounded almost entirely by open space or park land, the urban areas within the City of San Rafael are approximately 8 miles away, and a road traverses through the Park. San Rafael, with a population of about 56,000 is the largest city in Marin County. The City has a somewhat culturally diverse population: 75.8% White, 23.3% Hispanic or Latino, and 2.2% Black. San Rafael has a stronger, more vibrant Latino community than other areas within Marin County. Countywide there is still a significant percentage of residents that speak a language other than English at home (19%). The County's residents are fairly affluent, with Census.gov reporting an average household income of almost \$90,000 and the median home price over \$500,000, and 7% of residents living below the poverty level. The school system is very good, with many excellent public and private elementary, middle, and high schools as well as a few lower performing schools, several of which are located in San Rafael. Marin County traditionally boasts tremendous community support for environmental causes, and environmental awareness is high throughout the County. There has historically been great support for open space protection, very little new development is allowed, and the population size is stable with only a 1.4% increase from 2000-2009. (Census.gov 2010)

Biological Resources

The tidal marshlands at China Camp host several species that are listed as endangered by both the federal and the California State species protection laws; i.e., California clapper rail, California black rail, and the salt marsh harvest mouse. The site also supports a variety of other species of special status or concern, including golden eagle, peregrine falcon, northern harrier, black-shouldered kite, short-eared owl, salt marsh song sparrow, and soft bird's-beak. A total of more than 140 species of birds, 26 species of mammals, 44 species of fish, and 15 species of reptiles and amphibians have been observed within the site (California State Parks 1979). The hills support at least three small groves of coast redwood, in addition to coastal shrub, oak woodlands, and isolated riparian stands. In a few places, controlled burning of hill slopes has encouraged the production of native bunch grasses. The association of coast live oak forest and tidal marshland is a particular characteristic of this site.

Although such associations were historically abundant along the western shore of San Pablo Bay, they are not common today, due to filling of tidal marshlands and the urbanization of adjacent hillsides.

There are no published reports on the species composition of the fish of China Camp tidal marshlands. However, surveys of the fish community in San Pablo Bay offshore from China Camp have been conducted. For otter trawls and midwater trawls, the most common fish species are northern anchovy, longfin smelt, jacksmelt, Pacific herring, striped bass, American shad, starry flounder, shiner perch, and yellowfin goby (Herbold et al. 1992). The larger channels of the tidal marshlands of the site are likely to support juveniles of some of these species, in addition to staghorn sculpin, California bat ray, leopard shark, and brown smoothound sharks.

The plant community at China Camp is representative of that found in a mature middle marsh zone in the San Francisco Bay. The marsh plain is dominated by pickleweed. The natural levees of the largest channel of the mature, high-elevation marshland typically support gum plant, yarrow, frankenia, and fat hen, in addition to pickleweed. Gum plant also inhabits the upland ecotone of the marshland as well as the channel margins. Slump blocks within the large channels support small patches of Pacific cordgrass.

Resource Management Challenges

California State Parks and the Reserve currently face important challenges in managing natural and cultural resources at China Camp. More scientific research, stewardship, and education are needed to help with the following issues:

- ◆ fire management,
- ◆ erosion of trails and fire roads,
- ◆ sudden oak death syndrome,
- ◆ urban-wildland interface including wildlife-human interactions,
- ◆ impacts of mosquito control activities
- ◆ amphibian conservation, and
- ◆ public health on beaches.

RUSH RANCH OPEN SPACE PRESERVE

Rush Ranch is a 2,070-acre site located on the northern margin of Suisun Marsh in Solano County. It consists of approximately 1,050 acres of brackish tidal wetlands (old high-elevation marsh), 940 acres of grassland (including the Ranch headquarters), seasonal systems, springs and ponds, and a 70-acre managed wetland. The Ranch was purchased in 1988 by the Solano Land Trust through funding provided by the California State Coastal Conservancy. An Enhancement and Management Plan for this area was completed in 1989 (Wetland Research Associates Inc. 1990). The Rush Ranch property is bordered by wildlife areas. On the north and west lie the Hill Slough Wildlife Area (1,112 acres) and the Peytonia Slough Ecological Reserve (1,887 acres) and on the south and southeast is the Joice Island Wildlife Area (1,887 acres); all of these other properties are managed by the California Department of Fish and Game.



Marsh trail overlooking Suisun Hills at Rush Ranch
~ Teri Engbring

Physiographic Features

Rush Ranch protects the largest and least disturbed remnant of ancient mid-brackish tidal marshlands in the Estuary. The marshes at Rush Ranch are part of the larger Suisun Marsh that encompasses some 85,000 acres of tidal marsh, managed wetlands, and waterways. It is the largest remaining wetland in San Francisco Bay and includes more than ten percent of California's remaining wetland acres. The marshlands at Rush Ranch extend from Suisun Slough to the base of the Potrero Hills, rising to a maximum elevation of about 300 feet. There is one small island, Goat Island, that is surrounded by tidal marshland. The headward reaches of the system are represented by remaining tidal marshlands of Peytonia Slough, which leads west from the upper part of Suisun Slough, and Hill Slough, which leads east. The Peytonia Slough marshlands include some undisturbed remnants of a broad ecotone between the brackish tidal marshlands and the low-gradient alluvial plane that extends southward from the Fairfield Hills. The Hill Slough marshlands extend eastward along the northern base of the Potrero Hills. The northern boundary of these marshlands is complicated by the existence of very low-gradient lands with hardpan soils and vernal pool fields that, in combination with the tidal marshlands, create a complex mosaic of seasonal palustrine and brackish tidal environments. The geography of the upland ecotones of the Peytonia Slough and Hill Slough marshlands is distinctive in the estuary. Other low-gradient planes intersect either saline or freshwater tidal conditions. The only other example of vernal pools which intersect tidal marshlands is small, highly disturbed, and located in a high-saline part of the estuary.

Climate

Average annual rainfall around Rush Ranch is only about 20 inches. Climate at the Suisun Marsh is strongly affected by both inland and coastal conditions. During summer, daytime convection in the Central Valley draws large volumes of marine air across the low areas of the California Coast Ranges. Afternoon winds that exceed 30 mph are common along the downstream reaches of Suisun Slough. Windiness tends to decrease with distance upstream due to the shielding effects of the inner Coast Range ridges north and west of Suisun City. However, the marine fog that forms along the coast during summer and invades the Bay Area, frequently extends inland as far as Suisun Slough, although it does not tend to persist beyond midday.

Hydrology

Most of the tidal marshlands of the Suisun Marsh are remnants of mature marshlands above the Mean High Water, and therefore are not inundated by every high tide. During autumn, when the high tides are low, the highest areas of the mature marshlands are not inundated during the neap tide cycles. The youthful marshlands that are developing along the immediate margins of Suisun Slough are inundated at least daily through the year. Hill Slough receives a minor amount of fluvial input from intermittent drainages of the north-facing slopes of the Potrero Hills. Peytonia Slough receives moderate fluvial inputs from Ledgewood Creek, a perennial stream that drains a small watershed north of Suisun City. First Mallard Slough at Rush Ranch receives minor freshwater inputs from Spring Branch Creek, which was historically perennial but is now impounded within the Potrero Hills. An important aspect of the distinctive character of the Suisun Marsh is the lack of any major local freshwater influence. The most headward reaches of the Suisun Marsh terminate in low-gradient, poorly drained terrain. As a result, salinity does not decrease substantially with increasing distance upstream, away from the tidal source. During the dry seasons of drought years, the gradient may reverse, with lower salinities occurring downstream.

Geology

The Potrero Hills are a highly eroded anticlinal fold of sedimentary marine rocks. The axis of the fold trends east-west. An apron of eroded material extends around the hills and is intersected by much younger tidal marsh deposits. A few sandstone bedrock outcrops occur at the upland margin of the historical tidal marshlands.

Social Setting

The land surrounding Rush Ranch is farmland or open space, but the community of Suisun City is less than 2 miles away. Suisun City is a historic waterfront town with significant areas of modern suburban development; the population is nearly 27,000. The city supports a culturally diverse population: 44.4% White, 17.8% Hispanic or Latino, and 19.3% Black. Solano County has a mixed economy with strong, diverse agricultural interests (including ranching, orchards, and small and large farms) and a significant military presence (Solano County, 2010). Census data from 2010 shows the average household income within the county was just over \$70,000, the median home price was \$178,300, and 9% of people lived below the poverty level. Solano County has experienced 3% population growth from 2000 to 2009. The recent economic downturn has led to problematic home foreclosure rates in Solano County; these may slow the rate of development. (Statistics from Census.gov, 2010)

Biological Resources

The Suisun Marsh is located in the zone of the estuary where the salinity regime is almost equally affected by marine influences, via the Golden Gate, and the freshwater influences of the Sacramento River and San Joaquin River. Spatial and temporal variability in salinity is extreme in this zone, due to seasonal and annual variability in local and regional rainfall. As a result of this variability, the brackish tidal marsh at Rush Ranch is exceptionally rich in vegetation and wildlife (Moyle 1976, Eaton 2001). Because of its special character, the marsh is protected by the Suisun Marsh Preservation Act, the Suisun Marsh Protection Plan, and the Suisun Marsh Local Protection Program (CA Public Resources Code §29000-29612, Bay Conservation and Development Commission 1976, 1977).

Numerous sensitive species inhabit the Suisun Bay area. Threatened, endangered or rare plants and animals include: the winter-run Chinook salmon, delta smelt, Sacramento splittail, California clapper rail, California black rail, burrowing owl, California least tern, salt marsh yellowthroat, salt marsh song sparrow, Suisun shrew, saltmarsh harvest mouse, Mason's lilaeopsis, Suisun marsh aster, Suisun thistle, Delta tule pea, Contra Costa goldfields, and soft bird's beak (Fiedler and Zebell 1993, Wetland Research Associates Inc. 1990, U.S. Fish and Wildlife Service 1995, Eaton 2001). The Suisun Bay, in general, supports a great diversity and large numbers of waterfowl and shorebirds, as well as migratory passerines, due to the position of the Suisun Bay and the Pacific Flyway and also due to the conversion of the historical tidal marshlands to diked and intensively managed seasonal wetlands.

Resource Management Challenges

Solano Land Trust and the Reserve face important challenges in managing the natural and cultural resources at Rush Ranch. More scientific research, stewardship, and education are needed about the following topics:

- ◆ grazing,
- ◆ stormwater,
- ◆ visitor and research use and impacts,
- ◆ impacts of mosquito control activities
- ◆ invasive species control,
- ◆ grassland plant diversity, and
- ◆ tidal channel erosion.




San Francisco Bay National Estuarine Research Reserve

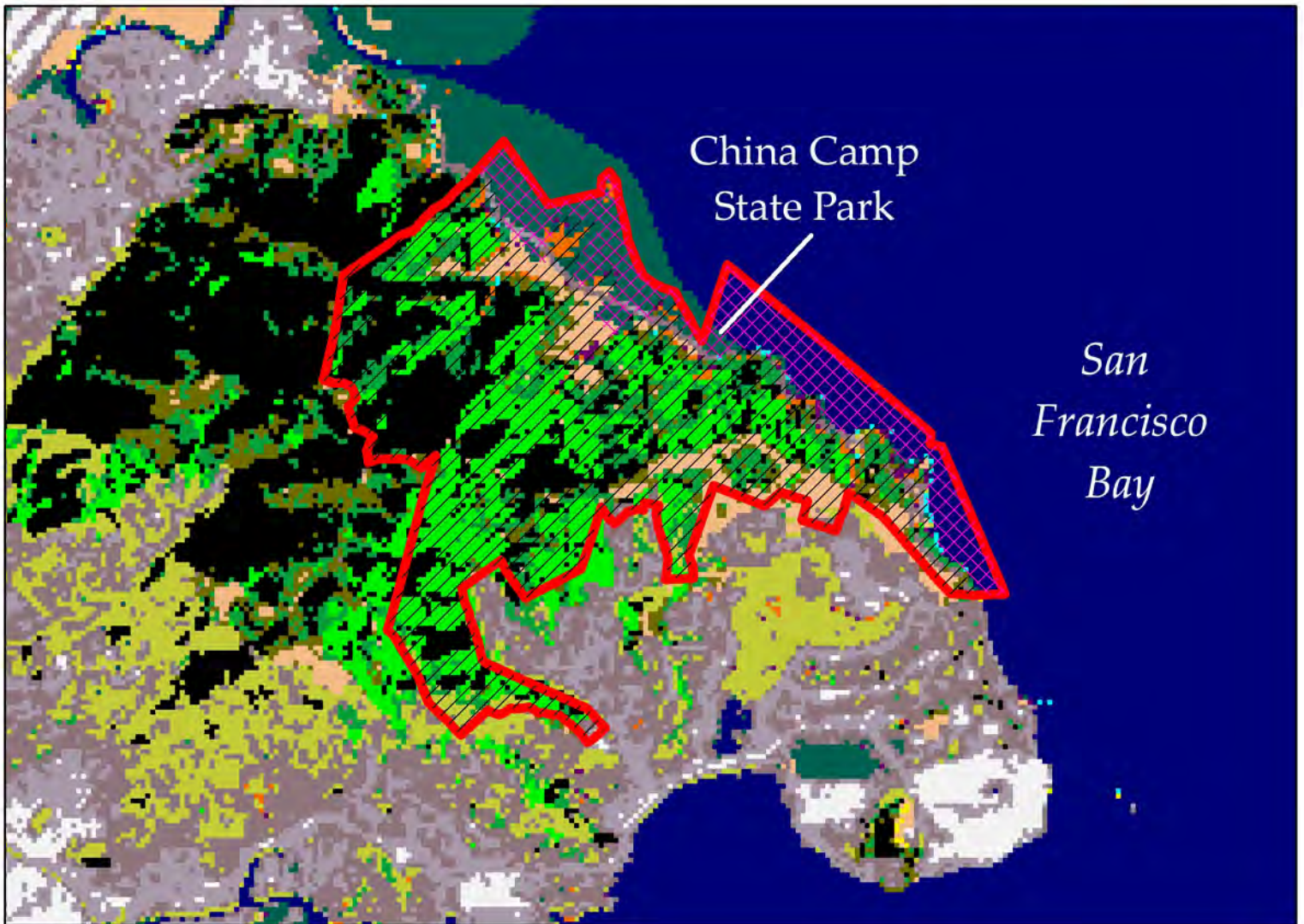
Water Quality / Nutrient Monitoring Stations
Weather Monitoring Stations



San Francisco Bay National Estuarine Research Reserve China Camp Land Cover Map

-  Bare Land
-  Deciduous Forest
-  Developed Open Space
-  Estuarine Aquatic Bed
-  Estuarine Emergent Wetland
-  Estuarine Forested Wetland
-  Estuarine Scrub/Shrub Wetland
-  Evergreen Forest
-  Grassland
-  High Intensity Developed
-  Low Intensity Developed
-  Medium Intensity Developed
-  Mixed Forest
-  Palustrine Aquatic Bed
-  Palustrine Emergent Wetland
-  Palustrine Forested Wetland
-  Palustrine Scrub/Shrub Wetland
-  Pasture/Hay
-  Scrub/Shrub
-  Unconsolidated Shore
-  Water

-  Reserve Boundary
-  Core
-  Buffer






Data courtesy of SF Bay NERR, NOAA and SFEI



San Francisco Bay National Estuarine Research Reserve China Camp Ecological Communities Map

-  Diked Marsh
-  Farmed Bayland
-  Grazed Bayland
-  Middle Elevation Tidal Marsh
-  Lagoon
-  Low/Mid Elevation Tidal Marsh
-  Managed Marsh
-  Muted Tidal Marsh
-  Ruderal
-  Storage or Treatment Basin
-  Tidal Flat

-  Reserve Boundary
-  Core
-  Buffer






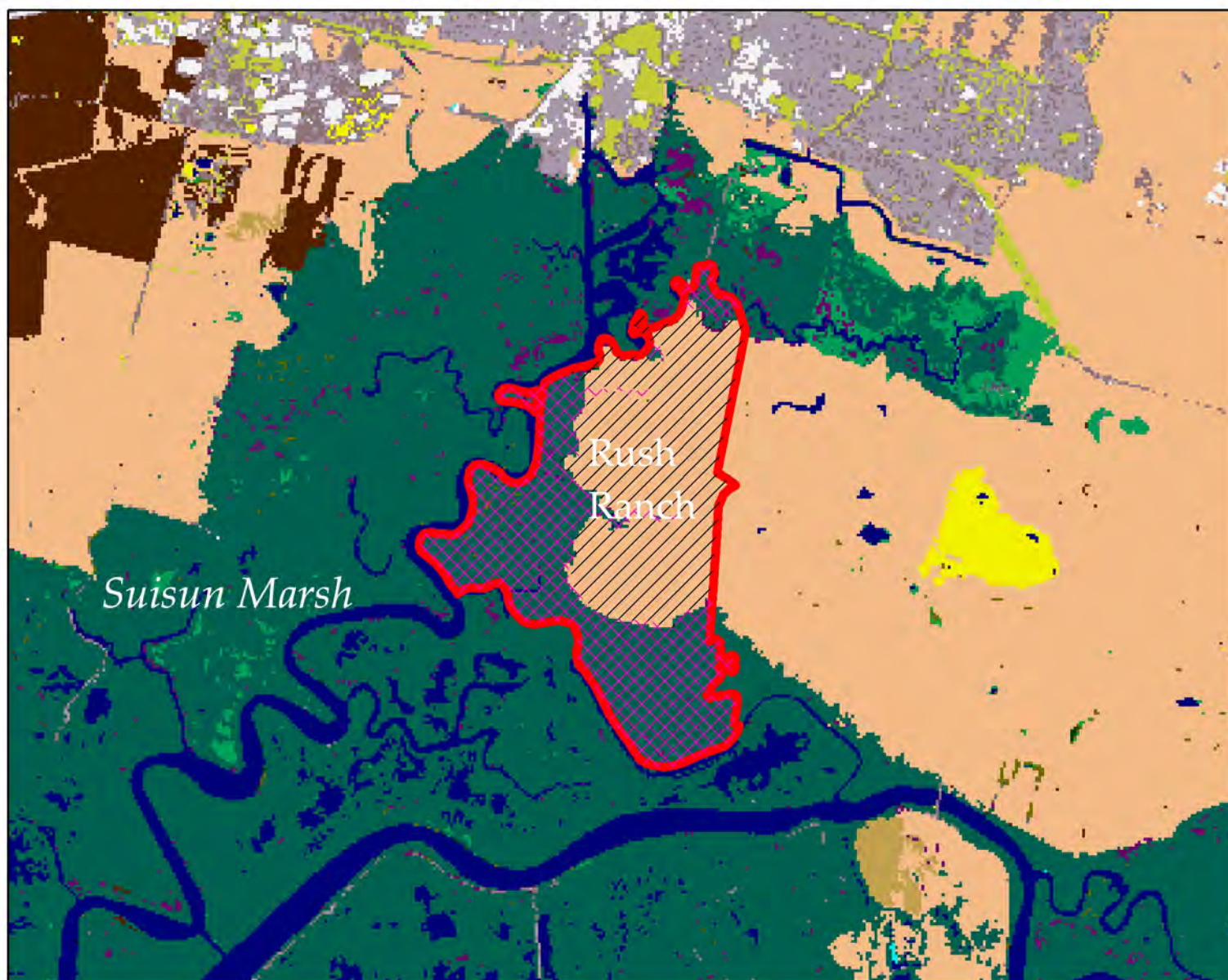
Data courtesy of SF Bay NERR, NOAA and SFEI



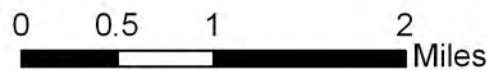
San Francisco Bay National Estuarine Research Reserve Rush Ranch Land Cover Map

-  Bare Land
-  Cultivated
-  Deciduous Forest
-  Developed Open Space
-  Estuarine Aquatic Bed
-  Estuarine Emergent Wetland
-  Estuarine Forested Wetland
-  Estuarine Scrub/Shrub Wetland
-  Evergreen Forest
-  Grassland
-  High Intensity Developed
-  Low Intensity Developed
-  Medium Intensity Developed
-  Mixed Forest
-  Palustrine Aquatic Bed
-  Palustrine Emergent Wetland
-  Palustrine Forested Wetland
-  Pasture/Hay
-  Scrub/Shrub
-  Unconsolidated Shore
-  Water












-  Reserve Boundary
-  Core Areas
-  Buffer Areas

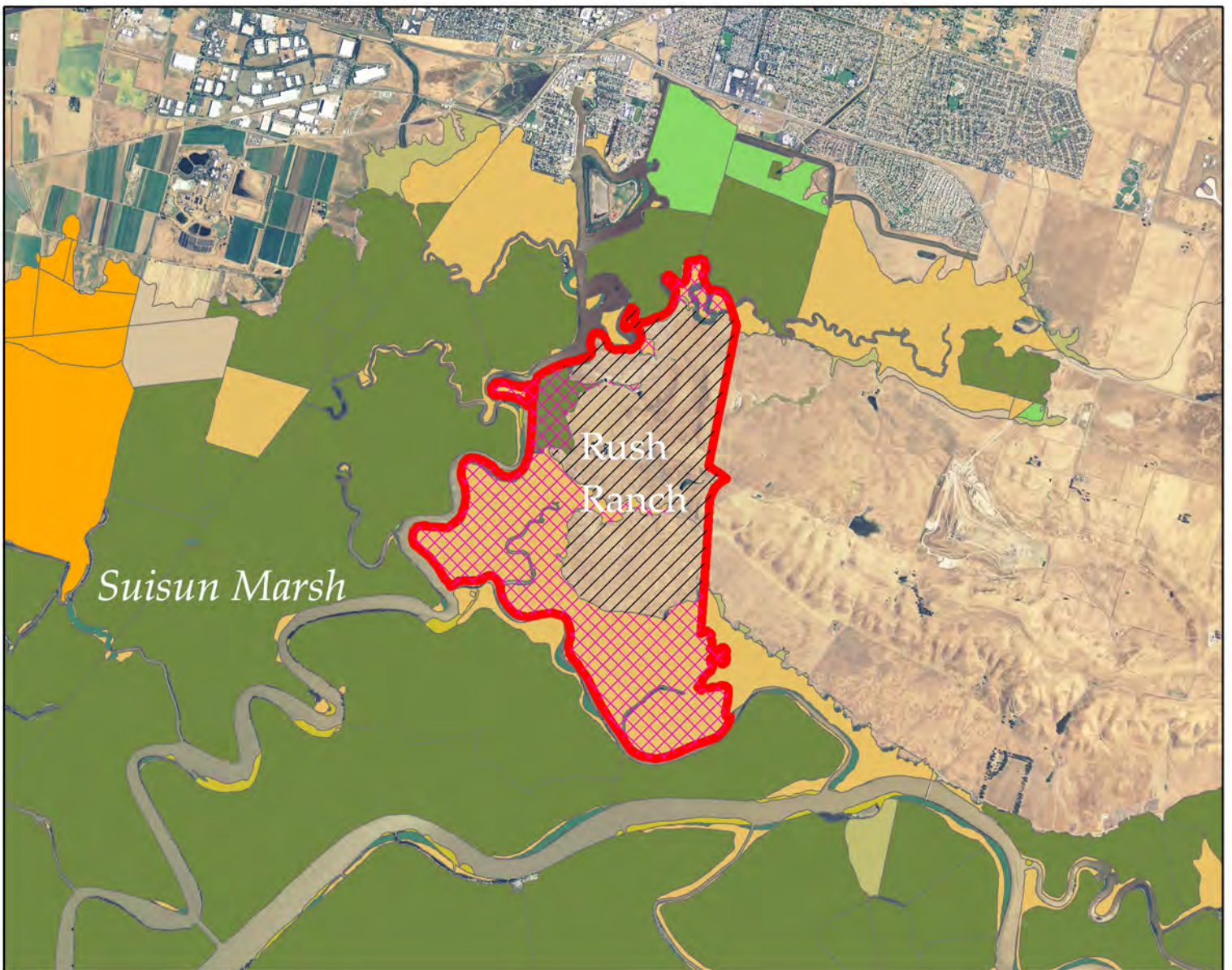


Data courtesy of SF Bay NERR, NOAA and SFEI



San Francisco Bay National Estuarine Research Reserve Rush Ranch Ecological Communities Map

-  Farmed Bayland
-  Grazed Bayland
-  High Elevation Tidal Marsh
-  Low/Mid Elevation Tidal Marsh
-  Managed Marsh
-  Muted Tidal Marsh
-  Ruderal
-  Tidal Flat
-  Reserve Boundary
-  Core Areas
-  Buffer Areas



Data courtesy of SF Bay NERR, NOAA and SFEI



2 PROGRAMMATIC DESCRIPTIONS

Section 2 describes the Research and Monitoring, Education, Coastal Training, and Stewardship programs both from the national perspective and the SF Bay NERR perspective. For the Research and Monitoring, Education, and Coastal Training programs, there is an introductory overview; followed by a section called “system-wide” that describes how the Reserve program implements the national program; highlights of accomplishments from the time of designation in 2003 to the present; key partnerships for the Reserve, both current and developing; and a discussion of the various resource needs of each program. Because California State Parks and the Solano Land Trust take the lead on implementing stewardship activities at China Camp and Rush Ranch respectively, that program has a description of the national program plan, followed by discussions of key stewardship topics and program needs, and concluding with a discussions of allowed uses at the Reserve and resource protection policies. Section 2 sets the stage for the operating context of the Reserve so that the goals, objectives, and actions discussed in Section 3 can be fully understood.



Pier at China Camp fishing village
~ SF Bay NERR Staff

These programs are also known as “sectors” within the Reserve System. Although it is helpful to group various national programs, activities, and meetings by themes such as “education,” “stewardship,” and so on, goals and objectives are best met through a holistic approach. To emphasize this, the Reserve System focuses on “cross-sector” projects to integrate research, education, and stewardship activities. Such cross-sector projects are referred to here and in Section 3 where actions to achieve Reserve goals and objectives are described.

Throughout this section, the term “issue area” refers to a specific topic or subject upon which the Reserve concentrates.

2.1 RESEARCH AND MONITORING PLANS

2.1.1 NATIONAL RESEARCH AND MONITORING PLAN [§921.50]

The Reserve System provides a mechanism for addressing scientific and technical aspects of coastal management problems through a comprehensive, interdisciplinary, and coordinated approach. Research and monitoring programs, including the development of baseline information, form the basis of this approach. Reserve research and monitoring activities are guided by the *Reserve System Research and Monitoring Plan, 2006–2011*, which identifies goals, priorities, and implementation strategies. This approach, when used in combination with the education and outreach programs, will help ensure the availability of scientific information that has long-term, system-wide consistency and utility for managers and members of the public to use in protecting or improving natural processes in their estuaries. Research within the reserves is designed to fulfill the Reserve System goals as defined in program regulations. These include:

- ◆ address coastal management issues identified as significant through coordinated estuarine research within the System;
- ◆ promote Federal, state, public and private use of one or more reserves within the System when such entities conduct estuarine research; and
- ◆ conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

RESERVE SYSTEM RESEARCH FUNDING PRIORITIES

Federal regulations, 15 CFR Part 921.50 (a), specify the purposes for which research funds are to be used:

- ◆ support management-related research that will enhance scientific understanding of the Reserve ecosystem;
- ◆ provide information needed by reserve managers and coastal ecosystem policy-makers; and
- ◆ improve public awareness and understanding of estuarine ecosystems and estuarine management issues.

The *Reserve System Research and Monitoring Plan* (2006–2011), available at http://www.nerrs.noaa.gov/Doc/PDF/Research/Research_Monitoring.pdf, identifies the following five priority research areas to complement the funding priorities outlined above:

1. habitat and ecosystem processes;
2. anthropogenic influences on estuaries;
3. habitat conservation and restoration;
4. species management; and
5. social science and economics.

RESERVE SYSTEM RESEARCH GOALS

The Reserve System research goals are embedded in Goal 2 of the *Reserve System Strategic Plan* (2005–2010), 'Increase the use of reserve science and sites to address priority coastal management issues,' and are outlined in *Reserve System Research and Monitoring Plan* (2006-2011). They include:

- ◆ Biological, chemical, physical, and ecological conditions of reserves are characterized and monitored to describe reference conditions and to quantify change.
- ◆ Scientists conduct research at reserves that is relevant to coastal management needs and increases basic understanding of estuarine processes.
- ◆ Scientists have access to NERRS datasets, science products and results.
- ◆ The scientific, coastal management and education communities, as well as the general public, use data, products tools, and techniques generated at NERRS.

Currently, there are two Reserve System-wide efforts to fund estuarine research. The Graduate Research Fellowship Program supports students to produce high quality research in the reserves. The fellowship provides graduate students with funding for 1-3 years to conduct their research, as well as an opportunity to assist with the research and monitoring program at a reserve. Projects must address coastal management issues identified as having regional or national significance, relate them to the Reserve System research focus areas, and be conducted at least partially within one or more designated reserve sites. Proposals must focus on the following areas:

1. eutrophication and effects of non-point source pollution and/or nutrient dynamics;
2. habitat conservation and/or restoration;

3. biodiversity and/or the effects of invasive species;
4. mechanisms for sustaining resources within estuarine ecosystems; or
5. economic, sociological, and/or anthropological research applicable to estuarine ecosystem management.

Students work with the Research Coordinator or Manager at the host reserve to develop a plan for participating in the reserve's research and/or monitoring, stewardship, education, or coastal training programs up to 15 hours per week. Work plans must be relevant to the Fellow's research, support their professional development, and be of service to NERRS. This training may take place throughout the school year or may be concentrated during a specific season.

The Science Collaborative is a NERRS program that focuses on integrating science into the management of coastal natural resources. Currently administered through the University of New Hampshire, the program integrates and applies the principles of collaborative research, information and technology transfer, graduate education, and adaptive management with the goal of developing and applying science-based tools to detect, prevent, and reverse the impacts of coastal pollution



and habitat degradation in a time of climate change. The program is designed to enhance the NERRS' ability to support decisions related to coastal resources through collaborative approaches that engages the people who produce science and technology with those who need it. In so doing, the NERRS Science Collaborative seeks to make the process of linking science to coastal management decisions, practices, and policies more efficient, timely, and effective.

SYSTEM-WIDE MONITORING PROGRAM

It is the policy of SF Bay NERR to implement each element of the System-Wide Monitoring Program initiated by ERD in 1989, and as outlined in the Reserve System regulations and strategic plan:

- ◆ Phase I: Environmental Characterization, including studies necessary for inventory and comprehensive site descriptions.
- ◆ Phase II: Site Profile, to include a synthesis of data and information.

◆ Phase III: Implementation of the System-Wide Monitoring Program.

The System-Wide Monitoring Program provides standardized data on national estuarine environmental trends while allowing the flexibility to assess coastal management issues of regional or local concern. The principal mission of the monitoring program is to develop quantitative measurements of short-term variability and long-term changes in the integrity and biodiversity of representative estuarine ecosystems and coastal watersheds for the purposes of contributing to effective coastal zone management. The program is designed to enhance the value and vision of the reserves as a system of national references sites. The program also takes a phased approach and focuses on three different ecosystem characteristics.

Abiotic Variables

The monitoring program currently measures pH, conductivity, salinity, temperature, dissolved oxygen, turbidity, water level, and atmospheric conditions. In addition, the program collects monthly nutrient and chlorophyll a samples and monthly diel samples at one SWMP data logger station. Each reserve uses a set of automated instruments and weather stations to collect these data for submission to a centralized data management office.

Biotic Variables

The Reserve System monitors biodiversity, habitat, and population characteristics by monitoring organisms and habitats as funds are available.

Watershed and Land Use Classifications

This aspect of monitoring attempts to identify changes in coastal ecological conditions with the goal of tracking and evaluating changes in coastal habitats and watershed land use and land cover. The main objective of this element is to examine the links between watershed land use activities and coastal habitat quality.

These data are compiled electronically at a central data management “hub,” the Centralized Data Management Office (CDMO) at the Belle W. Baruch Institute for Marine Biology and Coastal Research of the University of South Carolina. They provide additional quality control for data and metadata, and they compile and disseminate the data and summary statistics via the Web (<http://nerrsdata.org/>) where researchers, coastal managers, and educators can readily access the information. The metadata meets the standards of the Federal Geographical Data Committee.

2.1.2 SF BAY NERR RESEARCH AND MONITORING PROGRAM

INTRODUCTION

The Reserve’s research program conducts and promotes site-based research and monitoring at China Camp and Rush Ranch. Since the first water quality data were collected in 2005 off the China Camp fishing pier (38° 0' 4.49 N, 122° 27' 37.28 W), the Reserve has expanded to include an additional three stations—Gallinas Creek (38° 00' 57.3 N, 122° 30' 30.6 W), First Mallard Slough (38° 11' 41.70 N, 122° 1' 58.02 W),

and Second Mallard Slough (38° 10' 59.40 N, 122° 0' 46.68 W)—for monitoring water quality and nutrients, one weather station (38° 12' 01.6 N, 122° 1' 35.3 W) for monitoring meteorological conditions, student-led monitoring of benthic invertebrates, and a variety of completed and ongoing research projects. Future work will focus on priority Issue Areas and Actions identified in Section 3, as well as establishing the Reserve as part of the “sentinel sites” network for climate change according to the vision and standards set forth by Saumweber et al. (2010).

The Reserve’s research program offers a number of tangible benefits for all Reserve programs as well as unaffiliated graduate students, researchers, resource managers, educators, and the general public. For example, both real-time data streams and archived data subjected to quality control are provided via the national website (<http://nerrsdata.org/>) and are regularly accessed by local and non-



Researcher downloads weather station data at Rush Ranch
~ Sarah Ferner

local researchers, land owners, and resource managers at both Reserve sites; educators within and outside the Reserve; and recreational visitors to the Reserve. Coordination of research within the Reserve has helped to reduce impacts on natural resources by facilitating communication between researchers studying sensitive species such as secretive marsh birds, by reducing project overlap in heavily used areas such as the cobble beaches of China Camp, and by identifying alternate (non-Reserve) locations for research (when appropriate) to limit impacts of species collection, researcher activities, or equipment deployment. Participation of Reserve research staff in regional conferences has attracted the attention of external researchers and has initiated new collaborations focused on addressing management questions about responses of emergent marshes to sea level rise, restoration of living shorelines, and control of invasive weeds.

The Research Program is currently staffed by the Research Coordinator (RC), a full-time SWMP technician, and a half-time monitoring technician. The RC’s time is divided among coordination of research and monitoring inside and outside of the Reserve, teaching and mentoring of undergraduate and graduate students, and collaborative and independent research focused on physical-biological coupling in estuarine and coastal habitats. Because the Reserve has two sites, the Research Program coordinates with the Solano Land Trust and California State Parks to track research and support stewardship activities at each site. Having the research program housed at SF State’s Romberg Tiburon Center (RTC) offers the benefits of consultation and collaboration with internationally recognized research labs (including the Marine Invasions Research Laboratory of the Smithsonian Environmental Research Center),

access to seawater and general-use laboratory equipment, and institutional benefits associated with SF State (e.g., library privileges, facilities support). The Research Program's monitoring capacities are augmented by the work of the two Graduate Research Fellows who manage and implement benthic invertebrate sampling at both Reserve sites.

SYSTEM-WIDE CONTEXT

The Reserve currently maintains five monitoring stations (four water-quality and one weather) as part of the national SWMP. In addition, two Graduate Research Fellows use baited traps and quadrat surveys to monitor invertebrate populations at both Reserve sites. In 2010, Reserve staff participated in a proposal to the Science Collaborative in support of restoration and monitoring at Rush Ranch. The RC sits on the national Habitat Mapping and Change Technical Committee and the SWMP Guidance Committee. The Reserve's technicians regularly attend the Technician Training Workshop offered by CDMO and the RC regularly attends the annual NERRS meeting and Research Coordinators meetings. Anticipated system-wide activities over the next five years include instituting emergent marsh vegetation and elevation monitoring according to national standards and completing a Land Use, Land Cover, and Habitat Change plan.

SELECTED ACCOMPLISHMENTS 2003-2010

The first Research Coordinator (RC) served from 2004 through 2008 and was tasked with implementing SWMP and initiating Reserve research collaborations. This period of development and expansion included installation of free-standing pilings to serve as platforms for water-quality monitoring stations, assembly and installation of a weather station with satellite telemetry, initiation of the Reserve's Graduate Research Fellowship program, and collaboration on site-based research with regional scientists. Research technicians assisted in these efforts and developed procedures for timely submission of high-quality data to the NERRS CDMO.

In November 2008 the second RC was hired and continues to oversee and improve the established SWMP, Graduate Research Fellowship program, and site-based research activities while also expanding the program to include coordination of research permit approval with California State Parks and the Solano Land Trust; monitoring of hydrodynamics, elevation, sessile benthic invertebrates, and shorebirds; and additional collaboration on site-based research with regional scientists.

In 2010, a second weather station was installed in Richardson Bay to fill an identified need for data in the lower portion of San Francisco Bay and in accordance with the partnership agreement that supports collaborative research projects between the Richardson Bay Audubon Center and Sanctuary (Sanctuary) and the Reserve. (The Sanctuary is a potential third site of the Reserve as discussed in Section 4.4). New research projects include studies of herbicide effects on non-target species of phytoplankton and benthic invertebrates, livestock effects on vegetation cover and nutrient runoff, and the relationship between flow velocity and suspended sediment transport within tidal channels. Coordination of these projects with efforts of external

researchers working in the Reserve is ongoing and will form the basis for maintaining and expanding the research program in the future.

PROGRAM DEVELOPMENT 2011-2016

Over the next five years, the Reserve's research program will strive to strengthen and expand monitoring and research in the Reserve sites and surrounding areas as described below.

Monitoring

The primary goal for development of the monitoring program is to improve the efficiency of SWMP implementation and data Quality Assurance/Quality Control through consultation with other reserves, division of labor on essential SWMP tasks, and evaluation of calibration, sampling, and analysis protocols through controlled and replicated experimentation. An important complement to this effort will be an analysis of short-term variability and long-term trends revealed by the monitoring data collected to date. After data gaps and needs are identified, the research staff plans to gradually expand SWMP to include additional monitoring protocols and expected to include emergent and submerged aquatic vegetation, nekton, fecal indicator bacteria, hydrodynamics, sediment dynamics, and marsh elevation. Prioritization of these efforts will be guided by NERRS climate change initiatives (Saumweber et al. 2010), other issue areas and actions outlined in Section 3, and the evolving needs of resource managers at China Camp and Rush Ranch.



Researcher installing equipment
on piling at China Camp
~ SF Bay NERR Staff

Research

The RC will continue to seek funding to initiate novel and applied research projects in the Reserve and surrounding estuarine habitats. Prioritization of Reserve-sponsored research will be established in the same manner as for the monitoring described above, with a focus on the physical and biological drivers of patterns in species distribution and abundance. For example, successful restoration of the native Olympia oyster will require better understanding of the factors influencing larval transport, settlement, growth, and survival over space and time. Research staff will strengthen and support cross-sector collaboration within the Reserve so that key questions will not be overlooked, and results can be disseminated to appropriate audiences in a timely manner. Staff will also strive to strengthen and support collaboration with the key partners identified below. All of these pursuits will be implemented using actions outlined in Section 3 as well as supporting actions such as regular meetings with research staff, regular meetings with key partners and

collaborators including other Reserve staff, and annual reviews of programs and staff accomplishments.

PARTNERSHIPS

Key partnerships of the research and monitoring program play a number of critical roles through collaboration on scientific projects, shared stewardship of Reserve sites and resources, and shared investment in infrastructure or instrumentation. These key partnerships are:

- ◆ Audubon California,
- ◆ California State Parks,
- ◆ Central and Northern California Ocean Observing System,
- ◆ San Francisco State University, and
- ◆ Solano Land Trust.

Developing partnerships of the research and monitoring program are relationships being pursued for a variety of reasons such as topical expertise, shared interest in estuarine ecosystem structure and function, and shared commitment to informing and improving habitat restoration efforts in the region. These developing partnerships include:

- ◆ Bay Conservation and Development Commission,
- ◆ PRBO Conservation Science,
- ◆ Solano Community College,
- ◆ University of California, Davis
- ◆ University of San Francisco, and
- ◆ U.S. Geological Survey.

NEEDS

The most pressing needs for the research program are additional staff, funding support, professional development, and continued engagement of regional scientists and students in site-based research. A brief elaboration of these needs is as follows:

Research Staff

The Reserve now supports one full-time technician and one half-time technician. Experience has shown that sustainable operation of SWMP exceeds the currently available 60 staff hours per week. Increased productivity and enhanced efficiency for optimal SWMP implementation require hiring another full-time monitoring technician. Having this additional technician on staff would also enable expansion of research and monitoring activities programmatically and geographically to provide a better characterization of the Reserve sites within a regional context.

Funding Support

Successful management and operation of the Reserve's research program requires financial resources beyond what is currently available. Specifically, additional funding is needed to strengthen ongoing and future research and monitoring through (1) replacement of aging field instruments (e.g., sensors, data loggers, and telemetry equipment); (2) expansion of field and laboratory capabilities to address identified

regional issues of concern (e.g., sediment deposition and erosion, responses of marshes to sea-level rise, habitat use by threatened and endangered fishes, hydrology and hydrodynamics associated with restoration of diked marshes, and control of invasive species); and (3) provision of facilities and services that enable appropriate data collection and effective dissemination of results (e.g., wet lab and flume facilities, geographic information system (GIS) specialist and related technical resources, and a website interface for submission and approval of research permits for work in the Reserve).

Professional Development

All research staff members benefit from professional development activities, and these should be continued. Some of the most useful and needed types of professional development include attendance at regional or national meetings, GIS training, teaching opportunities, technical training on the use of research equipment and software, and development of new scientific collaborations.

Engagement of Regional Scientists and Students in Site-based Research

Strategies for continuing to increase and improve site-based research include advertisement of issue areas and management questions on the Reserve website, increased involvement in advising and mentoring SF State graduate students, and broader advertisement and recruitment of applications for the Graduate Research Fellowship Program.

2.2 EDUCATION PROGRAM PLAN

2.2.1 NATIONAL EDUCATION PLAN [§921.13(A)(4)]

The Reserve System provides a vehicle to increase understanding and awareness of estuarine systems and improve decision making among key audiences to promote stewardship of the nation's coastal resources. Education and interpretation in the reserves incorporates a range of programs and methodologies that are tailored to key audiences and include science-based content. Reserve staff members work with those key audiences, local communities, and regional groups to address coastal resource management issues, such as non-point source pollution, habitat restoration, and invasive species. Through integrated research and education programs, the reserves help communities develop strategies to deal successfully with these coastal resource issues.

Formal and informal education and training programs in the NERRS target K-12 students, teachers, university and college students and faculty, as well as coastal decision-maker audiences; i.e., environmental groups, professionals involved in coastal resource management, municipal and county zoning boards, planners, elected officials, landscapers, eco-tour operators, and professional associations.

K-12 and professional development programs for teachers include the use of established coastal and estuarine science curricula aligned with state and national science education standards and frequently involves both on-site and in-school follow-up activities. Reserve education activities are guided by national plans that identify

goals, priorities, and implementation strategies for these programs. Education and training programs, interpretive exhibits, and community outreach programs integrate elements of NERRS science, research, and monitoring activities, and they ensure a systematic, multi-faceted, and locally focused approach to fostering stewardship.

RESERVE SYSTEM EDUCATION GOALS

The National Estuarine Research Reserve System's mission includes an emphasis on education, interpretation, and outreach. Education policy at the SF Bay NERR is designed to fulfill the Reserve System goals as defined in the regulations (15 C.F.R Part 921(b)). Education goals include:

- ◆ enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation; and
- ◆ conduct and coordinate estuarine research within the system: gathering and making available the information necessary for improved understanding and management of estuarine areas.

RESERVE SYSTEM EDUCATION OBJECTIVES

Education-related objectives in the *Reserve System Strategic Plan (2005–2010)* include:

- ◆ People are aware of the ecological, economic, historical, and cultural importance of estuarine resources.
- ◆ People understand how human choices and natural disturbances impact social, economic, and estuarine ecological systems.
- ◆ People apply science-based information when making decisions that could impact coastal and estuarine resources.

2.2.2 SF BAY NERR EDUCATION PROGRAMS

The National Estuarine Research Reserve System was established with a unique vision of creating estuarine education programs with direct ties to the Reserve's research and monitoring efforts. Reserves reach out primarily to three audiences: K-16 students and teachers, the public, and coastal decision makers.

SF Bay NERR began developing education programs in January 2005. The Education Coordinator (EC) developed an implementation plan that included phasing in programming based on audience. The designation process revealed a need for training for coastal decision makers, so this was the first audience the Reserve created programming for. The success of these programs led to increased funding from NOAA that provides support for a full-time Coastal Training Program Coordinator to oversee this program. Community education products were also developed, including a brochure, table-top display, website, and interpretive exhibits at each of the Reserve sites. More recently, in addition to maintaining the CTP and community education

activities, the Reserve has begun focusing on creating education products and programs for science teachers. Regardless of specific target audiences, each of the education programs has two underlying principles: (1) To share the results of estuarine research with non-academic audiences and (2) To improve understanding and stewardship of the estuary.

K-16 EDUCATION

Introduction

There are a multitude of estuarine education opportunities in the Bay Area, many of which provide hands-on field experiences for students. All of the Reserve's education programs are designed to avoid duplication of existing programs and build from the unique strengths of the Reserve, especially providing access to scientists and their current research. The Reserve's education programs and products incorporate rigorous, accurate, and up-to-date science content and create direct links between teachers and scientists. The Education Coordinator's office is located at SF State's Romberg Tiburon Center, so there is great potential for integration of research from RTC scientists into K-16 programming. In addition, many of the Reserve's education programs and products utilize data from current research happening within the Reserve and data collected through SWMP. The EC oversees development, implementation, and management of all aspects of the K-16 education program, including teaching most of the programs. At this time there is no additional K-16 education staff. In summer of 2010, the Reserve began a strategic planning process for the K-16 Estuarine Education Program which will guide future growth of this program.

System-Wide Context

While individual reserves have been offering a variety of education programs and products for formal education audiences (pre-K through 20) for many years, the Reserve System has only recently begun to implement a standardized system-wide K-12 education program. The K-12 Estuarine Education Program (KEEP) will help integrate education efforts across reserves and raise the quality and consistency of programs offered at reserve sites. KEEP strives to integrate field-based estuarine science, SWMP data, and a technology-oriented approach into programs that are well-planned, include professional development training for teachers, and incorporate rigorous evaluation. Through such expanded and integrated offerings, NERR educators hope to increase knowledge about estuaries among K-12 teachers and students. Such increased knowledge will promote the growth of public awareness about the importance of oceanic and coastal resources and their connections to



Class gathered at marsh at Rush Ranch
~ Matt Ferner

humans' well-being, and will provide a basis for citizens to make informed decisions about managing and protecting such resources. Development and implementation of KEEP includes:

- ◆ continued implementation of EstuaryLive!;
- ◆ development of new system-wide education resources (e.g., the Estuaries 101 Curriculum and a new SWMP data interface on estuaries.gov); and
- ◆ implementation of a series of activities by individual reserves (e.g., professional teacher workshops called "Teachers on the Estuary" or "TOTE").

The overall goals of KEEP are:

- ◆ Teachers and students will have the knowledge, appreciation, and skills to act as stewards of estuarine resources.
- ◆ An increasing number of teachers and environmental educators in the U.S. will use NERRS' science education products and programs.

Selected Accomplishments 2003–2010

SF Bay NERR's K-16 program has educated hundreds of teachers through teacher workshops offered in partnership with the Romberg Tiburon Center, involved undergraduate students and teachers in hands-on research, and developed estuarine science lesson plans. Two highly visible accomplishments are described below:

ESTUARY LIVE! In September 2005, the Reserve hosted an interactive virtual field trip at China Camp State Park as part of the NOAA and EPA funded EstuaryLive! program. Thousands of elementary school students from around the country watched, asked questions, and gasped with surprise as students from Hamlin School in San Francisco discovered marsh animals, ate pickleweed, and fell in the mud! A full-length archived version of the field trip and short excerpts are available for download at www.estuaries.gov. An excerpt was also used in a widely circulated video created by the No Child Left Inside Coalition that advocates for the importance of environmental education.

ESTUARIES 101. SF Bay NERR's EC led a group of other ECs from around the country as they worked with NOAA's Estuarine Reserves Division and TERC, a non-profit education research group, to develop lesson plans for use in high school science classes. The lessons teach basic science concepts using real research and data collected within the reserves. Estuaries 101 is a centerpiece of the Reserve's new system-wide K-12 Estuarine Education Program and the new www.estuaries.gov website.

Program Development 2011–2016

Beginning in summer of 2010, the EC is leading a strategic planning process to determine future directions for the Reserve's K-16 education programs. This process includes discussions with signatory partners, establishing an Education Advisory Group, conducting a market analysis to document existing estuarine education

programs and identify any gaps the Reserve may be able to fill, and conducting a needs assessment of high school science teachers in Marin and Solano counties to determine their needs for estuarine, wetland, and research science-focused products, programs, and support. Each new program developed will include an evaluation strategy that will include assessment of participants' satisfaction with the program as well as changes in knowledge, awareness, interest, and collection of summary statistics (contact hours, number of programs taught, etc.). The programs described below will be altered, expanded, or cancelled based on results of the strategic planning process. Programs will be improved based on results of ongoing evaluations. The strategic planning and evaluation process will satisfy the requirements of KEEP and help the EC and Reserve Manager determine which programs and audiences should be given priority in terms of staff time and funding.

EXPANDED TEACHER TRAINING. The Reserve expects to offer more professional development workshops for teachers in the next five years. This includes offering training during in-service days, single and multi-day workshops at Rush Ranch and in Marin (with field excursions to China Camp). The target audience for existing workshops is primarily high school science teachers. The Reserve anticipates continuing to cater to this group, and may target the workshops specifically for physics, chemistry, and math teachers. The Reserve may also work closely with particular high schools or colleges to integrate a stronger research or service-learning component into their coursework. Some of these workshops will be part of NERRS' national teacher workshop series, TOTE.

PRE-SERVICE TEACHER TRAINING. The EC has led field trips for pre-service teachers (teachers-in-training) at Solano Community College for the last several years. This model is well suited for the currently staff-limited Reserve and has been well-received by the participants. Expansion of staff would enable the Reserve to include courses from other teacher preparatory programs, like those at SF State, College of Marin, and Dominican University.

Partnerships

Several key partners of the K-16 Education program play a critical role in integrating the Reserve's work with the other education efforts at the Reserve sites and magnifying the impact of the programs. Key partners are:

- ◆ California State Parks,
- ◆ SF State/Romberg Tiburon Center, and
- ◆ Solano Land Trust.

In addition to key partners listed above, the EC is pursuing additional partnerships to bring new audiences to the Reserve, maximize the impact of all programs, and better integrate the research and education programs. Developing partnerships of the K-16 Education program include:

- ◆ Audubon California,
- ◆ College of Marin,
- ◆ Dominican University
- ◆ PRBO Conservation Science, and
- ◆ Solano Community College.

Needs

FUNDING. The Reserve does not allocate a consistent budget to the K-16 program, although special project funds are made available as the budget allows or when competitive grants are successfully obtained. The lack of consistent funding severely limits long-term planning and creation of a strong set of unified programs. There are several approaches to remedy this problem, including (1) encouraging NOAA to provide a consistent, stable amount of money for K-16 education within each operating grant (e.g., through a line item funding for KEEP); (2) commitment from SF State to provide consistent, stable funding for K-16 education each year separate from the Reserve's operating grant; and/or (3) commitment from the Reserve to dedicate a minimum level of funding to K-16 programming each year from the operating grant.

STAFFING. The Reserve's K-16 education programs are limited by personnel. With only one educator, the Reserve is limited in the types, depth, and quality of programming that can be offered. The Reserve could overcome this barrier by partnering with other organizations, but hiring an Education Specialist who is knowledgeable about both estuarine research and education, understands the Reserve's mission and vision, and is able to develop a long-term professional relationship with other Reserve staff would greatly expand the Reserve's ability to offer more types of programs, e.g., multiple day workshops for teachers, field trips for high school students, in-class support for teachers, etc. An Education Specialist would also increase the quality of programs already offered, e.g., by allowing larger groups to be split into two smaller groups.

LIABILITY SUPPORT. The Reserve needs a stronger, more clearly defined liability relationship with the Reserve sites and SF State to ensure the safety of participants and educators. This includes better understanding, clarification, and written documentation of existing liability coverage and pursuit of additional coverage if necessary.

PROFESSIONAL DEVELOPMENT. The Education Coordinator's position requires a diverse and dynamic set of skills and expertise. Continuous professional development for the EC, such as attendance at regional and national meetings, participation in education and science conferences, and enrollment in specific skill-building courses for the Education Coordinator is critical for the education program growth and development.

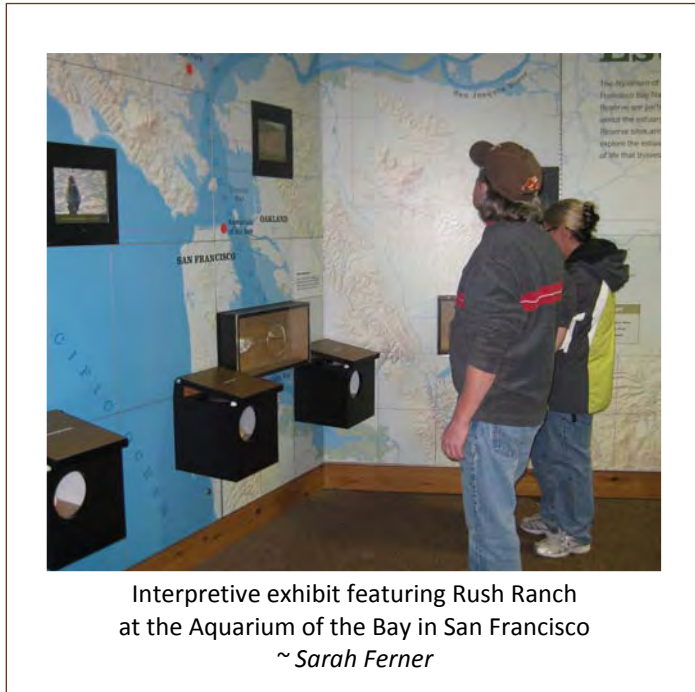
COMMUNITY EDUCATION

Introduction

The Reserve's community education program teaches visitors to the Reserve sites about the importance of the estuary and its wetlands as well as increasing understanding and support for science. Because the Reserve has only one educator (the EC) and hundreds of thousands of visitors to the Reserve sites each year, the Reserve has focused on creating interpretive exhibits that can educate and engage visitors even when no staff is available. The EC also offers occasional programs for the public, especially in conjunction with the annual open house events held at the Reserve's sites. In addition, the Reserve's partner organizations and their partners frequently offer community education programs at the Reserve sites.

System-Wide Context

Community education in the Reserve System focuses on audiences whose choices directly impact the integrity of estuaries and their associated watersheds, but who are outside of the K-16 and CTP target audiences. Throughout the Reserve System, these programs are a means to foster behavioral change to promote resource conservation and to support the mission of the Reserve System. Although the Reserve System does not financially support a unified community education program, nearly all reserves reach out to community members through a variety of programs, including volunteer-led research and monitoring programs, interpretation programs for visitors to the reserves, and interpretive exhibits in the reserves' visitor centers and on the trails.



Interpretive exhibit featuring Rush Ranch
at the Aquarium of the Bay in San Francisco
~ Sarah Ferner

Selected Accomplishments 2003-2010

SF Bay NERR's community education program has reached thousands of visitors to the Reserve and other local community

members through publications, temporary and permanent exhibits, and programming designed specifically for the public. The Reserve created a brochure, a one-page handout, a website, and a travelling table-top display—all with a unified graphic look and complementary messages. In addition, the EC regularly writes articles for the Reserve's partners' newsletters, including Solano Land Trust's *Vistas*, Rush Ranch Education Council's *Rush Breezes*, and the Romberg Tiburon Center's *Bayside*. The EC has also led the development of natural history and interpretive research exhibits at each of the Reserve's sites. Highlights of the community education program include:

OPEN HOUSE EVENTS. The Reserve sets up a travelling table-top display and interactive marsh exhibit items at annual open house events at Rush Ranch, China Camp, and the Romberg Tiburon Center. In partnership with the Romberg Tiburon Center, the EC also set up the table-top display at the Marin County Fair in 2005.

INTERPRETIVE EXHIBITS. The Reserve has led an interpretive exhibit project at Rush Ranch, consulted on exhibits placed on China Camp's Turtle Back Hill Trail, and led a major project that created exhibits for the Rush Ranch Nature Center, three of China Camp's most popular areas, and Aquarium of the Bay at PIER 39 in San Francisco.

Program Development 2011–2016

In 2011–2016, the Reserve will continue to support community education through participation in open house events, regular updating of changeable components of the interpretive exhibits at Rush Ranch and China Camp, and by contributing articles to partner newsletters. In addition, the Reserve will be undertaking three larger projects:

VOLUNTEER TRAINING. Both California State Parks and Solano Land Trust are strengthening their volunteer docent programs. The EC will work with these partners to educate the volunteers about natural history, research, and stewardship of the Reserve sites and inspire them to educate others. As part of this process, we will also help connect interested volunteers with other partner organizations operating at the Reserve sites.

MANAGED MARSH RESTORATION. Solano Land Trust and the Reserve are working together to restore tidal flow to a 70-acre diked marsh. Because the restoration will result in the removal of a significant trail, the EC has committed to work with Solano Land Trust and other Rush Ranch stakeholders to ensure that the new trail and boardwalk are designed to meet the education needs of Reserve partners and visitors.



Tidal managed marsh at Rush Ranch
~ Teri Engbring

NO CHILD LEFT INSIDE. In support of the national No Child Left Inside movement, and California State Parks' Children's Outdoor Bill of Rights movement, the EC plans to work with China Camp State Park to begin offering nature exploration opportunities for families with young children and/or research opportunities for adults or young adults. Once established, these programs could also be extended to Rush Ranch. We will also develop partnerships with other organizations offering community education programs within the Reserve.

Partnerships

Several organizations are instrumental to the success of the Community Education Programs because they support and organize volunteer docents, offer education opportunities to the public, and include SF Bay NERR-related content in their interpretive products. Key partnerships for the Community Education Program are:

- ◆ California State Parks,
- ◆ Rush Ranch Educational Council,
- ◆ SF State/Romberg Tiburon Center, and
- ◆ Solano Land Trust.

Needs

STAFFING. The Reserve's ability to offer community education programs, especially programming on weekends, is limited by personnel. The Reserve collaborates with partner agencies to train their volunteers and docents to lead many of these programs. Hiring a full-time Education Specialist would allow the Reserve to expand the number of community education programs and also increase the level of scientific content of the programs. Additional staff would also allow us to offer more meaningful programs, like those with hands-on research or stewardship components. It would also increase the Reserve's ability to effectively evaluate these programs.

LIABILITY SUPPORT. The Reserve needs a stronger, more clearly defined liability relationship with the Reserve sites and San Francisco State University to ensure the safety of participants, volunteers, and educators. This includes better understanding, clarification, and written documentation of existing liability coverage, and pursuit of additional coverage if necessary.

PROFESSIONAL DEVELOPMENT. The Education Coordinator's position requires a diverse and dynamic set of skills and expertise. Continued professional development, such as attendance at regional and national meetings, participation in education and science conferences, and enrollment in specific skill-building courses for the Education Coordinator is critical to allow for the program's growth and development.

2.3 COASTAL TRAINING PROGRAM PLAN

2.3.1 NATIONAL COASTAL TRAINING PROGRAM PLAN

The Coastal Training Program (CTP) provides up-to-date scientific information and skill-building opportunities to individuals who are responsible for making decisions that affect coastal resources. Through this program, NERRS can ensure that coastal decision-makers have the knowledge and tools they need to address critical resource management issues of concern to local communities.

Coastal Training Programs offered by reserves relate to climate change, coastal habitat conservation and restoration, biodiversity, water quality, and sustainable resource management; and they integrate reserve-based research, monitoring, and stewardship activities. Programs target a range of audiences, such as land-use planners, elected officials, regulators, land developers, community groups, environmental non-profits, business, and applied- science groups. These training programs provide opportunities

for professionals to network across disciplines and develop new collaborative relationships to solve complex environmental problems. Additionally, the CTP provides a critical feedback loop to ensure that professional audiences inform local and regional science and research agendas. Programs are developed in a variety of formats ranging from seminars, hands-on skill training, participatory workshops, lectures, and technology demonstrations. Participants benefit from opportunities to share experiences and network in a multidisciplinary setting, often with a reserve-based field activity.

Partnerships are important to the success of the program. Reserves work closely with State Coastal Programs, Sea Grant College extension and education staff, and a host of local partners in determining key coastal resource issues to address, as well as the identification of target audiences. Partnerships with local agencies and organizations are critical in the exchange and sharing of expertise and resources to deliver relevant and accessible training programs that meet the needs of specific groups.

The CTP requires a systematic program development process, involving periodic review of the Program's niche in the training provider market, audience assessments, development of a five-year program strategy, a marketing plan, and the establishment of an advisory group for guidance, program review and perspective in program development. The CTP implements a performance monitoring system wherein staff report data via operations progress reports according to a suite of performance indicators related to increases in participant understanding.

2.3.2 SF BAY NERR COASTAL TRAINING PROGRAM

INTRODUCTION

The Reserve's CTP works collaboratively with other training initiatives in the region to provide cost-effective, high-quality learning opportunities to coastal professionals. Training programs and technical assistance products are developed to address the greater San Francisco Bay Area's pressing environmental issues and are designed to foster open, multidisciplinary communication and real-world problem solving. The CTP Coordinator also works with scientists to help translate the information needs of decision makers and resource managers into actionable research projects. Together with the Elkhorn Slough and Tijuana River Reserves, the Coastal Training Program provides a broader presence in California by working with a number of state and regional partners to maximize the reach and impact of CTP programming.

SYSTEM-WIDE CONTEXT

Decisions made by coastal communities can have profound, long-term consequences for estuarine and coastal environments. Land use planners, regulators, developers, coastal managers and elected officials, to name a few, often do not have access to relevant science-based information, training, and tools that can support informed decisions affecting the coast. Considering the wide range of impacts to coastal areas from human and environmental factors, it is important to provide support to decision makers. The Reserve System, through its CTP, is uniquely positioned within coastal

communities across the nation to engage these decision makers and provide the scientific basis for informed decisions affecting the coast.

SELECTED ACCOMPLISHMENTS 2003-2010

The Reserve offered an initial series of workshops for coastal decision makers in 2005 and 2006 in partnership with the Elkhorn Slough NERR CTP. The classroom- and field-based workshops focused on tidal wetland ecology and wetland restoration. They enabled participants to identify lessons learned from observing and monitoring older restoration projects and to discuss how to apply those lessons to current and future restoration projects. Over 300 decision makers and scientists were brought together through these highly-rated workshops. These workshops served as the initial step in creating a CTP for the Reserve.

A full-time Coastal Training Program Coordinator was hired in January 2007. The Coordinator assembled a CTP Advisory Committee and developed the required Market Analysis, Needs Assessment, Marketing Plan, and Program Strategy documents. These program development documents were submitted to ERD in July 2007 and the CTP Program at the SF Bay Reserve was formally approved in January 2008.

The program planning process laid out a general framework for the development of SF Bay NERR's CTP that put the national CTP mission into a local context. The San Francisco Bay is the largest estuarine system on the West Coast and has been significantly impacted by the seven million inhabitants in the surrounding communities. The number of individuals and organizations involved in coastal resource-related decision making in this populous area is large and diverse and further complicated by the complex state regulatory environment.

A vibrant training provider market already exists in the Greater Bay Area. These training providers range from environmental nonprofit groups working with rural community leaders, to state regulatory programs providing city planners with non-point source pollution prevention tools, to university extension programs offering certification in a range of coastal management-related professions. Many of these organizations have already solidified their training niche and have more funding, staff, name recognition, and other resources than does the Reserve. However, a market analysis completed in 2007 indicated a continuing need for scientifically sound, timely, relevant, and low-cost training and technical assistance opportunities aimed at coastal decision makers.

In this context, the initial three-year topical focus of the CTP has been on wetland restoration, land use and water quality linkages, climate change impacts, and coastal management skill building. Programs have been geared towards municipal planning and permitting staff, staff from state regulatory agencies, consultants who advise land managers and local governments, and staff from resource management agencies and non-profits that are involved in wetlands restoration work. In order to ensure that budgetary constraints do not limit priority target audience members from acquiring the skills and knowledge necessary to better manage coastal resources, the majority of CTP events have been (and will continue to be) provided at low or no cost to attendees.

PROGRAM DEVELOPMENT 2011-2016

The focus of the CTP for the next five years will be on building the programmatic and technology infrastructures to support a program that:

- ◆ is linked with other training providers and training audiences through both ongoing and short-term partnerships;
- ◆ is a recognized leader in the design, provision, and facilitation of effective, high quality, audience-focused, and neutral training and information programs about coastal management issues;
- ◆ supports Bay Area partners in finding solutions to real-world problems by providing financial, logistical, and/or communications support to meet partners' science-training objectives; and
- ◆ can quickly respond to local concerns in the context of changing environmental or policy conditions.

Delivery Mechanisms

Developing more robust programmatic and technology infrastructures will improve and expand program delivery capabilities. As its core mission, the CTP will continue to provide decision makers with access to the most up-to-date science in the format that is best for that audience, whether that format is field-based training, printed materials, facilitated discussions, online modules, or classroom-style workshops. CTP events will range from 4 hours to as long as a week and involve anywhere from 10 to 100+ participants. Programming will be developed following the national CTP logic model that promotes best practices in multidisciplinary communication and adult learning, and that utilizes a system of performance monitoring measurements to ensure effectiveness.

Over the next few years, technology and programmatic infrastructure build out will focus on:

- ◆ implementing new media technology to enable distance and self-paced learning, social media supporting communities of practice¹, online archiving, and decision-support tools such as mapping and real-time data;
- ◆ expanding the utility of the existing contacts database to support Customer Relationship Management System functions such as marketing, tracking, outreach, and follow-up;

¹ Groups of individuals who share knowledge about a common work practice over a period of time, though they are not part of a formally constituted work team. Communities of practice generally cut across traditional organizational boundaries. They enable individuals to acquire new knowledge faster. They may also be called Communities of Interest if the people share an interest in something but do not necessarily perform the work on a daily basis.

www.admin.state.nh.us/hr/documents/Workforce_Development/worforce_development_definitions.doc

- ◆ creating a “catalogue” of recurring programming for certain high-demand topics, some of which will offer continuing education units and accreditation through various partners; and
- ◆ developing explicit pathways that link science, policy, and management communities at critical phases in a given project. These linkages will better enable scientists to focus their research on key management questions while at the same time providing decision-makers access to scientific information that is salient, up-to-date, and pertinent to the community.

Audience

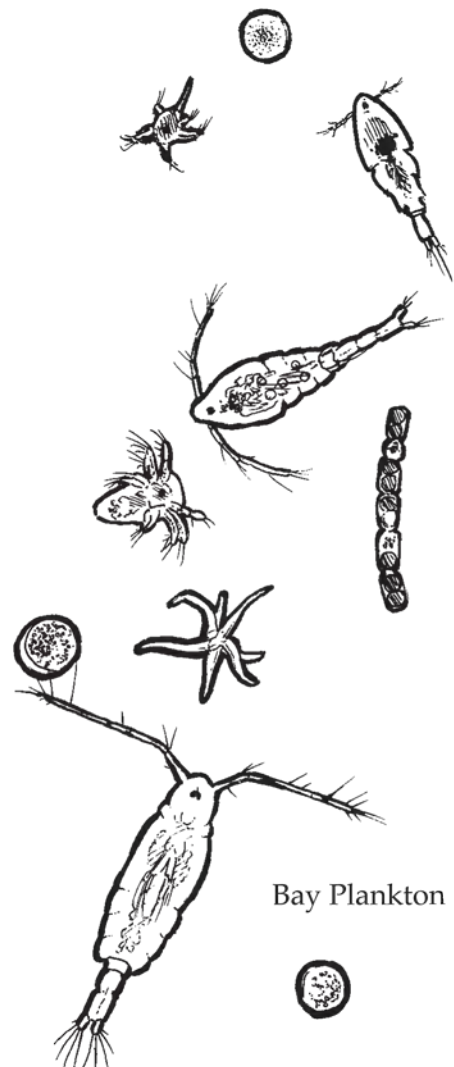
The CTP will continue to provide training to municipal planning and permitting staff, staff from state regulatory agencies, consultants who advise land managers and local governments, and staff from resource management agencies and non-profits that are involved in resource management. In addition, CTP will expand to reach local elected and appointed officials: this audience category has been identified through formal mechanisms including needs assessments and literature review, and through informal discussion with partners as an underserved, difficult-to-reach, and highly influential audience.

Partnerships

Key CTP partners play a variety of critical roles for the Program. “Key partners” include signatory partners as well as other organizations with which CTP staff have well-established working relationships that have contributed to the success of many past training programs and technical assistance products:

- ◆ Bay Conservation and Development Commission,
- ◆ California State Parks,
- ◆ Elkhorn Slough NERR Coastal Training Program,
- ◆ NOAA Coastal Services Center,
- ◆ SF State/Romberg Tiburon Center, and
- ◆ Solano Land Trust.

The CTP actively pursues additional partnerships. “Developing partnerships” include those newer relationships that have formed to provide access to additional target audiences, to provide subject expertise, or to contribute additional resources or



funding. In return, these developing partnerships benefit from the training design, product development, facilitation, and logistical expertise of CTP staff:

- ◆ Association of Bay Area Governments,
- ◆ California Coastal Commission,
- ◆ ICLEI, Local Governments for Sustainability², and
- ◆ San Francisco Estuary Partnership.

Needs

STAFFING. The CTP is currently staffed by the CTP Coordinator, a CTP Assistant (a temporarily-funded position), and occasional project-based contractors. In order to accomplish the above plan, more dedicated staffing is needed. Project-based interns and contractors are able to complete some important tasks, but a full-time, ongoing CTP Assistant would enable significant program expansion. For example, developing and delivering CTP programming entails a number of administrative tasks, participant follow-up, and logistics. A CTP Assistant could process registrations, payments, and receipts for CTP events; perform data analysis; assist with event logistics and facilitation; create fact sheets and other “science-translation” materials based on literature research and consultation with other Reserve staff; design online and print workshop materials; and maintain databases. This would have benefits for the overall quality of the CTP and allow the Coordinator to focus on other programmatic elements such as ongoing technical assistance.

ONGOING PROFESSIONAL DEVELOPMENT. Recognizing the unique approach that CTP brings to coastal management, the national CTP community is currently developing a set of core competencies that Coastal Training Program Coordinators should possess in order to do their work. Funding and management support for CTP staff to gain these core competencies is desired.

ONGOING TECHNICAL ASSISTANCE. A programmatic challenge for many in the CTP community lies in the need to sustain support for the learning networks and “communities of practice” that develop through CTP activities and programs. The CTP needs to offer easy, inexpensive, and effective ways to extend the learning experience beyond the workshop by helping participants communicate and collaborate with each other in the long-term.

2.4 STEWARDSHIP PROGRAM PLAN

2.4.1 NATIONAL STEWARDSHIP PLAN

A core mission of the reserves is to protect and conserve the more than 1.3 million acres of coastal and estuarine habitat within reserves and to facilitate improved stewardship of coastal habitats outside reserve boundaries. The Reserve System's stewardship approach uses the best available science to maintain and restore healthy,

² Formerly known as *International Council for Local Environmental Initiatives*. The name, mission, and charter were revised in 2003 to better reflect the challenges facing local governments.

productive, and resilient ecosystems, and disseminates information to regional and national stakeholders. Site-based stewardship strategies assess and respond to threats from coastal development, human use of reserve resources, climate change, and invasive species. Three inter-related issues that reserve stewardship strategies respond to include water quality, changes in biological communities, and habitat loss. An important approach to addressing these issues is the NERRS Habitat Mapping and Change Plan.

The goal of the Habitat Mapping and Change Plan is to track and evaluate short-term variability and long-term changes in the extent and type of habitats within NERRS and how these changes are affected by land uses within adjacent watersheds and changes in local sea level. The Land Use and Habitat Change Plan aims to: (1) map land cover and land use in reserves and their watersheds; (2) model elevation and tidal data in reserves and elevation in adjacent watersheds; and (3) enhance capacity within NERRS to map, model, and disseminate information on estuarine habitat trends and associated linkages with anthropogenic and climatic stressors. Such plans provide an important context to the abiotic and biological trends observed in the SWMP.

2.4.2 SCIENCE-BASED RESTORATION AND MANAGEMENT

At SF Bay NERR, primary stewardship is provided directly by the staff of California State Parks for the China Camp State Park site and by the Solano Land Trust for the Rush Ranch site as they are the landowning and managing entities.

The stewardship program at SF Bay NERR integrates aspects of research, monitoring, and resource management to provide long-term protection for the natural resources within the Reserve sites and to provide models for effective stewardship of other similar habitats. The integrity of the Reserve's resources must be protected and, where necessary, restored. This will provide a stable environment for research and education programs, while providing public access and allowing compatible traditional uses consistent with primary Reserve objectives. NERR staff support these efforts by focusing on:

- ◆ geographic information systems and habitat mapping,
- ◆ invasive species,
- ◆ managing visitor use,
- ◆ master planning, and
- ◆ science-based restoration and management.

As identified through discussions with the Solano Land Trust, the priorities of the stewardship program at Rush Ranch are:

1. maintain an economically viable and ecologically sustainable grazing operation, consistent with purposes of a National Estuarine Research Reserve ;
2. provide meaningful opportunities for education, public access, and scientific research;
3. protect high-quality habitats and biodiversity;

4. restore degraded sites;
5. re-establish the physical processes necessary to maintain the natural ecosystem within the context of agricultural, educational, and research goals; and
6. use adaptive management to respond to change over time.

The mission of the California State Parks is to provide for the health, inspiration, and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation. Thus, as identified through discussions with California State Parks, the priorities of the stewardship program at China Camp are:

1. management of natural resources by developing strategies for specific concerns such as the interface between wildlife and urban areas, trail erosion, and invasive species (e.g., fungal pathogens);
2. protection of the cultural resources of the China Camp Village and Miwok archeological resources;
3. provide meaningful opportunities for education, public access, and scientific research;
4. protect high quality habitats and biodiversity; and
5. use adaptive management to respond to change over time.

Lessons learned from stewardship activities within the Reserve are shared with the broader regional management community through the Reserve's CTP and direct communication between researchers and managers.

The tidal marshes at Rush Ranch and China Camp provide homes for numerous federally and state-listed threatened and endangered species, including salt marsh harvest mouse (*Reithrodontomys raviventris*), California clapper rail (*Rallus longirostris obsoletus*), and other rare and special-status species. Both of the Reserve sites also encompass tidal marsh, upland grasslands, and rare protected



Birders at Rush Ranch
~ Teri Engbring

transition zones between these habitats. Because of these unique habitat features, Rush Ranch and China Camp each serve as reference sites for restoration projects throughout the region.

Solano Land Trust, with SF Bay NERR staff support, is also looking at several options for restoring habitat at a 70-acre muted tidal marsh located within Rush Ranch. The project goals are to create habitat that is compatible with regional goals for water quality and habitat for the Suisun Marsh and to provide opportunities for education, research, and public enjoyment. A conceptual restoration design has already been completed for this project. Further action requires additional funding. Additional restoration opportunities at the sites include restoring physical processes on the marsh plain, protecting rare habitat, restricting weed infestation, and, possibly, restoring tidal inundation to high marsh-upland transition areas that are currently diked or ditched. Similar restoration opportunities exist throughout the San Francisco Bay area, and the approaches, successes, and failures in restoration within the Reserve will be actively and formally shared with the broader community of wetland managers.

2.4.3 MASTER PLANNING

The Solano Land Trust actively collaborates with SF Bay NERR staff to develop and implement stewardship projects at Rush Ranch. Solano Land Trust is currently preparing a marsh restoration master plan, to be completed in 2011, that describes the current physical and ecological conditions in the historic tidal marsh at Rush Ranch and prioritizes restoration and management actions for the next 30 years. Preparation of a new Master Plan will enable Solano Land Trust and the Reserve to move forward with marsh-wide habitat management, weed control, and other on-the-ground projects so as to ensure responsible stewardship of the marsh and surrounding grasslands. The tools and information generated from this master planning process will be made available for scientific research and public education via “Research in the Reserve” displays at the new Rush Ranch Nature Center, thereby contributing to broader understanding of tidal marsh ecosystems and wetland restoration in the Suisun Marsh ecosystem.

2.4.4 INVASIVE SPECIES

Despite being used as examples of “pristine” marshes in the San Francisco Bay, the tidal marshes at Rush Ranch and China Camp face numerous threats to the ecological resources in the marsh, transitional areas, and uplands. One of the most pervasive threats in the estuary is the ecological impact of invasive species. For example, the marsh at Rush Ranch has been impacted by a widespread infestation of perennial pepperweed (*Lepidium latifolium*), a highly invasive plant. Land managers from Solano Land Trust are working closely with scientists to test the safety and efficacy of several methods of pepperweed eradication. Conversations and presentations about this project, and future related projects, were facilitated through two workshops organized by the Reserve's CTP. At China Camp, the fungal pathogen *Phytophthora ramorum* is responsible for Sudden Oak Death syndrome, a devastating disease that affects oaks, tan oaks, and other plant species. Recommended management strategies are not

necessarily compatible with the public access mission of China Camp, thus posing a stewardship challenge. Problems with invasive plants and animals vary by site; for example, Rush Ranch has feral hogs. Each of these invasive species requires ongoing efforts to minimize impacts to the sites by these animals, including developing and implementing species management plans and partnering with groups like the Bay Area Early Detection Network (<http://www.baedn.org/>).

2.4.5 MANAGING VISITOR USE

California State Parks and Solano Land Trust staffs directly manage public access at their respective sites. Traditional visitor uses are directed to areas that do not interfere with the Reserve's research and education activities and that protect critical habitats. As excessive visitor use can have a detrimental effect on fragile Reserve ecosystems, barriers and trails are used to guide visitor activities to those areas best able to withstand heavy use. This effort seeks to find balance between visitor needs and habitat protection needs. Use of signs is critical to guide visitor use. Signs serve to provide guidance to visitors regarding the rules of and appropriate use of the sites, explain visitor impacts to the natural resources, identify SF Bay NERR and its mission, and provide site-specific information regarding protected habitats and species. Signs are used to designate critical habitats, including bird nesting areas and special plant areas. Challenges at China Camp include the effects of mountain biking, both for land impacts as well as human safety. California State Parks staff works with a volunteer group to patrol trails and police misuse. Challenges at Rush Ranch include the effects of intensified land use impacts from horse breeding conducted by a non-profit partner of the Solano Land Trust, Access Adventures. To address this challenge, the Reserve has initiated annual photographic monitoring of horse corrals and seasonal nutrient monitoring of stormwater runoff through the corrals and headquarters area.

2.4.6 GEOGRAPHIC INFORMATION SYSTEMS AND HABITAT MAPPING

An important tool in all stewardship activities is Geographic Information System data and technology. SF Bay NERR has made progress in developing data layers but needs to develop a comprehensive GIS strategy and then implement it. Associated with this need is the Reserve's intention to implement the Reserve System's Habitat Mapping and Change Plan that aims to identify long-term trends in the geographic extent of habitats in relation to local sea level change and anthropogenic stress from adjacent watersheds. The plan calls for each reserve to map critical habitats over time using the standard Reserve Classification System (based on the Cowardin scheme for intertidal and sub-tidal habitats and the Anderson scheme for uplands) for reserve-scale high resolution mapping. Watershed scale mapping relies on the NOAA Coastal Services Center's Coastal Change Assessment Program classification scheme. Example benefits from implementing this protocol include identifying invasive plants within the habitat mapping effort and identifying and assigning priorities to areas needing restoration. Reserve boundaries, associated watershed boundaries, digital elevation models of reserve watersheds, canopy cover and impervious surfaces in reserve watersheds, land use, land cover, and change data are available on the CDMO web site at <http://cdmo.baruch.sc.edu/> .

2.4.7 STEWARDSHIP NEEDS

SF Bay NERR seeks to hire a full-time Stewardship Coordinator who would serve as a liaison between the site staff and NERR staff for both stewardship and GIS activities. This would greatly enhance the Reserve's combined ability to address resource management issues. The Stewardship Coordinator would typically work with California State Parks and the Solano Land Trust to:

1. identify priority management issues and advise on policies and actions to address them;
2. plan and assist in the implementation of resource management projects, such as weed control;
3. develop and coordinate implementation of Geographic Information System program and database;
4. assist the partners in scheduling and directing student volunteers doing biomonitoring or invasive species control;
5. work with the Research coordinator to plan, organize, and carry out research and monitoring activities related to resource management issues such as research on marsh-to-upland ecotone dynamics, effectiveness of restoration techniques, and historical ecology;
6. work with the Education Coordinator and the Coastal Training Program Coordinator on presentations and reports to regional decision-makers, staff, volunteers, and the general public; and
7. explore and pursue funding opportunities to support resource management and restoration efforts.

2.4.8 GENERAL USE POLICIES AND AUTHORITIES

The NERRS regulations allow for multiple uses of reserves to the degree compatible with a reserve's management plan and consistent with the mission and goals of that reserve and the CZMA. Resource protection efforts are supported by policies and regulations regarding recreation, off-road vehicle access, fishing and hunting, habitat restoration, surveillance, enforcement, and maintenance. SF Bay NERR land-owning partners periodically review and update use policies to ensure protection of resources, coordinate with law enforcement and other agencies as appropriate, and monitor the Reserve sites on a regular basis. The various agencies and their respective resource protection policies that apply to the Reserve sites are detailed in Appendix G.

3 ISSUE AREAS AND STRATEGIC ACTIONS

To guide Reserve operations from 2011 through 2016, the Reserve staff had collaborative discussions with California State Parks, Solano Land Trust and the Bay Conservation and Development Commission (Reserve signatory partners) to choose four issues to focus the Reserve's programs around climate change, species interactions, water quality, and habitat restoration. Specific goals and objectives, along with actions for achieving them, are outlined below. The management context of each issue area (i.e., subject of focus) is followed by an example of a cross-sector project that integrates research, education, training, and stewardship activities. These will be undertaken by Reserve staff, primarily the Manager, Research Coordinator, Education Coordinator, Coastal Training Program Coordinator, and System-Wide Monitoring Program Technicians. For the purposes of this section, the word "knowledge" means facts and information, whereas the word "understanding" refers to human ability to integrate knowledge and concepts in order to draw appropriate conclusions.

3.1 CLIMATE CHANGE

In San Francisco Bay's watershed, climate change is anticipated to cause increased coastal flooding due to sea level rise; changes in amount and timing of rainfall, snowpack, and snowmelt; increased air and water temperatures; and increased acidity of the estuary's waters. Sea levels are expected to rise 0.5 to 1.4 meters by the year 2100. Locally, more intense storms are expected to increase the intensity of precipitation events, although total precipitation may decline. Snowpack within the Sierra Nevada is expected to decline, and freshwater diversion is likely to increase, resulting in less freshwater entering the estuary. The resulting changes in hydrology are expected to affect current and wave patterns, which in turn will affect sediment transport to, within, and from the estuary. Sea level rise may alter structure, composition, and distribution of estuarine habitats, including the migration of marshes landward. Ocean acidification is expected to affect the development and distribution of invertebrates, including ecologically and economically important shellfish. As the estuary undergoes substantial ecological change, human communities surrounding it will need to adapt to and mitigate the effects of climate change. SF Bay NERR plays a critical role in coordinating research to understand the impacts of climate change; educating coastal decision makers, the public, and science teachers about those impacts; and providing tools to help land managers and local governments mitigate and adapt to the effects of climate change.

3.1.1 CROSS-SECTOR PROJECT

Reserve staff will work closely with partners to develop and implement protection, management, and restoration strategies that proactively accommodate the predicted effects of climate change within the Reserve sites. This includes working together to promote Rush Ranch and China Camp on both regional and national scales as "sentinel sites" or areas that are used for long-term monitoring of physical environmental conditions (i.e., geodetic elevation, marsh surface elevation, sediment

dynamics, water levels, and vegetation conditions), so as to measure changes to ecosystem function in response to environmental stressors such as sea level rise. Examples of specific actions are:

- ◆ Reserve Manager will communicate with regional partners to encourage integration of NERR priorities and actions with the existing climate research activities in the San Francisco Bay Area.
- ◆ RC and SWMP technicians will work to institute specific monitoring programs outlined in the NERRS sentinel sites proposal (Saumweber et al., 2010).
- ◆ CTP Coordinator and EC will ensure that knowledge gained through these initiatives is shared with broad, diverse audiences both locally and nationally.



High tide over road at China Camp gives preview of sea level rise flooding

~ Jo Davies

Climate Change Goal 1: Increase knowledge and understanding of effects of climate change on Reserve sites.

Objective 1: Land managers and scientists working in the Reserve will have increased access to data illustrating short- and long-term variability of key climate change parameters such as sea level rise, marsh surface elevation, estuarine salinity, precipitation, wildlife response to climate change and vegetation community change.

- | | |
|----------|--|
| Action 1 | RC will work with California State Parks and Solano Land Trust staff to increase and document the percentage of researchers working within the Reserve who have current, accurate permits for conducting climate change research. |
| Action 2 | RC, CTP Coordinator and EC will collaborate with scientists working within the Reserve to post research summaries and updates on the SF Bay NERR website, including summaries of trends in marsh elevation and other monitoring data, such as wildlife response to climate change. |
| Action 3 | RC will conduct or coordinate research to measure effects of increased tidal heights within one or more of the Reserve sites, and will encourage collaboration and data sharing among researchers. |
| Action 4 | RC will oversee continued measurement of long-term meteorological conditions at Rush Ranch and Richardson Bay and the development of a new meteorological station at China Camp. |
| Action 5 | RC and EC will conduct or coordinate research to characterize and monitor vegetation communities along the critical transition zones at one or more of the Reserve sites. |
| Action 6 | CTP Coordinator will work with land managers to identify their needs and priorities for increased data access related to environmental and ecological change detection within the Reserve. |
-

Objective 2: Visitors to Reserve sites who participate in a guided tour or substantially interact with Reserve interpretive exhibits will know more about potential local effects of climate change on habitats and species within the Reserve sites and/or within their own communities.

- | | |
|----------|--|
| Action 1 | EC will offer guided programs at each of the Reserve sites, and will incorporate lessons about predicted climate change effects into these programs. |
| Action 2 | EC will train and support volunteers at Rush Ranch and China Camp and will provide volunteers with information about potential climate change effects within the region and specifically at the Reserve sites. |
| Action 3 | EC will regularly update changeable components of interpretive signage and write articles for newsletters. Climate change themes will be incorporated into these interpretive products. |
-

Climate Change Goal 2: Increase knowledge and understanding of effects of climate change on the Bay and other northern California estuaries and coastal habitats.

Objective 1: Reserve staff will facilitate partnerships that increase knowledge of climate change effects and adaptation strategies for the Bay Area.

Action 1 Reserve staff will participate in regional climate change research coordination efforts, such as the Bay Area Ecosystems Climate Change Consortium, including CTP assisting with development of trainings and Reserve Manager, with input from the Reserve staff, representing the Reserve.

Action 2 RC will conduct or encourage research on physical and biological linkages among the Bay, the Pacific Ocean and regional estuaries.

Action 3 CTP Coordinator will participate in national Climate Training Workgroup to develop additional training programs and funding sources.

Action 4 CTP Coordinator will assess and communicate regional coastal decision makers' informational needs to Reserve's RC, the NERRS research community, other research institutions, and other NOAA offices as appropriate.

Objective 2: Coastal land managers, local governments, and other interested coastal decision makers who make use of Reserve training resources will better understand the observed and predicted effects of climate change on the Bay Area's natural and human systems.

Action 1 CTP Coordinator will develop and deliver programming about anticipated climate change impacts to natural coastal systems and to coastal communities.

Action 2 CTP Coordinator will develop and/or provide access to documents about climate change impacts on Reserve's website.

Action 3 CTP Coordinator will work with both signatory and other partner organizations to develop and/or distribute management tools such as vulnerability assessment worksheets; presentations; model ordinance language; case studies; and other informational products.

Objective 3: Science teachers who participate in Reserve trainings will better understand potential local effects of climate change on habitats and species within their own communities, and will have access to lesson plans designed to aid teaching about these effects in their classrooms.

Action 1 EC will offer professional development program(s) for educators with content primarily focused on climate change impacts.

Action 2 EC will create and/or modify, and work with other educators and scientists to create and/or modify, lesson plans that incorporate climate change science.

3.2 SPECIES INTERACTIONS

Interactions among species, within species, and between species and their environments are of central importance to the structure and function of Northern California's estuaries and coastal habitats. Species interactions influence numerous ecological processes including production and consumption, nutrient cycling, and habitat change. Understanding the mechanisms and implications of these interactions is a critical step toward mitigating effects of invasive species, encouraging recovery of rare or threatened species, and reducing the extent of future declines in species diversity. The majority of scientific work being conducted in the Reserve is focused to varying degrees on species interactions, and these avenues of research are likely to broaden and intensify in the future. SF Bay NERR coordinates research to understand the dynamics of species interactions; educates coastal decision makers, the public, and science teachers about those interactions; and provides tools to help land managers and local governments support species diversity and ecosystem functions.

3.2.1 CROSS-SECTOR PROJECT

The RC, EC and CTP Coordinator will develop and implement strategies to improve the knowledge and responsible control of invasive species within the Reserve. Example actions include RC and EC working with Solano Community College students on species monitoring, EC producing fliers on how to minimize spread of target species, and CTP Coordinator developing training on specific invasive species and control methods, such as those on perennial pepperweed (*Lepidium latifolium*).



Lepidium removal at Rush Ranch
~ Christine Whitcraft

Species Interactions Goal 1: Increase knowledge and understanding of animal and plant species distributions and abundances within Reserve sites.

Objective 1: Reserve scientists will have access to lists of species present within the Reserve, and will know present distribution patterns for some species.

Action 1 RC will oversee the development by Graduate Research Fellows or others of an updated species list for the Reserve sites.

Action 2 RC and EC will conduct or coordinate research to characterize and monitor plant communities along critical transition zones at one or more of the Reserve sites.

Action 3 RC will evaluate effectiveness of the Reserve's existing biological monitoring projects, revise the Reserve's protocols, discontinue projects, and implement new monitoring projects where appropriate.

Action 4 EC, with guidance from RC, will use organized groups of college students to conduct biological monitoring projects.

Action 5 RC will conduct or coordinate research to investigate mechanisms and processes that determine species distributions and abundances within the Reserve.

Action 6 RC will work with Solano Land Trust and future GIS staff to develop a Habitat Mapping and Change plan according to guidelines developed by the NERRS Habitat Mapping and Change Committee.

Action 7 Reserve Manager, RC, EC and CTP Coordinator will seek funding to support biological monitoring within the Reserve.

Objective 2: Scientists and land managers who participate in Reserve programs will better know how to conserve and protect rare, threatened, and endangered species that occur within the Reserve sites.

Action 1 RC will encourage and/or facilitate well-planned research of listed species present within the Reserve sites, including amphibians, and will encourage researchers to share their findings with Reserve land managers.

Action 2 In coordination with RC, CTP Coordinator will develop field and classroom based trainings related to identification, ecology, handling, and management of listed species.

Species Interactions Goal 2: Increase knowledge and understanding of invasive species within the Reserve, the greater Bay Area, and other regional estuaries and coastal habitats.

Objective 1: Reserve scientists will have increased understanding of the ecology of invasive species within the Reserve sites.

Action 1 RC will encourage and/or facilitate research projects on invasive species present within the estuary, especially those that evaluate methods used to control invasive species while minimizing negative impacts to the environment and other, non-target species.

Action 2 RC will work with California State Parks and Solano Land Trust staff to improve percentage of researchers working within the Reserve who have current, accurate permits for conducting research on invasive species.

Objective 2: Reserve scientists and land managers will exchange information about invasive species projects and needs through increased development of informational products, including written summaries, tools, workshops and fliers.

Action 1 RC, EC and CTP Coordinator will collaborate with scientists working within the Reserve to create and post research summaries and updates, including invasive species research, on the SF Bay NERR website.

Action 2 CTP Coordinator will develop field and classroom-based trainings related to identification, ecology, handling, and management of listed species found in Reserve sites.

Action 3 EC and CTP Coordinator will create and disseminate flier(s) for scientists working at Reserve sites to educate them about their role in invasive species detection and prevention.

Action 4 RC and CTP Coordinator will create and promote list of research needs that can be used as project ideas for Graduate Research Fellows, graduate students, and other interested scientists; and as the basis for response to requests for proposals from funders such as NOAA, the Delta Science Program and the California State Coastal Conservancy.

Objective 3: Visitors to Reserve sites who participate in a guided tour or substantially interact with Reserve interpretive exhibits will better understand the impact invasive species have on the estuary and know ways they can help to prevent further introductions.

Action 1 EC will offer guided programs at each of the Reserve sites, and will incorporate information about invasive species into these programs.

Action 2 EC will regularly update changeable components of interpretive signage and write articles for newsletters. Invasive species themes will be incorporated into these interpretive products.

Species Interactions Goal 3: Improve understanding and ability of partners to respond to resource management issues within the Reserve sites.

Objective 1: Staff from California State Parks and Solano Land trust will have increased understanding of important resource management issues facing the sites, such as grazing, controlled use of fire, and visitor use impacts.

Action 1 RC will encourage and/or facilitate research that targets specific resource management issues affecting the sites.

Action 2 RC and CTP Coordinator will create list of research needs that can be used as project ideas for Graduate Research Fellows, graduate students, and other interested scientists; and as the basis for response to requests for proposals from funders such as NOAA, the Delta Science Program, and the California State Coastal Conservancy.

Action 3 CTP Coordinator will offer training(s) and create and distribute tool(s) to help increase land managers' knowledge and ability to respond to resource management concerns.

Objective 2: Visitors to Reserve sites who participate in a guided tour or substantially interact with Reserve interpretive exhibits will better understand specific resource management issues and how their actions influence the environment.

Action 1 EC will offer guided programs at each of the Reserve sites, and will incorporate information about resource management issues into these programs when appropriate.

Action 2 EC will regularly update changeable components of interpretive signage and write articles for newsletters. Resource management themes will be incorporated into these interpretive products.

Action 3 EC and/or CTP will create informational fliers about resource management topics relevant to the Reserve and the target audience.

3.3 WATER QUALITY

As a result of human activities and land use decisions throughout the watershed, the quality of the water in San Francisco Bay has changed dramatically since the 1800s due to

- ◆ sedimentation associated with the Gold Rush;
- ◆ development of dams, reservoirs, and canals that divert freshwater away from the estuary;
- ◆ non-point source pollution from extensive and intensive urban development;

- ◆ year-round discharge from sewage treatment plants along the estuary's shoreline;
- ◆ and the destruction of nearly 90% of the Bay's tidal marshes.

Further water quality changes in the Bay are expected to include increased salinities associated with rising sea levels, and increased freshwater use associated with agriculture and continued land development. Accurate, high-frequency, long-term monitoring is essential to the detection and understanding of subtle changes in water quality within the estuary. Following protocols established by the NERRS SWMP, the

Reserve maintains a network of water-quality monitoring stations spanning the salinity gradient encompassed by Rush Ranch and China Camp. These monitoring data, coupled with nutrient, contaminant, and flow studies conducted within the Reserve, can be used by scientists, educators, managers, and commercial and recreational users of the Bay. The Reserve is part of a disparate patchwork of water quality monitoring programs within the Bay, including no fewer than four multi-site water quality monitoring programs run by state, federal, and non-profit organizations. The Reserve plays an important role as its long-term funding has allowed for the development of high-quality, high-frequency monitoring programs at the Reserve's sites. Additionally, the Reserve offers a unique contribution of education programs and trainings that capitalize on the Reserve's monitoring programs.



Researcher conducting water quality monitoring at China Camp
~ Sarah Ferner

3.3.1 CROSS-SECTOR PROJECT

The System-Wide Monitoring Program is an ongoing integrative project at the SF Bay NERR: RC and SWMP technicians will maintain and improve the monitoring program, the EC will create lesson plans and train teachers to use the data, and the CTP Coordinator will assess needs of coastal decision makers related to water quality.

The RC, EC and CTP Coordinator will work together to restructure and augment the Reserve's website so that it is more useful for scientists, educators, and coastal decision makers, particularly in terms of access to water quality data. For example, a new feature of the website will include summaries of current and past monitoring and research happening within the Reserve and education resources for teachers. Links to external resources and related water quality monitoring programs around the SF Bay Area will also be incorporated.

Water Quality Goal 1: Improve knowledge and understanding of trends in water quality parameters within the Reserve sites.

Objective 1: Reserve scientists will have increased knowledge of short- and long-term water quality trends using data collected through SWMP.

- | | |
|----------|--|
| Action 1 | Reserve Manager will seek collaborations and funding opportunities to better integrate SWMP with regional monitoring efforts. |
| Action 2 | Reserve Manager and RC will seek funding to support expansion of SWMP to include additional parameters (e.g., suspended sediments) and more precise measurement of existing parameters (e.g., pH). |
| Action 3 | Reserve staff will participate in national-level NERRS workgroups related to SWMP to increase relevance of SWMP to other well-established monitoring programs in SF Bay. |
-

Objective 2: Interested parties, including scientists, land managers, science teachers, and commercial and recreational users of the Reserve, will have improved access to and understanding of water quality data collected within the Reserve.

- | | |
|----------|--|
| Action 1 | RC, CTP Coordinator and EC will collaborate with scientists working within the Reserve to post research summaries and updates on the SF Bay NERR website. |
| Action 2 | CTP Coordinator will determine potential end-users of system-wide monitoring data and assess barriers to their ability to access and use available data. |
| Action 3 | EC will conduct a Market Analysis and one or more Needs Assessments to determine most appropriate ways to support teachers in the use monitoring data and Estuaries 101 lesson plans. |
| Action 4 | EC will seek funding to support professional development programs for educators. |
| Action 5 | EC will offer professional development program(s) for educators with content primarily focused on water quality monitoring. |
| Action 6 | EC will create and/or modify, and work with other educators and scientists to create and/or modify, lesson plans that incorporate water quality and SWMP data. |
| Action 7 | EC will offer trainings for volunteer docents and educators that work within the Reserve about water quality and SWMP. |
| Action 8 | EC will regularly update changeable components of interpretive signage and write articles for newsletters. Topics related to water quality and system-wide monitoring program will be incorporated into these interpretive products. |
| Action 9 | EC will participate in national-level NERRS projects to improve data access and educational tools. |
-

Water Quality Goal 2: Increase understanding of the effects of land-use on nutrient and contaminant levels within the estuary.

Objective 1: Reserve scientists will have improved understanding of impacts of local land use on nutrient and contaminant levels within the Reserve.

Action 1	RC will conduct or coordinate annual summaries of water quality data collected at one or more Reserve sites.
Action 2	RC will conduct or coordinate research to measure fecal indicator bacteria within the Reserve’s waters.
Action 3	EC and CTP Coordinator will assess the need for meeting(s) and/or trainings related to best management practices of horses/livestock in coastal areas for local ranchers, land managers, and residents.
Action 4	CTP Coordinator will participate in groups that examine linkages between land use and water quality (such as the California Water and Land Use Partnership), and work with these organizations to deliver training and technical assistance programs.
Action 5	EC will work with California State Parks to increase visitors’ awareness of beach closure events at China Camp.

3.4 HABITAT RESTORATION

China Camp and Rush Ranch include rare remnants of habitats that were once common in the watershed, including native grasslands, tidal marsh, tidal marsh-upland transition zones, tidal flats, and rocky subtidal and intertidal areas. Fire suppression, sedimentation associated with the Gold Rush, and extensive urban development led to the destruction of much of this habitat within the estuary. In the past these habitats supported diverse native flora and fauna, provided essential nurseries for commercially important fish and invertebrates, filtered mud from the Bay's murky waters, and protected the shoreline from flooding. The SF Bay NERR plays an important role in bay-wide restoration activities because remnant habitats are often used as reference sites to compare functioning of the “natural” habitat with that of a recently restored area. Even within the Reserve, however, there are areas in need of restoration. SF Bay NERR, therefore, encourages basic research on the remnant habitats, supports applied restoration research, and actively facilitates education about best practices of restoration. Reserve stewardship activities, such as invasive weed control, likewise support habitat restoration. SF Bay NERR also fosters public support for resource protection and habitat restoration through facilitating the public’s experience of the Reserve sites in a responsible way.

3.5 CROSS-SECTOR PROJECT

The Reserve staff will participate in wetland restoration projects within the Reserve's sites, such as the proposed restoration of the managed marsh at Rush Ranch and potential restoration of portions of other muted tidal marshes at both Reserve sites. Collaboration will focus on seeking funds for integrated restoration, research, and education; and, if funded, will extend to professional sharing of lessons learned from these project(s) with appropriate audiences (such as restoration practitioners or public access planners).

Sediments in the Bay

Patterns of sediment transport, erosion, and deposition in San Francisco Bay have changed during the past 150 years due to human actions such as hydraulic mining that increased sediment input, dam construction that reduced sediment input, water diversions, filling, diking, and dredging, all of which have significantly altered the Bay's sediment dynamics (San Francisco Bay Plan, 2008).

Higher rates of sea level rise and declines in sediment inflow likely would result in additional loss of tidal flats, changes in the distribution of subtidal habitats, and alteration of Bay circulation. The Bay Conservation and Development Commission, a Reserve signatory partner, addresses these concerns through climate change initiatives and in fulfilling their role regulating dredging and disposal activity in San Francisco Bay and its marshes.

Reserve activities contribute to addressing sediment concerns in the estuary through promoting Reserve sites as sentinel sites, studying sediment dynamics in the Climate Change "cross-sector" project, and seeking funding to support expansion of the Reserve's monitoring program to include suspended sediments as an additional parameter.

Habitat Restoration Goal 1: Improve knowledge and understanding of strategies for effective habitat restoration within Reserve sites and the region's estuaries and coastal watersheds.

Objective 1: Reserve scientists and managers will have greater access to knowledge about the functioning of healthy estuarine reference habitats.

Action 1 RC will conduct or coordinate basic research about tidal marsh habitats and other "reference" habitats within the Reserve sites.

Action 2 RC, EC and CTP Coordinator will collaborate with scientists working within the Reserve to post research summaries and updates on the SF Bay NERR website, including summaries of relevant restoration research.

Objective 2: Land managers, restoration practitioners, and restoration scientists that participate in Reserve training opportunities will have a greater understanding of best practices of restoration and will be better prepared to implement those practices.

Action 1 RC will encourage and/or facilitate restoration research designed to determine best practices within the Reserve sites and communicate those practices through the CTP.

Action 2 CTP Coordinator will offer workshops, field trips, and other professional sharing networks to improve transfer of knowledge between scientists and restoration practitioners.

Action 3 Reserve Manager will seek out partnerships and funding opportunities that will allow the Reserve sites to move forward with restoration planning, research, and implementation.

Objective 3: Visitors to the Reserve that participate in guided programs or substantially interact with interpretive exhibits will have increased support for restoration of critical habitats.

Action 1 EC will assist with development of interpretive signage associated with new restoration projects within the Reserve, including seeking funds, providing/writing content, and managing the project(s) as needed.

Action 2 EC will regularly update changeable components of interpretive signage and write articles for newsletters. Topics related to habitat restoration will be incorporated when active restoration projects are visible at the Reserve sites.

Action 3 EC will offer guided programs for families or individuals, and will incorporate restoration components into these programs when appropriately accessible, active restoration projects are occurring within the Reserve.

Objective 4: Science teachers who participate in Reserve trainings will better understand how to incorporate restoration projects into science curriculum.

Action 1 EC will seek funding to conduct professional development programs for educators about restoration science.

Action 2 EC will seek out partnerships with restoration organizations and explore ways to utilize community volunteers within Reserve's restoration projects.

Habitat Restoration Goal 2: Provide or assist with obtaining technical expertise and funds to conduct restoration projects within or in support of the Reserve sites.

Objective 1: Reserve scientists and managers will have increased access to expertise and funds necessary to restore tidal marsh habitat within the Reserve sites.

Action 1 RC will conduct or coordinate basic research about tidal marsh habitats and other “reference” habitats within the Reserve sites.

Action 2 Reserve Manager, RC, and CTP Coordinator will seek funding opportunities to support restoration projects within the Reserve sites.

Objective 2: Reserve scientists and managers will have continued access to data and expertise needed to restore critical habitats within the Bay and regional estuaries.

Action 1 RC will consult with Richardson Bay Audubon Center and Sanctuary, NOAA Restoration Center, and regional scientists about oyster restoration projects within the estuary.

Action 2 RC will conduct or coordinate research on invertebrate populations and water flow within the Reserve sites.



Tide gate at Rush Ranch
~ Jo Davies

Action 3 Reserve Manager will seek out partnerships and funding opportunities that will allow the Reserve sites to move forward with restoration planning, research, and implementation.

Objective 3: Visitors to the Reserve that participate in guided programs or substantially interact with interpretive exhibits will have increased support for restoration of critical habitats.

Action 1 EC will assist with development of interpretive signage associated with new restoration projects within the Reserve, including seeking funds, providing/writing content, and managing the project(s) as needed.

Action 2 EC will regularly update changeable components of interpretive signage and write articles for newsletters. Topics related to habitat restoration will be incorporated when active restoration projects are visible at the Reserve sites

Action 3 EC will offer guided programs for families or individuals, and will incorporate restoration components into these programs when appropriately accessible, active restoration projects are occurring within the Reserve.

Action 4 CTP Coordinator will work with Subtidal Habitat Goals partners to develop training and technical assistance programs to communicate the latest knowledge about subtidal habitat restoration and management.



China Camp's varied habitats: oak woodland, salt marsh, beach, and tidal flat
~ SF Bay NERR Staff

4 LAND ACQUISITION AND BOUNDARY EXPANSION PLAN

The present boundaries of the SF Bay NERR are co-terminus with the entire China Camp State Park and the entire Rush Ranch property; see Plates 3 and 5. China Camp is bordered on the north by San Pablo Bay, and along the northwestern point (Grove Point) by the marsh and flats at the mouth of Gallinas Creek. Along the western and southwestern edges, the park border runs along the ridgeline and is bounded by the San Pedro Mountain Open Space Preserve and the City of San Rafael Harry A. Barbier Memorial Park. The eastern end of the park abuts the McNears Beach County Park. The Rush Ranch property is bordered by wildlife areas. On the north and west lie the Hill Slough Wildlife Area (1,112 acres) and the Peytonia Slough Ecological Reserve (1,887 acres) and on the south and southeast is the Joice Island Wildlife Area (1,887 acres); all of these properties are managed by the California Department of Fish and Game.

As described at 15 CFR 921.11 (C)(3)(Appendix A), NOAA research reserve boundaries generally include two subcategories: key land and water areas, called “core areas,” and a buffer zone. NOAA defines core areas as those containing critical estuarine ecological units for research purposes, encompassing “a full range of significant physical, biological, and chemical factors contributing to the diversity of fauna, flora, and natural processes occurring within the estuary.” A buffer zone is described as an area adjacent to or surrounding the core and on which the integrity of the core area depends. Buffer zones protect the core and provide additional protection for estuarine-dependent species, including those that are threatened or endangered. For this Reserve, the core areas are the tidally influenced wetlands that occur within China Camp and Rush Ranch, totaling approximately 1,150 acres. The buffer zones comprise the areas that are not tidally influenced wetlands, totaling approximately 2,560 acres.

The SF Bay NERR may pursue future opportunities for land acquisition, including the purchase of additional lands contiguous with existing Reserve sites. Acquisition of properties and agreements regarding conservation easements will only be pursued with the approval of the respective Reserve site managing agency. Decisions on the acquisitions of other lands will be based on the type and quality of the habitat being considered, including an appropriate rationale for expanding any boundary, and consistency with the vision, mission, and goals of the Plan. Acquisition of additional lands, if pursued, will be accomplished only through willing seller negotiations; eminent domain is not being considered. It is anticipated that willing-seller acquisition and conservation easement agreements may be used to acquire additional lands for the SF Bay NERR as such opportunities arise.

The preferred method of land acquisition for the SF Bay NERR is fee-simple acquisition from willing sellers. A fee-simple interest is desired in that it: (1) provides for opportunities to carry out the programs of the SF Bay NERR including education, research and monitoring, (2) consolidates small tracts for more effective resource management activities, and (3) provides the best assurance of long-term resource protection. A fee-simple interest may be acquired by out-right purchase, donation, tax

forfeiture or land exchanges. Fee-simple acquisition would only be sought from willing sellers.

Conservation easements are binding agreements that may be used to secure management agreements toward the objectives of the SF Bay NERR. Long-term, low cost leases may be considered to fulfill certain management or access needs. Memoranda of Understanding are usually no-cost agreements between parties that allow SF Bay NERR activities on a parcel, while acquiring no other legal interest in the property. Examples of properties or areas of interest for potential acquisition or boundary expansions are listed below. The Reserve is not actively pursuing acquisition of any properties at this time but may explore them in the future.

This Plan does not add any additional lands into the boundary of the Reserve at this time; designation of any additional lands or sites would be through an entirely separate, publically-conducted boundary expansion process.

4.1 RUSH RANCH OPEN SPACE PRESERVE

No inholdings exist at Rush Ranch, and the majority of surrounding lands are in public ownership. If the Solano Land Trust Board is willing, smaller non-adjacent properties within the Suisun Marsh may be acquired by the Trust and may be considered for inclusion in the Reserve.



Windmill at Rush Ranch
~ SF Bay NERR Staff

4.2 CHINA CAMP STATE PARK

In addition to being included in the California State Parks' primary mission, wetlands preservation is also a mandated responsibility under the Keene-Nejedly California Wetlands Preservation Act of 1976 (Public Resources Code Div. 5, Ch. 7). The Act directs California State Parks, along with the Department of Fish and Game, to recognize opportunities for protecting wetlands within or adjacent to State Park System units, and to consider acquisition of wetlands in proximity to California State Parks. Adjacent properties that may be considered for acquisition include: the county easement along San Pedro Road; the lands, wetlands and baylands along the northern park boundary near Gallinas Creek by Grove Point; and properties such as Boyd's Ranch and Buck's Landing immediately adjacent to the park.

4.3 BROWNS ISLAND REGIONAL SHORELINE

The original scope of the designation proposal submitted by the State of California in 2002 included Browns Island (Contra Costa County) as a third site, with the goal of representing the entire salinity gradient of the Bay in research and monitoring efforts. Browns Island is bounded by Middle Slough on the east, New York Slough on the south, and Suisun Bay on the west and northwest; the island is accessible by boat only through special arrangement with the East Bay Regional Park District (Plate 6).

The East Bay Regional Park District is a system of public parks and trails in Alameda and Contra Costa counties on the eastern side of San Francisco Bay that encompasses over 100,000 acres with 65 regional parks, recreation areas, wilderness, shorelines, preserves, and land bank areas. The core mission of the Park District is to “acquire, develop, manage, and maintain a high quality, diverse system of interconnected parklands which balances public usage and education programs with protection and preservation of our natural and cultural resources.”

Browns Island consists of 595 acres, with 490 acres owned by the California State Lands Commission and leased to the East Bay Regional Park District under a General Lease Agreement that expires in 2044. The Port of Stockton owns 100 acres in the center of the island and approximately 5 acres on the western tip near Point Emmet. The Port’s properties were not included within the proposed boundaries of the SF Bay NERR; only the publicly-owned portions of Browns Island had been proposed for designation, with the East Bay Regional Park District as the Reserve signatory partner.

Ultimately NOAA did not designate Browns Island due to concerns regarding how designation would affect potential dredging activities in the adjacent navigation channel. The designation of any reserve establishes a program that neither creates nor modifies any existing land-use permitting requirements beyond those currently enforced by state or Federal regulatory and resource agencies. Thus, the designation per se of Browns Island would not affect the regulations or procedures for dredging in the channel. However, these concerns were not able to be resolved within the timeframe of the designation process; therefore NOAA chose to set it aside.

In accordance with NOAA’s decision, the final Environmental Impact Statement was revised to remove Browns Island as a Reserve site in Chapter 3 on the preferred environmental alternative. However, the remainder of the document retained all the analyses of and references to Browns Island. Likewise, the Record of Decision designated the two Reserve sites at China Camp and Rush Ranch and retained the environmental impact statement information on Browns Island while not designating it as part of the Reserve.

Today, Browns Island remains an important ecological resource and a priority reference site for estuarine research in the Bay. For example, it is included in the Delta Science Program’s Integrated Regional Wetlands Monitoring program (www.irwm.org). Including Browns Island as a Reserve site would provide coordination of research, monitoring, and stewardship. In particular, the value of Browns Island to the Reserve and subsequent value to the San Francisco Bay region

Browns Island

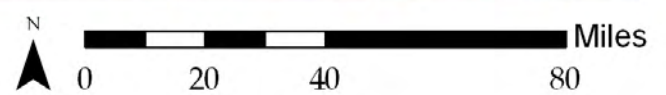


Suisun Bay

Sacramento River

Browns Island

Pittsburg



includes having a broader representation of the salinity gradient under a single monitoring framework that has local, regional, and national applications. Further, the location of Browns Island within the estuary makes it a critical study site for looking at climate change impacts on tidal marshes. Long-term monitoring and coordinated research efforts, like those supported through the Reserve System's proposed "sentinel sites" project, would be especially valuable at Browns Island. Thus, this Plan acknowledges the merit of adding Browns Island as a site and encourages exploration of such a possibility in the near future. Such designation would be through an entirely separate, publically-conducted boundary expansion process.

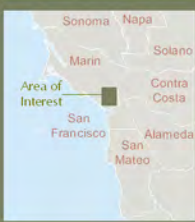
4.4 RICHARDSON BAY AUDUBON CENTER AND SANCTUARY

The Richardson Bay Audubon Center and Sanctuary (hereafter "Sanctuary"), protected and managed by Audubon California for over 50 years, is a 900-acre site located in Central San Francisco Bay close to the Golden Gate (Plate 7). Richardson Bay is exposed to a greater marine influence and would thus extend the salinity gradient covered by the existing SF Bay NERR sites. The Sanctuary encompasses eelgrass (*Zostera marina*) beds, an important foundation species not found at the other SF Bay NERR sites. This submerged aquatic vegetation is known to provide spawning substrate for Pacific herring (*Clupea pallasii*), a critical food for wintering birds and harbor seals in San Francisco Bay and an important local fishery. The Sanctuary also boasts a native oyster (*Ostrea lurida*) population, intertidal salt marshes and tidal flats, fish and invertebrates that are commercially important and/or serve as prey within the food web, and habitats that support migratory and resident birds. In recognition of the essential habitat and refuge for the tens of thousands of diving ducks, grebes and other waterbirds that winter in the Sanctuary, it has been designated as an Important Bird Area.³ In addition to these important ecological communities, the Sanctuary also encompasses natural, native bay beaches. Once prevalent in the Central Bay, the Baylands Habitat Goals project estimates that 75% or more of these beaches have been lost to shoreline hardening or other development. Bay beaches provide a long list of benefits, including roosting areas for wildlife, habitat for rare native plant species, habitat that will adapt and self-maintain in response to sea level rise, and areas for public access and recreation. Bay beaches provide a softer, visually pleasing alternative to constructed rip-rap, levees, and sea walls, while also providing protection from erosion and storm surges.

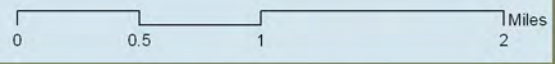
With two native bay beaches, eelgrass, native oysters, mudflats and salt marshes, the Sanctuary serves as an important reference site for restoration, thus supporting the Reserve's goals related to research and restoration at China Camp and Rush Ranch. The variety of ecological communities within the Sanctuary has already attracted researchers from diverse organizations.

³ The Important Bird Area (IBA) program of BirdLife International is a non-profit global network of areas for the conservation of the world's birds and other biodiversity. IBAs are identified, monitored, and protected by national and local organizations and individuals. As of 2009, nearly 11,000 sites in some 200 countries and territories have been identified as IBAs

Richardson Bay Audubon Center & Sanctuary



- Richardson Bay Audubon Center & Sanctuary
- Subtidal Sanctuary
- Public Land
- Aramburu Island



Operating under a Memorandum of Understanding (Appendix D), SF Bay NERR and Audubon California have established a strong partnership and are actively collaborating in a number of ways, including collaborative research to explore how flow interacts with eelgrass restoration and joint education activities.

Addition of the Sanctuary as a NERR site would bring added strengths to the SF Bay NERR. First, Richardson Bay includes valuable sub-tidal habitat that supports migratory birds and provides nursery habitats for fish among other valuable ecological services; since neither Rush Ranch nor China Camp have sub-tidal habitat, this would be a unique and important addition. Based on its unique qualities, Richardson Bay is listed in the San Francisco Bay Subtidal Habitat Goals Project as a potential site for establishing an eelgrass reserve as well as a site for exploring the integration of upland, intertidal, and subtidal habitats in the Bay through increased wetland restoration linked to existing oyster and eelgrass populations.

The Sanctuary already attracts scientific research, the results of which have been used to inform coastal management; for example, research on eelgrass has guided regional restoration efforts. Broader access to NERR datasets and research results for this site would bring added benefit to the scientific community. The geographic setting of Richardson Bay offers great potential for habitat restoration that increases the connectivity of subtidal to upland ecosystems as well as increased community awareness of the importance of these habitats. Further, Audubon California integrates its research and stewardship activities with its strong education and outreach programs, which serve approximately 15,000 children and adults annually at this site. With its bayside location, the Sanctuary plays a unique role in long-term education and outreach, community involvement, restoration, and research within Richardson Bay, while ensuring conservation and protection of the 900-acre Sanctuary. Acknowledging the value of adding the Sanctuary as a site in this Plan allows exploring such a possibility in the future. Such designation would be through an entirely separate, publically-conducted boundary expansion process.

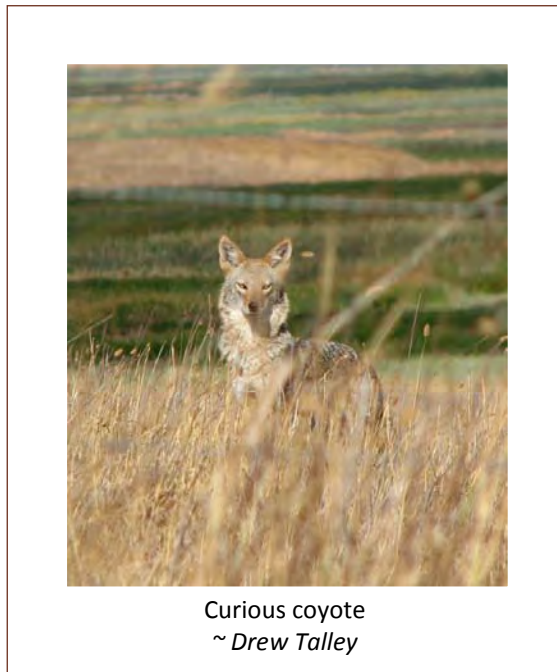
The existing mix of conservation, restoration, and education programs and activities at Richardson Bay underscores the value of including the Sanctuary in the SF Bay NERR. In particular, this includes having a broader representation of the salinity gradient under a single monitoring framework that has local, regional, and national applications. Moreover, Audubon California programs align and support the key issue areas the Reserve is addressing. For example, collaboration on the water quality monitoring equipment and the installation and use of the weather station for metrological data supports Water Quality goals (Section 3.3) and Audubon California's restoration project at the Aramburu site aligns with the Habitat Restoration goals (Section 3.4).

5 ADMINISTRATION PLAN

5.1 OVERVIEW OF ADMINISTRATIVE FRAMEWORK

The administrative framework for the SF Bay NERR is structured to forge a collaborative partnership between SF State, the Reserve staff and NOAA, and between the Reserve staff and the site management agencies. It is also the role of the Reserve staff to work with the site management agencies, SF State, regional planning organizations, and the public to promote Reserve projects and programs on Reserve sites. Reserve staff does not actually manage individual sites but works with site management agencies to channel resources to individual sites and establish and conduct desired Reserve programs and activities.

The SF Bay NERR is managed as a federal-state partnership between the NOAA's Office of Ocean and Coastal Resource Management and the San Francisco State University as the lead state agency. Partners include the California State Parks (China Camp site) and the Solano Land Trust (Rush Ranch site), and the Bay Conservation and Development Commission (Coastal Zone Management agency with jurisdiction for the nine counties of the San Francisco Bay area).



Appendix B is the Agreement Concerning Cooperative Management of the SF Bay NERR by SF State, California State Parks, Solano Land Trust, and the Bay Conservation and Development Commission; Appendix C is the Memorandum of Understanding between NOAA and SF State.

OCRM implements the National Coastal Zone Management Program and NERRS with authorization from the Coastal Zone Management Act of 1972. OCRM provides funding, technical assistance, and national coordination and oversight to Reserves within NERRS through the Estuarine Reserves Division and the National Policy and Evaluation Division.

As the lead state partner, SF State provides management, staff, matching funds, and facilities for implementation of the SF Bay NERR. SF State and the SF Bay NERR staff are also responsible for representing the Reserve in programs and partnerships of local, regional, or national scope that involve the SF Bay NERR program. Administratively, the Reserve is an institute (independent unit) within the SF State College of Science and Engineering; the Reserve Manager is an Institute Director who reports to the Dean of the College. The Reserve is physically housed at the SF State Romberg Tiburon Center for Environmental Studies, an off-campus research and teaching marine and estuarine laboratory on the Tiburon Peninsula in Marin County.

Land managing agencies include the California State Parks (China Camp) and the Solano Land Trust (Rush Ranch). These agencies are committed by a Memorandum of Understanding (Appendix B) to participate as partners in the SF Bay NERR program. They work to advance the use of SF Bay NERR sites to fulfill the mission of the SF Bay NERR; provide land ownership, management, staffing and matching funds; assign members to serve on various advisory boards; and facilitate a good working relationship between SF Bay NERR staff and site management staff.

The Bay Conservation and Development Commission, as the coastal zone management agency for San Francisco Bay, has regulatory authority over facility development and management practices at China Camp State Park and Rush Ranch. BCDC supports the SF Bay NERR in fulfilling its mission; provides guidance, staffing for collaborative programs (such as the Coastal Training Program and GIS support), office space, and matching funds; and participates as part of the Management Advisory Board.

5.2 MANAGEMENT ADVISORY BOARDS

In order to better support the work of the Reserve, Reserve staff works with various Management Advisory Boards.

5.2.1 SF BAY NERR MANAGEMENT ADVISORY BOARD

SF Bay NERR Management Advisory Board is a non-voting advisory body supported by Reserve staff that works together to facilitate coordination and cooperation among member agencies, aid implementation of the Plan, and promote the work of the Reserve through developing and supporting agreements that recognize the complex network of interests at the Reserve sites and how to best support them. Members include each of the Reserve site land managing agencies, BCDC, SF State and ex officio membership by NOAA. The Advisory Board's principal responsibilities are: (a) to aid with implementation of the Plan and promote adherence to the broader policies of the Reserve and support for its programs by involved agencies, (b) to promote interagency cooperation to advance the mission of the Reserve concurrent with the fulfillment of the respective missions of the agencies and organizations, (c) to assist with periodic reviews of the Reserve and progress on implementation of the Plan, (d) to assist with identifying and obtaining funding, and (e) to assist with revision and updating of the Plan at least every five years. The Board meets annually with additional meetings as needed.

5.2.2 COASTAL TRAINING PROGRAM ADVISORY COMMITTEE

PURPOSE OF BOARD

Each Coastal Training Program within the NERR system must convene an advisory committee to help guide the development and ongoing activities of the CTP. The committee is comprised of individuals from organizations that are either important target audiences of the CTP (such as the Association of Bay Area Governments, the regional planning agency for the Bay Area), are key partners in the development and

provision of training (such as NOAA's Coastal Services Center), or are researchers and subject experts in high priority topics for the CTP.

ROLES AND RESPONSIBILITIES

Committee members are expected to respond to periodic information and feedback requests and to attend annual meetings. Members also have a role in assisting the CTP Coordinator in establishing new connections with target audiences; with identifying and pursuing funding sources; and exploring additional partnering opportunities with members' organizations. The role of the CTP Coordinator is to lead the advisory committee by facilitating meetings, preparing annual and periodic update materials for the Committee's review and comment, soliciting input on all major programmatic documents, and proactively developing partnering opportunities with the organizations represented by members of the Committee.

MEETING LOCATION AND FREQUENCY

A full meeting of the advisory board happens annually, and ad hoc meetings with individual members are held as needed. Meetings take place at locations convenient to partners, typically in downtown San Francisco or in downtown Oakland.

5.2.3 EDUCATION ADVISORY COMMITTEE

PURPOSE OF COMMITTEE

In 2010, the Education Coordinator (EC) established an Education Advisory Committee (EAC) composed of teachers, science specialists, scientists, and other marine and estuarine education providers to help guide the development of new programs, evaluate existing programs, and assist with integration of estuarine education programs in the region.

ROLES AND RESPONSIBILITY

The role of EAC members is: (a) to offer insights and guidance as the EC plans, implements, and evaluates the Reserve's K-16 education programs, and (b) to help build connections between the Reserve's education programs and the local estuarine education community through sharing of knowledge of the members' programs, and those of their partners or collaborators. The role of the EC is to lead the advisory group, including scheduling and facilitation of meetings, preparing materials for review, and soliciting input on major decisions.

MEETING LOCATION AND FREQUENCY

A full meeting of the EAC generally occurs at least once per year, although assistance and guidance may be solicited more frequently through email, phone, or meetings of a sub-set of the committee. Meetings take place at locations convenient to partners or at a Reserve site.

5.2.4 RESEARCH ADVISORY COMMITTEE

PURPOSE OF COMMITTEE

The Research Advisory Committee is composed of resource managers, restoration planners, and scientists whose purpose is to help guide the development and ongoing activities of the Reserve's research and monitoring program.

ROLES AND RESPONSIBILITIES

Committee members are expected to attend annual meetings and to provide periodic feedback including review of Graduate Research Fellowship applications, suggestions for funding opportunities, and recommendations for networking among regional and national scientists whose work is relevant to the Reserve. Members also have a role in assisting the RC in prioritizing research activities and informing the development and improvement of the research program. The role of the RC is to prepare annual and periodic update materials for the Committee's review, to solicit input on all major programmatic documents, and to proactively develop partnering opportunities with the organizations represented by members of the Committee.

MEETING LOCATION AND FREQUENCY

A full meeting of the advisory committee happens annually, and *ad hoc* meetings with individual members are held as needed. Meetings take place via conference call or at locations convenient to members, such as Rush Ranch Nature Center or offices of member organizations.

5.3 MEMORANDA OF UNDERSTANDING

Various Memoranda of Understanding (MOUs) guide the work with Reserve partners. As mentioned above (Section 5.1), the state-federal partnership is defined in an MOU between SF State and NOAA. The creation of the Reserve among the signatory partners is likewise memorialized in an MOU. Periodically these MOUs are reviewed; the next review for these two MOUs by which the Reserve operates is 2013. Subsequent to these MOUs signed at the designation of the Reserve, additional MOUs have been created as circumstances warrant.

The Reserve staff is committed to maintaining good communications with all signatory partners, and now that the Reserve's programs have reached a level of maturation, additional clarification of roles and responsibilities would be beneficial. To that end, the Reserve will execute separate MOUs with California State Parks, Solano Land Trust, and BCDC that describe specifically how Reserve staff and partners will work cooperatively to protect resources within the Reserve; encourage, coordinate, and manage research, education, and stewardship activities within the Reserve; and provide and seek funds to support the Reserve's mission.

Further, the Reserve also has developed important partnerships with other entities that are governed by MOUs, such as Audubon California for the collaboration at the

Richardson Bay Audubon Center and Sanctuary. As the Reserve's programs develop, other such MOUs will be devised as needed.

5.4 ANNUAL WORK PLAN

This Plan is implemented through the development of an annual work plan that identifies the specific actions and milestones to which Reserve staff commit in a given fiscal year. The annual work plan runs from July 1 through June 30, California's fiscal year. Typically, the Reserve Manager and staff collaborate to develop the annual work plan in January through an internal process of meetings among Reserve staff to discuss specific objectives and resource allocations for the upcoming year. Individual staff members—in consultation with key partner staff—write their respective programmatic section's annual work plan, and together all staff agree on actions for the cross-sector projects. The Manager is responsible for the overall plan, including necessary budget decisions based on NOAA funding guidance. This work plan is the basis of the application for the annual NOAA funding allocation for each fiscal year, with the funding for the work plan becoming available on July 1 at the start of the state's fiscal year. The Reserve Manager communicates the final annual work plan to the Reserve's partners.

5.5 FINANCIAL MANAGEMENT PLAN

Funding for the Reserve programs comes primarily from the annual allocation grant from NOAA that supports administrative functions and the research, monitoring, education, and CTP at the Reserve. For each fiscal year, the Reserve Manager develops an operations award spending plan to support the Reserve's request for the funding allocation for all programs. This plan is based on previous year's expenditures and input from Reserve staff and constitutes the annual work plan that implements the Reserve Management Plan. As the lead state agency, SF State serves as federal recipient for the funding and charges indirect costs on the grants. SF State and the signatory partners (Solano Land Trust, California State Parks and the Bay Conservation and Development Commission (BCDC)) typically provide matching funds. For example, match from Solano Land Trust includes funds for staff time and services for stewardship functions at Rush Ranch, match from BCDC includes funds for staff time and services that support the CTP, while match from SF State provides for salary and benefits for the Reserve manager, travel, administrative supplies and printing, SWMP supplies, and education and CTP workshops. The Reserve Manager, an employee of SF State, manages the project; financial management is the responsibility of the SF State Office of Research and Sponsored Programs in accordance with state and federal guidelines.

Two aspects of staff funding deserve mention. First, NOAA strongly encourages state funding support for the "core" positions of Reserve Manager, Education Coordinator and Research Coordinator positions. SF State has consistently funded the Reserve Manager position; however, state funding for the Education Coordinator and Research Coordinator positions has been hampered by the fiscal crisis of California. Having state funding support for the Education Coordinator and Research Coordinator positions remains a goal for the Reserve. Second, in Section 2 and below in Section 5.6.2, the Plan identifies important staffing and program needs. An important avenue

for gaining resources for program build-out, even if on a temporary basis, would be dedicated grant staff to supplement NOAA and partner match funding for staff. Strategies for expanding the Reserve's resource base to do this include grant funding, developing agreements with other partners for sharing staff, seeking development funds, and using volunteers.

Two principles guide the Reserve's financial management. First, the Reserve's budgeting process and financial management will be transparent and accurate. As noted above, this is accomplished by having the Reserve Manager and staff collaborate in the fiscal planning for the annual NOAA operating grant. Following receipt of the NOAA grant, the Reserve Manager and Administrative Coordinator will clearly communicate to each staff member how much money was allocated to each program and for what purpose; e.g., supplies, equipment, workshop expenses, and travel. Second, Reserve staff will effectively track spending and ensure timely use of program funds. This is accomplished by having the Administrative Coordinator (1) serve as the lead on fiscal tracking and oversight of all purchasing, submission of invoices to SF State, and travel claims; and (2) provide quarterly reports directly to staff members on the status of program funds and fiscal deadlines. In turn, staff report on any changes in their spending plans.

5.6 FACILITIES PLAN

In this Section, the Reserve facilities at SF State, China Camp, and Rush Ranch are described, including identifying future needs. The Reserve is committed to "green," sustainable development. Thus, to reduce the impact of facilities and construction activities on the Reserve's natural resources, any new facilities and remodeling will include sustainable and "green" design and construction concepts and materials wherever possible. Likewise, damage from construction activity will be mitigated wherever possible; and disturbance from construction activity will not impact on-site wetland systems. The design of Reserve facilities, the construction methods used, and the materials chosen for building can serve as education tools for sustainability and low impact development; therefore, information and exhibits will be established on-site to educate visitors about sustainable buildings and materials, along with related topics such as reducing carbon emissions, the use of solar energy, and permeable parking lot surfaces.

5.6.1 SAN FRANCISCO STATE UNIVERSITY

The SF Bay NERR received an initial congressional allocation of over 2.9 million dollars for the construction of facilities for the Reserve; these funds were used at SF State and Rush Ranch; \$500,000 was used at Rush Ranch and the remainder at SF State. Building 36 at the Romberg Tiburon Center campus was renovated using funds from SF State and NOAA; approximately 75% of funding for the renovation was provided by NOAA. The Reserve also uses office and classroom space in Building 39 as well as other spaces. In accordance with SF State's letter of commitment to NOAA (Appendix F), the SF Bay NERR has use of these facilities:

RTC BUILDING 36

Dedicated Spaces

- ◆ Research and SWMP laboratory with workstations and capacity for both wet and dry lab activities.
- ◆ Research Coordinator principal investigator office (window).
- ◆ Reserve Manager office (with window; approximately 216 square feet).
- ◆ South wing of second floor, configured with seven offices, a shared seminar room (capacity 16), and a large room (approximately 500 square feet) that serves as the location of the combined NERR-RTC library.

Shared Spaces

- ◆ Keck teaching laboratory (capacity 20).
- ◆ IT classroom (capacity 15).
- ◆ Atrium for exhibits and displays.
- ◆ Other common use facilities, including kitchen, commons room, and restrooms.

RTC BUILDING 39

Dedicated Spaces

- ◆ The second floor, including usage of the former RTC administrative area, with offices and open area, to be configured for NERR and RTC Education and Outreach needs.
- ◆ The former “principal investigator wing” provides offices for NERR EC, NERR CTP Coordinator, NERR CTP Assistant, and a room for NERR storage.

Shared Spaces

- ◆ Shared use of Information Technology classroom (second floor; capacity 20) and lecture classroom (first floor; capacity 20).
- ◆ Shared storage area adjacent to Information Technology classroom.
- ◆ Shared spaces including lobby, kitchen, and restrooms.

BAY CONFERENCE CENTER AT RTC

SF Bay NERR has access to the Bay Conference Center for larger meetings as needed. The Bay Conference Center's facilities include a 140-seat main hall for large meetings or lectures, two carpeted meeting rooms seating from 10-60 people, and a comfortable lounge with fireplace. Free parking and outdoor picnic areas are available.

RTC BUILDING 50

Storage needs for equipment and gear are provided here, including space for a canoe and approximately 300 square feet of shelf space.

MAIN CAMPUS

An office with a desk and a phone is provided on the main campus. This space is shared among NERR staff for work days on the main campus. Space is assigned on an as-available basis each semester.

PRESENT USE AND FUTURE NEEDS

In accordance with the NOAA-approved purpose of the joint use of facilities in Building 36, RTC staff may occupy NERR offices on as-needed basis; such staff typically supports the work of the NERR. Any such arrangements are mutually agreed upon by the Reserve Manager and the RTC Director.

SF State is committed to accommodating persons with disabilities. Building 36 is a fully Americans with Disabilities Act (ADA)-compliant project. The Bay Conference Center is already accessible to persons with disabilities. Building 39 is a pre-existing structure with some modifications for persons with disabilities. For SF Bay NERR programs occurring in Building 39, reasonable accommodations for disabled program participants will be made.

Typically, space at SF State is assigned or reassigned according to university guidelines that reflect the most efficient and appropriate space assignment. As the space needs and success of the SF Bay NERR grow, SF State will assign appropriate space.

The NERR spaces in Building 36 on the south side have limitations that ideally would be overcome, funds permitting. In particular, it is important to improve the health and comfort for staff with natural light, individually controlled heating and cooling, and sound-proofing between offices and common areas. In addition, there is the need to correct deficiencies in the NERR laboratory in Building 36 that resulted from problems with the contractors who worked on the Building 36 renovations. Rectifying both the office space and laboratory concerns are goals that the NERR has included in discussions with the RTC Director and the architects with whom RTC is presently preparing their site-wide master plan.

After using the facilities at the Reserve's sites for several years, staff has identified needs for new facilities, including:

- ◆ Large, well-designed classroom space that is ADA compliant and comfortably seats 40 people.
- ◆ Dorm space for teachers, visiting scientists, and students who attend courses or workshops at RTC (capacity 20).

- ◆ “Flume facility” that includes wet lab with ample seawater supply, at least 10m x 5m space for a flume, and a small climate-controlled office.

This plan does not implement any specific construction plans, but the facilities plans identified herein provide the basis for developing specific future construction plans that will be pursued as funding allows. Any such projects would be compliant with environmental regulations such as the NOAA NERRS Regulations, California Environmental Quality Act, National Environmental Policy Act, and other regulations such as the Americans with Disabilities Act.

Goal: All Reserve staff will have adequate, safe offices with healthy ventilation in locations at RTC that promote internal cross-sector communication, as well as encourage collaboration with Romberg Tiburon Center scientists and educators.

Objective 1: Reserve's staff and partners will seek funding to implement facilities plan.

Action 1 Reserve Manager will collaborate with RTC to include NERR facilities plans into grants as opportunities arise.

Action 2 Reserve Manager will consider seeking NOAA funding to implement NERR facilities plan at RTC.

5.6.2 RUSH RANCH

Two construction grants totaling approximately \$800,000 provided funding that, with augmentation by other Solano Land Trust funding sources, was used to build the “Rush Ranch Nature Center” that offers space for meeting and events, a NERR laboratory, a small kitchen, offices, restrooms, and a foyer with interpretive exhibits. An adjacent building includes Guest Quarters for visiting scientists and others plus a 3-bedroom, 2-bath Field Stewards Residence. A landscaped patio in front of the Rush Ranch Nature Center offers additional outdoor gathering space.



Rush Ranch Nature Center
~ Sarah Ferner

Through an additional NOAA construction grant, interpretive exhibits were installed on the exterior walls and in the foyer of the Nature Center. The interactive exhibits include two beautiful murals, maps of the trails and estuary, and exhibits that highlight the three major habitats at Rush Ranch and the animals and plants that live in them.

Additional needs include renovation of the lab to increase its functionality, expanded sleeping capacity in the guest quarters, improvements to the classroom to improve sound quality, additional boat storage capacity, and a boardwalk to provide access to marsh areas and reduce the impacts of researchers who monitor the tidal marsh restoration projects planned by Solano Land Trust.



Mural artist Lee Wilder Snider with her art at Rush Ranch
~ Teri Engbring

Goal: Reserve staff and scientists working at Rush Ranch will have adequate facilities to conduct research and offer a range of education programs at Rush Ranch.

Objective 1: Reserve, Solano Land Trust, and other partners' facilities needs and limitations will be articulated in a written plan.

Action 1 RC, EC and CTP Coordinator will discuss with other scientists and educators the need for additional facilities at Rush Ranch, including lab, classroom, and guest quarters.

Action 2 Reserve Manager will lead discussion with Solano Land Trust and Rush Ranch Management Team about facilities plans, including limitations imposed by Solano Land Trust (e.g., maintenance costs, staffing, access, etc.) and prepare a written plan.

Objective 2: Reserve partners and staff will seek funding to implement facilities plan, or portions of it.

Action 1 Reserve Manager will collaborate with Solano Land Trust and Rush Ranch Management Team to include NERR facilities plans into grants as opportunities arise.

Action 2 Reserve Manager will consider seeking NOAA funding to implement facilities plan at Rush Ranch.

5.6.3 CHINA CAMP

The park offers 15 miles of hiking, biking, and equestrian trails, as well as a museum describing the cultural history of the site. Back Ranch Meadows Campground has walk-in sites for tent-camping only. China Camp has three reservable picnic areas with barbecues: Buckeye Point and Weber Point are day use areas with views of the water and are suitable for groups of 50 people or less; Miwok Meadows Picnic Area is larger (for groups up to 200 people) and is located in a grassy meadow among Oak and Bay woodlands. There are also non-reservable picnic tables throughout the park, including areas with numerous tables at China Camp Point and near the beach at the historic Chinese village.

The park has facilities for administrative headquarters, staff housing, and a maintenance shop. Presently the Reserve has no constructed facilities at China Camp, other than the modifications made to the pier at the fishing village to install SWMP equipment. The Reserve collaborated with California State Parks using NOAA construction funds to install interpretive signage at three areas within the park. Additional needs include installation of a new piling, access platform, and instrumentation mooring to allow future relocation of the SWMP equipment (presently on the China Camp village pier) to deeper water.

Goal: Reserve staff and scientists working at China Camp will have adequate facilities to conduct research and offer a range of education programs at China Camp.

Objective 1: Reserve and State Park's facilities needs and limitations will be articulated in a written plan.

Action 1 RC, EC and CTP will discuss with other scientists and educators about their needs for facilities at China Camp.

Action 2 Reserve Manager will lead discussions with California State Parks' Marin District Superintendent and rangers about facilities plans, including limitations imposed by California State Parks (e.g., maintenance costs, staffing, permitting, etc.) and prepare a written plan.

Objective 2: Reserve's partners and staff will seek funding to implement facilities plan, or portions of it.

Action 1 Reserve Manager will collaborate with California State Parks to include NERR facilities plans into grants as opportunities arise.

Action 2 Reserve Manager will consider seeking NOAA funding to implement facilities plan at China Camp.

5.7 STAFFING PLAN

5.7.1 CURRENT STAFF POSITIONS

The SF Bay NERR presently has seven staff positions including the Reserve Manager. In addition to these existing positions (described below), the Reserve supports two Graduate Research Fellows and occasional project-specific interns, contractors, and volunteers who work for the Reserve on an ad hoc basis.

The duties of existing Reserve positions include:



Poppies at Rush Ranch
~ Jessica Schneider Eckerlin

RESERVE MANAGER (FULL-TIME POSITION; STATE FUNDED)

- ◆ Lead staff in fulfilling the Reserve mission, and the goals and objectives of the Plan.
- ◆ Ensure that Reserve programs successfully meet the mandates of NERRS.
- ◆ Seek and administer federal and other grants, contracts, and state budget appropriations.
- ◆ Provide program leadership, oversight, and coordination of all Reserve programs.
- ◆ Actively engage site management agencies in a collaborative effort to build and operate projects and programs at individual sites that support the SF Bay NERR mission.
- ◆ Develop and maintain partnerships with local, state, and federal agencies, organizations, and individuals to enhance Reserve exposure and program and staff capacity.
- ◆ Supervise the following positions: Education Coordinator, CTP Coordinator, Research Coordinator, and Administrative Coordinator.

EDUCATION COORDINATOR (FULL-TIME POSITION; FEDERALLY FUNDED)

- ◆ Design and conduct K-16 and community education programs that translate estuarine science and research to these audiences in dynamic and innovative ways.
- ◆ Work with researchers to incorporate results and highlights from current research and monitoring projects at the Reserve into education programs and products.
- ◆ Organize and lead education events, including tours, field trips, and workshops.
- ◆ Manage existing grants and seek additional grant funding to support new programs and develop new products.
- ◆ Develop and maintain partnerships to enhance education programs.
- ◆ Represent the Reserve at local, state, and national levels.
- ◆ Coordinate with the Coastal Training Program and Research Coordinators to ensure education programs are complementary.

COASTAL TRAINING PROGRAM COORDINATOR (FULL-TIME POSITION; FEDERALLY FUNDED)

- ◆ Develop and deliver training and technical assistance programs for coastal decision makers, based on needs assessments, market analyses, and other evaluation tools.
- ◆ Communicate the informational needs of coastal decision-makers to appropriate research and funding communities.
- ◆ Manage CTP budget, including annual 315 funding, competitive grants, and registration fees; seek additional funding.
- ◆ Represent the Reserve at local, state, and national levels.
- ◆ Develop and maintain partnerships to enhance the CTP.
- ◆ Coordinate with Reserve's Education Coordinator, Romberg Tiburon Center's Wetlands Science Series Coordinator, and Elkhorn Slough CTP Coordinator to ensure programming is complementary.
- ◆ Manage websites, databases, and other informational media to enhance the CTP.

RESEARCH COORDINATOR (FULL-TIME POSITION; FEDERALLY FUNDED)

- ◆ Manage the System-Wide Monitoring Program.
- ◆ Develop and maintain partnerships to further research programs.
- ◆ Oversee all aspects of the Reserve's Graduate Research Fellowship Program.
- ◆ Supervise SWMP technicians and oversee the Reserve's laboratory.
- ◆ Represent the Reserve at local, state, and national levels.
- ◆ Work with Education Coordinator and CTP Coordinator to translate research and monitoring results for incorporation into education and training programs.
- ◆ Conduct research, submit grant proposals, and prepare manuscripts for publication, presentations, and other outreach activities.

SYSTEM-WIDE MONITORING PROGRAM TECHNICIAN (FULL-TIME POSITION; FEDERALLY FUNDED)

- ◆ Implement the System-Wide Monitoring Program in accordance with NERRS and the Centralized Data Management Office requirements.
- ◆ Procure and maintain SWMP equipment and supplies.
- ◆ Deploy equipment as scheduled.
- ◆ Perform Quality Assurance and Quality Control on data and prepare annual reports for submittal to CDMO.
- ◆ Perform data analysis.
- ◆ Develop and maintain partnerships to enhance SWMP programs.
- ◆ Assist the Research Coordinator with developing and maintaining partnerships to further research programs.
- ◆ Assist with Reserve research projects.

MONITORING TECHNICIAN (HALF-TIME POSITION; FEDERALLY FUNDED)

- ◆ Assist with implementing the System-Wide Monitoring Program in accordance with NERRS and the Centralized Data Management Office requirements.
- ◆ Procure and maintain SWMP equipment and supplies.

- ◆ Deploy equipment as scheduled.
- ◆ Develop and maintain partnerships to enhance SWMP programs.
- ◆ Assist with Reserve research projects.

ADMINISTRATIVE COORDINATOR (FULL-TIME POSITION; FEDERALLY FUNDED)

- ◆ Facilitate planning grant expenditures, making purchases, and tracking expenditures with all staff, and serve as liaison with campus procurement staff.
- ◆ Coordinate with campus grant administration staff to ensure grant funds are spent properly, including reviewing general ledgers, and submitting reimbursement and travel claim paperwork.
- ◆ Design and implement new procedures as needed to track expenditures, prepare spreadsheets, and other required paperwork.
- ◆ Various administrative duties as required.

5.7.2 FUTURE STAFF POSITIONS

Unmet staffing needs arise from the Reserve's limited budget. Some of these staffing needs may be met by applying for grant funding, developing agreements with other partners for sharing staff, seeking development funds and using volunteers. For more information on additional staffing needs, please see the respective programmatic descriptions in Section 2.

Desired Reserve staff positions and their duties include the following.

ADMINISTRATIVE AND FINANCIAL COORDINATOR

Typically the Reserve's budget has allowed for a half-time administrative position. The Reserve wants to continue this position as an ongoing full-time position, especially as more grant paperwork will arise in the course of applying for and managing more funds for additional programs and staff.

GEOGRAPHIC INFORMATION SYSTEM AND STEWARDSHIP COORDINATOR

- ◆ Coordinate, develop, and support stewardship activities at Reserve sites.
- ◆ Coordinate and collaborate with site managers
- ◆ Develop and manage the GIS program and database.
- ◆ Maintain and update GIS equipment.

- ◆ Support Reserve programs through GIS dataset and product development.
- ◆ Provide technical support to staff.

RESEARCH TECHNICIAN

- ◆ Assist with implementing the System-Wide Monitoring Program in accordance with NERRS and the Centralized Data Management Office requirements.
- ◆ Procure and maintain SWMP equipment and supplies.
- ◆ Deploy equipment as scheduled.
- ◆ Assist with Reserve research projects.

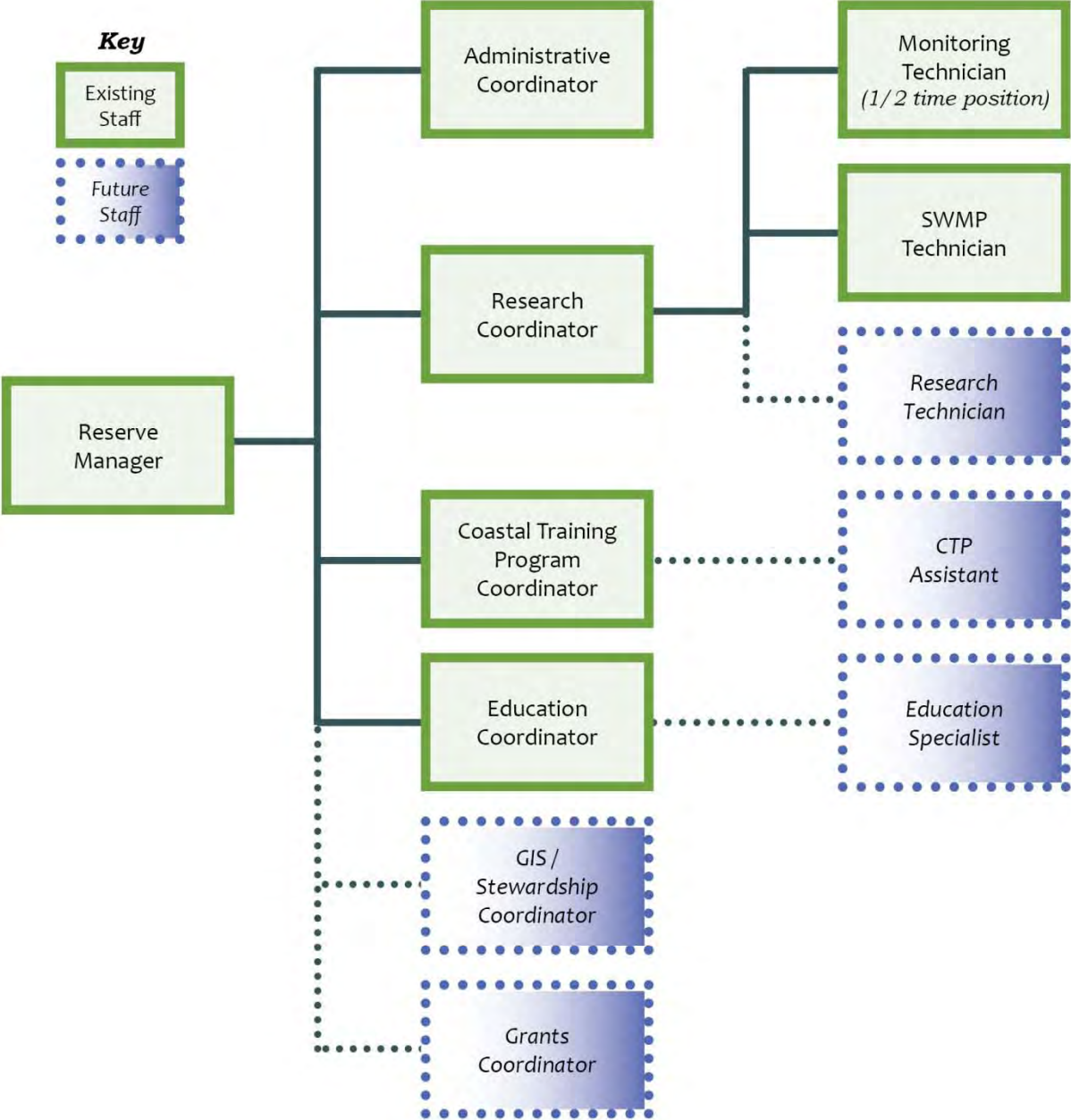
EDUCATION SPECIALIST

- ◆ Assist the Education Coordinator with K-16 and community education programs, including assisting with program logistics and teaching.
- ◆ Develop education materials for K-16 and community education programs.
- ◆ Provide presentations to various audiences about the Reserve.
- ◆ Represent the Reserve at open house events, conferences, etc.

COASTAL TRAINING PROGRAM ASSISTANT

- ◆ Process registrations, payments, and receipts for Coastal Training Program events.
- ◆ Perform data analysis to guide CTP programming.
- ◆ Assist CTP Coordinator with event logistics and facilitation.
- ◆ Create fact sheets, summaries, bibliographies, and other “science-translation” materials based on literature research and consultation with other Reserve staff.
- ◆ Design online and print workshop materials.
- ◆ Maintain Coastal Resource Management databases and produce various tracking reports.

Figure 2 Organizational Chart



6 PUBLIC ACCESS PLAN

6.1 NATIONAL RESERVE SYSTEM PRIORITIES FOR PUBLIC ACCESS

Section 921.13(a) (5) of the reserve regulations requires a plan for public access as part of the overall Reserve management plan. Public access can be defined as the ability of all members of the community to pass physically and visually to, from, and along the ocean shore, other waterfronts, and over public lands. The ability to enjoy the oceans, bays, and rivers is directly related to the ability to reach them from the uplands. A public access plan must allow for long-term public use and enjoyment of the water and shoreline while minimizing damage to the resources themselves.

The Reserve is seeking to protect natural resources and ensure positive visitor experiences, but visitor use impacts can damage the resources. For example, wildlife can be adversely affected by the presence of people through direct action (e.g., coyote poisoning) as well as inadvertent damage (e.g., stepping on sensitive habitat while going off trail) (San Francisco Bay Conservation and Development Commission http://www.bcdc.ca.gov/pdf/planning/reports/public_access_wildlife.pdf). At both sites, there are regulations in place (such as those for dogs at both sites) that seek to minimize this type of damage. Further, as discussed above in the research section, researchers can also contribute to habitat degradation and pressure on wildlife; therefore, the RC works with California State Parks and Solano Land Trust staff to increase the percentage of researchers with current, accurate permits so as to reduce such impacts.

6.2 RUSH RANCH

Rush Ranch is accessible by Grizzly Island Road which joins California State Highway 12 near Suisun City, approximately three miles from Fairfield. Rush Ranch includes a large staging area with an unpaved parking area, historical ranch buildings, Nature Center, guest quarters for visiting scientists, a Field Steward's residence, and a system of three well maintained trails, two relatively level and one steeper with panoramic views, described below. Rush Ranch is open to the public 8 a.m. to 6 p.m. daily, and has regular events for the public, especially on the third Saturday of the month, and an annual open house. Thousands of people visit the Ranch each year. There is no direct public transit to Rush Ranch; the nearest bus stop is approximately two miles away.

The Marsh Trail has several loop options, ranging from less than a mile to just over 2 miles long. The relatively level trail passes by a replica of a type of home the Patwin people may have built in this area, through grasslands and along the edge of tidal marsh, and is a great place to see birds.



This hut is a replica of the type of home the Patwin people may have lived in. Rush Ranch Educational Council volunteers made it from willow branches and stems of tules, tall flexible plants that thrive within the adjacent marsh. The Patwin visited this area to hunt, fish, and gather nutritious plants from the marsh. ~ Sarah Ferner

The South Pasture Trail is 2.4 miles long with little elevation change. It passes through agricultural land, near a Native American grinding rock, and provides good viewing of tidal marsh and spring wildflowers.

The Suisun Hill Trail is about 2 miles long and climbs 500 feet up Suisun Hill, providing a panoramic view of the Ranch and nearby Mount Diablo and the Potrero Hills. Presently there is no formal trail map for Rush Ranch.

6.3 CHINA CAMP

Over 500,000 people visit China Camp annually. The China Camp General Plan (California State Parks, 1979) divides the park into two main public use or access areas: a larger 1,581-acre area is a primarily natural, Native American resource and open space area (known as the Back Ranch); and a smaller 39-acre historic area known as the China Camp Village. Visitors can enjoy wildlife-watching, mountain biking, hiking, picnicking, swimming, fishing, boating, windsurfing, and kayaking. Vehicle access to the park is via San Pedro Road, a county road which traverses the park, which lies about eight miles from the City of San Rafael. There is no direct public transportation to China Camp, but visitors can walk or cycle into the park from a Golden Gate Transit bus stop near the Marin County Civic Center; the Golden Gate Transit website at <http://www.goldengate.org/schedules.php> has more information.

Facilities within China Camp State Park include approximately 15 miles of trails for hiking, bicycling, and equestrian use; staging areas at trail heads; and restrooms at staging areas. The China Camp trails traverse the ridgeline, wind through dense

forests, and parallel the shoreline. One highlight of the Park's beautiful and very popular trail system is Turtle Back Hill Trail. This trail is a 0.75-mile loop that offers views of the Bay as it passes across open grasslands, along the edges of the salt marsh, and through a rare oak woodland. Turtle Back Hill Trail is accessible to people in wheelchairs and people with limited vision, and features interpretive exhibits with tactile panels. Dogs are not allowed on the trails. Lastly, there are approximately 300 parking spaces.

CAMPING. A multi-use group camping area, and 30 walk-in tent-only campsites are in the Back Ranch Meadows area. Enroute camping is available for RVs with a grey water holding tank for one night only.



Kayaking at China Camp
~ Angela Gustavson

PICNICKING. Picnic areas are located at Buckeye Point, Weber Point, Bullhead Flat, and China Camp Point, offering scenic views. Each area has a lawn, picnic tables, running water, restrooms, and barbecues and is wheelchair accessible. There are also picnic tables throughout the park, including near the beach at the historic Chinese village.

CHINA CAMP VILLAGE. This 39-acre area has picnic areas although barbecuing is not allowed. A small museum describing early Chinese settlement is located in the village, the historical center of the park. There is beach access from China Camp Village.

FISHING. Striped bass, flounder, perch, and sturgeon may be caught at several access spots along the bay. (Anglers aged 16 and over must have valid California fishing licenses.)

PROGRAMS AND EVENTS. Campfire and Junior Ranger programs are held from June to September at China Camp. Every August, Heritage Day celebrates Chinese culture with activities, tours, and exhibits. The schedule is available at www.parks.ca.gov/chinacamp.

ACCESSIBILITY. Picnic areas and several trails at China Camp are accessible to people with disabilities. These areas are clearly marked on the official Park Map as well as signposted within the park. Turtle Back Hill trail was rebuilt in 2009 to better accommodate people with disabilities, lessen the impact of the trail on the marsh, and

offer additional education opportunities through new interpretive signage and an accompanying audio tour.

6.4 SF BAY NERR PUBLIC ACCESS POLICY

The SF Bay NERR access plan encourages the continuation of traditional uses on Reserve sites while maintaining the biological integrity of the Reserve's resources. As outlined in other areas of this document, traditional recreational and commercial activities that require access to the Reserve sites and are currently permitted by California State Parks and/or Solano Land Trust will continue to be supported as long as resource protection is not unduly compromised.

There are currently no plans for significant expansion of access where access does not already exist. However, access for recreational users, land managers, and/or researchers may be limited, changed, or expanded when necessary to be consistent with the goals and objectives of the Reserve sites and the Reserve program. In particular, access to wetland areas may be improved through the use of boardwalks, piers, or designated access points, and trails may be re-routed to limit their impact on sensitive species or habitats. For example, the Solano Land Trust's Board of Directors has recommended removing a levee that currently serves as the Marsh Trail; removal of the levee will allow for restoration of tidal flow to a formerly managed marsh area, but will also effectively remove the trail. The Reserve and Land Trust would like to construct a new trail, boardwalks, and other interpretive features adjacent to and in the proposed restoration area to provide access to the marsh and slough for education and research needs, while also protecting natural resources in the area. Similar projects would benefit users and natural resources at other areas within Rush Ranch, such as Spring Branch Creek, and at several locations within China Camp, including Back Ranch Meadows and Rat Rock Cove. All access planning will strive to implement the recommendations put forth in the Public Access and Wildlife Compatibility Plan (Bay Conservation and Development Commission, 2001). The design and construction of any proposed facilities will include appropriate environmental consultations with pertinent organizations (e.g., U.S. Fish and Wildlife Service and the National Marine Fisheries Service).

6.5 ACCESS NEEDS

Both Rush Ranch and China Camp have well maintained systems of trails which focus public access in corridors away from core areas of the Reserve. (See Plate 8 for the China Camp Trail Map; presently, the trail map for Rush Ranch is in development.) In some cases, overlooks or vantage points along these trails provide visual access to sensitive habitats. Any new major facilities will be sited only in currently utilized access areas and minor access needs such as boardwalks for the public, and outdoor interpretive areas will be sited in or near current access areas. A recognized need is that research access could be further enhanced through construction of strategically placed boardwalks accessible only to authorized personnel. Such access paths would assist scientists using methods that require minimal marsh disturbance, such as long-term monitoring of surface elevation.

6.6 TRADITIONAL USES

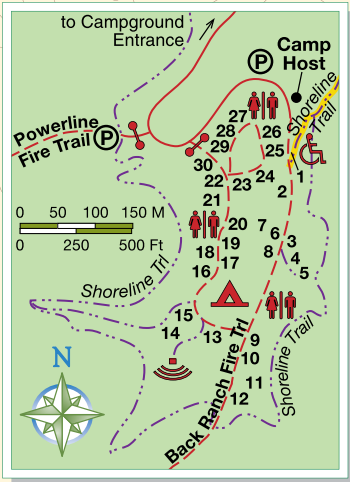
Recreational and commercial fishing, hiking, horseback riding, bicycling, camping, and boating are all traditional uses within the boundaries of the Reserve sites. Some of these activities are subject to state regulation and require licenses and/or permits. Traditional use access will continue according to local and state laws.

This park receives support in part from a nonprofit organization. For further information, contact:
 Marin State Park Association
 P.O. Box 223, Inverness, CA 94937

China Camp State Park



Legend	
	Campground
	Campsite Numbers
	Food Services
	Group Picnic Area
	Locked Gate
	Marsh Area
	Museum
	Parking
	Picnic Area
	Ranger Station
	Restrooms
	Swimming
	Viewpoint
	Major Road
	Paved Road
	Unpaved Road
	Accessible Trail
	Multi-Use Trail
	Accessible Multi-Use Trail
	Intermittent Stream
	State Park Boundary
	Accessible Feature
	Boat Launch (Hand)
	Boating
	Campfire Center



© 2009 California State Parks
 Map by Eureka Cartography, Berkeley, CA

REFERENCES

- Bay Conservation and Development Commission. 1976. Suisun Marsh Protection Plan. San Francisco. BCDC, 50 California Street, Suite 2600, San Francisco, CA 94111. 46 pp. Available at:
http://www.bcdc.ca.gov/laws_plans/laws/suisun_marsh.shtml
- Bay Conservation and Development Commission. 1977. Suisun Marsh Protection Plan Supplement. San Francisco. BCDC, 50 California Street, Suite 2600, San Francisco, CA 94111.
- Bay Conservation and Development Commission, 2001. Staff Report: Public access and wildlife compatibility. BCDC, 50 California Street, Suite 2600, San Francisco, CA 94111. 114 pp including appendices. Available at
http://www.bcdc.ca.gov/pdf/planning/reports/public_access_wildlife.pdf
- Bay Conservation and Development Commission, 2008. San Francisco Bay Plan. BCDC, 50 California Street, Suite 2600, San Francisco, CA 94111. 114 pp including appendices. Available at
http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan.shtml
- California State Parks. 1979. China Camp State Park General Plan. California State Parks, Marin District Headquarters, 845 Casa Grande Road, Petaluma, CA 94954-5804. 104 pp.
- Census.gov, 2010. Quickfacts accessed from www.census.gov on September 3, 2010.
- Eaton, J. 2001. A Slough Runs Through It: Solano County's Rush Ranch Reserve. Bay Nature 1:8-12.
- Fiedler, P. and R. Zebell. 1993. Final Report. Restoration and recovery of Mason's lilaepsis: Phase I. Report submitted October 28, 1993, to the Shell Oil Litigation Settlement Trustee Committee and the Endangered Plant Program, Natural Heritage Division, California Department of Fish and Game. 47pp. plus Appendix A.
- Goals Project, 1999. Baylands Ecosystem Habitat Goals. A report of recommendations prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. U.S. Environmental protection Agency, San Francisco, CA and SF Bay Regional Water Quality Control Board, Oakland, CA. 209 pp with five appendices. Also available at www.sfei.org.
- Herbold, B., A.D. Jassby, and P.B. Moyle. 1992. Status and trends report on aquatic resources in the San Francisco Estuary. 240 pp.

- May, M.D. 1999. Vegetation and salinity changes over the last 2000 years at two islands in the northern San Francisco Estuary, California. Master Thesis. University of California, Berkeley.
- Moyle, P.B. 1976. Inland Fishes of California. University of California Press, Berkeley.
- National Oceanic and Atmospheric Administration. 2002. San Francisco Bay National Estuarine Research Reserve Final Environmental Impact Statement; Final Management Plan. 142 pp with 9 appendices.
- National Oceanic and Atmospheric Administration. 2008. San Francisco Bay National Estuarine Research Reserve Final Evaluation Findings. 22 pp with 5 appendices.
- San Francisco Estuary Project. 2000. State of the Estuary 2000: Restoration primer. San Francisco Estuary Project (now San Francisco Estuary Partnership). 1515 Clay St. #1400, Oakland, CA 94612. 776 pp.
- Saumweber, W., S. Lerberg, M. Dionne, K. Wasson, C. Cornu, M. Bundy and N. Garfield. 2010. Establishing the NERRS as Sentinel Sites for Coastal Ecosystem Response to a Changing Climate. NERRS Strategic Proposal.
- Simenstad, C., J. Toft, H. Higgins, J. Cordell, M. Orr, P. Williams, L. Grimaldo, Z. Hymanson, D. Reed. 1999. Preliminary results from the Sacramento-San Joaquin Delta breached levee wetland study (BREACH). IEP Newsletter, 12:15-21.
- Simenstad, Charles, J. Toft, H. Higgins, J. Cordell, M. Orr, P. Williams, L. Grimaldo, Z. Hymanson and D. Reed. 2000. Sacramento/San Joaquin Delta breached levee wetland study (BREACH). Preliminary report to CALFED. 51 pp. Available at <http://depts.washington.edu/calfed/breachii.htm> or from C. Simenstad. Univ. WA. School of Fisheries, Seattle WA 98195.
- Solano County, 2010. Solano County: The Official Guidebook 2008. <http://www.co.solano.ca.us/civica/filebank/blobdload.asp?BlobID=6269>
- U.S. Fish and Wildlife Service, 1995. Sacramento-San Joaquin Delta Native Fishes Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon. Available at http://ecos.fws.gov/docs/recovery_plan/961126.pdf
- Wetland Research Associates Inc., 1990. Final Rush Ranch Enhancement and Management Plan. Report prepared for the Solano County Farmlands and Open Space Foundation, Fairfield, CA. 128 pp. plus appendices. Wetland Research Associates, San Rafael, CA. Available from: CA State Coastal Conservancy, 1330 Broadway, 13th Floor, Oakland, CA 94612-2530

APPENDIX A

National Estuarine Research Reserve System Regulations

Code of Federal Regulations

Title 15, Volume 3, Revised as of January 1, 2003
From the U.S. Government Printing Office via GPO Access
[CITE: 15CFR921]

TITLE 15--COMMERCE AND FOREIGN TRADE

CHAPTER IX--NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION,
DEPARTMENT OF COMMERCE

PART 921--NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM
REGULATIONS

Subpart A--General

[921.1 Mission, goals and general provisions.](#)

[921.2 Definitions.](#)

[921.3 National Estuarine Research Reserve System Biogeographic Classification Scheme and Estuarine Typologies.](#)

[921.4 Relationship to other provisions of the Coastal Zone Management Act and the Marine Protection, Research and Sanctuaries Act.](#)

Subpart B--Site Selection, Post Site Selection and Management Plan Development

[921.10 General.](#)

[921.11 Site selection and feasibility.](#)

[921.12 Post site selection.](#)

[921.13 Management plan and environmental impact statement development.](#)

Subpart C--Acquisition, Development and Preparation of the Final Management Plan

[921.20 General.](#)

[921.21 Initial acquisition and development awards.](#)

Subpart D--Reserve Designation and Subsequent Operation

[921.30 Designation of National Estuarine Research Reserves.](#)

[921.31 Supplemental acquisition and development awards.](#)

[921.32 Operation and management: Implementation of the management plan.](#)

[921.33 Boundary changes, amendments to the management plan, and addition of multiple-site components.](#)

Subpart E--Ongoing Oversight, Performance Evaluation and Withdrawal of Designation

[921.40 Ongoing oversight and evaluations of designated National Estuarine Research Reserves.](#)

[921.41 Withdrawal of designation.](#)

Subpart F--Special Research Projects

[921.50 General.](#)

[921.51 Estuarine research guidelines.](#)

[921.52 Promotion and coordination of estuarine research.](#)

Subpart G--Special Monitoring Projects

[921.60 General.](#)

Subpart H--Special Interpretation and Education Projects

[921.70 General.](#)

Subpart I--General Financial Assistance Provisions

[921.80 Application information.](#)

[921.81 Allowable costs.](#)

[921.82 Amendments to financial assistance awards.](#)

[Appendix I to Part 921--Biogeographic Classification Scheme](#)

[Appendix II to Part 921--Typology of National Estuarine Research Reserves](#)

Authority: Section 315 of the Coastal Zone Management Act, as amended (16 U.S.C. 1461).

Source: 58 FR 38215, July 15, 1993, unless otherwise noted.

Sec. 921.1 Mission, goals and general provisions.

(a) The mission of the National Estuarine Research Reserve Program is the establishment and management, through Federal-state cooperation, of a national system (National Estuarine Research Reserve System or System) of estuarine research reserves (National Estuarine Research Reserves or Reserves) representative of the various regions and estuarine types in the United States. National Estuarine Research Reserves are established to provide opportunities for long-term research, education, and interpretation.

(b) The goals of the Program are to:

1. Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources;
2. Address coastal management issues identified as significant through coordinated estuarine research within the System;
3. Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation;
4. Promote Federal, state, public and private use of one or more Reserves within the System when such entities conduct estuarine research; and
5. Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

(c) National Estuarine Research Reserves shall be open to the public to the extent permitted under state and Federal law. Multiple uses are allowed to the degree compatible with each Reserve's overall purpose as provided in the management plan (see Sec. 921.13) and consistent with paragraphs (a) and (b) of this section. Use levels are set by the state where the Reserve is located and analyzed in the management plan. The Reserve management plan shall describe the uses and establish priorities among these uses. The plan shall identify uses requiring a state permit, as well as areas where uses are encouraged or prohibited. Consistent with resource protection and research objectives, public access and use may be restricted to certain areas or components within a Reserve.

(d) Habitat manipulation for research purposes is allowed consistent with the following limitations. Manipulative research activities must be specified in the management plan, be consistent with the mission and goals of the program (see paragraphs (a) and (b) of this section) and the goals and objectives set forth in the Reserve's management plan, and be limited in nature and extent to the minimum manipulative activity necessary to accomplish the stated research objective. Manipulative research activities with a significant or long-term impact on Reserve resources require the prior approval of the state and the National Oceanic and Atmospheric Administration (NOAA). Manipulative research activities which can reasonably be expected to have a significant adverse impact on the estuarine resources and habitat of a Reserve, such that the activities themselves or their resulting short- and long-term consequences compromise the representative character and integrity of a Reserve, are prohibited. Habitat manipulation for resource management purposes is prohibited except as specifically approved by NOAA as: (1) A

restoration activity consistent with paragraph (e) of this section; or (2) an activity necessary for the protection of public health or the preservation of other sensitive resources which have been listed or are eligible for protection under relevant Federal or state authority (e.g., threatened/endangered species or significant historical or cultural resources) or if the manipulative activity is a long-term pre-existing use (i.e., has occurred prior to designation) occurring in a buffer area. If habitat manipulation is determined to be necessary for the protection of public health, the preservation of sensitive resources, or if the manipulation is a long-term pre-existing use in a buffer area, then these activities shall be specified in the Reserve management plan in accordance with Sec. 921.13(a)(10) and shall be limited to the reasonable alternative which has the least adverse and shortest term impact on the representative and ecological integrity of the Reserve.

(e) Under the Act an area may be designated as an estuarine Reserve only if the area is a representative estuarine ecosystem that is suitable for long-term research. Many estuarine areas have undergone some ecological change as a result of human activities (e.g., hydrological changes, intentional/unintentional species composition changes--introduced and exotic species). In those areas proposed or designated as National Estuarine Research Reserves, such changes may have diminished the representative character and integrity of the site. Although restoration of degraded areas is not a primary purpose of the System, such activities may be permitted to improve the representative character and integrity of a Reserve. Restoration activities must be carefully planned and approved by NOAA through the Reserve management plan. Historical research may be necessary to determine the "natural" representative state of an estuarine area (i.e., an estuarine ecosystem minimally affected by human activity or influence). Frequently, restoration of a degraded estuarine area will provide an excellent opportunity for management oriented research.

(f) NOAA may provide financial assistance to coastal states, not to exceed, per Reserve, 50 percent of all actual costs or \$5 million whichever amount is less, to assist in the acquisition of land and waters, or interests therein. NOAA may provide financial assistance to coastal states not to exceed 70 percent of all actual costs for the management and operation of, the development and construction of facilities, and the conduct of educational or interpretive activities concerning Reserves (see subpart I). NOAA may provide financial assistance to any coastal state or public or private person, not to exceed 70 percent of all actual costs, to support research and monitoring within a Reserve. Notwithstanding any financial assistance limits established by this Part, when financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, such assistance may be used to pay 100 percent of all actual costs of activities carried out with this assistance, as long as such funds are available. Predesignation, acquisition and development, operation and management, special research and monitoring, and special education and interpretation awards are available under the National Estuarine Reserve Program. Predesignation awards are for site selection/feasibility, draft management plan preparation and conduct of basic characterization studies. Acquisition and development awards are intended primarily for acquisition of interests in land, facility construction and to develop and/or upgrade research, monitoring and education programs. Operation and management awards

provide funds to assist in implementing, operating and managing the administrative, and basic research, monitoring and education programs, outlined in the Reserve management plan. Special research and monitoring awards provide funds to conduct estuarine research and monitoring projects with the System. Special educational and interpretive awards provide funds to conduct estuarine educational and interpretive projects within the System.

(g) Lands already in protected status managed by other Federal agencies, state or local governments, or private organizations may be included within National Estuarine Research Reserves only if the managing entity commits to long-term management consistent with paragraphs (d) and (e) of this section in the Reserve management plan. Federal lands already in protected status may not comprise a majority of the key land and water areas of a Reserve (see Sec. 921.11(c)(3)).

(h) To assist the states in carrying out the Program's goals in an effective manner, NOAA will coordinate a research and education information exchange throughout the National Estuarine Research Reserve System. As part of this role, NOAA will ensure that information and ideas from one Reserve are made available to others in the System. The network will enable Reserves to exchange information and research data with each other, with universities engaged in estuarine research, and with Federal, state, and local agencies. NOAA's objective is a system-wide program of research and monitoring capable of addressing the management issues that affect long-term productivity of our Nation's estuaries.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12540, Mar. 17, 1997; 63 FR 26717, May 14, 1998].

Sec. 921.2 Definitions

(a) Act means the Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 et seq.

(b) Assistant Administrator means the Assistant Administrator for Ocean Services and Coastal Zone Management or delegee.

(c) Coastal state means a state of the United States, in or bordering on, the Atlantic, Pacific, or Arctic Ocean, the Gulf of Mexico, Long Island Sound, or one or more of the Great Lakes. For the purposes of these regulations the term also includes Puerto Rico, the Virgin Islands, Guam, the Commonwealth of the Northern Marianas Islands, the Trust Territories of the Pacific Islands, and American Samoa (see 16 U.S.C. 1453(4)).

(d) State agency means an instrumentality of a coastal state to whom the coastal state has delegated the authority and responsibility for the creation and/or management/operation of a National Estuarine Research Reserve. Factors indicative of this authority may include the power to receive and expend funds on behalf of the Reserve, acquire and sell or convey real and personal property interests, adopt rules for the protection of the Reserve, enforce rules applicable to the Reserve, or develop and implement research and education programs for the reserve. For the purposes of these regulations, the terms ``coastal state" and ``State agency" shall be synonymous.

(e) Estuary means that part of a river or stream or other body of water having unimpaired connection with the open sea, where the sea water is measurably diluted with fresh water derived from land drainage. The term also includes estuary-type areas with measurable freshwater influence and having unimpaired connections with the open sea, and estuary-type areas of the Great Lakes and their connecting waters (see 16 U.S.C. 1453(7)).

(f) National Estuarine Research Reserve means an area that is a representative estuarine ecosystem suitable for long-term research, which may include all of the key land and water portion of an estuary, and adjacent transitional areas and uplands constituting to the extent feasible a natural unit, and which is set aside as a natural field laboratory to provide long-term opportunities for research, education, and interpretation on the ecological relationships within the area (see 16 U.S.C. 1453(8)) and meets the requirements of 16 U.S.C. 1461(b). This includes those areas designated as National Estuarine Sanctuaries or Reserves under section 315 of the Act prior to enactment of the Coastal Zone Act Reauthorization Amendments of 1990 and each area subsequently designated as a National Estuarine Research Reserve.

Sec. 921.3 National Estuarine Research Reserve System Biogeographic Classification Scheme and Estuarine Typologies.

(a) National Estuarine Research Reserves are chosen to reflect regional differences and to include a variety of ecosystem types. A biogeographic classification scheme based on regional variations in the nation's coastal zone has been developed. The biogeographic classification scheme is used to ensure that the National Estuarine Research Reserve System includes at least one site from each region. The estuarine typology system is utilized to ensure that sites in the System reflect the wide range of estuarine types within the United States.

(b) The biogeographic classification scheme, presented in appendix I, contains 29 regions. Figure 1 graphically depicts the biogeographic regions of the United States.

(c) The typology system is presented in appendix II..

Sec. 921.4 Relationship to other provisions of the Coastal Zone Management Act, and to the Marine Protection, Research and Sanctuaries Act.

(a) The National Estuarine Research Reserve System is intended to provide information to state agencies and other entities involved in addressing coastal management issues. Any coastal state, including those that do not have approved coastal management programs under section 306 of the Act, is eligible for an award under the National Estuarine Research Reserve Program (see Sec. 921.2(c)).

(b) For purposes of consistency review by states with a federally approved coastal management program, the designation of a National Estuarine Research Reserve is deemed to be a Federal activity, which, if directly affecting the state's coastal zone, must be undertaken in a manner consistent to the maximum extent practicable with the approved state coastal management program as provided by section 1456(c)(1) of the Act, and implementing regulations at 15 CFR part 930, subpart C. In accordance with section 1456(c)(1) of the Act and the applicable regulations NOAA will be responsible for certifying that designation of the Reserve is consistent with the state's approved coastal management program. The state must concur with or object to the certification. It is recommended that the lead state agency for Reserve designation consult, at the earliest practicable time, with the appropriate state officials concerning the consistency of a proposed National Estuarine Research Reserve.

(c) The National Estuarine Research Reserve Program will be administered in close coordination with the National Marine Sanctuary Program (Title III of the Marine Protection, Research and Sanctuaries Act, as amended, 16 U.S.C. 1431-1445), also administered by NOAA. Title III authorizes the Secretary of Commerce to designate discrete areas of the marine environment as National Marine Sanctuaries to protect or restore such areas for their conservation, recreational, ecological, historical, research,

educational or esthetic values. National Marine Sanctuaries and Estuarine Research Reserves may not overlap, but may be adjacent.

Sec. 921.10 General.

(a) A coastal state may apply for Federal financial assistance for the purpose of site selection, preparation of documents specified in Sec. 921.13 (draft management plan (DMP) and environmental impact statement (EIS)), and the conduct of limited basic characterization studies. The total Federal share of this assistance may not exceed \$100,000. Federal financial assistance for preacquisition activities under Sec. 921.11 and Sec. 921.12 is subject to the total \$5 million for which each Reserve is eligible for land acquisition. Notwithstanding the above, when financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, such assistance may be used to pay 100 percent of all actual costs of activities carried out with this assistance, as long as such funds are available. In the case of a biogeographic region (see appendix I) shared by two or more coastal states, each state is eligible for Federal financial assistance to establish a separate National Estuarine Research Reserve within their respective portion of the shared biogeographic region. Each separate National Estuarine Research Reserve is eligible for the full complement of funding. Financial assistance application procedures are specified in subpart I.

(b) In developing a Reserve program, a state may choose to develop a multiple-site Reserve reflecting a diversity of habitats in a single biogeographic region. A multiple-site Reserve allows the state to develop complementary research and educational programs within the individual components of its multi-site Reserve. Multiple-site Reserves are treated as one Reserve in terms of financial assistance and development of an overall management framework and plan. Each individual site of a proposed multiple-site Reserve shall be evaluated both separately under Sec. 921.11(c) and collectively as part of the site selection process. A coastal state may propose to establish a multiple-site Reserve at the time of the initial site selection, or at any point in the development or operation of the Reserve. If the state decides to develop a multiple-site National Estuarine Research Reserve after the initial acquisition and development award is made for a single site, the proposal is subject to the requirements set forth in Sec. 921.33(b). However, a state may not propose to add one or more sites to an already designated Reserve if the operation and management of such Reserve has been found deficient and uncorrected or the research conducted is not consistent with the Estuarine Research Guidelines referenced in Sec. 921.51. In addition, Federal funds for the acquisition of a multiple-site Reserve remain limited to \$5,000,000 (see Sec. 921.20). The funding for operation of a multiple-site Reserve is limited to the maximum allowed for any one Reserve per year (see Sec. 921.32(c)) and preacquisition funds are limited to \$100,000 per Reserve. Notwithstanding the above, when financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, such assistance may be used to pay 100 percent of all actual costs of activities carrier out with this assistance, as long as such funds are available.

[58 FR 38215, July 15, 1993, as amended at 63 FR 26717, May 14, 1998].

Sec. 921.11 Site selection and feasibility.

(a) A coastal state may use Federal funds to establish and implement a site selection process which is approved by NOAA.

(b) In addition to the requirements set forth in subpart I, a request for Federal funds for site selection must contain the following programmatic information:

1. A description of the proposed site selection process and how it will be implemented in conformance with the biogeographic classification scheme and typology (Sec. 921.3);
2. An identification of the site selection agency and the potential management agency; and
3. A description of how public participation will be incorporated into the process (see Sec. 921.11(d)).

(c) As part of the site selection process, the state and NOAA shall evaluate and select the final site(s). NOAA has final authority in approving such sites. Site selection shall be guided by the following principles:

1. The site's contribution to the biogeographical and typological balance of the National Estuarine Research Reserve System. NOAA will give priority consideration to proposals to establish Reserves in biogeographic regions or subregions or incorporating types that are not represented in the system. (see the biogeographic classification scheme and typology set forth in Sec. 921.3 and appendices I and II);
2. The site's ecological characteristics, including its biological productivity, diversity of flora and fauna, and capacity to attract a broad range of research and educational interests. The proposed site must be a representative estuarine ecosystem and should, to the maximum extent possible, be an estuarine ecosystem minimally affected by human activity or influence (see Sec. 921.1(e)).
3. Assurance that the site's boundaries encompass an adequate portion of the key land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation. Boundary size will vary greatly depending on the nature of the ecosystem. Reserve boundaries must encompass the area within which adequate control has or will be established by the managing entity over human activities occurring within the Reserve. Generally, Reserve boundaries will encompass two areas: Key land and water areas (or "core area") and a buffer zone. Key land and water areas and a buffer zone will likely require significantly different levels of control (see Sec. 921.13(a)(7)). The term "key land and water areas" refers to that core area within the Reserve that is so vital to the functioning of the estuarine ecosystem that it must be under a level of control sufficient to

ensure the long-term viability of the Reserve for research on natural processes. Key land and water areas, which comprise the core area, are those ecological units of a natural estuarine system which preserve, for research purposes, a full range of significant physical, chemical and biological factors contributing to the diversity of fauna, flora and natural processes occurring within the estuary. The determination of which land and water areas are "key" to a particular Reserve must be based on specific scientific knowledge of the area. A basic principle to follow when deciding upon key land and water areas is that they should encompass resources representative of the total ecosystem, and which if compromised could endanger the research objectives of the Reserve. The term buffer zone refers to an area adjacent to or surrounding key land and water areas and essential to their integrity. Buffer zones protect the core area and provide additional protection for estuarine-dependent species, including those that are rare or endangered. When determined appropriate by the state and approved by NOAA, the buffer zone may also include an area necessary for facilities required for research and interpretation. Additionally, buffer zones should be established sufficient to accommodate a shift of the core area as a result of biological, ecological or geomorphological change which reasonably could be expected to occur. National Estuarine Research Reserves may include existing Federal or state lands already in a protected status where mutual benefit can be enhanced. However, NOAA will not approve a site for potential National Estuarine Research Reserve status that is dependent primarily upon the inclusion of currently protected Federal lands in order to meet the requirements for Reserve status (such as key land and water areas). Such lands generally will be included within a Reserve to serve as a buffer or for other ancillary purposes; and may be included, subject to NOAA approval, as a limited portion of the core area;

4. The site's suitability for long-term estuarine research, including ecological factors and proximity to existing research facilities and educational institutions;
5. The site's compatibility with existing and potential land and water uses in contiguous areas as well as approved coastal and estuarine management plans; and
6. The site's importance to education and interpretive efforts, consistent with the need for continued protection of the natural system.

(d) Early in the site selection process the state must seek the views of affected landowners, local governments, other state and Federal agencies and other parties who are interested in the area(s) being considered for selection as a potential National Estuarine Research Reserve. After the local government(s) and affected landowner(s) have been contacted, at least one public meeting shall be held in the vicinity of the proposed site. Notice of such a meeting, including the time, place, and relevant subject matter, shall be announced by the state through the area's principal newspaper at least 15 days prior to the date of the meeting and by NOAA in the Federal Register.

(e) A state request for NOAA approval of a proposed site (or sites in the case of a multi-site Reserve) must contain a description of the proposed site(s) in relationship to each of the site selection principals (Sec. 921.11(c)) and the following information:

1. An analysis of the proposed site(s) based on the biogeographical scheme/typology discussed in Sec. 921.3 and set forth in appendices I and II;
2. A description of the proposed site(s) and its (their) major resources, including location, proposed boundaries, and adjacent land uses. Maps are required;
3. A description of the public participation process used by the state to solicit the views of interested parties, a summary of comments, and, if interstate issues are involved, documentation that the Governor(s) of the other affected state(s) has been contacted. Copies of all correspondence, including contact letters to all affected landowners must be appended;
4. A list of all sites considered and a brief statement of the reasons why a site was not preferred; and
5. A nomination of the proposed site(s) for designation as a National Estuarine Research Reserve by the Governor of the coastal state in which the state is located.

(f) A state proposing to reactivate an inactive site, previously approved by NOAA for development as an Estuarine Sanctuary or Reserve, may apply for those funds remaining, if any, provided for site selection and feasibility (Sec. 921.11a) to determine the feasibility of reactivation. This feasibility study must comply with the requirements set forth in Sec. 921.11 (c) through (e).

Sec. 921.12 Post site selection.

(a) At the time of the coastal state's request for NOAA approval of a proposed site, the state may submit a request for funds to develop the draft management plan and for preparation of the EIS. At this time, the state may also submit a request for the remainder of the predesignation funds to perform a limited basic characterization of the physical, chemical and biological characteristics of the site approved by NOAA necessary for providing EIS information to NOAA. The state's request for these post site selection funds must be accompanied by the information specified in subpart I and, for draft management plan development and EIS information collection, the following programmatic information:

1. A draft management plan outline (see Sec. 921.13(a) below); and
2. An outline of a draft memorandum of understanding (MOU) between the state and NOAA detailing the Federal-state role in Reserve management during the initial period of Federal funding and expressing the state's long-term commitment to operate and manage the Reserve.

(b) The state is eligible to use the funds referenced in Sec. 921.12(a) after the proposed site is approved by NOAA under the terms of Sec. 921.11.

Sec. 921.13 Management plan and environmental impact statement development.

(a) After NOAA approves the state's proposed site and application for funds submitted pursuant to Sec. 921.12, the state may begin draft management plan development and the collection of information necessary for the preparation by NOAA of an EIS. The state shall develop a draft management plan, including an MOU. The plan shall set out in detail:

1. Reserve goals and objectives, management issues, and strategies or actions for meeting the goals and objectives;
2. An administrative plan including staff roles in administration, research, education/interpretation, and surveillance and enforcement;
3. A research plan, including a monitoring design;
4. An education/interpretive plan;
5. A plan for public access to the Reserve;
6. A construction plan, including a proposed construction schedule, general descriptions of proposed developments and general cost estimates. Information should be provided for proposed minor construction projects in sufficient detail to allow these projects to begin in the initial phase of acquisition and development. A categorical exclusion, environmental assessment, or EIS may be required prior to construction;
7. (i) An acquisition plan identifying the ecologically key land and water areas of the Reserve, ranking these areas according to their relative importance, and including a strategy for establishing adequate long-term state control over these areas sufficient to provide protection for Reserve resources to ensure a stable environment for research. This plan must include an identification of ownership within the proposed Reserve boundaries, including land already in the public domain; the method(s) of acquisition which the state proposes to use--acquisition (including less-than-fee simple options) to establish adequate long-term state control; an estimate of the fair market value of any property interest--which is proposed for acquisition; a schedule estimating the time required to complete the process of establishing adequate state control of the proposed research reserve; and a discussion of any anticipated problems. In selecting a preferred method(s) for establishing adequate state control over areas within the proposed boundaries of the Reserve, the state shall perform the following steps for each parcel determined to be part of the key land and water areas (control over which is necessary to protect the integrity of the Reserve for research purposes), and for those parcels required for research and interpretive support facilities or buffer purposes:
 - (A) Determine, with appropriate justification, the minimum level of control(s) required [e.g., management agreement, regulation, less-than-fee simple property interest (e.g., conservation easement), fee simple property acquisition, or a combination of these approaches]. This does not preclude the future necessity of increasing the level of state control;
 - (B) Identify the level of existing state control(s);
 - (C) Identify the level of additional state control(s), if any, necessary to meet the

minimum requirements identified in paragraph (a)(7)(i)(A) of this section; (D) Examine all reasonable alternatives for attaining the level of control identified in paragraph (a)(7)(i)(C) of this section, and perform a cost analysis of each; and (E) Rank, in order of cost, the methods (including acquisition) identified in paragraph (a)(7)(i)(D) of this section.

(ii) An assessment of the relative cost-effectiveness of control alternatives shall include a reasonable estimate of both short-term costs (e.g., acquisition of property interests, regulatory program development including associated enforcement costs, negotiation, adjudication, etc.) and long-term costs (e.g., monitoring, enforcement, adjudication, management and coordination). In selecting a preferred method(s) for establishing adequate state control over each parcel examined under the process described above, the state shall give priority consideration to the least costly method(s) of attaining the minimum level of long-term control required. Generally, with the possible exception of buffer areas required for support facilities, the level of control(s) required for buffer areas will be considerably less than that required for key land and water areas. This acquisition plan, after receiving the approval of NOAA, shall serve as a guide for negotiations with landowners. A final boundary for the reserve shall be delineated as a part of the final management plan;

8. A resource protection plan detailing applicable authorities, including allowable uses, uses requiring a permit and permit requirements, any restrictions on use of the research reserve, and a strategy for research reserve surveillance and enforcement of such use restrictions, including appropriate government enforcement agencies;
9. If applicable, a restoration plan describing those portions of the site that may require habitat modification to restore natural conditions;
10. If applicable, a resource manipulation plan, describing those portions of the Reserve buffer in which long-term pre-existing (prior to designation) manipulation for reasons not related to research or restoration is occurring. The plan shall explain in detail the nature of such activities, shall justify why such manipulation should be permitted to continue within the reserve buffer; and shall describe possible effects of this manipulation on key land and water areas and their resources;
11. A proposed memorandum of understanding (MOU) between the state and NOAA regarding the Federal-state relationship during the establishment and development of the National Estuarine Research Reserve, and expressing a long-term commitment by the state to maintain and manage the Reserve in accordance with section 315 of the Act, 16 U.S.C. 1461, and applicable regulations. In conjunction with the MOU, and where possible under state law, the state will consider taking appropriate administrative or legislative action to ensure the long-term protection and operation of the National Estuarine Research Reserve. If other MOUs are necessary (such as with a Federal agency, another state agency or private organization), drafts of such MOUs must be included in the plan. All necessary MOU's shall be signed prior to Reserve designation; and

12. If the state has a federally approved coastal management program, a certification that the National Estuarine Research Reserve is consistent to the maximum extent practicable with that program. See Secs. 921.4(b) and 921.30(b).

(b) Regarding the preparation of an EIS under the National Environmental Policy Act on a National Estuarine Research Reserve proposal, the state and NOAA shall collect all necessary information concerning the socioeconomic and environmental impacts associated with implementing the draft management plan and feasible alternatives to the plan. Based on this information, the state will draft and provide NOAA with a preliminary EIS.

(c) Early in the development of the draft management plan and the draft EIS, the state and NOAA shall hold a scoping meeting (pursuant to NEPA) in the area or areas most affected to solicit public and government comments on the significant issues related to the proposed action. NOAA will publish a notice of the meeting in the Federal Register at least 15 days prior to the meeting. The state shall be responsible for publishing a similar notice in the local media.

(d) NOAA will publish a Federal Register notice of intent to prepare a draft EIS. After the draft EIS is prepared and filed with the Environmental Protection Agency (EPA), a Notice of Availability of the draft EIS will appear in the Federal Register. Not less than 30 days after publication of the notice, NOAA will hold at least one public hearing in the area or areas most affected by the proposed national estuarine research reserve. The hearing will be held no sooner than 15 days after appropriate notice of the meeting has been given in the principal news media by the state and in the Federal Register by NOAA. After a 45-day comment period, a final EIS will be prepared by the state and NOAA.

Sec. 921.20 General.

The acquisition and development period is separated into two major phases. After NOAA approval of the site, draft management plan and draft MOU, and completion of the final EIS, a coastal state is eligible for an initial acquisition and development award(s). In this initial phase, the state should work to meet the criteria required for formal research reserve designation; e.g., establishing adequate state control over the key land and water areas as specified in the draft management plan and preparing the final management plan. These requirements are specified in Sec. 921.30. Minor construction in accordance with the draft management plan may also be conducted during this initial phase. The initial acquisition and development phase is expected to last no longer than three years. If necessary, a longer time period may be negotiated between the state and NOAA. After Reserve designation, a state is eligible for a supplemental acquisition and development award(s) in accordance with Sec. 921.31. In this post-designation acquisition and development phase, funds may be used in accordance with the final management plan to construct research and educational facilities, complete any remaining land acquisition, for program development, and for restorative activities identified in the final management

plan. In any case, the amount of Federal financial assistance provided to a coastal state with respect to the acquisition of lands and waters, or interests therein, for any one National Estuarine Research Reserve may not exceed an amount equal to 50 percent of the costs of the lands, waters, and interests therein or \$5,000,000, whichever amount is less, except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of all actual costs of activities carrier out with this assistance, as long as such funds are available.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12540, Mar. 17, 1997; 63 FR 26717, May 14, 1998].

Sec. 921.21 Initial acquisition and development awards.

(a) Assistance is provided to aid the recipient prior to designation in:

1. Acquiring a fee simple or less-than-fee simple real property interest in land and water areas to be included in the Reserve boundaries (see Sec. 921.13(a)(7); Sec. 921.30(d));
2. Minor construction, as provided in paragraphs (b) and (c) of this section;
3. Preparing the final management plan; and
4. Initial management costs, e.g., for implementing the NOAA approved draft management plan, hiring a Reserve manager and other staff as necessary and for other management-related activities. Application procedures are specified in subpart I.

(b) The expenditure of Federal and state funds on major construction activities is not allowed during the initial acquisition and development phase. The preparation of architectural and engineering plans, including specifications, for any proposed construction, or for proposed restorative activities, is permitted. In addition, minor construction activities, consistent with paragraph (c) of this section also are allowed. The NOAA-approved draft management plan must, however, include a construction plan and a public access plan before any award funds can be spent on construction activities.

(c) Only minor construction activities that aid in implementing portions of the management plan (such as boat ramps and nature trails) are permitted during the initial acquisition and development phase. No more than five (5) percent of the initial acquisition and development award may be expended on such activities. NOAA must make a specific determination, based on the final EIS, that the construction activity will not be detrimental to the environment.

(d) Except as specifically provided in paragraphs (a) through (c) of this section, construction projects, to be funded in whole or in part under an acquisition and development award(s), may not be initiated until the Reserve receives formal designation (see Sec. 921.30). This requirement has been adopted to ensure that substantial progress

in establishing adequate state control over key land and water areas has been made and that a final management plan is completed before major sums are spent on construction. Once substantial progress in establishing adequate state control/acquisition has been made, as defined by the state in the management plan, other activities guided by the final management plan may begin with NOAA's approval.

(e) For any real property acquired in whole or part with Federal funds for the Reserve, the state shall execute suitable title documents to include substantially the following provisions, or otherwise append the following provisions in a manner acceptable under applicable state law to the official land record(s):

1. Title to the property conveyed by this deed shall vest in the [recipient of the award granted pursuant to section 315 of the Act, 16 U.S.C. 1461 or other NOAA approved state agency] subject to the condition that the designation of the [name of National Estuarine Reserve] is not withdrawn and the property remains part of the federally designated [name of National Estuarine Research Reserve]; and
2. In the event that the property is no longer included as part of the Reserve, or if the designation of the Reserve of which it is part is withdrawn, then NOAA or its successor agency, after full and reasonable consultation with the State, may exercise the following rights regarding the disposition of the property:
 - (i) The recipient may retain title after paying the Federal Government an amount computed by applying the Federal percentage of participation in the cost of the original project to the current fair market value of the property;
 - (ii) If the recipient does not elect to retain title, the Federal Government may either direct the recipient to sell the property and pay the Federal Government an amount computed by applying the Federal percentage of participation in the cost of the original project to the proceeds from the sale (after deducting actual and reasonable selling and repair or renovation expenses, if any, from the sale proceeds), or direct the recipient to transfer title to the Federal Government. If directed to transfer title to the Federal Government, the recipient shall be entitled to compensation computed by applying the recipient's percentage of participation in the cost of the original project to the current fair market value of the property; and
 - (iii) Fair market value of the property must be determined by an independent appraiser and certified by a responsible official of the state, as provided by Department of Commerce regulations at 15 CFR part 24, and Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally assisted programs at 15 CFR part 11.

(f) Upon instruction by NOAA, provisions analogous to those of Sec. 921.21(e) shall be included in the documentation underlying less-than-fee-simple interests acquired in whole or part with Federal funds.

(g) Federal funds or non-Federal matching share funds shall not be spent to acquire a real property interest in which the state will own the land concurrently with another entity unless the property interest has been identified as a part of an acquisition strategy

pursuant to Sec. 921.13(7) which has been approved by NOAA prior to the effective date of these regulations.

(h) Prior to submitting the final management plan to NOAA for review and approval, the state shall hold a public meeting to receive comment on the plan in the area affected by the estuarine research reserve. NOAA will publish a notice of the meeting in the Federal Register at least 15 days prior to the public meeting. The state shall be responsible for having a similar notice published in the local newspaper(s).

Sec. 921.30 Designation of National Estuarine Research Reserves.

(a) The Under Secretary may designate an area proposed for designation by the Governor of the state in which it is located, as a National Estuarine Research Reserve if the Under Secretary finds:

1. The area is a representative estuarine ecosystem that is suitable for long-term research and contributes to the biogeographical and typological balance of the System;
2. Key land and water areas of the proposed Reserve, as identified in the management plan, are under adequate state control sufficient to provide long-term protection for reserve resources to ensure a stable environment for research;
3. Designation of the area as a Reserve will serve to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation;
4. A final management plan has been approved by NOAA;
5. An MOU has been signed between the state and NOAA ensuring a long-term commitment by the state to the effective operation and implementation of the area as a National Estuarine Research Reserve;
6. All MOU's necessary for reserve management (i.e., with relevant Federal, state, and local agencies and/or private organizations) have been signed; and
7. The coastal state in which the area is located has complied with the requirements of subpart B.

(b) NOAA will determine whether the designation of a National Estuarine Research Reserve in a state with a federally approved coastal zone management program directly affects the coastal zone. If the designation is found to directly affect the coastal zone, NOAA will make a consistency determination pursuant to Sec. 307(c)(1) of the Act, 16 U.S.C. 1456, and 15 CFR part 930, subpart C. See Sec. 921.4(b). The results of this consistency determination will be published in the Federal Register when the notice of designation is published. See Sec. 921.30(c).

(c) NOAA will publish the notice of designation of a National Estuarine Research Reserve in the Federal Register. The state shall be responsible for having a similar notice published in the local media.

(d) The term state control in Sec. 921.30(a)(3) does not necessarily require that key land and water areas be owned by the state in fee simple. Acquisition of less-than-fee simple interests e.g., conservation easements) and utilization of existing state regulatory measures are encouraged where the state can demonstrate that these interests and measures assure adequate long-term state control consistent with the purposes of the research reserve (see also Secs. 921.13(a)(7); 921.21(g)). Should the state later elect to purchase an interest in such lands using NOAA funds, adequate justification as to the need for such acquisition must be provided to NOAA.

Sec. 921.31 Supplemental acquisition and development awards.

After National Estuarine Research Reserve designation, and as specified in the approved management plan, a coastal state may request a supplemental acquisition and/or development award(s) for acquiring additional property interests identified in the management plan as necessary to strengthen protection of key land and water areas and to enhance long-term protection of the area for research and education, for facility and exhibit construction, for restorative activities identified in the approved management plan, for administrative purposes related to acquisition and/or facility construction and to develop and/or upgrade research, monitoring and education/interpretive programs. Federal financial assistance provided to a National Estuarine Research Reserve for supplemental development costs directly associated with facility construction (i.e., major construction activities) may not exceed 70 percent of the total project cost, except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of the costs. NOAA must make a specific determination that the construction activity will not be detrimental to the environment. Acquisition awards for the acquisition of lands or waters, or interests therein, for any one reserve may not exceed an amount equal to 50 percent of the costs of the lands, waters, and interests therein of \$5,000,000, whichever amount is less, except when the financial assistance is provided from amounts recovered as result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of all actual costs of activities carrier out with this assistance, as long as such funds are available. In the case of a biogeographic region (see appendix I) shared by two or more states, each state is eligible independently for Federal financial assistance to establish a separate National Estuarine Research Reserve within their respective portion of the shared biogeographic region. Application procedures are specified in subpart I. Land acquisition must follow the procedures specified in Secs. 921.13(a)(7), 921.21(e) and (f) and 921.81.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12540, Mar. 17, 1997; 63 FR 26717, May 14, 1998].

Sec. 921.32 Operation and management: Implementation of the management plan.

(a) After the Reserve is formally designated, a coastal state is eligible to receive Federal funds to assist the state in the operation and management of the Reserve including the management of research, monitoring, education, and interpretive programs. The purpose of this Federally funded operation and management phase is to implement the approved final management plan and to take the necessary steps to ensure the continued effective operation of the Reserve.

(b) State operation and management of the Reserves shall be consistent with the mission, and shall further the goals of the National Estuarine Research Reserve program (see Sec. 921.1).

(c) Federal funds are available for the operation and management of the Reserve. Federal funds provided pursuant to this section may not exceed 70 percent of the total cost of operating and managing the Reserve for any one year, except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of the costs. In the case of a biogeographic region (see Appendix I) shared by two or more states, each state is eligible for Federal financial assistance to establish a separate Reserve within their respective portion of the shared biogeographic region (see Sec. 921.10).

(d) Operation and management funds are subject to the following limitations:

1. Eligible coastal state agencies may apply for up to the maximum share available per Reserve for that fiscal year. Share amounts will be announced annually by letter from the Sanctuary and Reserves Division to all participating states. This letter will be provided as soon as practicable following approval of the Federal budget for that fiscal year.
2. No more than ten percent of the total amount (state and Federal shares) of each operation and management award may be used for construction-type activities.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12541, Mar. 17, 1997].

Sec. 921.33 Boundary changes, amendments to the management plan, and addition of multiple-site components.

(a) Changes in the boundary of a Reserve and major changes to the final management plan, including state laws or regulations promulgated specifically for the Reserve, may be made only after written approval by NOAA. NOAA may require public notice, including notice in the Federal Register and an opportunity for public comment before approving a boundary or management plan change. Changes in the boundary of a Reserve involving the acquisition of properties not listed in the management plan or final EIS require public notice and the opportunity for comment; in certain cases, a categorical exclusion, an environmental assessment and possibly an environmental impact statement may be

required. NOAA will place a notice in the Federal Register of any proposed changes in Reserve boundaries or proposed major changes to the final management plan. The state shall be responsible for publishing an equivalent notice in the local media. See also requirements of Secs. 921.4(b) and 921.13(a)(11).

(b) As discussed in Sec. 921.10(b), a state may choose to develop a multiple-site National Estuarine Research Reserve after the initial acquisition and development award for a single site has been made. NOAA will publish notice of the proposed new site including an invitation for comments from the public in the Federal Register. The state shall be responsible for publishing an equivalent notice in the local newspaper(s). An EIS, if required, shall be prepared in accordance with section Sec. 921.13 and shall include an administrative framework for the multiple-site Reserve and a description of the complementary research and educational programs within the Reserve. If NOAA determines, based on the scope of the project and the issues associated with the additional site(s), that an environmental assessment is sufficient to establish a multiple-site Reserve, then the state shall develop a revised management plan which, concerning the additional component, incorporates each of the elements described in Sec. 921.13(a). The revised management plan shall address goals and objectives for all components of the multi-site Reserve and the additional component's relationship to the original site(s).

(c) The state shall revise the management plan for a Reserve at least every five years, or more often if necessary. Management plan revisions are subject to (a) above.

(d) NOAA will approve boundary changes, amendments to management plans, or the addition of multiple-site components, by notice in the Federal Register. If necessary NOAA will revise the designation document (findings) for the site.

Sec. 921.40 Ongoing oversight and evaluations of designated National Estuarine Research Reserves.

(a) The Sanctuaries and Reserve Division shall conduct, in accordance with section 312 of the Act and procedures set forth in 15 CFR part 928, ongoing oversight and evaluations of Reserves. Interim sanctions may be imposed in accordance with regulations promulgated under 15 CFR part 928.

(b) The Assistant Administrator may consider the following indicators of non-adherence in determining whether to invoke interim sanctions:

1. Inadequate implementation of required staff roles in administration, research, education/interpretation, and surveillance and enforcement. Indicators of inadequate implementation could include: No Reserve Manager, or no staff or insufficient staff to carry out the required functions.
2. Inadequate implementation of the required research plan, including the monitoring design. Indicators of inadequate implementation could include: Not

- carrying out research or monitoring that is required by the plan, or carrying out research or monitoring that is inconsistent with the plan.
3. Inadequate implementation of the required education/interpretation plan. Indicators of inadequate implementation could include: Not carrying out education or interpretation that is required by the plan, or carrying out education/interpretation that is inconsistent with the plan.
 4. Inadequate implementation of public access to the Reserve. Indicators of inadequate implementation of public access could include: Not providing necessary access, giving full consideration to the need to keep some areas off limits to the public in order to protect fragile resources.
 5. Inadequate implementation of facility development plan. Indicators of inadequate implementation could include: Not taking action to propose and budget for necessary facilities, or not undertaking necessary construction in a timely manner when funds are available.
 6. Inadequate implementation of acquisition plan. Indicators of inadequate implementation could include: Not pursuing an aggressive acquisition program with all available funds for that purpose, not requesting promptly additional funds when necessary, and evidence that adequate long-term state control has not been established over some core or buffer areas, thus jeopardizing the ability to protect the Reserve site and resources from offsite impacts.
 7. Inadequate implementation of Reserve protection plan. Indicators of inadequate implementation could include: Evidence of non-compliance with Reserve restrictions, insufficient surveillance and enforcement to assure that restrictions on use of the Reserve are adhered to, or evidence that Reserve resources are being damaged or destroyed as a result of the above.
 8. Failure to carry out the terms of the signed Memorandum of Understanding (MOU) between the state and NOAA, which establishes a long-term state commitment to maintain and manage the Reserve in accordance with section 315 of the Act. Indicators of failure could include: State action to allow incompatible uses of state-controlled lands or waters in the Reserve, failure of the state to bear its fair share of costs associated with long-term operation and management of the Reserve, or failure to initiate timely updates of the MOU when necessary.

Sec. 921.41 Withdrawal of designation.

The Assistant Administrator may withdraw designation of an estuarine area as a National Estuarine Research Reserve pursuant to and in accordance with the procedures of section 312 and 315 of the Act and regulations promulgated thereunder.

APPENDIX B

**Agreement Concerning Cooperative Management of
the San Francisco Bay National Estuarine Research Reserve**

Memorandum of Understanding
AGREEMENT CONCERNING COOPERATIVE MANAGEMENT OF
THE SAN FRANCISCO BAY NATIONAL ESTUARINE RESEARCH RESERVE

This Memorandum serves as an expression of intent among four parties-in-interest ("parties"): Solano Land Trust; California Department of Parks and Recreation (collectively referred to as "the land management parties"); San Francisco State University ("SFSU"), the state lead agency; and the San Francisco Bay Conservation and Development Commission ("the Commission").

Witnesseth:

WHEREAS, the State of California has received a grant from the United States Secretary of Commerce for the development and operation of certain portions of the San Francisco Bay Estuary (see Appended List) as the San Francisco Bay National Estuarine Research Reserve (the Reserve), and

WHEREAS, the purpose of this grant is to create new opportunities for coordinated San Francisco Bay estuarine resource management, research, monitoring, stewardship, and public education (the Program), and

WHEREAS, such Program has wide public support, as evidenced by the implementation of the Comprehensive Conservation and Management Plan for the San Francisco Bay Estuary, and the Baylands Ecosystem Habitat Goals Project and

WHEREAS, the parties have evidenced support for such a Program through their approval of the 1992 Site Nomination Proposal for the San Francisco Bay National Estuarine Research Reserve,

NOW THEREFORE, in consideration of the mutual benefits to be derived from implementing this Program, the parties agree to the following:

1. The lands described in the Appended List, which are and will remain independently owned and administered by the respective owners and lessees, are hereby designated as sites to be cooperatively managed by the land management parties, based in part on the advice of the Commission, as the San Francisco Bay National Estuarine Research Reserve in accordance with the provisions of this MOU.
2. There shall be a reserve management plan for the reserve ("reserve management plan") that provides a framework for conducting a specified Program on Reserve sites. Revisions of the reserve management plan shall be developed by the reserve staff and shall be subject to approval by a management advisory board that will include representatives of the parties. The reserve management plan shall be reviewed periodically and revised as specified by NOAA and the management advisory board.

3. A primary purpose of the Program is to provide funding, staff, and other resources and guidance that will assist reserve land management parties to develop site-specific activities that are consistent with the reserve management plan. This Program will focus on identifying and conserving sensitive ecological resources, promoting on-site research and long-term monitoring, engaging local communities in stewardship activities that support the conservation of sensitive reserve resources, and acting as a regional educational resource that serves the public of the San Francisco Bay and Delta region.

4. The parties agree, so far as it consistent with their respective governing laws, policies, regulations and available resources, to support the preparation and implementation of the reserve management plan.

5. The uses of reserve lands shall be compatible with the Program and its purpose as expressed in the reserve management plan.

6. Management Structure

a. There shall be a management advisory board that will include one member from each of the parties that shall review the recommendations of reserve staff and that shall represent the parties. The advisory board will be a non-voting advisory body and will be supported by reserve staff. The management advisory board shall review the reserve management plan periodically and shall advise SFSU regarding the adequacy of staff implementation of the reserve management plan. A representative of NOAA shall serve as an ex-officio representative on the management advisory board.

b. SFSU shall implement the program by hiring and directing reserve staff, supervising and coordinating implementation of the provisions of the reserve management plan, and by receiving and acting upon the recommendations of the management advisory board and participating site managers. The reserve staff will be directly responsible for program coordination with agency representatives having proprietary control over reserve sites.

c. The Commission will assist in developing an advisory structure that provides the management advisory board with an appropriate linkage to the broader community so that its direction of the reserve reflects the concerns and ideas of this regional constituency.

7. No projects shall be carried out on reserve lands without the approval of the party having proprietary control over such lands. Such party shall maintain all facilities built on lands that the party controls in furtherance of a project, and shall cooperate with reserve staff in carrying out the approved program.

8. The reserve staff, management advisory board and appropriate advisory participants shall confer regularly to ensure coordination between the Program and the broader goals and mandates of regional coastal management programs that affect the San Francisco Bay

Estuary. To the extent feasible, as necessary, and in accordance with the laws and regulations affecting and guiding the respective parties, the parties will coordinate resource management and manipulation, public entry and use of the properties, enforcement, development and operation of the Properties in accordance with the provisions of this MOU.

9. This Memorandum shall not be construed to preclude additional transfers of property among the parties, nor to preclude additions of appropriate lands to reserve sites.

10. The land management parties agree to reasonably commit their respective available resources towards achieving the objectives of this MOU, but no party shall be obligated to provide or expend any funds, staff, equipment or other resources over and above what such party is normally authorized in connection with the management and operation of its respective lands and what is necessary to meet the State match requirement.

11. This Memorandum shall continue in perpetuity so long as the Program is funded and has not been terminated; additional participants may join by unanimous approval of the parties, and this Memorandum may be amended or terminated by majority vote of the parties at any time. Nothing in this Memorandum shall preclude the unilateral withdrawal of any of the parties. Any party may terminate its participation under the MOU by providing sixty (60) days written notice to each of the other parties. In such an eventuality, it is understood that the lands of the withdrawing party would be withdrawn from reserve designation, and it is further understood that the federal Office of Management and Budget would take appropriate action with respect to repayment of grant funds as may be indicated by its regulations.

12. All parties agree, to the extent permitted by their respective governing laws, that they will cooperate with the Program so that it can achieve its mission to provide opportunities for long-term research, education, and interpretation. This will help the parties promote and recover the ecological health of the San Francisco Estuary and to create a more sustainable regional environment for future generations.

13. The parties shall neither be construed as partners nor an agent of the other by reason of this MOU nor be given any power to bind any other party to any obligation or liability. No provision of this MOU shall be interpreted to mean that a party assumes any responsibility for liability or claims of third parties on lands of another party.

14 Counterparts: The MOU may be executed in counterparts with each counterpart, when taken all together, constituting a full and complete binding document.

15. Severability: Should any provision of this MOU be found to be invalid as to any party, such invalidity shall not affect the remainder of the MOU and it shall be enforceable as if the invalid provision were never included.

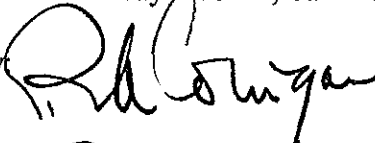
16 Existing law: This MOU does not supercede or modify existing statutory authority or direction of the parties and the parties will continue to administer their respective lands and programs or otherwise work within existing statutory authority. Decisions made pursuant to this MOU shall not be binding on a party unless the party's representative has the authority to bind the agency regarding the specific decision or the agency ratifies the decision.

17. Applicable law: Enforcement of the provisions of this MOU shall be in accordance with the laws of the State of California and appropriate local jurisdictions. It is the intent of the parties that the provisions of the MOU be interpreted in the broadest manner so as to give effect to the purposes of the MOU. However, no party shall be required to participate in a cooperative activity that it, in good faith, believes is not consistent with its underlying statutory, regulatory, budget authority or the policies of its respective entity.

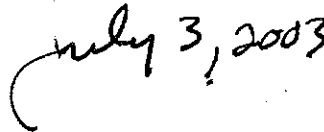
18. Notices: Notices shall be given to each of the other parties in writing by first-class mail or personal delivery at the addresses shown below.

Signed,

San Francisco State University
1600 Holloway Avenue, San Francisco CA 94132


By: 

Date:

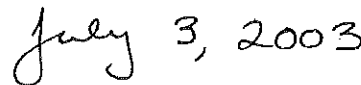


Title: 

Romberg Tiburon Center
San Francisco State University
3152 Paradise Drive
Tiburon CA 94920-1205

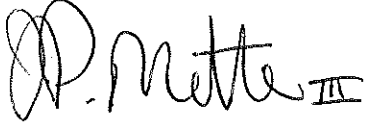
By: 

Date:



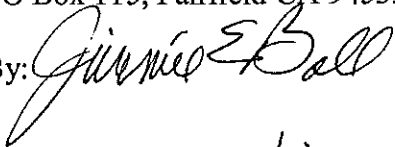
Title: 

California Department of Parks and Recreation
Marin District Headquarters
7665 Redwood Blvd, Suite 150, Novato, CA 94945.

By:  Date: JULY 3, 2003

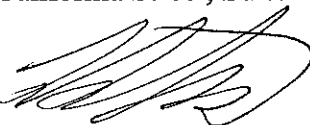
Title: General Manager

Solano Land Trust
PO Box 115, Fairfield CA 94533

By:  Date: July 1, 2003

Title: Executive Director

San Francisco Bay Conservation and Development Commission
50 California Street, Suite 2600, San Francisco CA 94111

By:  Date: JUNE 20, 2003

Title: EXECUTIVE DIRECTOR

Appended List of Properties included in the San Francisco Bay National Estuarine
Research Reserve:

China Camp State Park, California Department of Parks & Recreation

Rush Ranch Open Space Preserve, Solano Land Trust

APPENDIX C

**Memorandum of Understanding between
San Francisco State and National Oceanic and Atmospheric Administration**

Memorandum of Understanding
Between the
National Oceanic and Atmospheric Administration
and the
San Francisco State University
Detailing the State-Federal Roles in the
San Francisco Bay National Estuarine Research Reserve

This Memorandum of Understanding (MOU) serves to establish the framework for coordination, cooperation and communication regarding the San Francisco Bay National Estuarine Research Reserve (SFBNERR). This agreement concerns the Office of Ocean and Coastal Resource Management (OCRM), National Ocean Service, National Oceanic and Atmospheric Administration (NOAA), whose address is 1305 East-West Highway N/ORM, Silver Spring, Maryland, 20910, and the San Francisco State University (SFSU), whose address is 1600 Holloway Avenue, San Francisco, CA 94132.

WHEREAS, the State of California has determined that certain waters and coastal habitats of the San Francisco Bay system provide representative opportunities to study natural estuarine and human processes occurring within an estuarine ecosystem; and

WHEREAS, the State of California finds that the resources of San Francisco Bay and its value to the citizens of California and the United States will benefit from the management of this site as part of the National Estuarine Research Reserve System; and

WHEREAS, NOAA has concurred with that finding, and may designate certain areas of San Francisco Bay as a National Estuarine Research Reserve pursuant to its authority under Section 315 of the Coastal Zone Management Act of 1972, as amended, (CZMA, P.L. 92-583, 16 U.S.C. 1461) and in accordance with implementing regulations at 15 CFR 921.30; and

WHEREAS, SFSU is designated by the State of California and in the San Francisco Bay National Estuarine Research Reserve Management Plan ("Plan") as the agency responsible for managing the reserve, as defined in the Plan; and

WHEREAS, the Plan describes the goals, objectives, plans, administrative structure, and institutional arrangements for the reserve, including this MOU and others; and

WHEREAS, SFSU acknowledges the need and requirement for continuing State-Federal cooperation in the long term management of the reserve in a manner consistent with the purposes sought through its designation.

NOW THEREFORE, in consideration of the mutual agreements contained herein it is agreed by and between SFSU and NOAA as follows:

ARTICLE 1: STATE-FEDERAL ROLES IN RESERVE MANAGEMENT

The following section describes the roles and responsibilities of the reserve partners. The obligations described for each reserve partner are subject to available funding.

A. State Role in Reserve Management

San Francisco State University, as the principal contact for the State of California in all matters concerning the reserve, will be responsible for ensuring that the reserve complies with management objectives of the Plan, the California Coastal Management Program, other applicable provisions of California law, Section 315 of the Federal Coastal Zone Management Act (CZMA), and the federal regulations of the National Estuarine Research Reserve System (NERRS). San Francisco State University will be the grant receiving office for the SFBNERR under Section 315 of the CZMA. Subject to available and authorized appropriations, SFSU's responsibilities for plan implementation include the following:

1. Annually apply for, budget, and allocate funds received for SFBNERR operations, (e.g., education, research and monitoring programs), as well as for acquisition and facilities;
2. Conduct active research and monitoring programs that draw scientists from various institutions to work together on understanding coastal issues;
3. Conduct and maintain programs that provide materials, activities, workshops, and conferences that translate the research results to the resource users, regulators, and the public;
4. Provide a full-time, state-funded Reserve Manager, and endeavor to secure state-funding for Research and Education Coordinator positions to coordinate research, monitoring, education and translation of research results;
5. Secure facilities that will, among other things, include research laboratory, classroom, library, office, meeting, field equipment storage and interpretive display space;
6. Secure equipment to facilitate research and outreach activities that, among other things, will include boats, laboratory and field equipment, audiovisual, curriculum, reference materials and databases;
7. Maintain effective liaison with local, regional and state policy makers, regulators and the general public;
8. Serve as principal negotiator on issues involving proposed boundary changes and/or amendments to the Plan;
9. Respond to NOAA's requests for information and respond to evaluation findings made pursuant to Section 312 of the CZMA;

10. Expend funds in accordance with federal and state laws, the SFBNERR management plan, and annual appropriations; and
11. Ensure enforcement of the applicable provisions of California law, including the rules and regulations of the California Coastal Management Program, to protect the research reserve.
12. Coordinate and support research, monitoring, education, and management activities with staff at China Camp State Park, Rush Ranch, and Browns Island Regional Shoreline.

B. Federal Role in Reserve Operation

The Office of Ocean and Coastal Resource Management will serve to administer the provisions of Section 315 of the CZMA to ensure that the reserve operates in accordance with the goals of the NERRS and the Plan. These responsibilities are subject to the availability of appropriated funds. In carrying out its responsibilities, OCRM will:

1. Review and process applications for financial assistance to SFSU, consistent with 15 CFR Part 921 for acquisition, development, operations, education, research, and monitoring activities associated with the reserve;
2. This agreement does not create any obligation on the part of OCRM to award financial assistance.
3. Make periodic evaluations in accordance with Section 312 of the CZMA to measure SFSU's performance in Plan implementation;
4. Advise SFSU of existing and emerging national and regional issues; and
5. Establish an information exchange network cataloging all available research data and educational material developed on each reserve included within the reserve system.

C. General Provisions

1. Nothing in this agreement or subsequent financial assistance awards shall obligate any party in the expenditure of funds, or for future payments of money, in excess of appropriations authorized by law.
2. Both parties agree to comply with all applicable federal or State laws regulating ethical conduct of public officers and employees.
3. Each party will comply with all applicable laws, regulations, and executive orders relative to Equal Employment Opportunity.

4. Upon termination of this agreement or any subsequent financial assistance awards, any equipment purchased for studies initiated in furtherance of this agreement will be returned to the agency of initial purchase.
5. A free exchange of research and assessment data among agencies is encouraged and is necessary to insure the success of these cooperative studies.

D. Other Provisions

Nothing in this MOU diminishes the independent authority or coordination responsibility of each agency in administering its statutory obligations. Nothing herein is intended to conflict with current agency directives. If the terms of this MOU are inconsistent with existing directives of any agency entering into this agreement, then those portions which are determined to be inconsistent shall be invalid; but the remaining terms not affected by the inconsistency shall remain in full force and effect. At the first opportunity for review of this agreement, all necessary changes will be made by either an amendment to this MOU or by entering into a new MOU, which ever is deemed expedient to the interest of all Parties. Should disagreement arise on the interpretation of the provisions of this MOU, or amendments and/or revisions thereto, that cannot be resolved at the operating level, the area(s) of disagreement shall be stated in writing by each party and presented to the other parties for consideration.

ARTICLE II: REAL PROPERTY ACQUIRED FOR THE PURPOSE OF THE RESERVE

As well as agreeing to adhere to the rest of the provisions set forth at 15 CFR Part 921, SFSU agrees to the conditions set forth at 15 CFR 921.21(e), which specify the legal documentation requirements concerning the use and disposition of real property acquired for reserve purposes with Federal funds under Section 315 of the CZMA.

ARTICLE III. PROGRAM EVALUATION

OCRM will schedule periodic evaluations of the SFSU's performance in meeting the terms of financial assistance awards, in implementing the Management Plan and in meeting the provisions of this MOU. Where findings of deficiency occur, NOAA may initiate action in accordance with the designation withdrawal procedures established by the CZMA and applicable regulations.

ARTICLE IV. EFFECTIVE DATE, REVIEW, AMENDMENT AND TERMINATION

This MOU is effective on the date of designation of the reserve. The MOU will be reviewed periodically. This MOU may be amended by the mutual consent of the parties. This MOU may be terminated by mutual consent of the Parties, or by NOAA if it withdraws designation of the areas as a National Estuarine Research Reserve, pursuant to applicable provisions of the CZMA and its implementing regulations as described under 15 CFR Part 923 Subpart L. Should this MOU be terminated, reimbursement of unexpended funds shall be determined on a pro rata basis according to the amount of work done by the Parties at the time of termination. This MOU is subject to the availability of appropriated funds.

IN WITNESS THEREOF, the Parties hereto have caused this MOU to be executed.



Eldon Hout

Director

Office of Ocean and

Coastal Resource Management

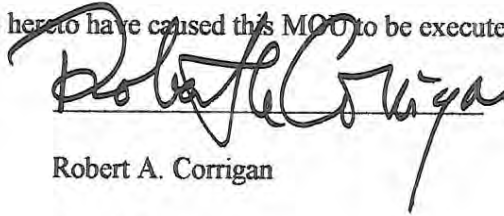
National Ocean Service

National Oceanic and Atmospheric Administration

U.S. Department of Commerce



Date



Robert A. Corrigan

President

San Francisco State University



Date

APPENDIX D

**Memorandum of Understanding between
San Francisco Bay National Estuarine Research Reserve and Audubon California**

MEMORANDUM OF UNDERSTANDING

This Memorandum serves as an expression of intent between two parties-in-interest ("parties"): San Francisco State University ("SFSU"), the state lead agency on behalf of the San Francisco Bay National Estuarine Research Reserve (San Francisco Bay NERR), and National Audubon Society, Inc. dba, Richardson Bay Audubon Center & Sanctuary ("Audubon") concerning collaboration on the management and protection of San Francisco Bay, and in particular, Richardson Bay.

Witnesseth:

WHEREAS, the Solano Land Trust, the California Department of Parks and Recreation, the San Francisco Bay Conservation and Development Commission and SFSU entered into that certain Memorandum of Understanding dated as of July 2, 2003 (the "MOU") to create new opportunities for coordinated San Francisco Bay estuarine resource management, research, monitoring, stewardship and public education (the Program), and

WHEREAS, the National Oceanic and Atmospheric Administration designated the San Francisco Bay NERR on August 27, 2003, and

WHEREAS, Audubon's mission focusing on stewardship, education, research and restoration of Richardson Bay aligns with the mission of the San Francisco Bay NERR, and

WHEREAS, Audubon currently owns land adjacent to, and undertakes research in, China Camp State Park, one of the federally designated San Francisco Bay NERR sites, and

WHEREAS, San Francisco Bay NERR staff and Audubon staff are currently collaborating on stewardship projects, research, and education projects and programs in the community, and are committed to continuing these collaborations,

NOW THEREFORE, in consideration of the mutual benefits to be derived from such collaboration, the parties agree to the following:

1. San Francisco Bay NERR staff and Audubon staff will cooperate in ways that will strengthen their respective education programs. San Francisco Bay NERR staff will offer additional support and expertise in estuarine science and science education to Audubon, while Audubon staff will offer San Francisco Bay NERR access to field sites and education facilities. Educators and managers from both organizations will work together to write grants to fund joint programs. At the request of Audubon, San Francisco Bay

NERR's Education Coordinator will assist with curriculum development for Audubon's education programs and training of education volunteers. In addition, San Francisco Bay NERR Education staff will consult with scientists working within the Sanctuary to create temporary exhibits about research in Richardson Bay. The temporary exhibits will be displayed on Audubon property and at other locations within Tiburon. The scientists will also occasionally speak at San Francisco Bay NERR and Audubon education programs.

2. Audubon will provide, at mutually acceptable times subject to scheduling, use of classroom facilities and access to field sites at the Richardson Bay Audubon Center & Sanctuary for San Francisco Bay NERR education workshops, such as professional development workshops for teachers and training sessions for coastal decision makers. San Francisco Bay NERR will provide, at mutually acceptable times subject to scheduling, use by Audubon of classroom facilities for education programs at the Romberg Tiburon Center and use by Audubon staff of the San Francisco Bay NERR laboratory facilities at the Romberg Tiburon Center.
3. The parties may link websites and cross-promote each other's work and programs as appropriate.
4. The parties agree that Audubon, through its Richardson Bay Audubon Center & Sanctuary Director, will participate in the proceedings of the Management Advisory Board of the San Francisco Bay NERR.
5. Audubon shall implement its programs in consideration of the San Francisco Bay NERR's Management Plan, and the San Francisco Bay NERR shall implement their programs at Richardson Bay in consideration of the plans and regulations of Audubon.
6. No projects shall be carried out on San Francisco Bay NERR lands without the approval of the party having proprietary control over such lands.
7. The parties agree to reasonably commit their respective available resources towards achieving the objectives of this Memorandum, but no party shall be obligated to provide or expend any funds, staff, equipment or other resources over and above what such party is normally authorized in connection with the management and operation of its respective programs.
8. This Memorandum may be amended by the mutual agreement of the parties. Either party may terminate this Memorandum by providing sixty (60) days written notice to the other party.
9. The parties shall neither be construed as partners nor an agent of the other by reason of this Memorandum nor be given any power to bind the other party to any obligation or liability. No provision of this Memorandum shall be interpreted to mean that a party assumes any responsibility for liability or claims of third parties on lands of the other party.

10. This Memorandum does not supersede or modify existing statutory authority or direction of the parties; the parties will continue to administer their respective lands and programs or otherwise work within existing statutory authority. Decisions made pursuant to this Memorandum shall not be binding on a party unless the party's representative has the authority to bind the party regarding the specific decision.

11. This Memorandum shall be governed by the laws of the State of California and appropriate local jurisdictions. It is the intent of the parties that the provisions of the Memorandum be interpreted in the broadest manner so as to give effect to the purposes thereof. However, neither party shall be required to participate in a cooperative activity that it, in good faith, believes is not consistent with its underlying statutory, regulatory, budget authority or policies.

12. Counterparts: This Memorandum may be executed in counterparts with each counterpart, when taken all together, constituting a full and complete binding document.

Signed,

San Francisco Bay National Estuarine Research Reserve
San Francisco State University
1600 Holloway Avenue, San Francisco CA 94132



By: Jaime C. Kooser, Ph.D.
Title: Reserve Manager



Date: 2/17/08

National Audubon Society
Richardson Bay Audubon Center & Sanctuary
376 Greenwood Beach Rd
Tiburon CA 94920



By: Brooke Langston
Title: Center Director



Date:

APPENDIX E

Species Lists

APPENDIX E

Species Lists

1. China Camp State Park

- Birds
- Fishes
- Mammals
- Plants

2. Rush Ranch Open Space Preserve

- Birds
- Fishes
- Mammals
- Reptiles
- Plants

Note: Lists of State and Federally threatened and endangered species for California, updated quarterly, are posted by the California Department of Fish and Game at their website <http://www.dfg.ca.gov/whdab/html/lists.html>

Bird Species List, China Camp State Park (tidal marsh).

Breeding season: March-July, 1996 - 2000. Source: Nadav Nur, Point Reyes Bird Observatory. Includes flyovers. A= abundant (e.g. SOSP, over 20 detections per survey); C= common- detections every year in point counts; R= rare (detected only 1 or 2 times in journal but not in point counts). **BOLD** - Threatened or Endangered Species

AOU SPECIES CODE	SPECIES COMMON NAME	SCIENTIFIC NAME	Status	Documented breeding
AMCO	American Coot	<i>Fulica americana</i>	C	
AMCR	American Crow	<i>Corvus brachyrhynchos</i>	C	
AMGO	American Goldfinch	<i>Carduelis tristis</i>	C	
ANHU	Anna's Hummingbird	<i>Calypte anna</i>	C	
BAEA	Bald Eagle	<i>Haliaeetus leucocephalus</i>	R	
BARS	Barn Swallow	<i>Hirundo rustica</i>	C	
BHCO	Brown-headed Cowbird	<i>Molothrus ater</i>	C	
BLRA	California Black Rail	<i>Laterallus jamaicensis</i>	C	yes
BNST	Black-necked Stilt	<i>Himantopus mexicanus</i>	C	
BRBL	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	C	
CAGO	Canada Goose	<i>Branta canadensis</i>	C	
CLRA	California Clapper Rail	<i>Rallus longirostris obsoletus</i>	R	Yes
CLSW	Cliff Swallow	<i>Hirundo pyrrhonota</i>	C	
CORA	Common Raven	<i>Corvus corax</i>	C	
COSN	Common Snipe	<i>Gallinago gallinago</i>	R	
EUST	European Starling	<i>Sturnus vulgaris</i>	C	
GBHE	Great Blue Heron	<i>Ardea herodias</i>	C	
GCSP	Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	R	
GREG	Great Egret	<i>Ardea alba</i>	C	
GRYE	Greater Yellowlegs	<i>Tringa melanoleuca</i>	C	
HOFI	House Finch	<i>Carpodacus mexicanus</i>	C	
LESC	Lesser Scaup	<i>Aythya affinis</i>	R	
LEYE	Lesser Yellowlegs	<i>Tringa flavipes</i>	C	
MAGO	Marbelled Godwit	<i>Lumosa fedoa</i>	C	
MALL	Mallard	<i>Anas platyrhynchos</i>	C	
MAWR	Marsh Wren	<i>Cistothorus palustris</i>	C	
NOHA	Northern Harrier	<i>Circus cyaneus</i>	C	
OSPR	Osprey	<i>Pandion haliaetus</i>	R	
PEFA	Peregrine Falcon	<i>Falco peregrinus</i>	R	
RBGU	Ring-billed Gull	<i>Larus delawarensis</i>	C	
RTHA	Red-tailed Hawk	<i>Buteo jamaicensis</i>	C	
RWBL	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	A	
SCAU	Scaup Sp.	<i>Aythya sp.</i>	C	
SNEG	Snowy Egret	<i>Egretta thula</i>	C	
SOSP	Samuel's Song Sparrow	<i>Melospiza melodia samuelis</i>	A	yes
STJA	Steller's Jay	<i>Cyanocitta stelleri</i>	C	
TRES	Tree Swallow	<i>Tachycineta bicolor</i>	C	
TUVU	Turkey Vulture	<i>Cathartes aura</i>	C	
VGSW	Violet-green Swallow	<i>Tachycineta thalassina</i>	R	
VIRA	Virginia Rail	<i>Rallus limicola</i>	R	
WCSP	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	C	

AOU SPECIES CODE	SPECIES COMMON NAME	SCIENTIFIC NAME	Status	Documented breeding
WEGR	Western Grebe	<i>Aechmophorus occidentalis</i>	C	
WEME	Western Meadowlark	<i>Sturnella neglecta</i>	C	
WESJ	Western Scrub Jay	<i>Aphelocoma coerulescens</i>	C	
WILL	Willet	<i>Catoptrophorus semipalmatus</i>	C	
WTKI	White-tailed Kite	<i>Elanus leucurus</i>	C	

Fishes captured in China Camp State Park.

Source: Robert Blizard, California Department of Transportation and Tammie Visintainer, SFSU – Romberg Tiburon Center.

Common Name	Genus species
Inland silverside	<i>Menidia beryllina</i>
Northern anchovy	<i>Engraulis mordax</i>
Longjaw mudsucker	<i>Gilichthys mirabilis</i>
Yellowfins goby	<i>Acanthogobius flavimanus</i>
Bay goby	<i>Lepidogobius lepidus</i>
Shimofuri goby	<i>Tridentiger bifasciatus</i>
Tidewater Goby	<i>Eucyclogobius newberryi</i>
Arrow goby	<i>Clevelandia ios</i>
Plainfin midshipman	<i>Porichthys notatus</i>
Threespine stickleback	<i>Gasterostues aculeatus</i>
Rainwater killifish	<i>Lucania parva</i>
Bay pipefish	<i>Sygnathus leptorhynchus</i>
Shiner surfperch	<i>Cymatogaster aggregata</i>
Western mosquitofish	<i>Gambusia affinis</i>
Pacific staghorn sculpin	<i>Leptocottus armatus</i>
Pacific herring	<i>Clupea pallasii</i>
American shad	<i>Alosa sapidissima</i>
Threadfin shad	<i>Dorosoma pretense</i>
Striped bass	<i>Marone saxatilis</i>
Topsmelt	<i>Atherinops affinis</i>
Longfin smelt	<i>Spirinchus thaleichthys</i>

BOLD = Threatened or endangered species

Mammals of China Camp State Park.

Source: T. Kucera and T.E. Hopkins personal observations, 2001

Common Name	<i>Genus species</i>
California vole	<i>Microtus californicus</i>
Black tailed hare	<i>Lepus californicus</i>
Pocket gopher	<i>Thomomys bottae</i>
Virginia opossum	<i>Didelphis virginiana</i>
Striped skunk	<i>Mephitis mephitis</i>
Raccoon	<i>Procyon lotor</i>
California ground squirrel	<i>Spermophilus beecheei</i>
Woodrat	<i>Neotoma fuscipes</i>
Black-tailed deer	<i>Odocoileus hemionus</i>

BOLD = Threatened or endangered species

Gillies, Eric; Gillies, Jennifer; and Katie Martin. 1995. "A List of Vascular Plants of China Camp State Park, Marin County, California". *The Four Seasons* 10:23-41. *The Four Seasons* is the annual journal of the Regional Parks Botanic Garden. Reprinted with the kind permission of the East Bay Regional Park District.

A List of Vascular Plants of China Camp State Park, Marin County, California

by Eric Gillies, Jennifer Gillies, and Katie Martin

TO COMPILE THIS LIST, which is part of an assemblage of interpretive information pertaining to the park, the authors conducted a survey during the spring and summer of 1994. The purpose of the list, which incorporates not only the authors' own findings, but also those of earlier botanical surveyors, is to help park visitors learn about the flora there.

China Camp State Park is situated in eastern Marin County between the City of San Rafael and San Pablo Bay, a part of San Francisco Bay. It lies mostly on the north-facing slope of San Pedro Mountain, which is the highest point of the San Rafael Hills and a part of the Central Coast Range. Because its southern exposures are few, it is somewhat protected against the urban sprawl of San Rafael and Santa Venetia, which lie south and west of it, respectively.

The park ranges in elevation from sea level to 323 m (1058 ft.) and encompasses approximately 661 hectares (1640 acres). Its climate, one of cool, wet winters and dry, warm summers, is typical of the "Californian Mediterranean." Annual average temperature is approximately 14°C (57°F), and annual average precipitation is approximately 76 cm (30 in.). But because of the rainshadow effect, rain is not distributed uniformly: on the windward side of San Pedro Mountain, precipitation is higher than elsewhere in the park, averaging at about 94 cm (37 in.).

Except for the intertidal deposits of the tidal marsh associated with the San Francisco Bay, the park is composed entirely of Tocaloma-McMullin soil derived from Franciscan-complex sandstone and shale (USDA 1985). The Franciscan complex constitutes the primary geologic formation throughout Marin County east of the San Andreas fault zone (Howell 1970). The relative simplicity of the substrate at China Camp State Park is not

especially advantageous to plants of any particular category—for example, obligate serpentinophiles, which flourish elsewhere in the county in some of the places where formations of the mineral serpentinite have extruded.

The shore of the park, however, is one of the few remaining areas of the Bay region where a salt-marsh community is in interaction with other natural vegetative communities. Of the latter, there are transitional communities—brackish to freshwater marshes and meadows that are influenced by tidal activity, precipitation, or alteration of drainage patterns due to installation of the road that affords the only passage through the park—and terrestrial communities that meet the salt-marsh and transitional communities: native and non-native grasslands, coastal scrub, and oak woodland.

Communities commonly found at higher elevations of the park are oak-bay woodland and redwood forest (the latter in small pockets), occurring mostly on north-facing slopes, and chaparral, occurring mostly on south-facing slopes. There is also a eucalyptus forest occurring in the southeast area of the park.

The park's many plant communities and uncommon setting allow for a rich and diverse flora. Approximately 423 species are within the park, and of these, 279 are native. The total is one quarter of the estimated total of all taxa found in Marin County (Howell et al. 1981). Of the approximately 144 non-native species, many were introduced by Chinese settlers after 1864. Although there are no species in the park that have officially been declared to be endangered or threatened, there are some "sensitive" plants, among them the California Native Plant Society-listed *Grindelia stricta* var. *angustifolia* and *Lessingia hololeuca* (Skinner and Pavlik 1994).

Table 1 provides the complete list of vascular plants known to be in the park and, after the name of each taxon, the community in which it is commonly found. All botanical names have been changed, where necessary, to be in accordance with the new Jepson Manual. The abbreviations used to designate the plant communities are as follows: OW = oak-bay woodland; Rw = redwood forest; Ch = chaparral; CS = coastal scrub; G = grassland; SM = coastal salt marsh or brackish marsh; Fw = freshwater marsh, wetland, or drainage; Euc = eucalyptus forest; RC = rock outcrop or cliff; Rud = ruderal area, roadside, landscaped area, picnic area, residence, etc. (the taxa in this category are mostly non-native). An asterisk indicates a taxon not native to the region.

ACKNOWLEDGMENTS

We are grateful to Angela Nowicki, of California State Parks and Recreation, for the opportunity to move about the park at will for the purpose of

making this list. The list would not be complete without the surveys previously made by Wilma Follette, of the Marin Chapter of the California Native Plant Society.

REFERENCES

- Hickman, J. C., ed. 1993. *The Jepson manual: higher plants of California*. Berkeley and Los Angeles: Univ. Calif. Press.
- Howell, J. T. 1970. *Marin flora: manual of flowering plants and ferns of Marin County, California*, with supplement. Berkeley and Los Angeles: Univ. Calif. Press.
- Howell, J. T.; True, G. H.; and Best, C. 1981. Notes on Marin County plants. *The Four Seasons* 6(3):3–18.
- Munz, P. A., and Keck, D. D. 1969. *A California flora*, with supplement. Berkeley and Los Angeles: Univ. Calif. Press.
- Skinner, M. W., and Pavlik, B. M., eds. 1994. *Inventory of rare and endangered vascular plants of California*. Special Publication Number 1 (fifth edition), California Native Plant Society, Berkeley.
- USDA. 1985. *Soil survey of Marin County, California*. U.S. Department of Agriculture Soil Conservation Service.

TABLE 1
LIST OF VASCULAR PLANTS
OF CHINA CAMP STATE PARK, MARIN COUNTY, CALIFORNIA

FAMILY	SCIENTIFIC NAME	VERNACULAR NAME	COMMUNITY
Ferns and Fern Allies			
Blechnaceae	<i>Woodwardia fimbriata</i>	Western chain fern	OW,Rw
Dennstaedtiaceae	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	Bracken fern	OW,G
Dryopteridaceae	<i>Dryopteris arguta</i>	Coastal wood fern	OW
	<i>Polystichum munitum</i>	Western sword fern	Rw,OW
Equisetaceae	<i>Equisetum arvense</i>	Common horsetail	Fw
	<i>E. hyemale</i> var. <i>affine</i>	Giant California horsetail	Fw
	<i>E. telmateia</i> ssp. <i>braunii</i>	Horsetail	Fw
Polypodiaceae	<i>Polypodium californicum</i>	California polypody	RC
Pteridaceae	<i>Adiantum jordanii</i>	California maidenhair fern	Rw,OW
	<i>Pellaea andromedifolia</i>	Coffee fern	RC
	<i>P. mucronata</i> var. <i>m.</i>	Bird's-foot fern	RC
	<i>Pentagramma triangularis</i>	Goldback fern	OW
Gymnosperms			
Cupressaceae	<i>Juniperus</i> sp.*	Juniper	Rud
Pinaceae	<i>Pinus radiata</i> *	Monterey pine	Rud
	<i>Pseudotsuga menziesii</i> var. <i>m.</i>	Douglas-fir	OW
Taxodiaceae	<i>Sequoia sempervirens</i>	Coast redwood	Rw

Dicotyledons

Aizoaceae	<i>Carpobrotus chilensis</i> *	Iceplant	Rud
	<i>C. edulis</i> *	Hottentot-fig	Rud
	<i>Tetragonia tetragonioides</i> *	New Zealand-spinach	Rud
Anacardiaceae	<i>Toxicodendron diversilobum</i>	Poison-oak	OW,Ch,CS
Apiaceae	<i>Angelica tomentosa</i>	Angelica	OW
	<i>Anthriscus caucalis</i> *	Bur-chervil	OW,CS
	<i>Apium graveolens</i> *	Celery	Fw
	<i>Conium maculatum</i> *	Poison-hemlock	OW,Fw
	<i>Foeniculum vulgare</i> *	Sweet fennel	Rud,G
	<i>Heracleum lanatum</i>	Cow-parsnip	CS
	<i>Lomatium dasycarpum</i> ssp. <i>d.</i>	Hog-fennel	G
	<i>Oenanthe sarmentosa</i>	Water-parsley	Fw
	<i>Osmorhiza chilensis</i>	Sweet cicely	OW
	<i>Perideridia kelloggii</i>	Yampah	G
	<i>Sanicula bipinnatifida</i>	Purple sanicle	OW,G
	<i>S. crassicaulis</i>	Snake root	OW
	<i>S. laciniata</i>	Sanicle	OW
	<i>Scandix pecten-veneris</i> *	Venus' needle	Rud,G
	<i>Tauschia kelloggii</i>	Tauschia	Ch,OW
<i>Torilis arvensis</i> *	Hedge-parsley	G,OW	
<i>T. nodosa</i> *	Hedge-parsley	OW	
<i>Yabea microcarpa</i>	California hedge-parsley	G,OW,Ch	
Apocynaceae	<i>Vinca major</i> *	Periwinkle	Rud
Araceae	<i>Zantedeschia aethiopica</i> *	Cala-lily	Rud
Araliaceae	<i>Hedera helix</i> *	English ivy	Rud
Aristolochiaceae	<i>Aristolochia californica</i>	Pipevine	OW

TABLE 1, *continued*
 LIST OF VASCULAR PLANTS
 OF CHINA CAMP STATE PARK, MARIN COUNTY, CALIFORNIA

FAMILY	SCIENTIFIC NAME	VERNACULAR NAME	COMMUNITY
	<i>Collinsia heterophylla</i>	Chinese houses	RC
	<i>Mimulus aurantiacus</i>	Sticky monkeyflower	CS
	<i>M. cardinalis</i>	Scarlet mimulus	Fw
	<i>M. guttatus</i>	Yellow monkeyflower	Fw
	<i>Pedicularis densiflora</i>	Indian warrior	Ch,OW
	<i>Scrophularia californica</i> ssp. <i>c.</i>	California bee plant	CS
	<i>Triphysaria eriantha</i>	Butter and eggs	G
	<i>T. pusilla</i>	Owl's-clover	G
	<i>T. versicolor</i> ssp. <i>faucibarbata</i>		G, Fw
	<i>Veronica americana</i>	American brooklime	Fw
Simaroubaceae	<i>Ailanthus altissima</i> *	Tree of heaven	Rud,G
Solanaceae	<i>Lycopersicon esculentum</i> *	Tomato	Rud
Urticaceae	<i>Urtica dioica</i> ssp. <i>holosericea</i>	Stinging nettle	CS,Fw
	<i>U. urens</i> *	Dwarf nettle	CS,Fw
Valerianaceae	<i>Centranthus ruber</i> *	Jupiter's beard	RC
	<i>Plectritis ciliosa</i>		G,OW
Verbenaceae	<i>Phyla nodiflora</i> var. <i>n.</i>	Creeping verbena	Fw
Violaceae	<i>Viola ocellata</i>	Western heart's ease	G
	<i>V. pedunculata</i>	Johnny-jump-up	OW,G,Ch
Viscaceae	<i>Phoradendron villosum</i>	Mistletoe	OW
Vitaceae	<i>Vitis vinifera</i> *	Grape	Rud
Monocotyledons			
Cyperaceae	<i>Carex globosa</i>	Sedge	Fw
	<i>C. gracilor</i>	Slender sedge	Fw
	<i>C. obnupta</i>	Weeping sedge	Fw
	<i>C. praegracilis</i>	Sedge	SM
	<i>C. tumulicola</i>	Foothill sedge	Fw
	<i>Cyperus eragrostis</i>	Umbrella sedge	Fw
	<i>Scirpus acutus</i> var. <i>occidentalis</i>	Common tule	Fw
	<i>S. robustus</i>	Bulrush	SM
Iridaceae	<i>Iris douglasiana</i>	Marin iris	OW,G
	<i>I. macrosiphon</i>	Ground iris	G,OW
	<i>Sisyrinchium bellum</i>	Blue-eyed grass	G,OW
Juncaceae	<i>Juncus bufonius</i> var. <i>occidentalis</i>	Toad rush	Fw
	<i>J. effusus</i> var. <i>brunneus</i>	Rush	SM
	<i>J. mexicanus</i>	Rush	OW,Fw
	<i>J. patens</i>	Rush	CS,OW
	<i>J. xiphioides</i>	Rush	Fw
	<i>Luzula comosa</i>	Wood rush	OW
Juncaginaceae	<i>Lilaea scilloides</i>	Flowering quillwort	Fw
	<i>Triglochin maritima</i>	Arrowgrass	SM
Liliaceae	<i>Agave</i> sp.*	Agave	Rud
	<i>Allium triquetrum</i> *	White onion	Rud
	<i>Asparagus officinalis</i> *	Asparagus	Rud
	<i>Brodiaea elegans</i>	Harvest brodiaea	G
	<i>Calochortus luteus</i>	Yellow Mariposa-lily	G
	<i>Chlorogalum pomeridianum</i>	Soap plant	G,OW
	<i>Dichelostemma congestum</i>	Ookow	G
	<i>Disporum hookeri</i>	Fairy bells	OW
	<i>Fritillaria affinis</i> var. <i>a.</i>	Checker-lily	OW
	<i>Scoliopus bigelovii</i>	Fetid adder's tongue	Rw

TABLE 1, *continued*
 LIST OF VASCULAR PLANTS
 OF CHINA CAMP STATE PARK, MARIN COUNTY, CALIFORNIA

FAMILY	SCIENTIFIC NAME	VERNACULAR NAME	COMMUNITY	
Polygonaceae	<i>Eriogonum nudum</i> var. <i>n.</i>	Naked buckwheat	RC,G	
	<i>Pterostegia drymarioides</i>		Fw	
	<i>Rumex acetosella</i> *	Sheep sorrel	G	
	<i>R. conglomeratus</i> *	Dock	Fw	
	<i>R. crispus</i> *	Curly dock	Fw	
Portulacaceae	<i>Calandrinia ciliata</i>	Red maids	G	
	<i>Claytonia exigua</i>	Miner's lettuce	OW	
	<i>C. perfoliata</i> ssp. <i>p.</i>	Miner's lettuce	OW	
Primulaceae	<i>Anagallis arvensis</i> *	Scarlet pimpernel	Rud	
	<i>Dodecatheon hendersonii</i>	Shooting star	OW	
	<i>Trientalis latifolia</i>	Star flower	OW	
Ranunculaceae	<i>Aquilegia formosa</i>	Columbine	G,OW	
	<i>Delphinium hesperium</i>	Coast larkspur	OW	
	<i>D. nudicaule</i>	Red larkspur	OW,RC	
	<i>D. patens</i> ssp. <i>p.</i>	Spreading larkspur	OW	
	<i>Ranunculus californicus</i>	California buttercup	OW,G	
	<i>R. muricatus</i>	Buttercup	Fw	
	<i>Thalictrum fendleri</i> var. <i>polycarpum</i>	Meadow-rue	OW,G	
Rhamnaceae	<i>Rhamnus californica</i> ssp. <i>c.</i>	Coffeeberry	OW	
	<i>R. crocea</i>	Redberry	CS	
Rosaceae	<i>Acaena pinnatifida</i> var. <i>californica</i>		G	
	<i>Adenostoma fasciculatum</i>	Chamise	Ch	
	<i>Cotoneaster pannosa</i> *	Cotoneaster	OW, Rud	
	<i>Eriobotrya japonica</i> *	Loquat	Rud	
	<i>Fragaria vesca</i>	California strawberry	CS	
	<i>Heteromeles arbutifolia</i>	Toyon	OW,Ch	
	<i>Holodiscus discolor</i>	Ocean spray	OW	
	<i>Malus pumila</i> *	Apple	Rud	
	<i>Oemleria cerasiformis</i>	Oso berry	OW	
	<i>Potentilla anserina</i> ssp. <i>pacifica</i>	Cinquefoil	Fw	
	<i>P. glandulosa</i>	Cinquefoil	G,OW	
	<i>Prunus</i> sp.*	Plum	Rud	
	<i>Pyracantha angustifolia</i> *	Pyracantha	Rud	
	<i>Pyrus communis</i> *	Pear	Rud	
	<i>Rosa californica</i>	California rose	OW	
	<i>R. gymnocarpa</i>	Wood rose	OW	
	<i>Rubus discolor</i> *	Himalayan blackberry	Rud,CS	
	<i>R. ursinus</i>	California blackberry	OW,CS	
	Rubiaceae	<i>Galium aparine</i>	Goose grass	OW,G
		<i>G. californicum</i> ssp. <i>c.</i>	California bedstraw	OW
<i>G. porrigens</i>		Climbing bedstraw	OW	
<i>Sherardia arvensis</i> *		Field madder	Rud	
Salicaceae	<i>Salix laevigata</i>	Red willow	Fw	
	<i>S. lasiolepis</i>	Arroyo willow	Fw,CS	
Saxifragaceae	<i>Heuchera micrantha</i>	Alumroot	RC	
	<i>Lithophragma affine</i>	Woodland star	G	
	<i>L. heterophyllum</i>	Woodland star	OW	
	<i>Saxifraga californica</i>	Saxifrage	OW	
Scrophulariaceae	<i>Antirrhinum orontium</i> *	Snapdragon	Rud	
	<i>Bellardia trixago</i> *	Bellardia	G,Rud	
	<i>Castilleja affinis</i>	Indian paintbrush	G	
	<i>C. attenuata</i>	Valley tassels	G	
	<i>C. densiflora</i>	Owl's-clover	G,OW	
	<i>C. foliolosa</i>	Indian paintbrush	RC	

TABLE 1, *continued*
 LIST OF VASCULAR PLANTS
 OF CHINA CAMP STATE PARK, MARIN COUNTY, CALIFORNIA

FAMILY	SCIENTIFIC NAME	VERNACULAR NAME	COMMUNITY
	<i>Smilacina racemosa</i>	Western false Solomon's-seal	OW,Rw
	<i>S. stellata</i>	False Solomon's-seal	OW
	<i>Trillium ovatum</i> ssp. <i>o.</i>	Western trillium	Rw
	<i>Triteleia laxa</i>	Ithuriel's spear	OW,G
	<i>Zigadenus fremontii</i>	Star-lily	OW,Ch
Orchidaceae	<i>Corallorhiza striata</i>	Striped coralroot	Rw
	<i>Piperia elegans</i>	Piperia	OW
Poaceae	<i>Agrostis hallii</i>	Bentgrass	OW
	<i>Aira caryophyllea</i> *	Silver european hairgrass	G,OW
	<i>Avena barbata</i> *	Slender oats	G
	<i>A. fatua</i> *	Wild oats	G
	<i>Bambusa</i> sp.*	Bamboo	Rud
	<i>Briza maxima</i> *	Rattlesnake grass	G,OW
	<i>B. minor</i> *	Little rattlesnake grass	G
	<i>Bromus carinatus</i> var. <i>c.</i>	California brome	G
	<i>B. carinatus</i> var. <i>maritimus</i>	California brome	CS
	<i>B. diandrus</i> *	Ripgut grass	G,OW
	<i>B. hordeaceus</i> *	Soft chess	G, OW
	<i>B. laevipes</i>	Brome	OW
	<i>B. madritensis</i> ssp. <i>rubens</i> *	Red brome	G
	<i>Cortaderia jubata</i> *	Pampas grass	Rud,OW
	<i>Cynodon dactylon</i> *	Bermuda grass	Rud
	<i>Cynosurus echinatus</i> *	Dogtail grass	G,OW
	<i>Danthonia californica</i> var. <i>c.</i>	Oatgrass	G
	<i>Distichlis spicata</i>	Saltgrass	SM
	<i>Elymus glaucus</i>	Blue wildrye	G,OW
	<i>E. glaucus</i> ssp. <i>jepsonii</i>	Blue wildrye	G
	<i>E. multisetus</i>	Big squirrel-tail grass	G
	<i>Festuca californica</i>	California fescue	G
	<i>Gastridium ventricosum</i> *	Nitgrass	OW,Ch
	<i>Hierochloa occidentalis</i>	California vanilla grass	OW, Rw
	<i>Holcus lanatus</i> *	Velvet grass	G,Fw
	<i>Hordeum brachyantherum</i>	Meadow barley	G
	<i>H. jubatum</i> *	Foxtail	G
	<i>H. murinum</i> ssp. <i>glaucum</i> *	Foxtail	OW
	<i>H. murinum</i> ssp. <i>leporinum</i> *	Farmer's foxtail	G
	<i>Koeleria macrantha</i>	June grass	OW,G
	<i>Leymus triticoides</i>	Creeping wildrye	SM,G
	<i>Lolium multiflorum</i> *	Italian ryegrass	G
	<i>L. perenne</i> *	Perennial ryegrass	G
	<i>Melica californica</i>	California milk grass	OW
	<i>M. geyeri</i>	Melic grass	OW
	<i>M. torreyana</i>	Melic grass	OW
	<i>Nasella lepida</i>	Needle grass	G
	<i>N. pulchra</i>	Purple needle grass	G,OW
	<i>Parapholis incurva</i> *	Sickle grass	SM
	<i>Paspalum dilatatum</i> *	Dallis grass	Rud
	<i>Phalaris aquatica</i> *	Harding grass	G
	<i>Poa annua</i> *	Bluegrass	Rud
	<i>P. secunda</i> ssp. <i>s.</i>	Bluegrass	OW
	<i>Polypogon monspeliensis</i> *	Rabbit-foot grass	Fw,SM
	<i>Spartina foliosa</i>	Pacific cordgrass	SM
	<i>Taeniatherum caput-medusae</i> *	Medusa-head grass	G
	<i>Vulpia bromoides</i> *	Annual fescue	G
	<i>V. myuros</i> var. <i>m.</i> *	Fescue	G,OW
Typhaceae	<i>Typha domingensis</i>	Southern cattail	Fw
	<i>T. latifolia</i>	Broad-leaved cattail	Fw

Birds of Rush Ranch Tidal Marsh

Breeding season: March-July, 1996 to 2000. Source: Nadav Nur, Point Reyes Bird Observatory. Includes flyovers.

AOU SPECIES CODE	SPECIES COMMON NAME	SCIENTIFIC NAME	status	Documente d breeding
AMBI	American Bittern	<i>Botaurus lentiginosus</i>	C	
AMGO	American Goldfinch	<i>Carduelis tristis</i>	C	
AMKE	American Kestrel	<i>Falco sparverius</i>	C	
ANHU	Anna's Hummingbird	<i>Calypte anna</i>	C	
AWPE	American White Pelican	<i>Pelecanus erythrorhynchos</i>	R	
BARS	Barn Swallow	<i>Hirundo rustica</i>	C	
BCNH	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	C	
BHCO	Brown-headed Cowbird	<i>Molothrus ater</i>	C	
BLRA	California Black Rail	<i>Laterallus jamaicensis</i>	C	
BNOW	Barn Owl	<i>Tyto alba</i>	R	
BNST	Black-necked Stilt	<i>Himantopus mexicanus</i>	R	
BRBL	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	R	
BSKI	Black-shouldered Kite	<i>Elanus caeruleus</i>	C	
BUOW	Burrowing Owl	<i>Athene cunicularia</i>	R	
CAGO	Canada Goose	<i>Branta canadensis</i>	C	
CAGU	California Gull	<i>Larus californicus</i>	C	
CITE	Cinnamon Teal	<i>Anas cyanoptera</i>	R	
CLRA	California Clapper Rail	<i>Rallus longirostris obsoletus</i>	*	
CLSW	Cliff Swallow	<i>Hirundo pyrrhonota</i>	R	
CORA	Common Raven	<i>Corvus corax</i>	C	
COSN	Common Snipe	<i>Gallinago gallinago</i>	C	
COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	C	Yes
DCCO	Double-crested Cormorant	<i>Phalacrocorax auritus</i>	C	
DOWI	Dowitcher sp.	<i>Limnodromis sp.</i>	C	
DUNL	Dunlin	<i>Calidris alpina</i>	R	
GADW	Gadwall	<i>Anas strepera</i>	C	
GBHE	Great Blue Heron	<i>Ardea herodias</i>	C	
GCSP	Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	R	
GHOW	Great Horned Owl	<i>Bubo virginianus</i>	R	
GOEA	Golden Eagle	<i>Aquila chrysaetos</i>	R	
GREG	Great Egret	<i>Ardea alba</i>	C	
GRYE	Greater Yellowlegs	<i>Tringa melanoleuca</i>	C	
KILL	Killdeer	<i>Charadrius vociferus</i>	C	
LBCU	Long-billed Curlew	<i>Numenius americanus</i>	C	

AOU SPECIES CODE	SPECIES COMMON NAME	SCIENTIFIC NAME	status	Documente d breeding
LEYE	Lesser Yellowlegs	<i>Tringa flavipes</i>	R	
LISP	Lincoln's Sparrow	<i>Melospiza lincolnii</i>	R	
LOSH	Loggerhead Shrike	<i>Lanius ludovicianus</i>	R	
MALL	Mallard	<i>Anas platyrhynchos</i>	C	
MAWR	Marsh Wren	<i>Cistothorus palustris</i>	A	Yes
MODO	Mourning Dove	<i>Zenaida macroura</i>	C	
NOHA	Northern Harrier	<i>Circus cyaneus</i>	C	Yes
NOPI	Northern Pintail	<i>Anas acuta</i>	C	
OCWA	Orange-crowned Warbler	<i>Vermivora celata</i>	R	
OSPR	Osprey	<i>Pandion haliaetus</i>	R	
PBGR	Pied-bill Grebe	<i>Podilymbus podiceps</i>	R	
PEFA	Peregrine Falcon	<i>Falco peregrinus</i>	R	
RODO	Rock Dove	<i>Columba livia</i>	C	
RPHE	Ring-necked Pheasant	<i>Phasianus colchicus</i>	C	
RTHA	Red-tailed Hawk	<i>Buteo jamaicensis</i>	C	
RWBL	Red-winged blackbird	<i>Agelaius phoeniceus</i>	A	Yes
SAVS	Savannah Sparrow	<i>Passerculus sandwichensis</i>	C	
SEOW	Short-eared Owl	<i>Asio flammeus</i>	R	
SNEG	Snowy Egret	<i>Egretta thula</i>	C	
SORA	Sora	<i>Porzana carolina</i>	R	
SOSP	Samuel's Song Sparrow	<i>Melospiza melodia samuelis</i>	A	Yes
TRBL	Tri-colored Blackbird	<i>Agelaius tricolor</i>	R	
TRES	Tree Swallow	<i>Tachycineta bicolor</i>	C	
TUVU	Turkey Vulture	<i>Cathartes aura</i>	C	
VIRA	Virginia Rail	<i>Rallus limicola</i>	R	
WCSP	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	C	
WEKI	Western Kingbird	<i>Tyrannus verticalus</i>	C	
WEME	Western Meadowlark	<i>Sturnella neglecta</i>	C	
WESJ	Western Scrub Jay	<i>Aphelocoma coerulescens</i>	C	
WTKI	White-tailed kite	<i>Elanus leucurus</i>	C	
YRWA	Yellow-rumped Warbler	<i>Dendroica coronata</i>	C	

A= abundant (e.g. SOSP, over 20 detections per survey)

C= common- detections every year in point counts

R= rare (detected only 1 or 2 times in journal but not in point counts)

*= not documented by PRBO during this time period but presence likely.

BOLD- Threatened or Endangered Species

Fishes collected from May 1979 to December 1999 using an otter trawl and beach seine in Suisun Marsh, California, listed in decreasing order of abundance in the trawl. The principal environment of each species is coded as follows: A = anadromous, E = estuarine, F = freshwater, M = marine. An asterisk (*) denotes native species **Bold** = threatened or endangered species. Source: Peter Moyle, Fish Ecology Group, UC Davis.

Common name, <i>genus species</i>	Code	Otter trawl		Beach seine		Principal environment
		Number	%	Number	%	
Striped bass <i>Morone saxatilis</i> ¹	SB ²	46,125	36	5,497	12	E
*Threespine stickleback <i>Gasterosteus aculeatus</i> ¹	STBK	13,128	10	1,955	4	E
Yellowfin goby <i>Acanthogobius flavimanus</i> ^{1,4}	YFG	12,470	10	8,551	19	E, M
*Tule perch <i>Hysterothorax traski</i> ¹	TP	11,069	9	817	2	F, E
* Sacramento splittail <i>Pogonichthys macrolepidotus</i> ¹	ST	10,770	8	1,358	3	E
*Longfin smelt <i>Spirinchus thaleichthys</i> ^{1,4}	LFS	7,514	6	20	< 1	E
*Prickly sculpin <i>Cottus asper</i> ¹	PSCP	7,017	6	311	1	F, E
Shimofuri goby <i>Tridentiger bifasciatus</i> ^{1,3,5}	SG	6,044	5	698	2	F, E
Common carp <i>Cyprinus carpio</i> ^{1,5}	CP	2,732	2	250	1	F
*Sacramento sucker <i>Catostomus occidentalis</i> ⁴	SKR	2,114	2	72	< 1	F
*Pacific staghorn sculpin <i>Leptocottus armatus</i> ^{1,4}	STAG	1,630	1	1,704	4	M
Threadfin shad <i>Dorosoma petenense</i> ¹	TFS	1,369	1	1,180	4	E
*Starry flounder <i>Platichthys stellatus</i> ^{1,4}	SF	1,302	1	213	< 1	M
White catfish <i>Ameiurus catus</i> ¹	WCF	1,038	1	71	< 1	F
* Delta smelt <i>Hypomesus transpacificus</i> ¹	DS	442	< 1	69	< 1	E
Inland silverside <i>Menidia beryllina</i>	ISS	335	< 1	21,843	47	F, E
American shad <i>Alosa sapidissima</i> ¹		263	< 1	24	< 1	A
Black crappie <i>Pomoxis nigromaculatus</i> ⁵		235	< 1	10	< 1	F
*Northern anchovy <i>Engraulis mordax</i>		224	< 1	0	0	M
*Pacific herring <i>Clupea harengus</i>		208	< 1	54	< 1	M
Goldfish <i>Carassius auratus</i>		162	< 1	11	< 1	F
Channel catfish <i>Ictalurus punctatus</i> ¹		123	< 1	6	< 1	F
*Hitch <i>Lavinia exilicauda</i>		99	< 1	13	< 1	F
*Sacramento pikeminnow <i>Ptychocheilus grandis</i>		96	< 1	85	< 1	F
Black bullhead <i>Ictalurus melas</i>		90	< 1	2	< 1	F
White crappie <i>Pomoxis annularis</i>		88	< 1	0	0	F
*White sturgeon <i>Acipenser transmontanus</i>		43	< 1	0	0	A
*Pacific lamprey <i>Lampetra tridentata</i>		38	< 1	0	0	A
* Chinook salmon <i>Oncorhynchus tshawytscha</i> ⁵		34	< 1	183	< 1	A
Brown bullhead <i>Ictalurus nebulosus</i>		19	< 1	0	0	F
Fathead minnow <i>Pimephales promelas</i>		16	< 1	23	< 1	F

Bigscale logperch <i>Percina macrolepida</i>	15	< 1	5	< 1	F
Western mosquitofish <i>Gambusia affinis</i>	15	< 1	215	< 1	F
Rainwater killifish <i>Lucania parva</i>	15	< 1	24	< 1	E
*Sacramento blackfish <i>Orthodon microlepidotus</i>	15	< 1	78	< 1	F
*Shiner perch <i>Cymatogaster aggregata</i>	14	< 1	0	0	M
Bluegill <i>Lepomis macrochirus</i>	11	< 1	12	< 1	F
*Plainfin midshipman <i>Porichthys notatus</i>	10	< 1	0	0	M
*California halibut <i>Paralichthys californicus</i>	3	< 1	0	0	M
Green sunfish <i>Lepomis cyanellus</i>	3	< 1	2	< 1	F
Golden shiner <i>Notemigonus crysoleucas</i>	3	< 1	2	< 1	F
*Green sturgeon <i>Acipenser medirostris</i>	3	< 1	0	0	A
* Steelhead <i>Oncorhynchus mykiss</i>	3	< 1	2	< 1	A
*Speckled sanddab <i>Citharichthys stigmaeus</i>	3	< 1	0	0	M
*Bay pipefish <i>Syngnathus leptorhynchus</i>	2	< 1	0	0	M
Redear sunfish <i>Lepomis microlophus</i>	2	< 1	0	0	F
*Surf smelt <i>Hypomesus pretiosus</i>	2	< 1	0	0	M
Shokihaze goby <i>Tridentiger barbatus</i>	1	< 1	0	0	E
*Longjaw mudsucker <i>Gillichthys mirabilis</i>	1	< 1	0	0	E, M
*Pacific sanddab <i>Citharichthys sordidus</i>	1	< 1	0	0	M
Wakasagi <i>Hypomesus nipponensis</i>	1	< 1	1	< 1	F, E
*White croaker <i>Genyonemus lineatus</i>	1	< 1	0	0	M
Warmouth <i>Lepomis gulosus</i>	1	< 1	0	0	F
Largemouth bass <i>Micropterus salmoides</i>	0	0	2	< 1	F
¹ Species collected in all 10 sloughs.					
² SB-J denotes "juveniles" (<150 mm), SB-A denotes "adults" (≥ 150 mm).					
³ Identified as chameleon goby <i>Tridentiger trigonocephalus</i> in Meng et al. (1994) but later shown to be shimofuri goby (Matern and Fleming 1995).					
⁴ Collected in significantly greater abundance in Suisun slough seines.					
⁵ Collected in significantly greater abundance in Denverton slough seines.					

Mammals of Rush Ranch.

Source: WRA, 1989 and the Rush Ranch Handbook (RREC, 1999)

Common Name	Genus species
California vole	<i>Microtus californicus</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Western harvest mouse	<i>Reithrodontomys megalotis</i>
Salt marsh harvest mouse	<i>Reithrodontomys raviventris</i>
Black tailed hare	<i>Lepus californicus</i>
Desert cottontail	<i>Sylvilagus auduboni</i>
Pocket gopher	<i>Thomomys bottae</i>
Virginia opossum	<i>Didelphis virginiana</i>
Striped skunk	<i>Mephitis mephitis</i>
Mule deer	<i>Odocoileus hemionus</i>
Muskrat	<i>Ondatra zibethicus</i>
Raccoons	<i>Procyon lotor</i>
Suisun ornate shrew	<i>Sorex ornatus sinuosus</i>
House mouse	<i>Mus musculus</i>
California ground squirrel	<i>Spermophilus beecheei</i>
Coyote	<i>Canis latrans</i>
Gray fox	<i>Urocyon cinereoargenteus</i>
River otter	<i>Lutra canadensis</i>
Feral pigs	<i>Sus scrofa</i>

Bold = Threatened or endangered species

Reptiles of Rush Ranch.

Source: WRA, 1989 and the Rush Ranch Handbook (RREC, 1999)

Common Name	Genus species
King snake	<i>Lampropeltus getulus</i>
Gopher snake	<i>Pituophis melanoleucus</i>
Racer	<i>Coluber constrictor</i>
Striped racer	<i>Masticophis lateralis</i>
Western garter snake	<i>Thamnophis couchii</i>
Giant garter snake *	<i>Thamnophis couchii gigas</i>
Western fence lizard	<i>Sceloporus occidentalis</i>
Western pond turtle	<i>Clemmys marmorata</i>
Southwestern pond turtle *	<i>Clemmys marmorata padilla</i>

Bold = Threatened or endangered species

* = known to inhabit from Suisun Marsh but not confirmed on Rush Ranch property

**Vascular Plant Species of Rush Ranch (Suisun Marsh and Potrero Hills),
Solano County, California 1996**

10th Revision of 1989 List

Brenda J. Grewell¹

Department of Water Resources
Environmental Services Office
Suisun Marsh Program Technical Contribution

FLOWERING PLANTS: DICOTS

Family

Genus species

Common Name

Aizoaceae

Sesuvium verrucosum

Carpet Weed Family

Western sea purslane

Anacardiaceae

Toxicodendron diversilobum

Sumac or Cashew Family

Poison oak

Apiaceae

* *Apium graveolens*

Cicuta maculata var. *bolanderi*

* *Conium maculatum*

Eryngium articulatum

Eryngium vaseyi

* *Foeniculum vulgare*

Hydrocotyle verticillata

Lilaeopsis masonii (CR; List 1B)

Lomatium utriculatum

Sanicula bipinnatifida

Sanicula crassicaulis

Carrot Family

Celery

Water hemlock

Poison hemlock

Coyote thistle

Vasey's button celery

Fennel

Marsh pennywort

Mason's lilaeopsis

Foothill lomatium

Purple sanicle, Shoe buttons

Pacific snakeroot

Asteraceae

Achillea millefolium L.

Achyraea mollis

Ambrosia psilostachya

Artemisia douglasiana

Aster lentus (List 1B)

Aster subulatus var. *ligulatus*

Baccharis douglasii

Baccharis pilularis

* *Centaurea calcitrapa*

* *Centaurea solstitialis*

Cirsium hydrophilum var. *hydrophilum* (FE, List 1B)

* *Cirsium vulgare*

Sunflower Family

Yarrow

Blow wives

Western ragweed

Mugwort

Suisun Marsh aster

Slim aster

Marsh baccharis

Coyote brush, Chaparral broom

Purple star thistle

Yellow star thistle

Suisun thistle

Bull thistle

* *Cotula coronopifolia*
* *Cynara cardunculus*
Euthamia occidentalis
Grindelia stricta var. *angustifolia* (**List 1B**)
Helenium bigelovii
Helianthus annuus
Hemizonia pungens ssp. *maritima*
Heterotheca sessiliflora var. *bolanderi*
Isocoma arguta (**List 1B**) (**Introduced to RR**)
Jaumea carnosa
* *Lactuca saligna*
* *Lactuca serriola*
Lasthenia californica
Lasthenia chrysostoma
Lasthenia conjugens (**FE, List 1B**)
Lasthenia glabrata
Layia chrysanthemoides
Micropus californicus var. *californicus*
Microseris douglasii ssp. *douglasii*
* *Picris echioides*
Pluchea odorata
Senecio hydrophilus
* *Senecio vularis*
* *Silybum marianum*
Sonchus oleraceus L.*
* *Taraxacum officinale*
* *Tragopogon porrifolius*
Wyethia angustifolia
*Xanthium strumarium**

Boraginaceae

Amsinckia eastwoodiae
Plagiobothrys greenei
Plagiobothrys stipitatus var. *stipitatus*

Brassicaceae

* *Brassica nigra*
* *Capsella bursa pastoris*
Lepidium dictyotum var. *acutidens*
* *Lepidium latifolium*
Lepidium nitidum var. *nitidum*
* *Raphanus sativa*
* *Sinapsis arvensis*

Caprifoliaceae

Sambucus mexicana

Caryophyllaceae

Brass buttons
Cardoon, Artichoke thistle
Western goldenrod
Marsh gumplant
Bigelow's sneezeweed
Sunflower
Common spikeweed
Hairy goldenaster
Carquinez goldbush
Fleshy jaumea
Willow lettuce
Prickly lettuce
California goldfields
Goldfields
Contra Costa goldfields
Yellowray goldfields
Smooth layia
Slender cottonweed
Douglas' microseris
Bristly oxtongue
Saltmarsh fleabane
Marsh butterweed
Groundsel
Milk thistle
Common sow thistle
Dandelion
Salsify, Oyster plant
Narrow leaved mules ears
Cocklebur

Borage Family

Common fiddleneck
Greene's popcornflower
Stipitate popcornflower

Mustard Family

Black mustard
Shepard's purse
Sharp-toothed peppergrass
Perennial peppergrass
Shining peppergrass
Wild radish
Charlock

Honeysuckle Family

Blue elderberry

Pink Family

- * *Cerastium glomeratum*
- * *Silene gallica* L.
- * *Spergula arvensis* L. ssp. *arvensis*
- Spergularia marina*
- * *Spergularia media*

Chenopodiaceae

- Atriplex triangularis*
- * *Beta vulgaris*
- Salicornia subterminalis*
- Salicornia virginica*

Convolvulaceae

- * *Calystegia sepium* L. ssp. *limnophila*
- * *Convolvulus arvensis*
- Cressa truxillensis*

Cucurbitaceae

- Marah fabaceus*

Cuscutaceae

- Cuscuta salina* var. *major*

Euphorbiaceae

- Eremocarpus setigerus*

Fabaceae

- Glycyrrhiza lepidota*
- Lathyrus jepsonii* var. *jepsonii* (**List 1B**)
- * *Lotus corniculatus* L.
- Lotus wrangelianus*
- Lupinus bicolor*
- Lupinus formosus*
- Lupinus nanus*
- Lupinus succulentus*
- * *Medicago polymorpha*
- * *Melilotus alba*
- Trifolium depauperatum* var. *amplectens*
- * *Trifolium hirtum*
- * *Trifolium pratense*
- Trifolium wormskioldii*
- Vicia sativa* ssp. *nigra*
- Vicia sativa* ssp. *sativa*
- Vicia villosa* ssp. *varia*

Frankeniaceae

- Frankenia salina*

- Mouse ear chickweed
- Catchfly
- Stickwort, starwort
- Saltmarsh sand spurry
- Medium sand spurry

Goosefoot Family

- Fathen, Spearscale
- Beet
- Parish's glasswort
- Perennial pickleweed

Morning Glory Family

- Hedge bindweed
- Bindweed, Orchard morning-glory
- Alkali weed

Gourd Family

- California man-root

Dodder Family

- Saltmarsh dodder

Spurge Family

- Turkey mullein, Dove weed

Legume Family

- Wild licorice
- Delta tule pea
- Bird's-foot trefoil
- Chilean trfoil
- Miniature lupine
- Summer lupine

- Arroyo lupine
- California burclover
- White sweetclover
- Pale sack-clover
- Rose clover
- Red clover
- Cow clover
- Common vetch, Narrow leaved vetch
- Spring vetch, Common vetch
- Purple winter vetch

Frankenia Family

- Alkali heath

Geraniaceae

- * *Erodium botrys*
- * *Erodium brachycarpum*
- * *Erodium cicutarium*
- * *Geranium dissectum*

Lamiaceae

Stachys albens

Lythraceae

- * *Lythrum hyssopifolia*
- * *Lythrum tribracteatum*

Malvaceae

- * *Malva parviflora*
- Malvella leprosa*
- Sidalcea malvaeflora* ssp. *laciniata*

Myrtaceae

- * *Eucalyptus globulus*

Onagraceae

Epilobium ciliatum ssp. *ciliatum*

Papaveraceae

Eschscholzia californica

Plantaginaceae

- * *Plantago lanceolata*
- Plantago maritima*
- Plantago subnuda*

Plumbaginaceae

Limonium californicum

Polemoniaceae

Gilia tricolor

Polygonaceae

- Eriogonum nudum*
- * *Polygonum arenastrum*
- Polygonum lapathifolium*
- * *Rumex acetosella*
- * *Rumex crispus*
- * *Rumex pulcher*

Portulacaceae

Calandrinia ciliata

Geranium Family

Filaree, Storksbill
Filaree
Redstem filaree
Cut-leaved geranium

Mint Family

Hedge nettle

Loosestrife Family

Hyssop loosestrife

Mallow Family

Cheeseweed
Alkali mallow, White-weed
Cutleaf Checkerbloom

Myrtle Family

Blue gum

Evening Primrose Family

Willow Herb

Poppy Family

California poppy

Plantain Family

English plantain
Seaside plantain
Mexican plantain

Leadwort Family

Western marsh rosemary

Phlox Family

Bird's eyes

Buckwheat Family

Nudestem buckwheat
Common knotweed, Doorweed
Willow weed
Sheep sorrel
Curly dock
Fiddle dock

Purslane Family

Redmaids

Claytonia perfoliata
* *Portulaca oleracea* L.

Potamogetonaceae
Potamogeton pectinatus

Primulaceae
* *Anagallis arvensis*
Glaux maritima

Ranunculaceae
Ranunculus canus

Rosaceae
Potentilla anserina ssp. *pacifica*
* *Prunus*, sp.
* *Pyracantha angustifolia*
Rosa californica
* *Rubus discolor*

Salicaceae
Populus fremontii
Salix lasiolepis

Saxifragaceae
Saxifraga californica

Scrophulariaceae
* *Bellardia trixago*
Castilleja attenuata
Castilleja exserta
Cordylanthus mollis ssp. *mollis* (**CR, FE**)
Triphysaria eriantha

Solanaceae
* *Solanum sarrachoides*

Violaceae
Viola pedunculata

Zygophyllaceae
*Tribulus terrestris**

Miner's lettuce
Common purslane

Pondweed Family
Fennel-leaved pondweed

Primrose Family
Scarlet pimpernel
Sea milkwort

Buttercup Family
Sacramento Valley buttercup

Rose Family
Common silverweed, marsh cinquefoil

Firethorn
California rose
Himalayan blackberry

Willow Family
Fremont's cottonwood
Arroyo willow

Saxifrage Family
California saxifrage

Figwort Family
Bellardia
Valley tassels
Purple owl's clover
Soft bird's beak
Butter and eggs, Johnny-tuck

Nightshade Family
Nightshade

Violet Family
Johnny jump up

Caltrop Family
Puncture vine

FLOWERING PLANTS: MONOCOTS

Cyperaceae

Carex barbarae
Eleocharis macrostachya
Scirpus acutus var. *occidentalis*
Scirpus americanus
Scirpus californicus
Scirpus cernuus
Scirpus koilolepis
Scirpus maritimus
Scirpus, sp. (*S. acutus* X *S. californicus*)
Scirpus, sp. (*S. californicus* x *S. americanus*)

Iridaceae

Sisyrinchium bellum

Juncaceae

Juncus balticus
Juncus bufonius
Juncus mexicanus

Juncaginaceae

Triglochin concinna var. *concinna*
Triglochin maritima
Triglochin striata

Liliaceae

* *Asparagus officinalis* ssp. *officinalis*
Brodiaea elegans
Chlorogalum pomeridianum var. *pomeridianum*
Dichelostemma capitatum
Muilla maritima
Triteleia hyacinthina
Triteleia laxa

Poaceae

* *Agropyron*, sp.
* *Avena barbata*
* *Avena fatua*
* *Bromus diandrus*
* *Crypsis schoenoides*
* *Cynodon dactylon*
Deschampsia cespitosa ssp. *cespitosa*
Distichlis spicata
Elymus elymoides X *glaucus*
Elymus multisetus

Sedge Family

Santa Barbara sedge
Creeping spikerush
Hardstem bulrush, common tule
(formerly Olney's misapplied)
California bulrush
Low club rush
Keeled club rush
Alkali bulrush (*S. robustus misapplied*)
bulrush hybrid
bulrush hybrid

Iris Family

Blue-eyed grass

Rush Family

Baltic rush
Toad rush
Mexican rush

Arrow Weed Family

Elegant arrowgrass
Seaside arrowgrass
Three ribbed arrowgrass

Lily Family

Asparagus
Harvest brodiaea
Soap plant
Blue dicks
Common muilla
White brodiaea
Ithuriel's spear

Grass Family

wheatgrass
Slender wild oat
Wild oat
Rippgut brome
Soft chess, swamp grass
Bermuda grass
Tufted hairgrass
Salt grass
Squirrel tail/Blue wild rye
Big squirrel tail

* <i>Hainardia cylindrica</i>	Thintail
<i>Hordeum depressum</i>	Low barley
* <i>Hordeum marinum</i> ssp. <i>gussoneanum</i>	Mediterranean barley
* <i>Hordeum murinum</i> L. ssp. <i>leporinum</i>	Wall barley
<i>Leymus tritcoides</i>	Alkali ryegrass
* <i>Lolium multiflorum</i>	Italian ryegrass
<i>Nassella pulchra</i>	Purple needlegrass
<i>Parapholis incurva</i>	Sicklegrass
* <i>Phalaris caroliniana</i>	Harding grass
<i>Phragmites australis</i>	Common reed
<i>Poa secunda</i> ssp. <i>secunda</i>	One sided bluegrass
* <i>Polypogon monspeliensis</i>	Rabbitfoot grass
* <i>Taeniatherum caput-medusae</i> L.	Medusa head
<i>Vulpia octoflora</i> var. <i>octoflora</i>	Six weeks fescue

Potamogetonaceae

Ruppia maritima

Pondweed Family

Widgeon grass

Typhaceae

Typha angustifolia L.

Typha domingensis

Typha latifolia L.

Typha, sp.

Cattail Family

Narrow leaved cattail

Southern cattail

Broad-leaved cattail

T.latifoliaX T.domingensis hybrids

¹ Author current affiliation: Department of Environmental Science & Policy,
University of California, Davis, One Shields Avenue, Davis, CA 95616
bjgrewell@ucdavis.edu

This species list was generated from many field surveys conducted 1989 - 1996.
Taxonomy reflects Hickman ed. 1993.
Uplands and high to middle marsh elevational zones were surveyed on foot.
Low marsh elevational zones, tidal creek and slough banks were covered by boat.

Special thanks to several field companions during this time period. I learned something new about the Suisun Marsh flora from each of them: Perry Allen, Curtis Hagen, Jake Ruygt, Neil Havlik, Peggy Fiedler, Randy Zebell, Mike Vasey, and Wayne Ferren.

* = designates non-native species

Special Status, Sensitive Plant Species CR = California Rare, FPE = Federal Proposed Endangered, FE = Federal Endangered , List 1B = CNPS List

APPENDIX F

San Francisco State University Letter of Commitment on Space



**SAN FRANCISCO
STATE UNIVERSITY**

COLLEGE OF SCIENCE AND ENGINEERING
OFFICE OF THE DEAN


1600 Holloway Avenue, Thornton Hall 323
San Francisco, CA 94132-4163

phone: 415/338-1571
fax: 415/338-6136
web: www.sfsu.edu/~cse

18 August 2010

e-mail: axler@sfsu.edu
website: www.axler.net

To: Alison Krepp, Program Specialist
Laurie McGilvray, Chief, Estuarine Reserves Division
NOAA Estuarine Reserves Division
1305 East West Highway N/ORM5
Silver Spring, Maryland 20910

From: Sheldon Axler 
Dean, College of Science & Engineering

Subject: Letter of Commitment Regarding Space for the San Francisco Bay
National Estuarine Research Reserve

Per the suggestion in the federal evaluation of the SF Bay NERR in 2007, I am providing a revised letter of commitment from San Francisco State University ensuring that the space needs of the San Francisco Bay National Estuarine Research Reserve (SF Bay NERR) are and will be met. This letter supersedes the letter of 4 November 2004.

The SF Bay NERR uses space in several buildings at the Romberg Tiburon Center for Environmental Studies (RTC):

Building 36:

Dedicated Spaces

- Research and System-wide Monitoring Program laboratory
- Research Coordinator principal investigator office (window)
- Reserve Manager office (with window; approximately 216 square feet)
- South wing of second floor, configured with 7 offices, a shared seminar room, and a large room. Originally the large room was envisioned as space to house students, visitors, and NERR servers. It now serves as the location of the combined NERR-RTC library.

Shared spaces

- Keck teaching laboratory
- IT classroom
- Atrium for exhibits and displays
- Other common-use facilities, including kitchen, commons room, restrooms

Building 39:

Dedicated Spaces

- The second floor, including usage of the former RTC administrative area, including offices and open area, to be configured for NERR/RTC Education and Outreach needs.
- The former “principal investigator wing” provides offices for NERR Education Coordinator, NERR Coastal Training Program Coordinator, NERR Coastal Training Program assistant, RTC Education and Outreach Coordinator, and a room for NERR storage.

Shared spaces

- Shared use of IT classroom (second floor) and lecture classroom (first floor)
- Shared storage area adjacent to IT classroom
- Shared spaces including lobby, kitchen, restrooms

Bay Conference Center:

- NERR access to Bay Conference Center for larger meetings as needed.

Building 50:

Storage needs for equipment and gear are provided here.

Main Campus:

An office with a desk and a phone is provided on the main campus. This space is shared among NERR staff for work days on the main campus. Space is assigned on an as-available basis each semester.

We recognize that the NERR spaces in Building 36 on the south side have limitations that ideally we would overcome, funds permitting. In particular, we want to improve the health and comfort for staff with natural light, individually controlled heating and cooling and sound proofing between offices and common areas. In addition, we acknowledge the need to correct deficiencies in the NERR laboratory in Building 36 that resulted from problems with the contractors who worked on the Building 36 renovations. Rectifying both the office space and laboratory concerns are goals that the

NERR has included in discussions with the RTC Director and the architects with whom RTC is presently preparing their site-wide master plan.

In accordance with the NOAA-approved purpose of the joint use of facilities in Building 36, RTC staff may occupy NERR offices on as needed basis; such staff supports the work of the NERR. Any such arrangements are mutually agreed upon by the Reserve Manager and the RTC Director.

SF State is committed to accommodating persons with disabilities. Building 36 is a fully ADA compliant project. The Bay Conference Center is already accessible to persons with disabilities. Building 39 is a pre-existing structure with some modifications for persons with disabilities. For SF Bay NERR programs occurring in Building 39, reasonable accommodations for disabled program participants will be made.

Typically, space at SF State is assigned or reassigned according to university guidelines that reflect the most efficient and appropriate space assignment. As the space needs and success of the SF Bay NERR grow, SFSU will assign appropriate space.

Lastly, looking ahead to future needs, Jaime Kooser and her staff have identified additional facilities needs in the context of preparing the draft SF Bay NERR management Plan. Of course, such facilities are dependent on availability of construction funds. This information has also been submitted for consideration in the master plan that RTC is preparing for its campus:

- Large, well-designed classroom space that is ADA compliant and comfortably seats 40 people.
- Dorm space for teachers, visiting scientists and students who attend courses or workshops at RTC.
- “Flume facility” that includes wet lab with ample seawater supply, at least 10m x 5m space for flume, and a small climate-controlled office.

Thank you for your continued support of the SF Bay NERR. Please let me know if you need any additional information or clarifications. I look forward to continuing our collaboration with you as we work to that ensure the SF Bay NERR remains an outstanding program.

APPENDIX G

Resource Protection Plan

RESOURCE PROTECTION PLAN

The combined 3,710 acres within the SF Bay NERR are managed by the Solano Land Trust (Rush Ranch) and California State Parks (China Camp) local and state entities. As such, there is a significant level of resource protection in place. Designation of any research reserve does not introduce any new regulations, nor will it alter any regulatory review process or traditional uses such as overnight camping, hiking, fishing, or marine transportation within, or adjacent to, the Reserve sites. Several state and local agencies, described below, have regulatory authority over the lands, wetlands, and submerged lands within the boundaries of the Reserve. Many of the California State Statutes cited below can be accessed via the internet at <http://www.leginfo.ca.gov/calaw.html> and the California Code of Regulations can be found at <http://ccr.oal.ca.gov/>.

California Department of Fish and Game

The California Department of Fish and Game, and the Fish and Game Commission have ultimate responsibility and authority for management of the fish and wildlife resources of California (Title 14 § 1.04-886.6 of the California Fish and Game Code). State Game Wardens enforce wildlife regulations throughout the state. As California Peace Officers, they have full police power. However, no Fish and Game Wardens are specifically assigned to China Camp or Rush Ranch; their work at Reserve sites is generally on an on-call basis.

California Department of Parks and Recreation

The California Department of Parks and Recreation (California State Parks) is a signatory partner in the SF Bay NERR that manages China Camp State Park, a 1,640-acre property in Marin County, California that is a Reserve site. The mission of the California State Parks is “to provide for the health, inspiration, and education of the people of California by helping to preserve the State's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation”. The Department manages over 270 park units amounting to nearly 1.4 million acres and is authorized under California Public Resources Code §5001-5019.5 In addition to lands directly owned by California State Parks, the Department also has certain jurisdiction over granted or ungranted tidelands or submerged lands abutting State Park System lands (CA Pub. Res. Code §5003.5). Park Rangers are responsible for patrol activities and for enforcement of State Park Regulations codified in Title 14 of the California State Public Resources Code. State Park Rangers and Superintendents with law enforcement authority are Peace Officers of the State of California and, as such, have full police powers throughout the state.

California State Parks has rules and regulations to protect park areas for the enjoyment of future generations as well as for the convenience and safety of the park visitors. The summary of the rules and regulations is below; the general provisions are available at: http://www.parks.ca.gov/default.asp?page_id=21301.

NATURAL SCENERY, PLANTS AND ANIMAL LIFE are the principal attractions of most state parks. They are integral parts of the ecosystem and natural community. As such they are protected by Federal, State and Park laws. Disturbance or destruction of these resources is strictly forbidden.

LOADED FIREARMS AND HUNTING are not allowed in units of the State Parks System. Possession of loaded firearms or air rifles is prohibited. Exceptions are for hunting in recreation areas that have been designated by the State Park and Recreation Commission.

DEAD AND DOWN WOOD is part of the natural condition. Decayed vegetation forms humus and assists the growth of trees and other plants. For this reason the gathering of down wood is prohibited. Fuel is sold in the parks for your convenience. (When considered a hazard, down wood is removed by park personnel.)

FIRES are permitted only in facilities provided for this purpose. This is necessary to prevent disastrous fires. Portable stoves may be used in designated areas. It is the responsibility of every visitor to use extreme caution with any burning materials, including tobacco. All fireworks are prohibited.

ANIMALS, including cats, cannot be turned loose in park units. All animals, other than grazing animals, must be under immediate physical control. Dogs must be on a tended leash no more than 6 feet or confined in an enclosed vehicle, tent or pen. Unless posted to the contrary, dogs, other than those that assist the permanently disabled, are prohibited on trails, beaches, and wherever posted. Visitors with vicious, dangerous, noisy, or disturbing animals will be ejected from park units.

NOISE - ENGINE DRIVEN ELECTRIC GENERATORS which can disturb others, may be operated only between the hours 10:00 a.m. and 8:00 p.m. Loud disturbing noise is prohibited at all times, and is disturbing those asleep between 10:00 p.m. and 6:00 a.m.

ALL VEHICLE TRAVEL must be confined to designated roads or areas. The speed for all vehicles is 15 miles per hour in camp, picnic, utility or headquarters areas and areas of general assemblage. Parking is permitted only in designated areas. Blocking parking spaces is prohibited.

CAMPSITE USE must be paid for in advance. To hold a campsite, it must be reserved or occupied. To prevent encroachment on others the limits of each campsite may be regulated by the District Superintendent. Checkout time is 12:00 NOON. In order to provide for the greatest

number of visitors possible the CAMPING LIMIT in any one campground is 30 days per calendar year.

REFUSE, including garbage, cigarettes, paper boxes, bottles, ashes and other rubbish, shall be placed only in designated receptacles. Your pleasure and pride in your parks will be enhanced when they are kept clean.

PLEASE clean up after yourself so that others may enjoy the beauty of these parks.

LEAVE ONLY FOOTPRINTS - TAKE ONLY MEMORIES

California State Lands Commission

The mission of the California State Lands Commission (Commission) is to manage approximately 4.5 million acres of land held in trust for the people of California. The State holds these lands for all the people of the State for the public trust purposes of water related commerce, navigation, fisheries, recreation, and open space. Within these State owned lands lie many wetlands. The Commission manages the use of the State owned wetlands through leases to other public agencies and private parties. For example, the Commission has leased wetlands around the San Francisco Bay to the California Department of Fish and Game and the U.S. Fish and Wildlife Service for wetlands habitat management and restoration. Private parties may also apply to lease lands for wetlands or habitat purposes for environmental mitigation. In its role as Trustee of the Kapiloff Land Bank Fund, the Commission has participated in acquiring wetlands for the inclusion in habitat management projects. The State also retains a public trust easement over some formerly State-owned sovereign lands which have been conveyed into private ownership. The Commission may exercise this public trust easement to constrain the use of those lands consistent with their resource values.

The Commission has jurisdiction and control over State-owned lands pursuant to Division 6 of the California Public Resources Code (§6000). These lands include: a three mile-wide section of tidal and submerged land adjacent to the coast and offshore islands, including bays, estuaries, and lagoons; the waters and underlying beds of more than 120 rivers, lakes, streams, and sloughs; and 585,000 acres of school lands granted to the state by the Federal government to support public education.

Delta Science Program

On February 3, 2010, the Delta Stewardship Council was created as an independent state agency tasked with developing the Delta Plan for achieving the coequal goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Sacramento-San Joaquin Delta ecosystem. It consists of seven members with diverse expertise providing a broad statewide perspective; four are appointed by the Governor, one each by the Senate and Assembly, and the seventh is the Chair of the Delta Protection Commission. The Delta Science Program, formerly the CALFED Bay-Delta Ecosystem Restoration Program, reports to the Delta Stewardship Council. Its mission is “to provide the best possible scientific information

for water and environmental decision-making in the Bay-Delta system.” They accomplish this through supporting research on the Bay-Delta system; synthesizing scientific information; facilitating independent peer review of plans, programs and products; coordinating agencies to promote science-based adaptive management; and communicating science. Multiple Delta Science Program sponsored projects occur at China Camp and Rush Ranch.

Dredged Material Management Office

The Dredged Material Management Office (DMMO) is a partnership entity that facilitates the management of dredging and sediments in an area that encompasses the Reserve sites. The DMMO is a joint program of the Bay Conservation and Development Commission, San Francisco Bay Regional Water Quality Control Board, State Lands Commission, the San Francisco District U.S. Army Corps of Engineers, and the Environmental Protection Agency (EPA). Also participating is the California Department of Fish and Game, which provides advice and expertise to the process. The purpose of the DMMO is to cooperatively review sediment quality sampling plans, analyze the results of sediment quality sampling and make suitability determinations for material proposed for disposal in San Francisco Bay. The goal of this interagency group is to increase efficiency and coordination between the member agencies and to foster a comprehensive and consolidated approach to handling dredged material management issues. The DMMO was specifically designed to provide a mechanism for consistent review of permit applications through coordinated efforts by DMMO member agencies. No new regulatory statutes were initiated in the formation of the DMMO and all applicable regulatory authority and processes of the member agencies remain in full force and effect.

The geographic area of the DMMO includes all of the San Francisco Bay Estuary up to Sherman Island, its major tributaries to the point where navigation is no longer feasible, upland areas surrounding the estuary, and the ocean disposal site designated by the EPA known as the San Francisco Deep Ocean Disposal Site or SF-DODS.

Environmental Protection Agency

The Environmental Protection Agency has enforcement and commenting authority for the Federal wetland permitting program and the Clean Air and Clean Water Acts, among other regulatory responsibilities.

Local Sheriff Offices

The sheriff has the broadest authority of any enforcement officer. The respective County Sheriff’s Office (Marin County for China Camp and Solano County for Rush Ranch) has jurisdiction over all lands and laws and regulations.

National Marine Fisheries Service

The National Marine Fisheries Service (NMFS) is responsible for identifying essential fish habitats for federally regulated species of fishes and carrying out provisions of the Magnuson-Stevens Act. Under the Endangered Species Act, the NMFS helps protect threatened and endangered species such as the Winter Run Chinook Salmon. In

addition, the NMFS is responsible for marine mammal protection under the Marine Mammal Protection Act. NMFS may make recommendations to the U.S. Army Corps of Engineers on wetland permits under the Clean Water Act.

Resource Conservation Districts

Resource Conservation Districts (RCDs) are government entities that provide technical assistance and tools to manage and protect land and water resources. Under Division 9 (§9001-9978) of the California Public Resources Code, the counties of Solano and Marin have both formed RCDs. The text of Division 9 can be found at the website for California State legislative information at <http://www.leginfo.ca.gov/> or at the website for the California Code of Regulations: <http://ccr.oal.ca.gov/> . These RCDs collectively work to conduct: watershed planning and management, water conservation, water quality protection and enhancement, agricultural land conservation, soil and water management on non-agricultural lands, wildlife habitat enhancement, wetland conservation, recreational land restoration, irrigation management, conservation education, forest stewardship and urban resource conservation.

In 1977, California State Assembly Bill 1717 established the Suisun Marsh Preservation Act. This act:

- ◆ designated the respective responsibilities of “...certain local government agencies and districts with respect to the preservation of the marsh.” This includes the Solano Resource Conservation District (SRCD).
- ◆ provided for the preparation and implementation of a local protection program by designated local government agencies and districts having jurisdiction over the marsh.
- ◆ added provisions relating to the responsibility of the SRCD over water management practices in the marsh.
- ◆ provided for reimbursement of local governmental costs mandated by the bill.
- ◆ gave SRCD the power to issue regulations requiring compliance with any water management plan or program for privately owned lands in the marsh.

The provisions of AB1717 are found in Chapter 12 of Division 9 of the Public Resources Code.

Pursuant to the Suisun Marsh Preservation Act of 1974 (repealed by the 1977 Act), the Bay Conservation and Development Commission (BCDC) and the California Department of Fish and Game made a detailed study of the Suisun Marsh. With extensive participation from other governmental agencies, private interests, and the general public BCDC prepared the Suisun Marsh Protection Plan as a result of the study. Division 19 of the Public Resources Code outlines general provisions of the Suisun Marsh Protection Plan “for the orderly and long-range conservation, use, and management of the ... marsh.”

San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission (BCDC) is a signatory partner for the Reserve and the coastal zone agency with regulatory jurisdiction in the nine-county Bay Area. In 1965 the California State Legislature passed the McAtteer-Petris Act creating the first coastal management agency in the United States, the 27 member Bay Conservation and Development Commission. BCDC is a state agency with the responsibility for comprehensively managing the protection and use of San Francisco Bay and its shoreline and the Suisun Marsh. The Commission carries out this responsibility under the provisions of the McAtteer-Petris Act (California Government Code §66600-66682) and the provisions of the San Francisco Bay Plan (Bay Plan) and the Suisun Marsh Preservation Act (California Public Resources Code §29000-29612); the Suisun Marsh Protection Plan, and the Suisun Marsh Local Protection Program; and the Federal Coastal Zone Management Act of 1972, as amended. All persons, organizations, and local and state governmental agencies must secure a permit from BCDC for work within its jurisdiction including Reserve sites. All Federal funding must be generally consistent with BCDC's management program for San Francisco Bay. Permits are issued or denied and Federal consistency is determined based on the conformance of the proposed project with the provisions of the McAtteer-Petris Act and the Bay Plan or the Suisun Marsh Preservation Act, the Suisun Marsh Protection Plan, and the Solano County Local Protection Program as applicable. The Suisun Marsh Protection Plan discusses policies for Environment, Water Supply and Quality, Natural Gas Resources, Utilities, Facilities and Transportation, Recreation and Access, Water-related Industry, and Marsh and Upland Resource Management. Documents relating to BCDC's mission can be obtained either from the Commission or from their website at <http://www.bcdc.ca.gov/>.

Solano Land Trust

The Solano Land Trust is a signatory partner to the SF Bay NERR that owns and manages seven properties and holds easements comprising 7,215 acres. Rush Ranch Open Space Preserve, designated as a Reserve site, is a 2,070 acre property located within the area of the Suisun Marsh covered by the Suisun Marsh Preservation Act. The Solano Land Trust is a private non-profit, public benefit corporation dedicated to the preservation of agricultural lands, open space, and wetlands within Solano County. Preservation is accomplished through acquisition, donation, or purchase of land and conservation easements, public education and land management. To date, Solano Land Trust has permanently protected 19,403 acres of natural areas and agricultural lands while also providing stewardship of the diverse and important habitats and species on those properties, including many that are threatened and endangered. Rush Ranch has a resident Field Steward who contacts relevant enforcement agencies as necessary regarding resource management issues.

Rules for Rush Ranch Open Space Preserve

Rush Ranch Open Space Preserve is a 2070 acre preserve owned by Solano Land Trust (SLT), a nonprofit organization. We provide public access to Rush Ranch at no charge as a way to give back to the people and communities that support our work.

Rush Ranch contains many historic buildings and important cultural resources. Its diverse habitats provide a home to many sensitive plants, wildlife, and fish. Rush Ranch is also a working agricultural operation. We request that all visitors strictly adhere to the following rules to protect historic, cultural, natural, and agricultural resources at the preserve.

Entry

- ◆ Entry to Rush Ranch is allowed only during designated hours. Entry outside of designated hours is restricted to SLT and National Estuarine Research Reserve (NERR staff), volunteers from Rush Ranch Education Council (RREC) and Access Adventure, or others with prior approval from SLT.

Vehicle Use

- ◆ Visitor parking is located in the gravel lot north of the barn, or in the overflow lot designated by SLT during special events. Parking in the gravel area south of barn is reserved for official SLT vehicles, contractors, people with disabilities, and short-term loading and unloading. Suisun Hill Trail users may park outside of the entrance without blocking the gate.
- ◆ Caretaker parks their vehicle within fenced caretaker yard.
- ◆ Parking and driving outside of gravel areas is not allowed, except for staff, rancher, and SLT- authorized volunteers, contractors, or visitors. Do not drive or park in tall grass during fire season and avoid wet areas in rainy season.

Facilities

- ◆ Alcoholic beverages in public areas are not allowed, except during SLT approved events.
- ◆ Food and drink around exhibits at Nature Center is not allowed, except during SLT approved events.
- ◆ Fire pit and BBQ in picnic area may be used with permission from SLT staff. Picnic tables may be moved within picnic area. Please do not move tables outside of picnic area without staff permission.
- ◆ Smoking is permitted within 10 feet of fire pit or under olive tree. Due to high fire risk, smoking, campfires, barbecues and fireworks are strictly prohibited outside of these areas.
- ◆ Camping is allowed in picnic area with a reservation, payment, and permit. Contact Solano Land Trust's Office Manager at 707-432-0150 ext 209 to make arrangements.

- ◆ Entry to caretaker's quarters and yard is not allowed, except with permission from SLT or caretaker. Entry to barns, stables, corrals, and pastures is not allowed, except with supervision from staff or volunteers from Access Adventure or Rush Ranch Educational Council.

Designated Uses/Restrictions

- ◆ All trails are designated for hiker use. All hikers shall remain on designated trails.
- ◆ Please obey "No Trespassing" signs and other posted restrictions. Do not climb fences. Unauthorized trail construction strictly prohibited.
- ◆ Equestrian and bicycle use of trails is not allowed. Carriage driving on trails by Access Adventure is allowed by special permit.
- ◆ Access to marsh areas, wetlands, and other areas marked as sensitive habitat is not allowed, except with prior written approval from SLT and NERR. Swimming or wading in stock ponds and sloughs is prohibited for the protection of public health, aesthetics, and habitat.
- ◆ Dogs are allowed in parking area, picnic area, building area and on Suisun Hill Trail. Please keep your dog on a leash at all times and pick up after your dog. With the exception of guide dogs, dogs are prohibited from all other areas of Rush Ranch for protection of wildlife and livestock.
- ◆ Fishing is not allowed, except with prior written approval from SLT. Fishing is available nearby at Hill Slough and Belden's Landing.
- ◆ Hunting is not allowed.
- ◆ Firearms, archery equipment, slingshots, air pistols, rifles, paintball guns and other weapons are not allowed, except with the prior written approval of SLT Land Steward.
- ◆ Geocaching is not allowed, except with prior written approval from SLT.

Ranchland and Backcountry Etiquette

- ◆ Deposit all trash and recycling in receptacles or carry it out with you.
- ◆ Feeding, petting, chasing, etc. of wild animals and livestock is prohibited for the safety of both the public and the animals. *Do not disturb newborn calves under any circumstances.* If concerned about health or safety of an animal, please notify SLT Land Steward at 707-432-0152.
- ◆ When you pass through a gate, leave it exactly as you found it. If concerned that livestock have access to an area where they do not belong, please notify SLT Land Steward.

- ◆ Collecting or removing plants, wildlife, artifacts, rocks, and other natural or cultural materials is not allowed, except with written permission from SLT and NERR staff.

State Water Resources Control Board and Department of Water Resources

The State Water Resources Control Board (SWRCB) and the San Francisco Bay Regional Water Quality Control Board have regulatory jurisdiction over the water quality at the reserve sites; the Department of Water Resources has plans that support the protection of water quality that cover the Reserve sites. The State of California recognized the biological importance of the Sacramento-San Joaquin Delta and Suisun Marsh and passed a series of laws and regulations designed to protect it.

Water Rights Decision 1485 (D-1485), adopted by the State Water Resources Control Board (through authority under California Code Title 23 §640-4007) in 1978, was enacted to protect water quality in the delta and Suisun Marsh. Condition 7 of D-1485 required the California Department of Water Resources (through authority under California Code Title 23 §220-649.6 and §640-4007) and the United States Bureau of Reclamation to develop a plan to ensure compliance with water quality standards. In addition, Conditions 4 and 7 of D-1485 required development of a monitoring plan to measure various physical, chemical, and biological parameters in the marsh. Decision 1485 was amended in 1995 by SWRCB Order WR 95-6 to make it more consistent with the SWRCB Water Quality Control Plan.

In late 1999, the State Water Resources Control Board adopted Decision 1641. This Decision implements flow objectives for the Bay-Delta Estuary, approves a petition to change points of diversion of the Central Valley Project and the State Water Project in the Southern Delta, and approves a petition to change places of use and purposes of use of the Central Valley Project.

Other plans and policies of the SWRCB that contribute to water quality protection for the Reserve sites include: *Water Quality Control Plan for Enclosed Bays and Estuaries of California – Part 1 Sediment Quality*, effective August 25, 2009; *San Francisco Bay/Sacramento - San Joaquin Delta Estuary Water Quality Control Plan*, December 13, 2006, approved by Office of Administrative Law on June 27, 2007; *San Francisco Bay Region Basin Plan*; and *Volume 1: Nonpoint Source Program Strategy and Implementation Plan (1998-2013)* (January 2000), and *Volume II: California Management Measures for Polluted Runoff* (January 2000). See the main website for more information: <http://www.swrcb.ca.gov/>.

Collectively, these decisions provide protection of the water quality and quantity of the Reserve sites of the SF Bay NERR.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers is responsible for administration of the Federal wetland permitting programs for tidal and non-tidal wetlands within the SF Bay NERR and on adjacent waters and wetlands throughout the San Francisco Bay area; thus their permitting authority affects activities in wetlands, such as restoration, at the Reserve sites. The Corps has a range of responsibilities, including maintenance of

certain navigable waters, flood risk management, environmental protection, ecosystem restoration, and emergency preparedness and response. They are a member organization of the Dredged Materials Management Office.

USACE has regulatory jurisdiction, primarily under the following three authorities: (1) Section 404 of the Clean Water Act for the discharge of dredged or fill material in waters of the United States (33 USC 1201 et seq.)(Section 404); (2) Section 10 of the Rivers and Harbors Act for working in navigable waters (33 USC 403) (Section 10); and (3) Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408) for the alteration of a Federal project (to include sea wall, jetty, dike, levee, wharf, pier, or other work) (Section 408). Several projects of the Corps that are pertinent to the Reserve include:

Delta Islands and Levees Feasibility Study

Partners: California Department of Water Resources (DWR), USACE Sacramento District

Description: This feasibility study is USACE's mechanism to participate in a cost-shared solution to a variety of water resources needs for which USACE has the authority. Results of state planning efforts will be used to help define problems, opportunities, and specific planning objectives. The feasibility study will address ecosystem restoration and flood risk management, and may also investigate related issues such as water quality and water supply. USACE and DWR signed a Feasibility Cost Sharing Agreement (FCSA) in May 2006.

Website: <http://www.spk.usace.army.mil/projects/civil/Delta/News.html>

Contacts: Mr. Dennis Clark, Project Manager, Dennis.G.Clark@usace.army.mil; Ms. Brooke Schlenker, Lead Planner, Brooke.E.Schlenker@usace.army.mil

Sacramento River Deep Water Ship Channel Project

Partners: Port of West Sacramento and USACE San Francisco District

Description: The Sacramento River Deep Water Ship Channel Project (SRDWSC) is a Congressionally-authorized project. Currently, USACE and the Port are conducting a Limited Reevaluation Study to recommend navigation improvements for Federal funding and preparing a joint SEIS/SEIR to evaluate the action of resuming construction of navigational improvements to the SRDWSC. Technical studies include, hydrodynamic and salinity modeling, beneficial reuse survey, and ship simulation studies. A draft SEIS/SEIR is scheduled for completion in late 2010.

Website: <http://www.sacramentoshipchannel.org/>

Contacts: Mr. Dave Patterson, Project Manager, David.R.Patterson@usace.army.mil; Dr. Bill Brostoff, Environmental Lead, William.N.Brostoff@usace.army.mil

San Francisco Bay to Stockton Navigation Improvement Project _____

Partners: Port of Stockton and the Contra Costa County Water Agency and USACE San Francisco District.

Description: The SF Bay to Stockton Deep Water Ship Channel Project is a Congressionally authorized project. A General Reevaluation Report is being prepared to determine the feasibility of modifying the current dimensions of the West Richmond, Pinole Shoal, Suisun Bay, and Stockton Ship Channels, which are currently maintained to -35 feet MLLW and provide access to oil terminals, industry in Pittsburg, and the Port of Stockton. Current technical studies include hydrodynamic, salinity and dissolved oxygen modeling, and beneficial reuse survey to identify additional dredged material placement sites in the project area.

Website: http://www.spn.usace.army.mil/projects/stockton_navigation/index.html

Contacts: Mr. Dave Patterson, Project Manager, David.R.Patterson@usace.army.mil;
Ms. Bonnie Hulkover, Environmental Lead,
Bonnie.Hulkover@usace.army.mil

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) has regulatory authority for endangered species and migratory bird issues as they relate to the China Camp and Rush Ranch sites. The USFWS also makes recommendations to the U.S. Army Corps of Engineers regarding wetland permits.

APPENDIX H

Management Plan Process

MANAGEMENT PLAN PROCESS

Reserve staff worked in close collaboration with the Estuarine Reserves Division (ERD) in all aspects of the management plan process, in accordance with ERD’s guidance document entitled, *Guidelines for Management Plan Revisions; National Estuarine Research Reserve System*.

Reserve staff worked in collaboration with all our signatory partners to create the draft of this plan. This effort included a series of individual facilitated meetings with both land-owning partners - California State Parks and Solano Land Trust - and the Bay Conservation and Development Commission. Individual meetings were held with various SF State partners. The discussions of all these meetings were reflected in a draft that was again reviewed by all partners and the Estuarine Reserves Division prior to engaging stakeholders and the public.

Outreach to the wider Bay community was actively pursued and occurred in a variety of media and venues. The plan was presented to the maritime community at a public meeting of the San Francisco Harbor Safety Committee. Outreach included e-mailing a briefing document to all members in advance of the public meeting and providing for follow-up, in-person meetings for additional discussion. The legal notice of availability for the 30-day public comment period was published in the Federal Register on October 26, 2010. In addition, notice was e-mailed to the SF Bay NERR interested-parties list, and hard copies were mailed to all who requested it. The plan was presented at a public meeting on November 3 with the San Francisco Estuary Partnership, and again to the San Francisco Bay NOAA Coordination Group on November 10.

Comments were received via mail and e-mail. All comments received during the 30-day public comment period are in the table below, along with our response to each comment; the table is organized by page number.

In conclusion, we again thank everyone involved in the process for contributing to making the Management Plan as clear and effective as possible.

<i>Page</i>	<i>Comment Received</i>	<i>Response To Comment</i>
Overall Comment	BCDC commends the San Francisco NERR on the thoroughness and depth of the Draft Plan.	<i>Comment noted; thank you.</i>
Overall comment	Overall, we felt the plan was well written and approved of your approach.	<i>Comment noted; thank you.</i>
Page 1-7	Section 1.4.1: The impact of mosquito control activities (monitoring and control, particularly artificial channels) on hydrology and biotic resources should be mentioned somewhere in this section.	<i>Text revised as requested.</i>

<i>Page</i>	<i>Comment Received</i>	<i>Response To Comment</i>
Page. 1-8	North San Pedro Road does not “bisect” the marsh—the implication of equal areas is inaccurate. Perhaps use “divide.”	<i>Text revised as requested.</i>
Page 1-10	China Camp is referred to as “high elevation salt marsh” but it is actually lower elevation than most ancient marshes. Most of China Camp marsh should be classified as “middle marsh zone” (occupying the range between MHW and MHHW).	<i>Text revised as requested.</i>
Pages 1-15, 16	China Camp Map: China Camp boundary does not include the entire marsh area. Shouldn’t the boundary extend to the outboard edge of the marsh?	<i>The legal boundary of the NERR coincides exactly with the state park boundary rather than the marsh area.</i>
Page 1-16	The ecological community classification for China Camp marsh is labeled as “High Elevation Tidal Marsh” and should be middle elevation marsh. The outboard edge of the marsh should be low marsh. High marsh (mostly above MHHW) should only be found in a thin strip at the upland edge.	<i>The legend has been revised to change “High Elevation Tidal Marsh” to “Middle Elevation Tidal Marsh” as requested. With respect to the high and low marsh elevations that exist at China Camp, the resolution of the San Francisco Estuary Institute Eco-Atlas regional data used for this map does not support delineating those margins at this map scale.</i>
Page 2-5	Section 2.1.2: PRBO’s long-term and ongoing songbird and rail monitoring, dating back to 1996 and earlier, should be mentioned.	<i>The ongoing monitoring effort by PRBO falls outside the scope of this section (2.1.2) which is focused exclusively on past and present NERR activities. Future collaborations between PRBO and NERR on such topics will certainly be included in subsequent management plans.</i>

Page	Comment Received	Response To Comment
Page 2-10	Section 2.2, Education: Overall the section looks good - the focus on education by target audiences is the right way to approach it.	<i>Comment noted; thank you.</i>
Page 2-14	In the first introductory section would be good to add a reference to sea level rise/climate change as a key coastal resource management issue.	<i>Comment noted. This is an important resource management issue and will be incorporated into our education programs, as reflected in the text in Section 3.1.</i>
Page 2-15	K-16 education: NERR could partner with PRBO to integrate PRBO data from Rush Ranch and China camp for high school science programs - in other words - more emphasis on adding real-time site-based data to science education programs.	<i>Comment noted. Text revised to add PRBO to the list of “developing partnerships”. Thank you! We incorporate site-based science into our education programs.</i>
Page 2-16	Volunteer training: Link NERR volunteers with existing ongoing volunteer efforts such as the PRBO Pacific Flyway shorebird survey which will happen annually every November, beginning in 2010.	<i>Comment noted. Text revised to include connections with partner organizations.</i>
Page 2-17	Community Programs: Seek to partner with other organizations already offering community programs, enabling existing efforts to complement each other. Specifically, we at PRBO do some community programs at Rush Ranch and other sites throughout the Bay each year.	<i>Comment noted. Text revised to include connections with partner organizations.</i>
Page 2-17	Hiring an education specialist is a great idea, to help support the education coordinator and increase the focus on public education.	<i>Comment noted.</i>
Page 2-23	Section 2.4.1: The habitat change mapping in this section is highly important and should be prioritized.	<i>Comment noted.</i>
Page 2-26	Partnerships: Partnering with the Bay Area Early Detection Network could be helpful in the effort to control novel invasive plant species.	<i>Text revised to include partnering with Bay Area Early Detection Network.</i>

<i>Page</i>	<i>Comment Received</i>	<i>Response To Comment</i>
Page 3-2	Include measures of biotic conditions in addition to physical (in particular, wildlife response to environmental change).	<i>Comment noted. We currently do not have the necessary resources needed to monitor wildlife responses. We continue to support other groups such as PRBO and USGS that monitor wildlife responses in the Reserve.</i>
Page 3-3	Climate Change Goal 1: Measure wildlife response to climate change. China Camp and Rush Ranch are core monitoring sites for PRBO where information on bird use of the Reserves has been collected and analyzed annually since 1996. Supporting these and other studies of wildlife response to environmental change should be encouraged. Work on these two sites is part of an Estuary-wide program of monitoring, conducted by PRBO, that is now, through support of the Landscape Conservation Cooperatives (a national program led by USFWS), seeking to address the question of impact of climate change on vegetation and wildlife. Integration of the SF Bay NERR studies of climate change with ongoing and future studies by other organizations should be highly encouraged.	<i>Text revised.</i>
Page 3-3	Climate Change Goal 1: BCDC supports and encourages the NERR to study and help understand the risks and impacts climate change and sea level rise will have on sensitive aquatic and wetlands habitats.	<i>Comment noted; thank you</i>
Page 3-6	Is Species Interactions Goal 1 limited to plants? Plants are the only group mentioned. If all species (invertebrates, plants, birds, and fish) are meant to be included, that should be stated. If all species are meant, perhaps they should be prioritized.	<i>Text revised to clarify this includes animals and plants.</i>

<i>Page</i>	<i>Comment Received</i>	<i>Response To Comment</i>
Page 3-7	Species Interaction Goal 2 (Obj. 2): Partnering with the Bay Area Early Detection Network could be helpful in the effort to control novel invasive plant species.	<i>Comment noted.</i>
Page 3-12	Public access is mentioned as a resource management issue under the Species Interaction section, but the NERR may also want to consider the issue in the Habitat Restoration context as well, with the same objective of facilitating the public's experience of the Bay's natural resources to thus foster public support for resource protection and habitat restoration.	<i>Text revised as requested to reflect facilitating the public's experience in a responsible way.</i>
Page 3-13	Habitat Restoration is also listed as a strategic research focus, particularly in "conduct or coordinate basic research about tidal marsh habitats and other 'reference' habitats within the Reserve sites." While BCDC supports this research, we encourage the NERR to tie habitat restoration with sea level rise by studying to what extent restoration can be used as a mitigation restoration of subtidal habitats.	<i>Comment noted. We look forward to continuing to partner with BCDC and others to develop key research questions on climate change.</i>
Page 3-13	BCDC encourages the NERR to look at the draft Subtidal Habitat Goals Project document (Goals Report). Among items of potential interest in that document, BCDC has specific acreage goals for restoration of native oysters and eelgrass. The Goals Report also specifically identified China Camp as a possible priority native-eelgrass survey and restoration site.	<i>Comment noted. SF Bay NERR participated in the Subtidal Habitat Goals Project.</i>
Page 3-13	BCDC supports the incorporation of interpretive exhibits and guided tours of restoration sites as a strategy under the habitat restoration goal, and providing the public with education on restoration science.	<i>Comment noted; thank you.</i>

<i>Page</i>	<i>Comment Received</i>	<i>Response To Comment</i>
Page 4-1	Expanding the Reserve site boundary at China Camp to include the entire marsh area (including the entire outboard edge of the marsh) is supported. The outboard edge of the marsh supports plant and bird species not found within the current boundary. The outboard edge is an integral part of the tidal marsh/tidal flat ecosystem.	<i>Comment noted; thank you.</i>
Page 4-3	Including Brown's Island is also supported. Many research and monitoring projects have been conducted at Brown's Island since 2002, not just the interdisciplinary Integrated Regional Wetlands Project, but also studies by USGS. Inclusion of Brown's Island into the SF Bay NERR will promote additional studies that can continue and build on this established foundation. Access to Brown's island has been difficult and/or costly. Hopefully, its inclusion in the Reserve system will facilitate researcher access.	<i>Comment noted; thank you.</i>
Page 4-5	Adding Richardson Bay as a NERR site is supported. Many of the remnant tidal marshes in Richardson Bay are considered sediment-starved. Marsh drowning and other effects from accelerating sea-level rise may occur at these sites earlier than other sites. Our understanding of how other sites may react to sea-level rise should be improved by studying remnant marshes in Richardson Bay. Their inclusion as NERR "sentinel" sites is supported. PRBO has been monitoring remnant marshes in Richardson Bay since 1997.	<i>Comment noted; thank you.</i>
Page 6-1	BCDC commends the NERR for its discussion on supporting research on public access and wildlife compatibility, mentioning specific design and management strategies to support public access/ recreation, and guided programs while protecting wildlife.	<i>Comment noted; thank you.</i>

APPENDIX I

Bay Conservation and Development Commission Approval



Making San Francisco Bay Better

November 24, 2010

Jaime Kooser, Reserve Director
San Francisco Bay NERR
3152 Paradise Drive
Tiburon, CA 94920

SUBJECT: San Francisco Bay National Estuarine Research Reserve
Draft Management Plan, 2011-2016

Dear Ms. Kooser:

Thank you for the opportunity to comment on the San Francisco Bay National Estuarine Research Reserve's (NERR) Draft Management Plan, 2011-2016. The Draft Plan was published in the Federal Register on October 26, 2010. The following staff comments are based on the Commission's law and policies and the Memorandum of Understanding between BCDC and San Francisco State University, the Romberg Tiburon Center, the California Department of Parks and Recreation, and the Solano Land Trust as outlined in the "Agreement Concerning Cooperative Management of The San Francisco Bay National Estuarine Research Reserve" (Memorandum of 2003). This agreement is based on the following understandings of BCDC and SF Bay NERR:

1. The purpose of the SF Bay NERR is to create new opportunities for coordinated San Francisco Bay estuarine resource management, research, monitoring, stewardship, and public education.
2. BCDC shall serve on the management advisory board of the SF Bay NERR and "will assist in developing an advisory structure that provides the management advisory board with an appropriate linkage to the broader community so that its direction of the reserve reflects the concerns and ideas of this regional constituency."
3. Reserve staff and the management advisory board shall confer regularly to ensure coordination between the program for SF Bay NERR and the broader goals and mandates of regional coastal management programs that affect the San Francisco Bay.
4. Close coordination between the staff of the SF Bay NERR and BCDC on various projects will ensure the needs of the San Francisco Bay are thoroughly addressed and will increase the overall effectiveness of the SF Bay NERR's programs.

BCDC commends the San Francisco NERR on the thoroughness and depth of the Draft Plan. Many of the stated goals coincide with BCDC's current focus on issues concerning climate change and sea level rise. As stated under Section 3: Issue Areas and Strategic Actions, Climate Change is one of four strategic focus areas the NERR hopes to research over the next five years. Climate Change Goal 1 is to "increase knowledge and understanding of effects of climate change on Reserve sites." BCDC supports and encourages the NERR to study and help understand the risks and impacts climate change and sea level rise will have on sensitive aquatic and wetlands habitats.


Habitat Restoration is also listed as a strategic research focus, particularly in "conducting or coordinating basic research about tidal marsh habitats and other 'reference' habitats within the Reserve sites." While BCDC supports this research, we encourage the NERR to tie habitat restoration with sea level rise by studying to what extent restoration can be used as a mitigation

restoration of subtidal habitats. BCDC encourages the NERR to look at the draft Subtidal Habitat Goals Project document (Goals Report) (available on our website at http://www.bcdc.ca.gov/planning/shg/subtidal_habitat.shtml#shgrpt). Among items of potential interest in that document, BCDC has specific acreage goals for restoration of native oysters and eelgrass. The Goals Report also specifically identified China Camp as a possible priority native eelgrass survey and restoration site. BCDC supports the incorporation of interpretive exhibits and guided tours of restoration sites as a strategy under the habitat restoration goal, and providing the public with education on restoration science.

BCDC commends the NERR for its discussion on supporting research on public access and wildlife compatibility, mentioning specific design and management strategies to support public access, recreation, and guided programs while protecting wildlife. Public access is mentioned as a resource management issue under the Species Interaction section, but the NERR may also want to consider the issue in the Habitat Restoration context as well, with the same objective of facilitating the public's experience of the Bay's natural resources to thus foster public support for resource protection and habitat restoration.

Thank you for the opportunity to comment on the San Francisco Bay National Estuarine Reserve Research Draft Management Plan. BCDC commends the NERR on its excellent tradition of public education and outreach on issues facing San Francisco Bay. As recognized in the Plan, the uncertainty of the impacts of climate change and sea level rise will add a new importance to NERR's research and education mission. We encourage future coordination to ensure continued success. If you have any questions regarding this or any other matter, please do not hesitate to contact me at (415) 352-3656 or by email joel@bcdc.ca.gov.

Sincerely,



JOSEPH LaCLAIR
Chief Planner

JL/gg