Padilla Bay National Marine Estuarine Research Reserve

Management Plan

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Padilla Bay
National Estuarine Research Reserve

Management Plan

By
Padilla Bay National Estuarine Research Reserve

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Table of Contents

List of Figures

Glossary of Terms and Acronyms

CCAP: Coastal Change Analysis Program

CELCP: Coastal and Estuarine Land Conservation Program

CFR: Code of Federal Regulations, the formal codification of federal government regulations. On-line access is available through the Government Printing Office at http://www.access.gpo.gov/nara/cfr/

Corps: US Army Corps of Engineers

CTP: Coastal Training Program

CZMA: Coastal Zone Management Act, a federal law adopted by Congress in 1972

Ecology: the Washington State Department of Ecology

EALR: Essential Academic Learning Requirements

EPA: US Environmental Protection Agency; the EPA's Region X office is in Seattle

ERD: Estuarine Reserve Division, a branch of OCRM

GLE: Grade Level Expectations

GMA: Growth Management Act; see Appendix C

IOOS: Integrated Ocean Observation System

KEEP: K-12 Estuary Education Program

LULCHC: Land Use, Land Cover and Habitat Change (SWMP Phase III)

MESA: Marine Ecosystems Analysis Program, a federal interagency program lead by NOAA and headquartered in Boulder, Colorado, the sponsor of many Puget Sound studies.

MLLW: Mean Lower Low Water, a tidal datum. The average of the lower low water height of each tidal day observed over the 18.6-year National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch. On navigation charts MLLW is the zero datum, or the zero tide level.

NERR: National Estuarine Research Reserve.

NIFC: Northwest Indian Fisheries Commission, an inter-tribal organization with offices in Olympia.

NOAA: National Oceanic and Atmospheric Administration, a branch of the federal Department of Commerce.

NOS: National Ocean Service, a branch of NOAA.

NTIS: National Technical Information System, a federal service which sells reprints of federal technical reports on an on-demand basis.

NWS: Northwest Straits Marine Conservation Initiative

OCRM: Office of Ocean and Coastal Resource Management, a branch of NOAA.

PBNERR: Padilla Bay National Estuarine Research Reserve.

PMEL: Pacific Marine Environmental Laboratory, a NOAA facility in Seattle.

PSP: Puget Sound Partnership, a new agency of the State with a mission to clean up Puget Sound by the year 2020.

RCW: Revised Code of Washington, the formal codification of Washington State laws (statutes) adopted by the Washington State Legislature.

the Reserve: the Padilla Bay National Estuarine Research Reserve.

the System: the National Estuarine Research Reserve System.

SMA: Shoreline Management Act; see Appendix C.

SWMP: System-wide Monitoring Program, comprehensive and standardized water quality, land use and biological monitoring that takes place at all 27 NERR sites.

USC: United States Code, the formal codification of federal laws adopted by the United States Congress. On-line access is available through the Government Printing Office at http://www.access.gpo.gov/uscode/index.html

USFWS: US Fish and Wildlife Service, a branch of the federal Department of the Interior.

WAC: Washington Administrative Code, the formal codification of Washington State regulations.

WASL: Washington Assessment of Student Learning

Washington Pollution Control Commission: a predecessor agency of the Washington Department of Ecology.

WDFW: Washington Department of Fish and Wildlife

WDNR: Washington Department of Natural Resources.

Executive Summary

In 1972, Congress passed the Coastal Zone Management Act (CZMA), officially recognizing that the resources of the coastal zone are of "national significance and rapidly disappearing". Section 315 of the CZMA establishes the National Estuarine Reserve System (NERRS). Under this System, healthy estuarine ecosystems that typify different regions of the U.S. can be designated and managed as sites for long-term research, and used as a base for estuarine education and training. The System also provides a framework through which management approaches, research results, and educational methodologies can be shared with others. The NERRS is one element in a formula for maintaining healthy coastal resources. The research, education, and resource management programs at Padilla Bay NERR are tools that can help fill the gaps in knowledge and assist decision-makers so that estuaries, specifically Puget Sound, can sustain the growth expected throughout its watershed while maintaining a healthy and diverse ecosystem.

In December, 1980, Padilla Bay was officially designated as the nation's 8th National Estuarine Research Reserve. The Washington State Department of Ecology (Ecology), Shorelands and Environmental Assistance Program (SEAP) is the cooperating state agency. The mission of the Padilla Bay NERRR is:

> To promote improved management and stewardship of estuarine ecosystems in the Columbian/Puget Sound Biogeographical region through research, monitoring, education, training and interpretation.

Padilla Bay is an estuarine system, part of the larger Skagit River delta, located along the fringe of the fertile Puget Sound lowlands adjacent to the San Juan Archipelago, some 60 miles north of Seattle. The Reserve's proposed boundary contains 13,500 acres of land and water habitats that support a wide variety of plant and animal species, many of high commercial and recreational value. It can be characterized as representative of the greater Puget Sound biogeographic region, and is the only NERRS designated in Washington State. Habitats in the PBNERR range from forested uplands and grasslands to deep water benthic environments on its western edge. The majority of the Bay is intertidal and subtidal mudflats covered with extensive meadows of eelgrass, providing home and nursery for important species such as Dungeness crab, juvenile salmon, and hundreds of thousands of waterfowl and marine birds. The Reserve also offers recreational and educational opportunities to the citizens of this coastal area.

The Reserve boundary as proposed and adopted in 1980 contained many privately owned parcels, including over 1,700 subdivided tideland tracts. Over the past 28 years, through purchase, donation, litigation and settlement, and cooperative management with other agencies, the Reserve now owns and manages approximately 12,100 acres of the originally-proposed 13,500. Other state agencies own 400 acres and PBNERR has cooperative agreements with these. The remaining 1,000 acres (half in farmland, half in tidelands) remains in private hands and PBNERR will continue acquisition efforts for fee

simple title on the tidelands and other protective easements on the farmland in the years ahead.

Every reserve in the NERRS is required by Federal regulations to have an approved management plan. It is important for a variety of reasons: it provides a framework for the direction and timing of a Reserve's programs; it also allows for an examination of performance and progress in meeting goals and objectives and guides CZMA Section 312 evaluation of the Reserve. The plan describes these goals and objectives, and identifies actions and strategies for all PBNERR operational and programmatic elements.

The PBNERR management plan provides a framework to steer the activities of the Reserve. Goals and objectives are long-term strategies and actions or tasks are normally accomplished in 2-5 years. Changes in funding levels or direction may also necessitate a long or short term change in priorities.

The Reserve operates in partnership with many other agencies, organizations, tribes, and volunteers, and relies on advisory committees and a non-profit foundation (Padilla Bay Foundation) to carry out its mission. Many local and regional (Puget Sound) management issues are part of the Reserve's workplan. Some of these are: protection and restoration of habitat, reduction of toxic inputs, reduction of human and animal waste inputs, protection of ecosystem biodiversity and imperiled species, controlling invasive species, and planning for climate change. Responsibilities for addressing these issues reside with our state managing agency (Ecology), the Puget Sound Partnership (PSP), and a host of other federal, state, local and tribal governmental entities. To accomplish these, local and regional decision-makers will need the tools for improved shoreline management and a citizenry with an increased environmental literacy.

Three major goals have been established to guide Reserve management, programs, and implementation. These are: 1) Protect and improve habitat and biological diversity within the Reserve and the Puget Sound biogeographic region; 2) utilize and increase the use of Reserve science and stewardship to address priority coastal management issues; and 3) enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

The management plan was developed over several years in accordance with NOAA regulations and follows the established NERR structure and content guidelines. It is consistent with the Congressional intent of Section 315 of the CZMA, as amended, and the provisions of the Washington State Coastal Management Program. It is the intent of the Reserve to provide leadership and promote informed management of coastal resources. This is accomplished through programs in resource stewardship, scientific research and monitoring, professional training, and addressing community and regional needs of education and outreach.

More information on each of the above programs is available at the Padilla Bay web site www.padillabay.gov including reports, curricula, maps and data.

1 Introduction

This revised management plan for the Padilla Bay National Estuarine Research Reserve (NERR) updates and replaces the original plan first published in 1984 (Shorelands Division, 1984 and all revisions thereafter). It provides information about the Reserve, describes current and planned programs, and establishes goals and policies for management of the Reserve. This plan will be used to guide Padilla Bay NERR staff and the Washington State Department of Ecology (the managing agency) in program development and implementation. This management plan will be updated within five years or as deemed necessary by the managing agency. Changes may be mandated by alterations to:

- Section 315 of the Federal Coastal Zone Management Act by the US Congress;
- Federal regulations related to the administration of the National Estuarine Research Reserve System;
- Washington State Department of Ecology priorities; and
- Concerns presented by Reserve advisory committees, cooperating state agencies, local government, and the general public.

This document does not attempt to include every detail on administration and management of the Reserve, but does set out broader issues and establishes objectives for the next several years. Any questions or comments regarding this plan may be forwarded to the Manager, Padilla Bay National Estuarine Research Reserve, 10441 Bay View Edison Road, Mount Vernon, Washington, 98273.

This document is divided in three sections. Section I. (Operational Elements) begins (Chapter 1) with an Introduction and Summary of Reserve accomplishments and an overview of the National Estuarine Research Reserve System. A description of the Padilla Bay region follows (Chapter 2). Next we describe how the NERR System is implemented in Washington State through the Padilla Bay NERR Administrative Plan (Chapter 3), followed by the Boundary and Acquisition Plan (Chapter 4), and by the Facilities and Construction Plan (Chapter 5) and Public Access Plan (Chapter 6).

Section II contains the five Programmatic Elements which all Reserves must implement, including the: Natural Resources Stewardship Plan (Chapter 7); Research Plan (Chapter 8); Monitoring Plan (Chapter 9); Education and Interpretation Plan (Chapter 10); and Coastal Training Program Plan (Chapter 11).

Section III contains the Bibliography and Appendices. The appendices provide supplemental information including Federal, State and Local Laws and Regulations Relating to the Reserve, Hat Island Cooperative Agreement, and the Memorandum of Agreement between NOAA and Ecology)

A **policy** is the ***standard*** we will follow to achieve our goals and objectives, and the *guidance* and *principles* to be utilized as we carry out our work in performing tasks.

This management plan is not a rigid formula, but simply a plan for management and operations. We have organized this according to a fairly standard approach and nomenclature.

A **goal** is ***what*** is desired; it is ***what*** we are working to achieve in a broad sense. Our goals provide stable, long-term direction for the Padilla Bay National Estuarine Research Reserve.

Objectives are statements of expected results that contribute to the goal; they are specific measurable, and realistic.

Actions are ***specific items or tasks***, performed within a given time, to accomplish our goals and objectives, consistent with our policies.

Regulations are general or specific rules established to protect natural resources and/or the biological integrity of the Reserve. They are implemented through a variety federal, state and local codes (See Appendix).

Major Reserve Goals and Management Issues

Three major goals have been established to guide management, program development, and implementation. They are: 1) Protect and improve habitat and biological diversity within the Reserve and the Puget Sound biogeographic region; 2) utilize and increase the use of Reserve science and stewardship to address priority coastal management issues; and 3) enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems. There are many other important goals and these are located throughout the applicable chapters of this document.

The Padilla Bay Reserve, representing the larger Puget Sound ecosystem, has many management issues to address. Several of these issues are now the focus of the new Puget Sound Partnership (PSP), created by the Governor to clean up the Sound, making it "fishable, swimmable, and diggable" by the year 2020. The Department of Ecology (Coastal Management Office) is increasingly involved in these actions, with additional mandates for Puget Sound Health. Some of these issues of regional importance are: protection and restoration of habitat, reduction of toxic inputs, reduction of human and animal waste inputs, protection of ecosystem biodiversity and imperiled species, controlling invasive species and understanding the impacts of climate change.

Padilla Bay NERR Designation and Accomplishments

Overview

The potential benefits of having Padilla Bay become a National Estuarine Research Reserve were significant but not without potential problems from a variety of concerns. The cooperation of technical working groups and non-technical lay people made the difference between success and failure. The initial and continued involvement of local

citizens, government, commerce, and academia has been instrumental in providing a philosophy of cooperation among the diverse user groups, including agriculture, industry, marine commerce, recreation, and the Reserve.

As early as l974, state and federal working groups were trying to find areas in Washington that would be eligible for estuarine reserve status under the provisions of the Coastal Zone Management Act. Approximately 40 areas were eventually listed by a committee working with the Department of Ecology as potential sites, and a final list of 10 sites was reached after applying criteria from the federal guidelines. After lengthy deliberations, Padilla Bay, with its unique eelgrass resource, was selected to be presented to the federal Office of Ocean and Coastal Resource Management under Section 315 of the Coastal Zone Management Act. Upon formal application to NOAA in 1979, the Governor established steering and technical committees to study boundaries, research, education, and administrative alternatives for the newly-proposed Reserve. A draft environmental impact statement was published in April, l980, and the final in July of that year. After dozens of informal meetings and formal public hearings held throughout the study period, formal designation of the Padilla Bay National Estuarine Research Reserve[1] took place in August, 1980.

At that time an application was also submitted to NOAA/OCRM for a 50/50 matching grant to start the first phase of property acquisition and the construction of an interpretive center overlooking the bay on 64 acres donated by the Breazeale family. With federal approval complete, property acquisition and facility construction began with the Breazeale-Padilla Bay Interpretive Center being dedicated in fall, l982. During l984-85 the barn on the 64 acre site was remodeled to provide residential research quarters, laboratory space, a group meeting area, and much needed storage. A l,900 square foot addition to the interpretive center was completed in l986 and provided space for aquarium displays. An access plan for public beach access was finished in l987 and trail projects followed soon thereafter, including a pedestrian walkway connecting the interpretive center to the nearby state park. A 2-1/4 mile trail on the dike in south Padilla Bay opened in l989, constructed by the Skagit County Parks Department in cooperation with various agencies, including the Department of Ecology. Interpretive signs along the trail were prepared under the direction of Reserve staff. A continuation of the pedestrian walkway along Bay View-Edison Road connected all trail sections. In late l989 the Reserve finished the final major construction element, which included a pathway from the Interpretive Center under the roadway, an observation deck with interpretive signs, and a stairway to the beach. Additional construction work in the early 1990s provided additional parking for visitors and buses. With the passing of Miss Edna Breazeale in 1987, her gift of the family residence for Reserve use completed the family's bequest. Minor remodeling provided space for a much needed meeting room and research offices.

In 1996, having completed all planned facility elements initially identified in the 1982 facility guidance paper, PBNERR commissioned a Comprehensive Facility Plan to guide program needs for the next twenty years. This plan was completed in 1998, and identified specific facility needs for research space, offices, training areas and

classrooms, meeting areas, bunkhouse, storage, and equipment. Design work initiated on phase one of this work (interpretive center expansion, classrooms and laboratory construction, and an overall site plan. Construction initiated on the project in March 2004, and design work began on phase two (barn renovation, bunkhouse, Breazeale House) in mid-2004. As of May, 2008 all this construction work is complete. This also included an updated public water system and design and installation of a 112-panel solar photovoltaic system on the barn roof.

In 1998 PBNERR began a major exhibit renovation project and in May 1999 finished the installation of new displays on estuaries and watersheds in the main exhibit room of the Interpretive Center. Upgrades to the aquaria exhibits are scheduled for 2008-09 and a garage for boat security is planned for 2009-10.

Work on property acquisition within the Reserve's proposed boundary area (see Figure 4.1) began in 1980 with completion of title searches and mapping. In accordance with agency policy expressed in the final environmental impact statement, all properties acquired were to be on a "willing seller" basis; condemnation of private lands would not used. Due to the complexity of tideland ownerships and historic subdivision of these and upland areas, over 1,700 individual parcels had been created within the proposed boundary area, This included 846 parcels (each 10 acres) in the Padilla Bay Tracts, and 943 parcels (each one acre) in the Associated Oyster Tracts. Additional tideland and upland acreage brought the total area within the proposed boundary to approximately 13,535 acres (Wyatt-Jaykim Engineers, 1989).

Acquisition activity continued throughout 1980-89 with the State purchasing or receiving by gift a total of over 2,500 acres of tidelands and uplands. This included representative parcels throughout the various habitat types in the bay. In 1993 the State obtained the 8,004 acres of tidelands held by the Orion Corporation through a negotiated settlement process. After more than twelve years of litigation this settlement brought an end to several rounds of County Superior Court and State Supreme Court actions resulting from the Orion Corporation's lawsuit against the State for purportedly "taking" their tidelands without reasonable compensation (Ecology had offered to purchase these tidelands at appraised value since the early 1980s). As of 2008 approximately 490 acres of tidelands within the original Padilla Bay NERR boundary area remains in private ownership and purchases continue each year from willing sellers.

In 1995 the Reserve added 100 acres of farmland (within the original boundary) to its ownership and entered into a cooperative management program with Washington State University, the Skagit Conservation District and local farmers to initiate and monitor experimental farming practices that would hopefully reduce non-point pollution from row-crop agriculture. Discussions also began in 1997 with county officials regarding the purchase of conservation easements on 700-800 acres of farmland (within the Reserve boundary) through the county's new farmland protection program. This program had insufficient funds to acquire the necessary easements and in 2006 the Washington State Department of Fish and Wildlife, in consultation with PBNERR, acquired approximately 200 acres of this land with additional purchases currently in review. The adoption of Hat Island into the Reserve in 1998 added 90 acres to the boundary on its western perimeter.

Programs, activities and staffing at the Reserve have seen outstanding successes. Educational programs for all school ages have won awards and since the mid-1980's have filled to capacity every year. Nearly 300,000 students and teachers have participated in these programs and these curricula are used throughout Puget Sound by public, private and home schools. Teacher training courses (approved for teacher's continuing education credits) have been offered on a variety of topics. The Coastal Training Program, implemented to provide coastal decision-makers opportunities to advance their professional skills and knowledge, has seen outstanding success and serves hundreds of participants each year in an effort to improve coastal management.

The research and monitoring programs have expanded and matured, and the Reserve has received consistent recognition for performance and data management in the System-wide Monitoring Program. Various research opportunities have been offered, with Master's degree candidates eligible for assistantships provided by the Padilla Bay Foundation, and Ph.D. students competing for graduate research fellowships in partnership with NOAA and the university system.

Volunteers continue to provide a wide variety of assistance to the Reserve. The Stream-Team cooperative monitoring program engages about 40 adult volunteers each year, sampling water quality throughout the Skagit River delta. Many volunteers assist with programs, both in the field and within the facilities, donating thousands of hours of time every year.

The Padilla Bay Foundation, initiated in 1987 to assist the Reserve with programs and capital needs, has been of tremendous support in providing events, volunteers, and establishing successful fundraising campaigns for facility construction and furnishings.

Natural resource issues, such as invasive species and proposed flood by-pass projects, have required significant staff work. *Spartina*, an invasive cordgrass native to the east coast, expanded to cover over 17 acres of tidelands in the Reserve by the late 1980s. Thanks to staff and volunteers this has been reduced to less that 1/8 acre. Skagit County and the Army Corps of Engineers have been engaged in flood planning for the Skagit River for years, and the Reserve has been involved in reviewing the many proposed solutions, with a keen interest in the impact of by-pass options to the resources in the Bay, particularly eelgrasses.

In the past 10 years the Reserve has provided leadership, administrative support and a home for the N.W. Straits Marine Conservation Initiative. Created by Senator Murray and Representative Metcalf 1n 1998 this program engages volunteers form the seven northern counties to improve habitat and marine resources throughout the Straits.

The past several years have seen the development of mapping and biographical data capabilities at PBNERR. The provision of equipment and needed staff for this program has enabled many internal projects, and has brought outstanding educational tools to students, volunteers, and our partners.

Staffing has been consistent the past 10 years with all core staff (defined by NOAA/ERD) in position and without turnover. All other top-priority positions have also been filled and stable. The Reserve has been fortunate to have the full support of its managing agency,

local and state agencies, and other organizations in working together to fund cooperative programs and create partnerships to share resources.

Direction of Reserve Programs

The Reserve's programs and activities will continue to support its goals and the issues related to the Puget Sound biogeographic sub-region. Emphasis will be placed on the key management problems facing our state managing agency and the Puget Sound Partnership (PSP) in an effort to protect and preserve habitat, improve water quality, reduce toxic inputs, enhance shoreline management and improve the environmental literacy of the citizens and decision-makers.

Education and coastal training programs will focus both on the national initiatives and support the needs of the agencies, schools, decision-makers and citizens. Teacher and citizen training will focus on the key Puget Sound problems, and curricula to expand knowledge about climate change and related issues.

Natural resource work will continue to monitor for and manage invasive species, both marine and upland. Staff will also assist the Department of Ecology and other agencies as they attempt to clean up the historic landfill on the shore of Padilla Bay to the west of the Reserve's boundary. Efforts will also be made to assist the Corps and Skagit County in the preparation of an update Comprehensive Flood Management Plan for the Skagit River, and review and evaluation of any proposed flood control option that may impact the Reserve.

Our research and monitoring efforts will continue to implement the System-wide Monitoring Program, and engage citizens and volunteers in additional efforts to protect regional resources. Development of land-use change mapping and data management tools will occur, and the extent of the Reserve's major resource, eelgrass, will again be mapped in 2008-2009. An emphasis will be made to assist the PSP and Ecology as key scientific needs are determined through their current process.

The Reserve will continue to make offers (and hopefully acquire) the remaining tidelands within the boundary. The parcels, totaling approximately 500 acres, make up the remains of the core area of the Reserve (Figures 1.1, 4.1). Continued efforts will also be made to protect, through conservation easements or other programs, the remaining buffer lands (also totaling about 500 acres).

In the next 3 years the Reserve will complete its next phase of construction, including new exhibits and aquaria, and a parking garage for watercraft and equipment.

Staffing levels will remain consistent within the budget allotments provided by the NOAA and Ecology. Primary emphasis is on stability for current staff, and the need for staff to assist with volunteer coordination. In the future, additional support will be needed for maintenance personnel to assist with the several facilities on the PBNERR campus.

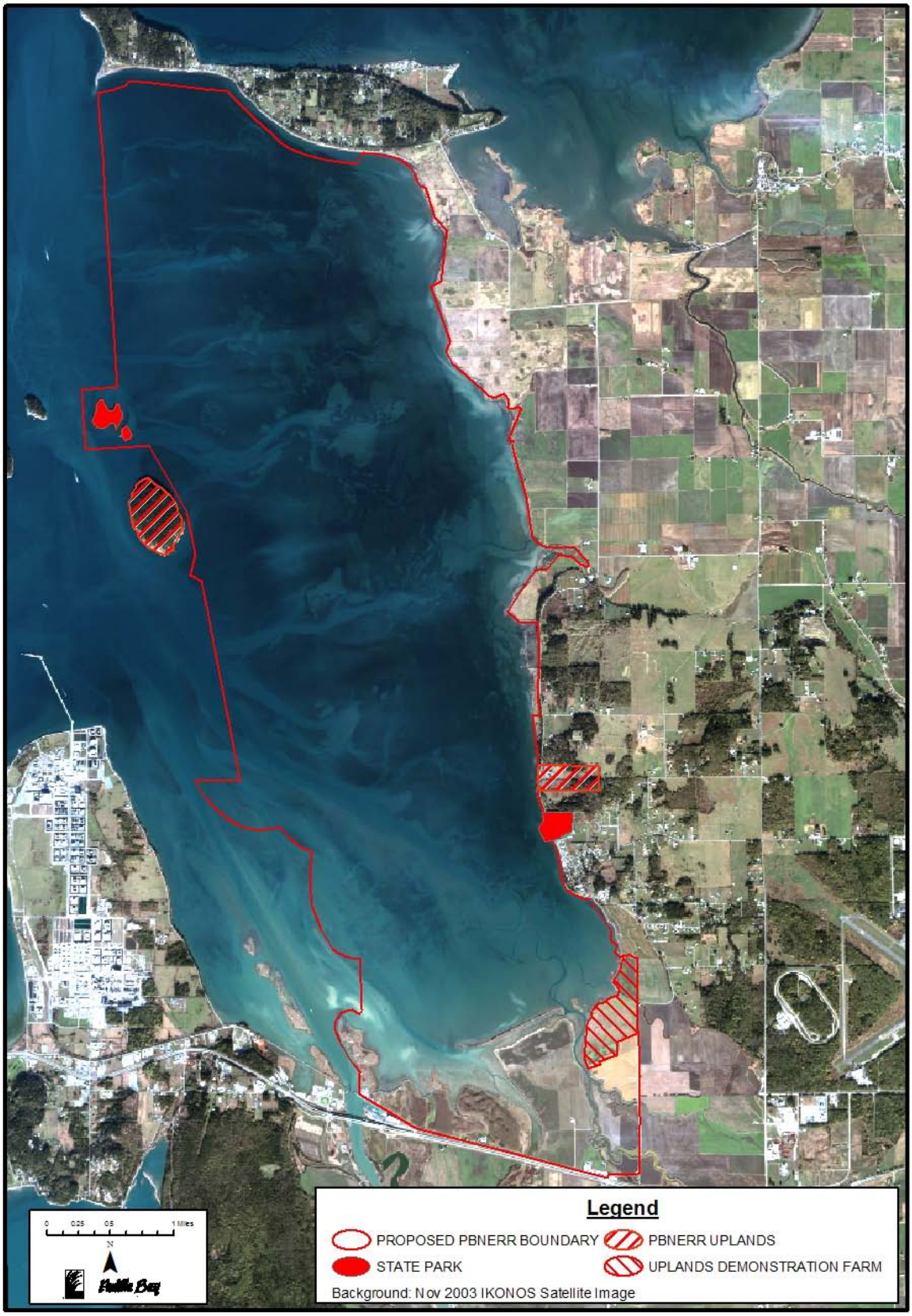


Figure 1.1 – PBNERR Boundary Map

National Estuarine Research Reserve System

This section describes the statutory foundation of the National Estuarine Research Reserve System (NERR System) and its implementation by the National Oceanic and Atmospheric Administration (NOAA).

The National Estuarine Reserve System (NERRS) was created by the Coastal Zone Management Act (CZMA) 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 27 reserves in 22 states and territories, protecting over one million acres of estuarine lands and waters (see Figure 1.2).

Mission

As stated in the NERRS regulations, 15 C.F.R. 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."

Goals

Federal regulations, 15 C.F.R. 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; and

(5) Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

Figure 1.2 – Estuarine Research Reserve Network

National Estuarine Research Reserve System Administrative Framework

The Estuarine Reserves Division (ERD) 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 C.F.R. 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, the Graduate Research Fellowship Program, and the Coastal Training Program. 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.

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 staff has conducted a multi-year action planning process on an annual basis since 1996. The resulting five-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.

Goals

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 peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Biogeographic Regions

NOAA has identified eleven distinct biogeographic regions and 29 subregions in the U.S., each of which contains several types of estuarine ecosystems (15 C.F.R. Part 921, Appendix I and II). When complete, the reserve system will contain examples of estuarine hydrologic and biological types characteristic of each biogeographic region (see Figure 1.3). As of 2006, the reserve system includes 27 reserves and two reserves in the process of designation.

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. 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;

4. The law of the coastal State provides long-term protection for the proposed Reserve's resources to ensure a stable environment for research;

5. 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; and

6. 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/interpretation, stewardship, development projects, facility construction, and land acquisition.

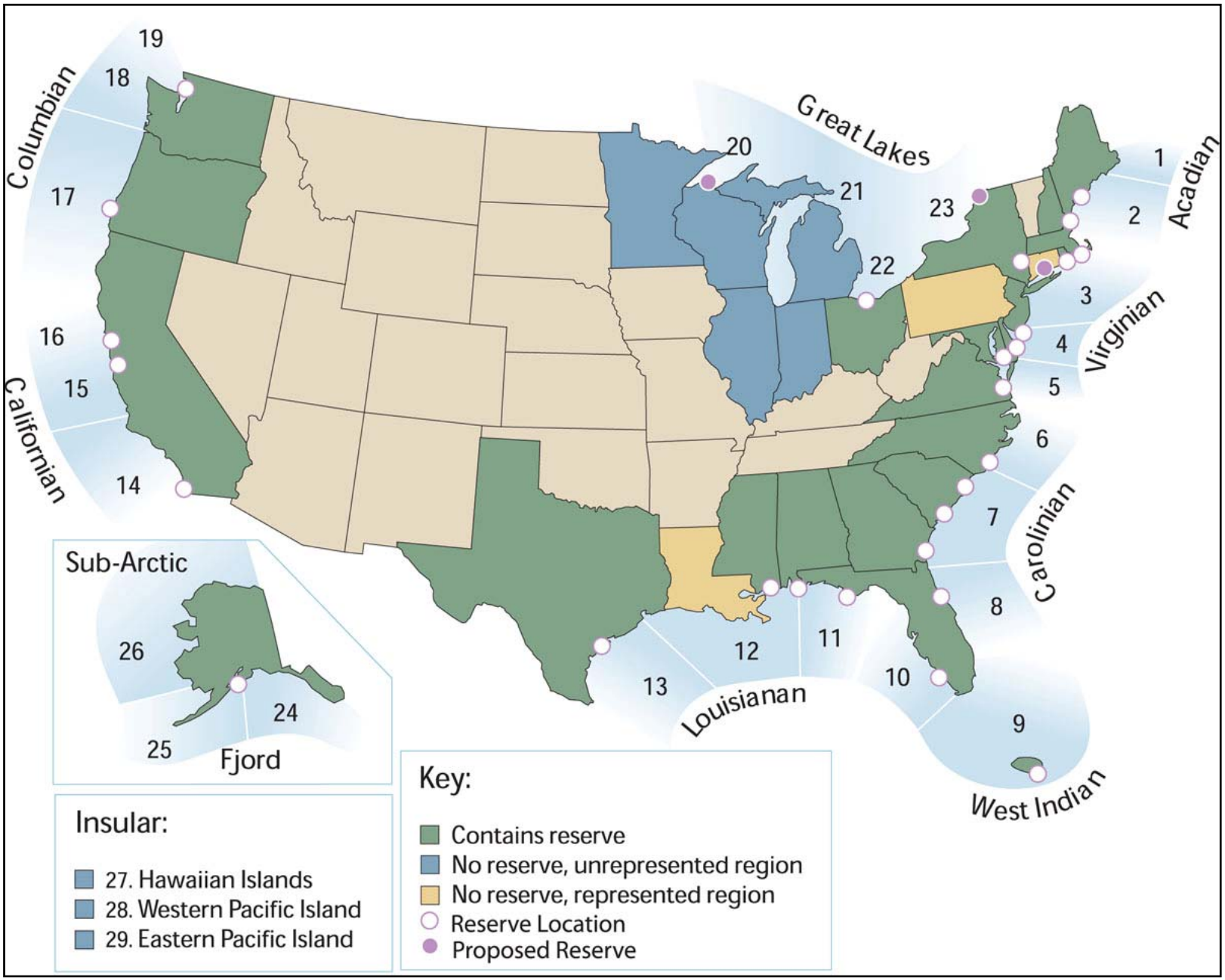


Figure 1.3 – National Estuarine Reserve Bio-Regions

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 C.F.R. 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 has identified 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
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 the 2006-2011 Reserve System Research and Monitoring Plan. 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 the NERRS.

Currently, there are two reserve system-wide efforts to fund estuarine research. The Graduate Research Fellowship Program (GRF) 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, 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 to participate in the reserve's research and/or monitoring program. Students are asked to provide up to 15 hours per week of research and/or monitoring assistance to the reserve; this training may take place throughout the school year or may be concentrated during a specific season.

Secondly, research is funded through the Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), a partnership between NOAA and the University of New Hampshire (UNH). CICEET uses the capabilities of UNH, the private sector, academic and public research institutions throughout the U.S., as well as the 27 reserves in the reserve system, to develop and apply new environmental technologies and techniques.

System-Wide Monitoring Program

It is the policy of the Padilla Bay Reserve to implement each phase of the System-Wide Monitoring Plan 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; and
- 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.

1. 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.

2. Biotic Variables: The reserve system is focusing on monitoring biodiversity, habitat and population characteristics by monitoring organisms and habitats as funds are available.

3. Watershed and Land use Classifications: This component attempts to identify changes in coastal ecological conditions with the goal of tracking and evaluating changes in coastal habitats and watershed land use/cover. The main objective of this element is to examine the links between watershed land use activities and coastal habitat quality and climate change.

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://cdmo.baruch.sc.edu) where researchers, coastal managers and educators readily access the information. The metadata meets the standards of the Federal Geographical Data Committee.

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 systematically tailored to key audiences around priority coastal resource issues and incorporate science-based content. Reserve staff members work with 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 non-formal 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 such as environmental groups, professionals involved in coastal resource management, municipal and county zoning boards, planners, elected officials, landscapers, eco-tour operators and professional associations.

The K-12 Estuary Education Program (KEEP) provides implementation of programs for K-12 students and teachers at both site and national levels. Coastal and estuarine science curricula are aligned with state and national science education standards and frequently involve both on-site and in-school follow-up activity. 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 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 Padilla Bay Reserve 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;

- Conduct and coordinate estuarine research within the system, gathering and making available 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:

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

Reserve System Coastal Training Program

The Coastal Training Program (CTP) provides up-to-date scientific information and skill-building opportunities to coastal decision-makers who are responsible for making decisions that affect coastal resources. Through this program, National Estuarine Research Reserves 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 coastal habitat conservation and restoration, biodiversity, water quality and sustainable resource management and 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 scientific 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 Coastal Training Program requires a systematic program development process, involving periodic review of the reserve niche in the training provider market, audience assessments, development of a three to five year program strategy, a marketing plan and the establishment of an advisory group for guidance, program review and perspective in program development. The Coastal Training Program implements a performance monitoring system, wherein staff report data in operations progress reports according to a suite of performance indicators related to increases in participant understanding, applications of learning and enhanced networking with peers and experts to inform programs.

2 The Padilla Bay Region

This chapter sets a geographical context for the Padilla Bay NERR by describing the regional setting of Padilla Bay (see Figure 2.1) as well as the Reserve itself, including activities and land uses which influence the Reserve.

Figure 2.1 – National Estuarine Reserve Bio-Regions

National and Regional Setting

The NERR System is designed to establish research reserves in representative bioregions and subregions of the nation (see Figure 1.3). The Padilla Bay NERR is located in the Puget Sound subregion of the Columbia bioregion. The Columbia bioregion encompasses the northeast Pacific Coast in the general vicinity of the Columbia River basin, from Point Arena, California, north to the Strait of Juan de Fuca, Washington. Within the Columbian bioregion, the Middle Pacific subregion (Point Arena north to the Columbia River) is represented by South Slough NERR in southern Oregon, and the Puget Sound subregion by the Padilla Bay NERR. There is no research reserve in the Washington Coast subregion.

The Local Setting

Geography

Padilla Bay is located in Skagit County, Washington, in the northern reaches of greater Puget Sound, on the southeastern fringe of the San Juan Archipelago (see Figure 2.2.). The surrounding region is part of the Skagit Valley agricultural complex, one of the most fertile regions in the world. It produces 25% of the nation's frozen peas and 85% of the cabbage and beet seed crop. It is a world leader in daffodil and tulip bulb and flower production. The agricultural richness is a result of thousands of years of sediment deposition by the Skagit River, combined with recent river and bay-front diking programs over the past 100 years. The drained estuarine and marsh soils, combined with the unique moderate temperatures, are ideal for cool weather crops. Annual rainfall at Padilla Bay is approximately 27 inches, while Mt. Vernon, located eight miles eastward, receives about 34 inches.

Figure 2.2 – Northern Puget Sound Region Map

Geology

Puget Sound was carved by continental glaciers containing up to 2,500 cubic miles of ice. This crushing weight descended on the Puget Sound area probably four times in the last 100,000 years. The massive sheets of ice created valleys, basins, and the north-south aligned bays commonly found here. The retreat and melting of the last glacier some 12,000 to 13,000 years ago left most of the topographic features we recognize today (see Figure 2.3).

Saddlebag, Dot, and Hat islands are the oldest features, consisting of serpentine rocks over 200 million years old.

The majority of surrounding agricultural soils and the sediments in the bay itself originated as historic delta deposits from the Skagit River complex. For thousands of years the lower Skagit Valley was extended into the estuary by seasonal deposition of materials carried from far up in the watershed, including glacial erosion in the North Cascade Mountains. With diking of the river and bay completed during the last century, normal river flow (and sediment load) no longer enters Padilla Bay but is carried directly into Skagit Bay through the diked channels of the north and south forks of the Skagit River. The extensive areas of mudflats and coastal marsh that existed throughout the lower Skagit Valley have been diked and drained to create agricultural lands.

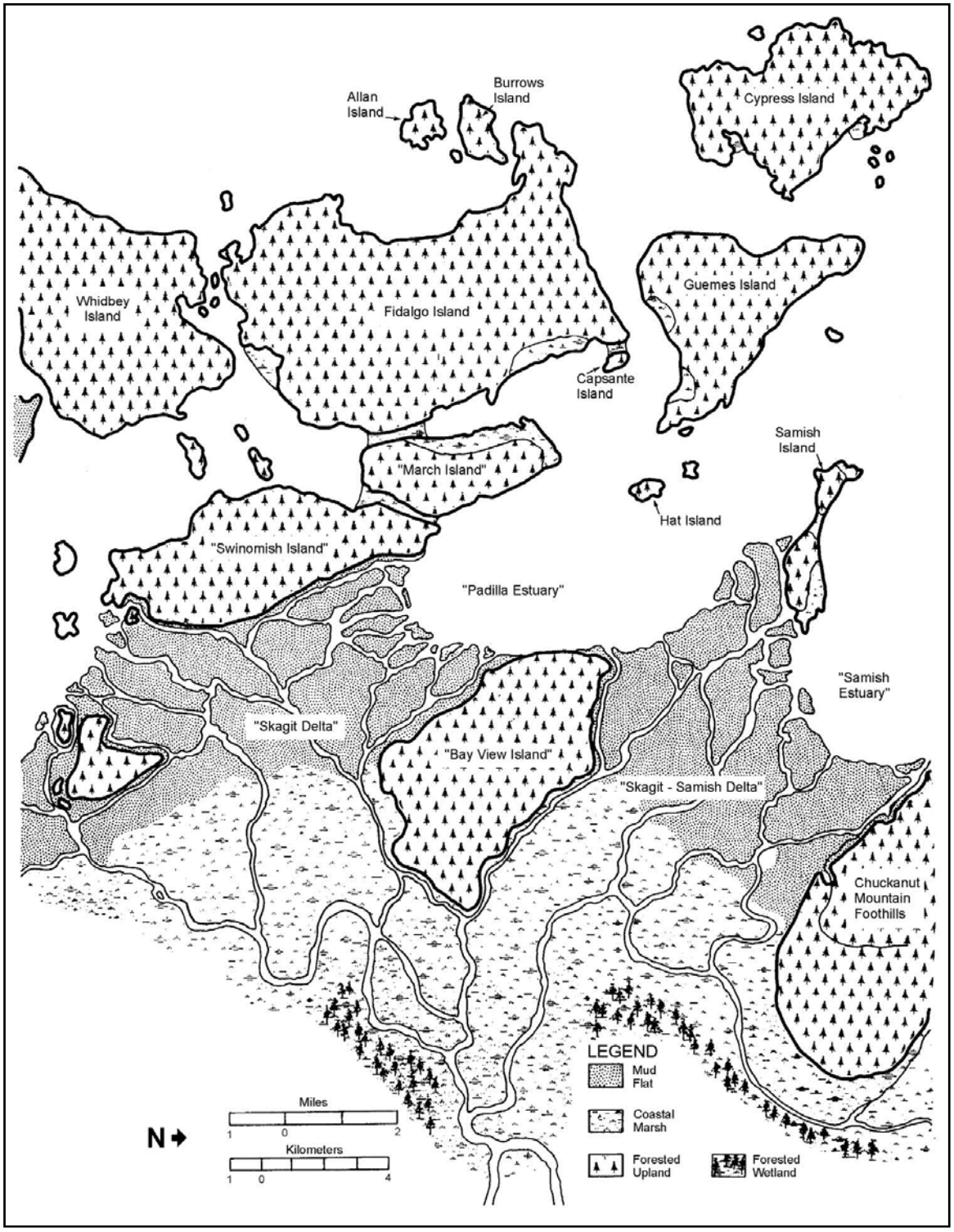
Land Use in the Watershed

The Padilla Bay watershed encompasses approximately 23,000 acres (see Figure 2.4). Three principal drainage systems exist within the watershed: Big Indian Slough (draining 4,730 acres), Joe Leary Slough (draining 11,600 acres), and No-Name Slough draining 2,608 acres. Many other minor drainages, ditches, culverts, and agricultural pumping stations also empty into Padilla Bay from the surrounding lands.

The northern limit of the watershed lies just south of the Samish River, the eastern boundary near the towns of Burlington and Sedro Woolley, and the western limit midway of March Point and the southern boundary near State Highway 20. The watershed measures approximately 14 miles east to west, and 10 miles north to south.

Land use in the watershed was approximately 52% cropland, 20% pasture, 20% forest (mainly on Bayview Ridge), and 8% in urban and miscellaneous uses (which includes industrial, commercial, and residential areas), airport runways, etc. in the 1980s. There have been small shifts to more urban uses, but the vast majority of the lands in the watershed are still used for agricultural or dairy operations. Several residential areas are located in the far eastern reaches, with the Port of Skagit County industrial park and airport located on Bayview Ridge near the Center. The eastern half of March Point, site of refineries and chemical processing industries, also drains directly to Padilla Bay.

Commercial development and light industry are located along major transportation routes adjacent to the Reserve, and on the western fringe, near the City of Anacortes, industrial development is intensive. This area (March Point) harbors two large oil refineries (Shell and Tesoro), along with other chemical industries. Both refineries have large unloading wharves extending into the Padilla Bay/Fidalgo Bay convergence which receive oil tankers from around the world. The Burlington Northern Railroad crosses the Bay in the


Allan Island
Burrows Island
Cypress Island
Whidbey Island
Fidalgo Island
Guemes Island
Capsante Island
Samish Island
"March Island"
Hat Island
"Swinomish Island"
"Padilla Estuary"
"Samish Estuary"
"Skagit Delta"
"Bay View Island"
"Skagit - Samish Delta"
Chuckanut Mountain Foothills
LEGEND
Mud Flat
Coastal Marsh
Forested Upland
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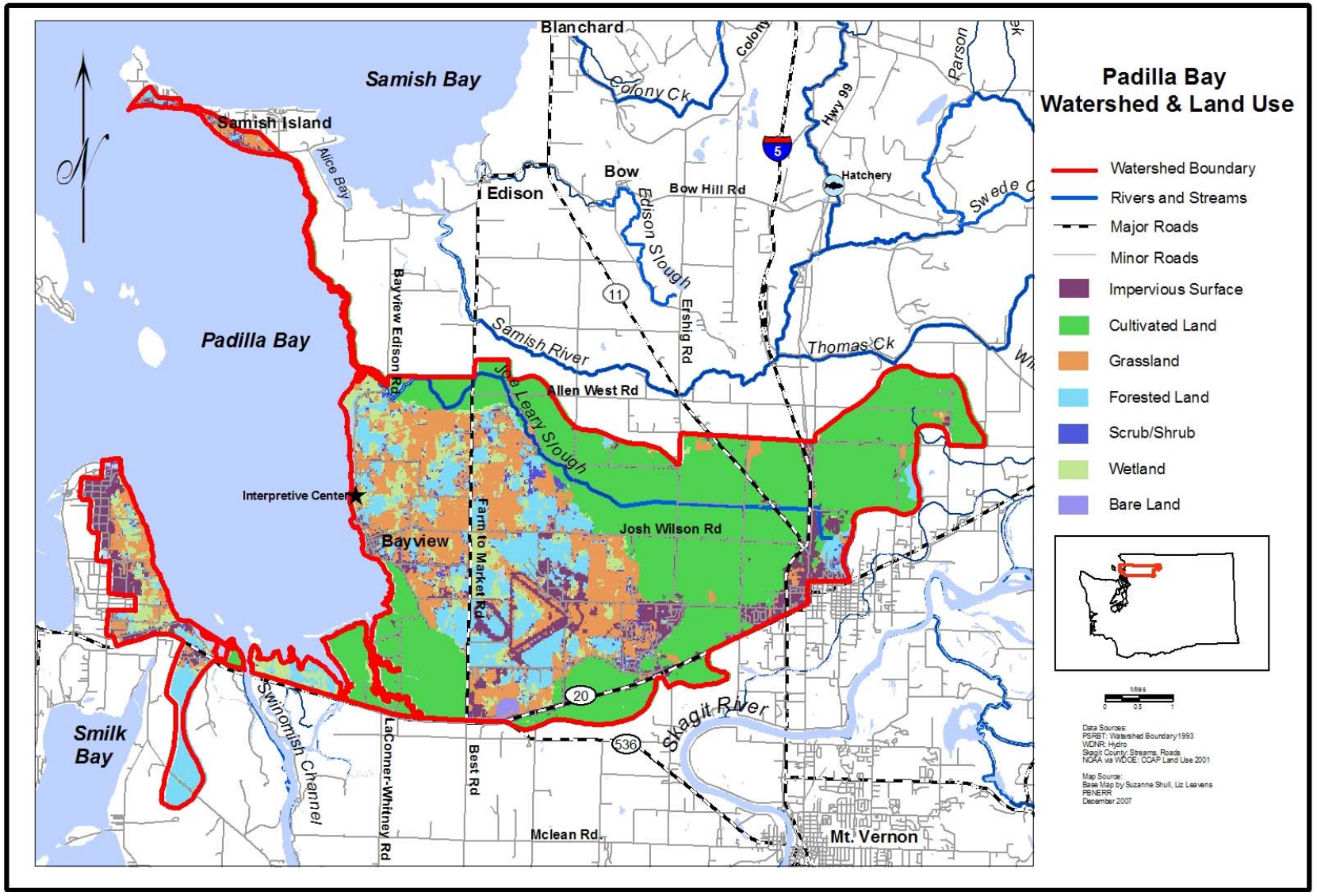

Figure 2.4 – Padilla Bay Watershed and Land Use

southern area, and carries petroleum products in both directions. Fertilizer, feed, and seed processing facilities are also located adjacent to the southern boundary of the Bay.

Adjacent water bodies provide Padilla Bay with waters of varying salinity. From the south via the Swinomish Channel, Skagit Bay waters diluted by the Skagit River provides lower salinity (10-20 parts per thousand), while open exposures to the west (Guemes Channel to Rosario Straits) provide waters in the range of 25-35 parts per thousand. The average salinity of the bay is 26-29 parts per thousand. Much of the regional freshwater influence is from the Fraser River in Canada to the north.

Padilla Bay is a vast natural resource, covering more than 14,000 acres in its total geographic boundary. It is a broad, flat intertidal embayment which fills and empties fairly rapidly with the two daily tides. It is an "orphaned estuary," currently abandoned by normal flows of the Skagit River due to diking, but truly estuarine in the sense of the characteristics of the entire Puget Sound estuary.

Waters in Padilla Bay are well-mixed, with little entrapment. Water temperatures approach a mean of 52ºF although very hot summers can elevate temperatures in the shallow bay significantly. The normal range of temperatures is 40ºF to 65ºF. Water depths average around 9 feet with channel depths approaching 15 to 20 feet below MLLW. At a usual summer low tide approximately 60 to 70 percent of the bay is exposed, including substantial portions of the eelgrass meadow, which covers approximately 7,500 acres (Bulthuis, 1991a). This extensive eelgrass area, one of the largest on the western coastline of North America, is an important nursery habitat for fish and crab and a wintering ground for many migratory waterfowl.

Marine waters throughout northern Puget Sound, particularly within the San Juan Islands (west of Padilla Bay) are heavily utilized by seasonal and year-around tourists. The hundreds of miles of shoreline in the region contain numerous state parks and public beaches, including marinas and marine parks. State-managed public ferry service connects the mainland to many of the larger islands, and ferry connections extend beyond the San Juan Islands to Victoria, British Columbia. Recreational boating in the region during summer months is very popular.

Two marine laboratories are close to Padilla Bay: Shannon Point Marine Center in Anacortes (Western Washington University) and Friday Harbor Laboratory on San Juan Island (University of Washington).

History and Human Environment

Evidence shows Native American habitation in the general Padilla-Skagit area for at least 5,000 years. Several prehistoric sites are found near Padilla Bay but none actually on the bay or its margin. This is probably due to extensive diking which occurred in the late 19th and early 20th centuries. Habitation by Native Americans elsewhere in Washington can be traced back some 12,000 to 15,000 years. The Noo-Wha-Ah, the Samish, and the Swinomish all used the resources of Padilla Bay.

Spanish explorers traveled through Skagit and Padilla Bay in the 1790s and Padilla Bay was "discovered" by Jose Narvaez and named after the Viceroy of Mexico, Juan Vicente de Guemes Pacheco de Padilla. Many of the islands and landforms in northern Puget Sound were named by the original Spanish explorers.

In the early 1800s many Native American tribes were decimated by diseases brought by white trappers, traders, and settlers. The Swinomish Reservation is currently the closest tribal land to Padilla Bay, with their tribal center located near the Swinomish Channel, adjacent to the town of LaConner. They have hunted and fished at Padilla Bay for hundreds of years. The current boundary of the Swinomish Reservation is adjacent and across the channel from the southwest boundary of the Reserve.

The earliest settlers built log cabins on Fidalgo Island in 1858 (just west of Padilla Bay). In 1867 a trading post was erected on the Swinomish flats in LaConner, and shortly thereafter the agricultural and timber potential of the area was recognized. Also in 1867, a logging camp was established on Samish Island, which forms the northern boundary of the Bay (Samish Island is no longer an island — the wetlands which separated it from the diked mainland were also eventually diked and filled). By 1888 eleven camps were situated between Edison (east of the bay), and Bay View, near the southern end of the bay.

In 1874 much of the area was served by regular steamboat service as there were few roads. Land access was limited to horse trails and short, local wooden plank roads, called puncheon roads.

By 1882 the community of Bay View had a butcher shop, hotel/saloon and other stores. One of the state's biggest logging companies was headquartered there. By 1890 most of the area had been logged off except portions of Bay View Ridge, and this area was soon to be cut. Huge fires consumed large areas and the thriving community of Bay View in 1910. It was never rebuilt to its previous size.

This logging and clearing, along with the diking of the southern end of the bay, brought a pronounced agricultural movement to the region which thrives to this day. The original marsh areas, when diked and allowed to lose their salt, provided much valuable acreage for farm land and brought even more settlers to the area.

Fishing was and is an important part of the Padilla Bay history. Clam beds and oysters were abundant early in the bay's history, although few remain today. Many early attempts to stock the bay with seed oysters and clams were initially successful, but later in the century increased sedimentation and predators made commercial use of the bay infeasible. Crabbing and salmon harvesting occur on the fringe of the bay but are not as productive as they were at the turn of the 20th century.

Padilla Bay and Environs

Biological features of the Reserve and surrounding areas include a variety of habitat types and specific flora and fauna. General information is provided in this section to identify the complexity of the Padilla Bay resources. Habitat types in and around the bay are identified from 2001 Coastal Change Analysis Program (CCAP) source data in Figure 2.5. This rich diversity of flora and fauna, particularly the more marine influenced, provides a unique area to study the natural history and science of those organisms in a relatively undisturbed setting.

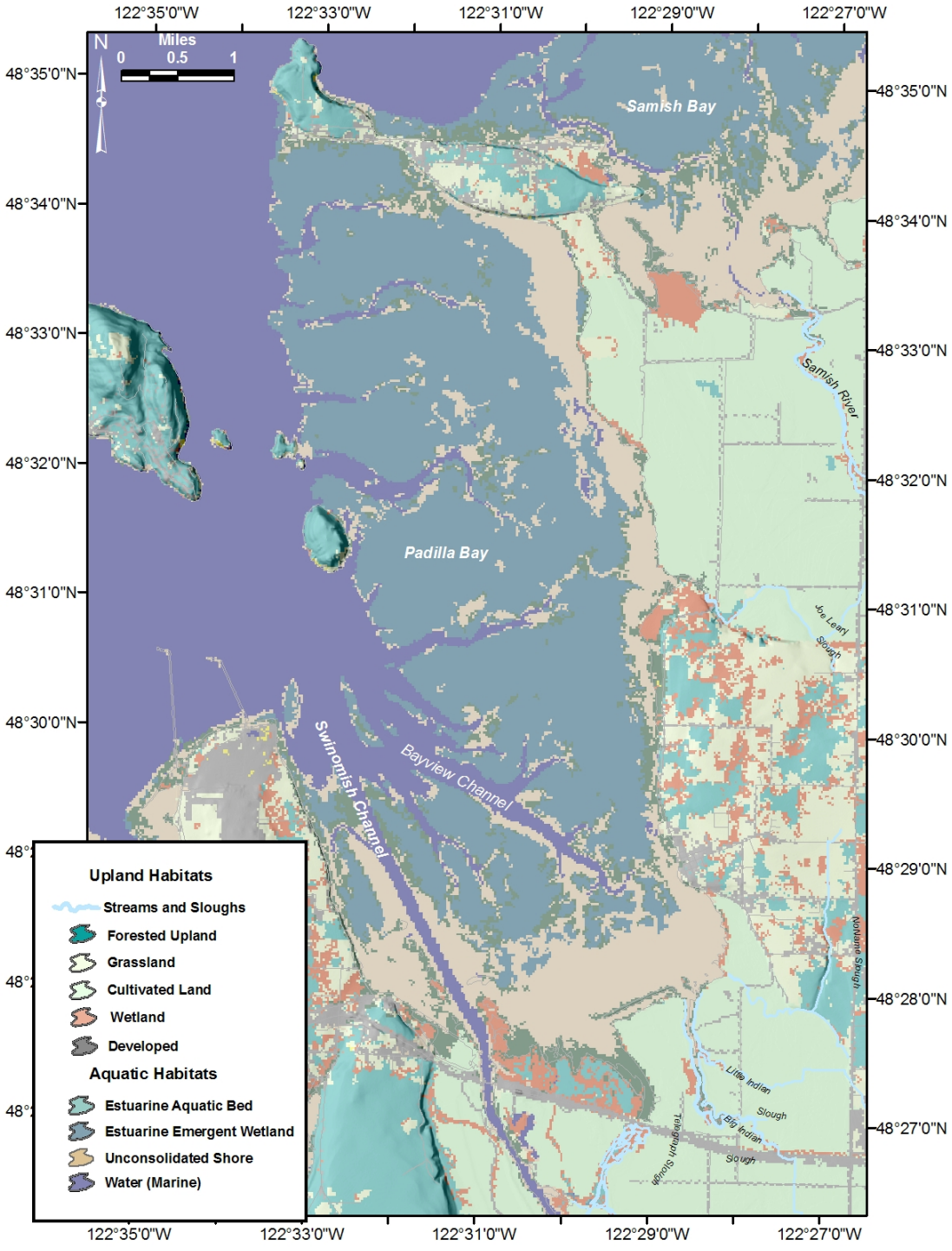

Figure 2.5 – Padilla Bay Habitats from 2001 Coastal Change Analysis Program (CCAP).

Habitats and Their Flora

This description proceeds geographically from the uplands and freshwater systems, down through the intertidal to the subtidal portions of Padilla Bay

Uplands and Freshwater Sloughs

The upland areas surrounding the bay are characterized by second growth forests of mixed conifers, broad leaf trees and occasional pastures. Douglas-fir (*Pseudotsuga menziesii*), western red-cedar (*Thuja plicata*), red alder (*Alnus rubra*), Pacific madrone (*Arbutus menziesii*) and big-leaf maple (*Acer macrophyllum*) are the most common trees. The shrubs and understory are mostly Oregon grape (*Berberis nervosa*), stinging nettle (*Urtica dioica*) and salal (*Gaultheria shallon*).

The freshwater sloughs around Padilla Bay contain Lyngby's sedge (*Carex lyngbyei*) and tufted hairgrass (*Deschampsia caespitosa*).

Dredge spoil materials were historically pumped along the perimeters of the Swinomish Channel when maintenance dredging operations were carried out. These areas are dominated by dune wildrye (*Leymus mollis*), red fescue (*Festuca rubra*), and cheat grass (*Bromus tectorum*).

Dikes

The dikes constructed over the past century along the salt marshes, sloughs and mudflats support clumps of blackberries (*Rubus* spp.), wild rose (*Rosa pisocarpa*), and small stands of red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*) and willows (*Salix* spp.). On the dikes bordering agricultural lands red clover (*Trifolium* sp.), English plantain (*Plantago lanceolata*), Canada thistle (*Cirsium arvense*), redtop velvet grass (*Holcus mollis*), quack grass (*Agropyron repens*), and pearly everlasting (*Anaphalis margaritacea*) are found.

High Salt Marsh

Of the 700 acres of high salt marsh meadows in the upper intertidal zone, salt grass (*Distichlis spicata*) and pickleweed (*Salicornia virginica*) predominate. Other species include orache (*Atriplex* sp.), Canada sand spurry (*Spergularia* sp.), gumweed (*Grindelia integrifolia*), seaside arrow grass (*Triglochin maritimum*), and foxtail barley (*Hordeum* sp.).

One major salt marsh area (the former Sullivan-Minor property) located on the central eastern shore of the bay is a result of an early dike breaching and washing away. This area is characterized by seven plant communities listed in Granger & Burg (1986) as: 1) log dump (low elevation), 2) Lyngby's sedge (*Carex lyngbyei*; eastern border/northern third), 3) Cattail (*Typha latifolia*) - reed canarygrass (*Phalaris arundinaceae*; southeast corner), 4) saltgrass (*Distichlis spicata*; transitional between low and high marsh), 5) pickleweed (*Salicornia virginica*; low elevation and around salt pans), 6) saltgrass (*Distichlis spicata*) - pickleweed (*S. virginica*; low to moderate elevations in marsh), and 7) bentgrass (*Agrostis alba*) - *Aster* sp.; (high elevation, southern portion).

Introduced Species

Of significance due to its possible adverse effects on native salt marsh, mudflat and seagrass habitats, is the presence of *Spartina* (cordgrass) in the bay. There are two species of *Spartina* in Padilla Bay. *Spartina alterniflora*, or smooth cordgrass, was introduced by a gun club in the mid 1940s probably to control erosion of a long narrow island. Although *S. alterniflora* flowers in Padilla Bay, the flowering is late (October to November) and seed production is limited. The second species, *Spartina anglica*, is the more aggressive species in the bay. *Spartina* X *townsendi* — a cross between *Spartina alterniflora* and *Spartina maritima* (the British species) — was planted on Camano Island in the 1960s. The hybrid is sterile, but through a chromosome doubling event called allopolyploidy, it becomes the fertile *Spartina anglica*. This plant is vigorous and goes to seed throughout the summer. The seeds are carried on bay currents to new areas and the original plantings have created an infestation that spreads from Port Susan Bay to Camano Island, Whidbey Island, and Skagit Bay. Seed carried through the Swinomish Channel finds suitable habitat for germination and growth in Padilla Bay.

Spartina is classified as a noxious weed in coastal Washington, and the Washington State Department of Agriculture oversees control efforts in this State. The Reserve reduced the amount of *Spartina* in the bay from 17 acres to 5 acres through Integrated Weed Management control from 1993-1999. By 2007 the extent of *Spartina* had been reduced to less than 0.10 acre. The control of *Spartina* does require monitoring and ongoing management measures. Additional information on *Spartina* can be found in the Natural Resources Stewardship section of this document.

Estuarine

The estuarine flora of Padilla Bay consists primarily of the eelgrasses *Zostera marina* and *Z. japonica*. These are vascular marine grasses which actually flower and send rhizomes through the sand and mud to sprout new blades of grass. This seagrass meadow covers approximately 7,500 acres of the bay (Bulthuis, 1991a). Nowhere else in the coastal regions of Washington has such a large, contiguous meadow been mapped. The salinity and sand/mud matrix of the bay's bottom and shallow depth are good for its growth, as is the absence of major sediment inflows via major river inputs. The eelgrass is used by a myriad of creatures from small marine snails to the black brant (sea goose), which eats eelgrass as a major part of its diet. Many smaller organisms live around and on the grass blades. Small fish obtain prey and worms burrow for bits of eelgrass detritus. The detritus, colonized by bacteria, is eaten or converted by microbes into nutrients.

Common algae found in the intertidal zone are sea lettuce (*Ulva* sp.) and *Enteromorpha* spp., thin translucent green algae. Other common genera include *Laminaria*, *Ceramium*, *Gracilaria*, and *Fucus*. Colonial diatoms coat the surface of the mud exuding silver bubbles of oxygen. A larger red algae (*Tiffaniella snyderae*) is sometimes found.

Fauna

Some of the more spectacular fauna of Padilla Bay include the bald eagle (*Haliaeetus leucocephalus*) which not only feed on small mammals from the surrounding agricultural land but also take dead fish and other organisms from the bay. Eagles have also been

observed hunting and killing ducks. Besides a large wintering population, a few pairs reside in the area using nest sites around Padilla Bay.

Padilla Bay and Samish Bay support one of the largest known wintering populations of peregrine falcons (*Falco peregrinus*) in North America. The endangered *anatum* subspecies occurs here. All five species of North American falcons have, on occasion, been seen here in a single day. Ten species of raptors winter in this area including peregrine falcon, merlin (*Falco columbarius*) and snowy owl (*Nyctea scandiaca*),

During the winter the bay contains an average 50,000 ducks of 26 species. Counts as high as 120,000 have been made, however. The black brant (*Branta bernicla nigricans*) winters at Padilla Bay. Peak numbers of 20,000 dwindled to 2,000 to 3,000 in 1980-81 causing a temporary ban on hunting black brant to be imposed by the Department of Wildlife and the US Fish and Wildlife Service in 1983. A limited brant season was opened again in 1987.

Two great blue heron (*Ardea herodias*) rookeries are located north and southwest of the bay, both outside of Reserve property. The larger heron rookery (around 200 pair) is located on private property on Samish Island. The smaller rookery is located just north of Highway 20 on March Point. At times over 100 have been counted in the bay stalking fish and crabs in the shallow water.

One of the most prolific visitors is the dunlin (*Calidris alpina*). These shore birds are found by the thousands, probing the mud on receding tides with their long beaks for amphipods, insects, worms, and small molluscs.

More than 240 species of birds can be found at Padilla Bay, making it one of the most interesting areas for birding in the state.

Marine mammals found in Padilla Bay include the harbor seal (*Phoca vitulina*) and river otter (*Lutra canadnsis*). Harbor seals use the bay's isolated sand and mud flats along tidal channels as haul-out sites for resting, grooming, and sunning. Large numbers of seals have been observed in the bay near Indian and Joe Leary sloughs.

Outside of Padilla Bay in deeper water, pods of killer whales (*Orcinus orca*) have been seen regularly. The harbor porpoise (*Phocoena phocoena*) and Dall's porpoise (*Phocoenoides dalli*) are occasionally found in the deeper waters near the bay.

A common fish using the bay is the herring (*Clupea harengus*). They normally use eelgrass as a spawning substrate upon which to lay eggs, although this has not been recently observed in Padilla Bay. Smelt (*Hypomesus pretiosus*) also use the area for spawning. Padilla Bay is an important migration route for juvenile chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), pink (*O. gorbuscha*) and chum salmon (*O. keta*). To pink and chum salmon, Padilla Bay is especially important as a rearing area. They use the nearshore and shallow areas to obtain food before they venture to deeper water. Common flat fish include English sole (*Parophrys vetulus*), Dover sole (*Microstomus pacificus*), rock sole (*Lepidopsetta bilineata*) and starry flounder (*Platichthys stellatus*).

Marine invertebrates are found abundantly in the bay's mud and sand. Examples are polychaete worms such as the lugworm (*Abarenicola* sp.) and *Capitella*. Clams include the bent-nosed clam (*Macoma nasuta*), the mud clam (*Mya* sp.) and *Transenella* sp.

Many other organisms live on the surface probing the sediment for food or discarded material. Shrimp and crab, particularly the Dungeness crab (*Cancer magister*) are the most common.

Terrestrial non-marine mammals include black-tailed deer (*Odocoileus hemionus columbianus*), raccoon (*Procyon lotor*), red fox (*Vulpes fulva*), coyote (*Canis latrans*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*) and the long-tailed weasel (*Mustela frenata*).

Major fish and wildlife concentration areas in the bay and adjacent lands are mapped in Figure 2.6. A generalized species relationship and food pyramid for Padilla Bay is diagrammed in Figure 2.7.

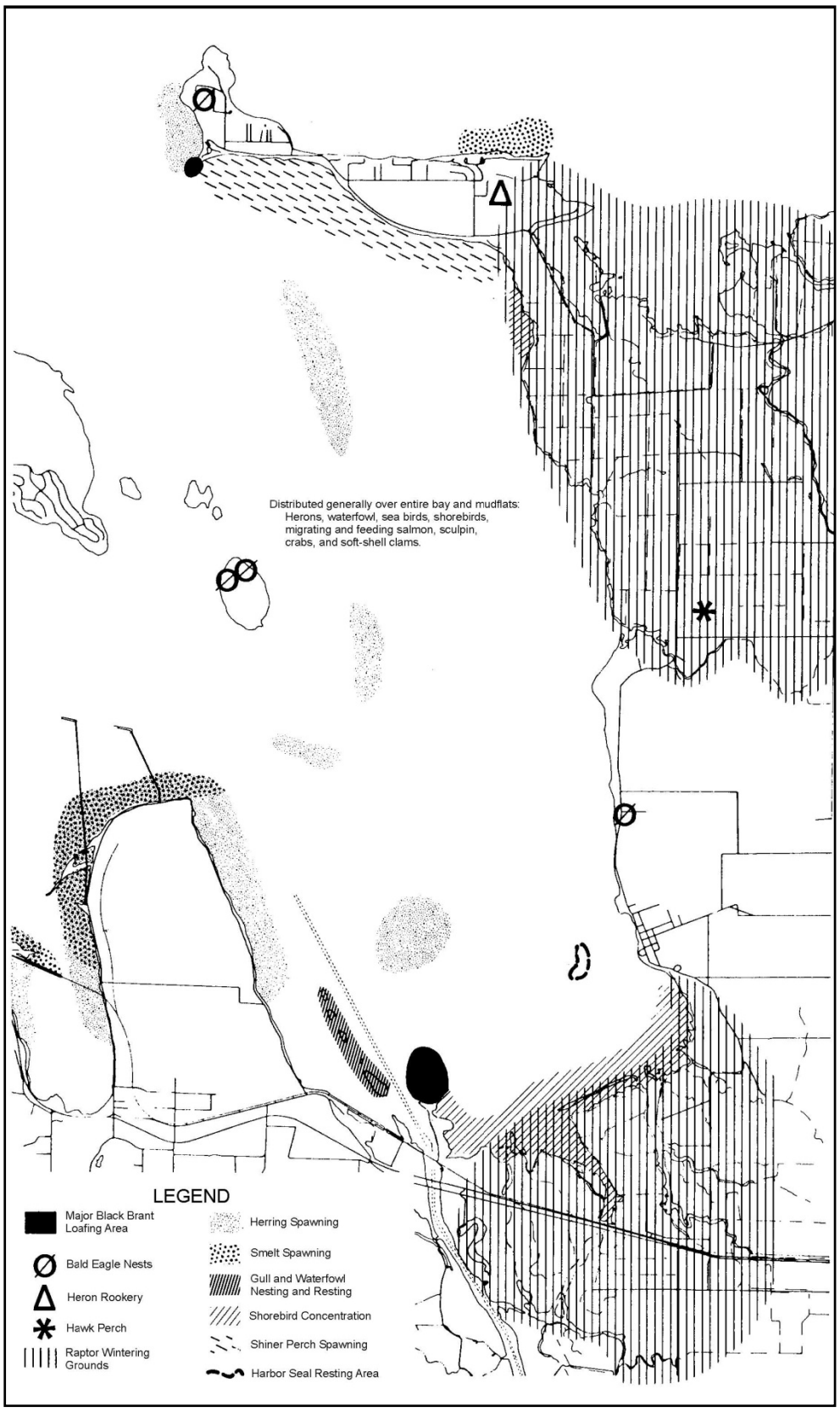

Figure 2.6 – Major Fish and Wildlife Concentration Areas

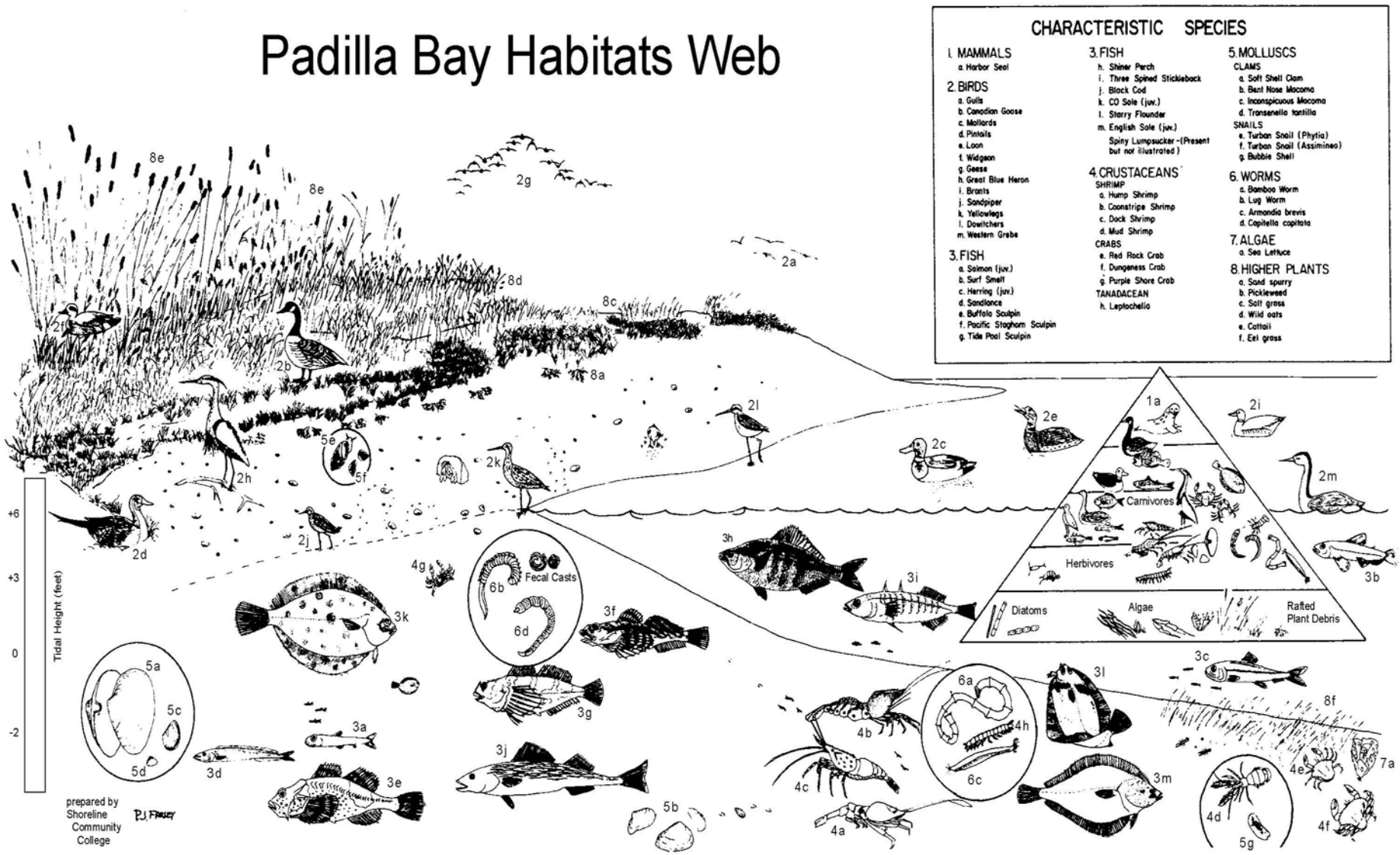

Figure 2.7 – Padilla Bay Habitat Web

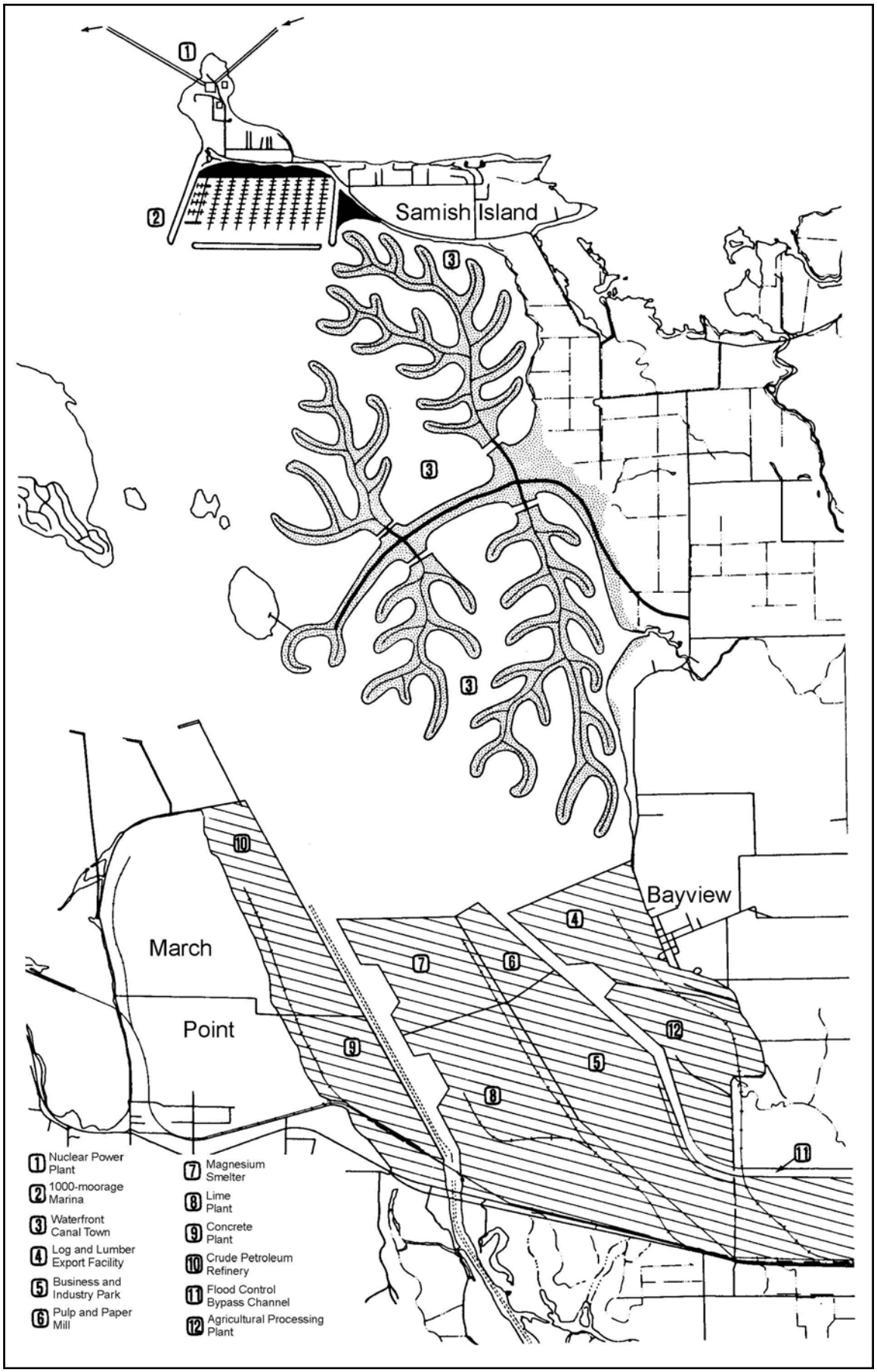

Figure 2.8 – Composite of Past Development Proposals

Local Land Use and Associated Activities

Historic Uses and Proposals

Since the arrival of settlers in the late 1800s and the initiation of logging, diking, and agriculture, significant changes to the margins of the bay and the surrounding lands have occurred. Thousands of acres of marsh and mudflat have been converted to prime farmland with the construction of drainage systems, and the incorporation of many farms into diking and drainage districts has provided comprehensive protection through their ability to collect taxes for construction of dikes and maintenance of drainage ditches. The dikes that exist around the perimeter of Padilla Bay's eastern and southern shores have been in their current form since about 1918. Other diking proposals were considered, such as the one to dike the entire bay (this was actually started in the early 1920s), but were abandoned due to financial or physical problems.

During the last 70 years various other projects and developments have been proposed for the bay. Many of these proposals are located on Figure 2.8. In-text references to these proposals are keyed to the map legend by numbers in brackets, e.g. [1].

Most prominent was a massive dredge and fill residential development proposed by the Orion Corporation [3]. With the 1993 acquisition of their 8,004 acres of Orion's tidelands this proposal is no longer under consideration. Public meetings and hearings in the 1960s identified a proposal for a massive industrial park development for the entire south end of the bay [4, 5, 6, 7, 8, 9, 10, and 12].

With the passage of the State Shoreline Management Act in 1971 and the designation of Padilla Bay as a Shoreline of Statewide Significance under the act, the majority of such proposals are no longer feasible.

Current and Anticipated Activities

During recent years significant developments in the watershed, growth along shorelines, and modernization of agricultural methods have brought about changes that may have impacts on Padilla Bay's resources. During the late 1950s two major refineries were constructed on March Point, on the western shore of Padilla Bay. Utilizing wharves for unloading, millions of barrels of crude oil and other petroleum products are transported via tanker through Guemes Channel every month, and tankers are frequently lightered off Hat Island, adjacent to the Reserve boundary. Planning for possible spills and the resulting hydrocarbon clean-up activities has become institutionalized within a regional committee of representatives from private industry, government (including Padilla Bay NERR staff), and volunteer groups.

Intensive agricultural use of the lands surrounding two sides of the bay and within the watershed includes the utilization of modern pesticides and herbicides. The delicate ecological balance of the eelgrass community could become upset with spills or mishandling of these substances. Increased turbidity of the waters in the bay due to heavy inputs of sediment from agricultural lands might also cause damage to portions of the sensitive eelgrass meadow. The same concerns are shared with the use of fertilizers and other organic inputs which could raise nutrient levels in the sloughs and create excessive

algae growth on eelgrass plants. Study of these topics is a major emphasis of the Padilla Bay NERR Research and Monitoring programs and are discussed in those chapters.

With every local flood season discussion is often heard regarding construction of the "Avon Bypass" [11]. This Skagit River flood bypass channel, if built, would divert flood flows around the city of Mt. Vernon and the lower Skagit Flats and send them west to Padilla Bay, either directly into the south end of the Bay or just south of this into the Swinomish Channel. Effects of the inflow of water and sediments from an actual flood via this channel project would be significant to the present ecological structure of the bay. This project, and similar concepts to move flood water from its present channel to Padilla and/or Samish Bay are currently under evaluation by the Army Corps of Engineers as part of their Skagit River Study. The Department of Ecology, with input from the NOAA Estuarine Reserve Division, has informed the Corps of the problems such a bypass channel would create to the ecological status of the Bay, and has noted our operational policies and federal/state agreements which serve to avoid and prevent such impacts.

Through a committee process and working closely with many agencies and research organizations, over 20 significant concerns were identified that could result from the flood bypass channel, the major one being the impact of huge quantities of sediment being introduced quickly into the Padilla Bay ecosystem. The proposed channel would carry 80,000 cubic feet per second at full capacity, depositing the sediment load as waters slowed near the outlet into the Swinomish Channel at the south end of the Bay. Seagrasses, such as the 7,500 acres of eelgrass in Padilla Bay, can be smothered directly or shaded by sediment in the water column to the point where photosynthesis cannot successfully occur. The Department of Ecology, with support from several state and federal agencies, strongly recommended that the Army Corps and Skagit County conduct research to identify the impact to the eelgrass beds, and other resources, as part of the environmental impact statement process. Initial portions of this research began during 2001-03, but are now on hold as the County and its consultants investigate additional floodwater storage behind existing dams on the upper Skagit River as a more cost-effective method of flood control. Costs estimated for the bypass channel as proposed in 1999-2001 were approximately $250 million. More recently, the county initiated has begun an update of their Comprehensive Flood Management Plan for the Skagit River. Reserve staff are involved in this effort and will contribute input and advice as needed.

Many wildlife species, particularly waterfowl, are sensitive to disturbance by motorboats. Increased marina construction throughout the region has caused an increase in the boat traffic on the Swinomish Channel (along the Reserve's western border), and a proposed marina in the northern reaches of the Swinomish Channel is very near important black brant graveling areas.

A railroad line runs east to west along the southern shore of Padilla Bay and crosses the Swinomish Channel. This line carries many tank cars to and from the refineries and other industrial sites on March Point. Preparation for the possibility of derailments and spills in this area, given the type of materials transported, is prudent.

Other activities and/or situations of concern to the protection of Reserve resources include leachate from the county's current and historic landfills within the watershed, introduced species within Reserve boundaries (more than *Spartina* is of concern),

development along shorelines and in the watershed and resulting runoff, and other uses that might adversely impact the eelgrass community. In 2008 the old March Point landfill, just west of the Reserve boundary, was added to the Department of Ecology's list for clean-up action. Reserve staff will coordinate with Ecology Toxic Clean-up personnel and provide historic and scientific data in our library. An analysis of issues within Padilla Bay NERR that may require research efforts can be found in the Research and Monitoring Section of this document.

With growth occurring throughout Skagit County, increasing residential, commercial and industrial development in the Padilla Bay watershed poses rising water quality and water quantity issues. Recently, monitoring results have forced a shellfish harvest closure adjacent to the community of Bayview and funds are being sought by the Skagit County Health Department for residential septic system testing. Either too much (winter) or too little (summer) surface water entering the sloughs, combined with excess nutrients from farming and lawn care, have placed some sloughs on the State's Impaired Waters list. The Reserve is participating in studies with agencies and local citizens to remedy these problems while improving habitat function, and increasing upland surface water storage and groundwater recharge.

3 Reserve Administrative Plan

Administration of the Reserve is a cooperative effort involving the managing agency and a variety of other agencies, organizations, user groups and advisory bodies. The administrative framework provide a vehicle for management of lands, facilities, funds and people. It ensures the protection of resources, implementation of programs, and allows for the evaluation of Reserve performance.

Managing Agency and Mission

Since the management of all National Estuarine Research Reserves is delegated by Section 315 of the Coastal Zone Management Act (CZMA) to the states, the overall management and administration of the Padilla Bay NERR is the responsibility of Washington State. This responsibility, by written agreement, rests with the Department of Ecology. Implementation of various program elements at the Reserve is accomplished through a coordinated and cooperative effort among several governmental agencies, tribes, committees, universities, and private (non-profit) organizations. This type of effort is essential given that much of the management, enforcement, and operational structure relies on existing state and county authorities, laws, and programs. Figure 3.1 outlines the Padilla Bay NERR management and operational structure.

The Padilla Bay NERR is administered and managed by the Shorelands and Environmental Assistance Program of the Washington State Department of Ecology (Ecology). From 1977 to 1980 Ecology managed the nomination and project planning functions to establish the Reserve, and after official designation became the managing agency. Ecology's Shorelands & Environmental Assistance Program is the State's designated coastal management office, and is the recipient for all federal CZMA funding, including Sections 306, 306A, 309, 310 and 315 CZMA cooperative agreements. As the managing agency, state funding for Reserve operations and programs are provided from the State General Fund to Ecology. All Padilla Bay NERR staff are employees of the Washington State Department of Ecology.

Since Section 315 of the federal CZMA does not create or designate any federal regulatory authority for the NERR System, Ecology manages the Padilla Bay NERR under existing state authority. No new regulations were adopted or implemented as a result of the designation of Padilla Bay NERR. Meeting the standards of the federal operating guidelines is dependent on the adequacy of existing local, state and federal laws.

The State of Washington established the Padilla Bay NERR in 1980 to provide a representative area for long-term research, monitoring, and education/interpretation. The Reserve has adopted a mission statement consistent with state and federal guidelines as follows:

> The mission of the Padilla Bay NERR is to promote improved management and stewardship of estuarine ecosystems in the

Columbian/Puget Sound Biogeographical region through research, monitoring, education and interpretation.

Supporting Agencies

Cooperation with other agencies and entities provides increased management and operational efficiency. Padilla Bay NERR coordinates with the Washington State Parks and Recreation Commission in the management of Saddlebag and Dot Islands and with the Washington State Department of Natural Resources in the management of Hat Island. These islands on the Reserve's western perimeter are owned by these respective agencies, but the properties are managed under a cooperative agreement. Padilla Bay NERR also utilizes the services of the Washington State Department of General Administration for real estate services related to property acquisition, and for architectural/engineering services related to facility construction and design. Program and operational coordination also occurs between the Reserve and Skagit County Parks, the Skagit County Conservation District, Educational Service District 189, state and regional colleges and universities. Program and project support also comes from other offices within the Department of Ecology. Details related to cooperation with other agencies for specific programs can be found in other chapters of this plan (Research, Education, and Natural Resource Stewardship).

Operational Partnerships

Northwest Straits Marine Conservation Initiative

In 1998, at the request of US Senator Patty Murray and Representative Jack Metcalf, Padilla Bay NERR was asked to administer and house the newly-established NW Marine Conservation Initiative. This program, rising from the ashes of a long-proposed marine sanctuary, was established and funded by Congress as a grass-roots organization representing the seven northwestern coastal counties (each with a Marine Resource Committee), tribes, and local citizens. Based on a series of priority objectives and benchmarks adopted by a citizen's committee, the Initiative, through an elected and appointed NW Straits Commission and its staff, is focused on making improvements to marine habitats and related species populations throughout the region. Funds for this program are directed from NOAA to the Department of Ecology and expended for a variety of planning, scientific, and on-the-ground projects consistent with the annual workplan prepared by the NW Straits Commission. The Commission is staffed by a full-time director and three additional staff that assist with program implementation, plus Reserve staff that assist with administrative responsibilities. The director of the Commission is hired by Ecology and reports through the Reserve manager in cooperation with the Commission's Executive Committee. There are many opportunities for joint programming and projects between the Reserve and the NW Straits program, including education, habitat restoration, scientific study and monitoring.

Padilla Bay Foundation

The Padilla Bay Foundation, incorporated in late 1987 as a non-profit, tax-exempt corporation in the State of Washington, was established for the purpose of generating and providing supportive funds and resources for the management, development and operation of the Padilla Bay NERR. The Foundation is managed by a 15-member Board of Directors, and has a general membership program for all ages. Support for Padilla Bay NERR activities has made possible the creation of research and education assistantship/intern positions, scholarships, matching funds for federal grant awards (educational projects), public interpretive signage and displays, equipment, computer and printing purchases and services, design work on new exhibits for the Interpretive Center, and construction projects. The Reserve manager meets regularly with the Foundation Board in an advisory capacity and submits both short and long-term project assistance priorities for consideration.

Advisory Bodies

The Reserve maintains standing oversight and advisory committees to assist in program implementation, long-term planning, and regional/local relationships.

Oversight Committee

The Oversight Committee is composed of the Skagit County Board of Commissioners and was established during preparation of the final environmental impact statement for the Reserve in 1980. Their function is to provide the Reserve manager with input and be a "sounding board" for ongoing and proposed activities in and adjacent to the Reserve, both from the Commissioner's perspective as well as on behalf of their individual constituents. The county has provided invaluable assistance and advice to the Reserve over the past several years. The committee does not approve or disapprove Reserve policy but lends advice and counsel on how Reserve programs may affect the county's residents and provides input from interested citizens. The Reserve manager provides the Oversight Committee with an annual report outlining accomplishments and significant actions and/or issues of concern, and is available to meet with the Committee at their request.

Advisory Committees

The **Research Advisory Committee** was established in 1984 for the purpose of providing guidance and evaluation in the implementation of the Reserve's research and monitoring programs. Committee membership includes representatives from state universities and colleges, federal and state resource agencies, and major laboratories.

The **Education Advisory Committee** was established in 1985 for the purpose of providing guidance and evaluation on the implementation of the Reserve's educational and interpretive program. Representatives are from local and regional school districts, the educational service district, the Office of the State Superintendent for Public Instruction, and regional universities.

The **Coastal Training Program Advisory Committee** was established in 2001 to provide guidance on development and implementation of a new program to provide on-

going training for coastal zone managers. The committee is composed of representatives from state agencies, local governments, and Washington Sea Grant Program.

The **Natural Resource Advisory Committee** was established in 2002 with representatives from the Reserve (manager, stewardship coordinator, research coordinator), local and regional field biologists and ecologists from agencies and the tribes, and university staff. The purpose of the committee is to provide guidance regarding natural resource issues and concerns, perspectives of various agencies and tribes and cooperative solutions to problems.

Reserve Staff

Staff and personnel at the Reserve are employees of the Washington State Department of Ecology. An adequate and well-trained staff is essential to meet the educational, research, monitoring, stewardship, interpretive, administrative, coastal training and support needs related to program operations at Padilla Bay NERR. The Reserve, as a Department of Ecology Section, reports to the Manager of the Shorelands and Environmental Assistance Program. Padilla Bay NERR staff and their general program responsibilities are listed below. In some instances, functional duties may be shared by more than one staff, or some staff may have assignments within more than one functional area. The following staffing responsibilities are carried-out at the Padilla Bay NERR (see Figure 3.1):

Reserve Manager: This position serves as an Ecology Section Supervisor, reporting to the agency's Shorelands and Environmental Assistance Program Manager. The role of this position is multi-functional in scope, with responsibility for overall operation, administration, policy and budget development for the Reserve. Detailed duties of this position include supervision of Reserve staff and Reserve programs, short- and long-term planning, facilities management and capital development, public relations, policy development and enforcement, establishment of operational procedures, coordination with other agencies and the Padilla Bay Foundation, contract and administrative agreements, budget development, and liaison responsibilities with senior management within Ecology, NOAA's Estuarine Reserve Division, and with other elected and appointed government officials. The manager also participates on the Shorelands and Environmental Assistance Program's Management Team and the CZM Team, and provides administrative oversight for the NW Straits Marine Conservation Initiative budget and staff.

Research and Monitoring Coordinator and Staff: This position is responsible for implementation of the Reserve's research and monitoring programs through direct field and laboratory work, grant preparation, coordination with visiting researchers and the research advisory committee, technical assistance to Ecology staff, publication of Reserve technical reports and newsletters, and coordination with the national research coordinator within NOAA's Estuarine Reserve Division. Duties also include implementation and supervision of the NERR System-wide Monitoring Program and the NERR Graduate Research Fellowship program. Due to the scientific expertise of this position this individual often is called upon to provide technical assistance to other offices of the Department of Ecology on coastal habitat issues. An additional 2-3

technical, research and monitoring and staff are employed or contracted to provide laboratory, sampling,, and data management services.

Education Coordinator and Staff: This position is responsible for the development and implementation of the Reserve's interpretive education program, including curriculum development, maintaining exhibits and displays, teaching, leading teacher workshops, organizing educational volunteers, conducting programs, and coordination with the national education coordinator within NOAA's Estuarine Reserve Division. Additional on-site education staff (2-4) are involved in implementation of educational and outreach programs related to estuaries, watersheds, and coastal habitats either full-time or on a seasonal basis. Stable funding is needed for some of these positions.

Natural Resource Stewardship and Operations Coordinator: This is a full-time position responsible for implementation of the natural resource stewardship program and for Reserve operations in the scheduled absence of the manager. This includes coordination with staff from many other resource agencies and tribes, field investigations, and management of significant projects and contracts.

Coastal Training Program Coordinator: This is a full-time position responsible for development and implementation of the program to provide on-going training for coastal zone managers. It requires close coordination with the State CZM Office and local land-use planning organizations and staff.

Watershed and Community Outreach Coordinator: This is a full-time position responsible for watershed issues and working with the community to improve water and habitat quality, including non-point pollution problems. Outreach duties extend to advanced students and adult audiences. This position also manages the Stream Team program which, in cooperation with the Skagit Conservation District, implements a 50-member volunteer water quality sampling program through the lower Skagit River delta.

GIS Specialist: This is a full-time position responsible to coordinate GIS-based projects for PBNERR and provide relevant technology and products for other Reserve and agency programs as needed.

Facilities Services Coordinator: This is a full-time position responsible for the maintenance, safety and security of all facilities, grounds, and vehicles, and the operation and stocking of display aquariums in the interpretive center. This position is also responsible for supervision of other maintenance workers and private contractors, minor construction duties, and supervision of Washington Conservation Corps/AmeriCorps employees involved in facilities operations and support functions. Funding for an additional maintenance position is needed.

Receptionist/Secretarial: This is a full-time position responsible for managing the secretarial duties for the Reserve and the manager, including word-processing, mailing, telephone coordination, filing, ordering, scheduling, budget reports and record keeping, and answering questions from the general public.

AmeriCorps/Washington Conservation Corps Employees: These programs, funded by the state legislature and the federal government, are aimed at providing introductory employment to persons 18-25 years of age in conservation-oriented jobs. At Padilla Bay NERR, three to five employees are retained under an agreement with Ecology's

AmeriCorps/WCC office and are supervised by applicable Reserve staff. These positions are normally assigned to operational, education, stewardship and research tasks.

Assistantships and Internships: Funding from federal and state grants and the Padilla Bay Foundation provides opportunities for college-level training and employment in both research and educational fields at the Reserve. These positions can be either temporary staff appointments or arranged as contracted projects. Intern positions require at least junior-year standing and assistantships are available at the graduate level. All positions require participation of the student's undergraduate or graduate advisors in designing and approving project content.

Volunteer Coordinator: Establishment of a full- or part-time volunteer coordinator is essential in the development of a comprehensive volunteer/docent program. This position would market, train, evaluate, and coordinate volunteers and match their talents with the needs of the Reserve. While these duties are currently covered by the Education Coordinator and informally by other functional staff, discussions are underway to fill or jointly fill this position in cooperation with the Padilla Bay Foundation.

Future Administrative Needs and Opportunities

The Reserve's managing agency (Ecology) is a key partner in the newly-established Puget Sound Partnership, created by the Governor in mid-2007 to focus efforts on the health and restoration of the Sound. As planning and implementation details unfold on this new initiative the Reserve anticipates increased coordination and expansion throughout all of our programmatic sectors, including Coastal Training, Education, Research and Monitoring, and Stewardship. This will involve new and/or expanded collaboration with other offices and divisions within the Department of Ecology, including the Water Quality, Environmental Assessment, and Toxics Programs.

Over the next five years the Reserve anticipates increased coordination and possibly project planning and development with the Washington Department of Fish and Wildlife on lands they have recently purchased within the Reserve's boundary. These actions will involve habitat improvements and wetlands and water management.

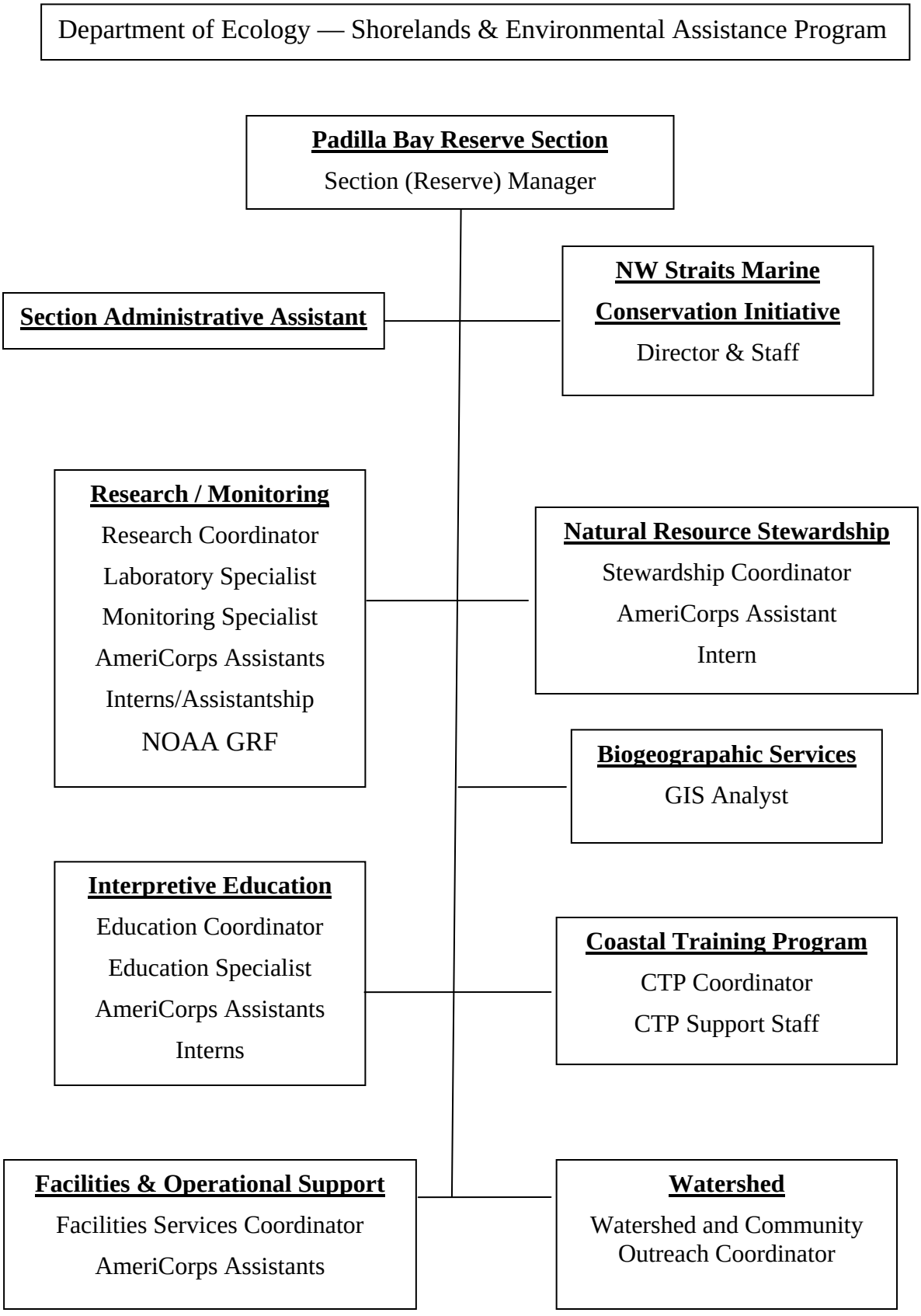

Figure 3.1 – PBNERR Administrative Structure

Goals, Objectives and Actions

Goal: Protect and improve habitat and biological diversity within the Reserve and the Puget Sound biogeographic region.

Objective: PBNERR role in the new Puget Sound Partnership Action Plan clarified and articulated.

Action: Participate in PSP Action Plan development and sub-area planning workshops; share databases and GIS information.

Action: Align Ecology coastal management priorities with PSP Actions and translate to specific tasks for PBNNERR.

Objective: Agencies owning lands within the Reserve boundary or proposing projects that impact Reserve resources will develop plans coordinating activities and projects with the Reserve.

Action: Develop cooperative agreement with WDF&W for use of their agricultural lands.

Action: Maintain active participation in Skagit County flood management studies and committees.

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Volunteers actively engaged in core activities at the Reserve

Action: Hire volunteer coordinator and develop program for PBNERR and PBF.

Action: Advisory committees will meet annually with specific agendas and responsibilities.

Goal: The Reserve has adequate and stable long-term fiscal resources to manage resources and implement programs.

Objective: Funding for educational and maintenance positions is obtained.

Action: Write grants to fund educational positions and other opportunities.

Action: Develop new fund source or mechanism to address facility maintenance needs.

Action: Provide fiscal administration to ensure funds are solicited, managed and utilized efficiently and within State regulations.

Action: Work with the PBF staff and Board to fundraise through their annual plan for gifting and trust donations.

4 Boundary and Acquisition Plan

The State of Washington has been purchasing or receiving (via donation) properties within its proposed boundary area since 1980. The long-term protection of these lands, both core and buffer areas, is critical to the overall mission of the Reserve and its use for research, education, monitoring, and interpretation. Acquisition of lands and tidelands within the proposed boundary from willing sellers will continue, subject to availability of funds. No specific boundary expansions are identified in this plan, although coordination with other local and regional organizations to explore upland (watershed) conservation easement will occur. An emphasis will be placed on obtaining privately owned parcels (in-holdings) within the current boundary.

Boundary and Amendments

The original proposed boundary area for the Padilla Bay NERR was established in 1979 by the Governor's Padilla Bay Steering Committee & Technical Advisory Subcommittee (see Figure 4.1) and includes approximately 13,500 acres. This includes tidelands, uplands, and various other minor ownerships. It also includes Hat Island which was added to the overall Reserve area in 1998 (99 acres).

The Reserve boundary included over 1,700 subdivided tideland tracts and many upland parcels. Over the past 28 years, through purchase, donation, litigation and settlement, the Reserve now owns and manages approximately 12,100 acres of the proposed 13,500. Other state agencies own 400 acres and PBNERR has cooperative agreements with these. The remaining 1,000 acres (half in farmland, half in tidelands) remains in private hands and PBNERR will continue acquisition efforts for fee simple title on the tidelands and other protective easements on the farmland in the years ahead.

Due to historic sale and subdivision of tidelands, the ownership of Padilla Bay is highly fragmented. Detailed mapping of specific property ownership status is kept on file at the Reserve office. A general description of the Reserve's proposed boundary is as follows:

South: The southern boundary is the Burlington Northern Railroad right-of-way, which is located parallel to State Highway 20.

East: The eastern boundary, approximately 8 miles long, follows Bayview Edison Road northward to No-Name Slough, then follows the dike and shoreline northward along Bay View Ridge and the agricultural lands to Samish Island. It also includes Bayview State Park and the Breazeale property where the Reserve's facilities are located.

North: The northern boundary is parallel with, but located 500 feet south of, Samish Island, a high-density residential area.

West: The western boundary is open water and is easterly of the Swinomish Channel. The southern part of the western boundary is located consistent with the claimed Swinomish Indian Tribal Community eastern reservation boundary. The northern part of the boundary is the seaward boundary established in 1931 by the State Commissioner of Lands and the western boundary of Saddlebag Island State Park. The new addition (1998) to the Reserve (Hat Island) changes the western boundary to include the upland acreage of the Island.

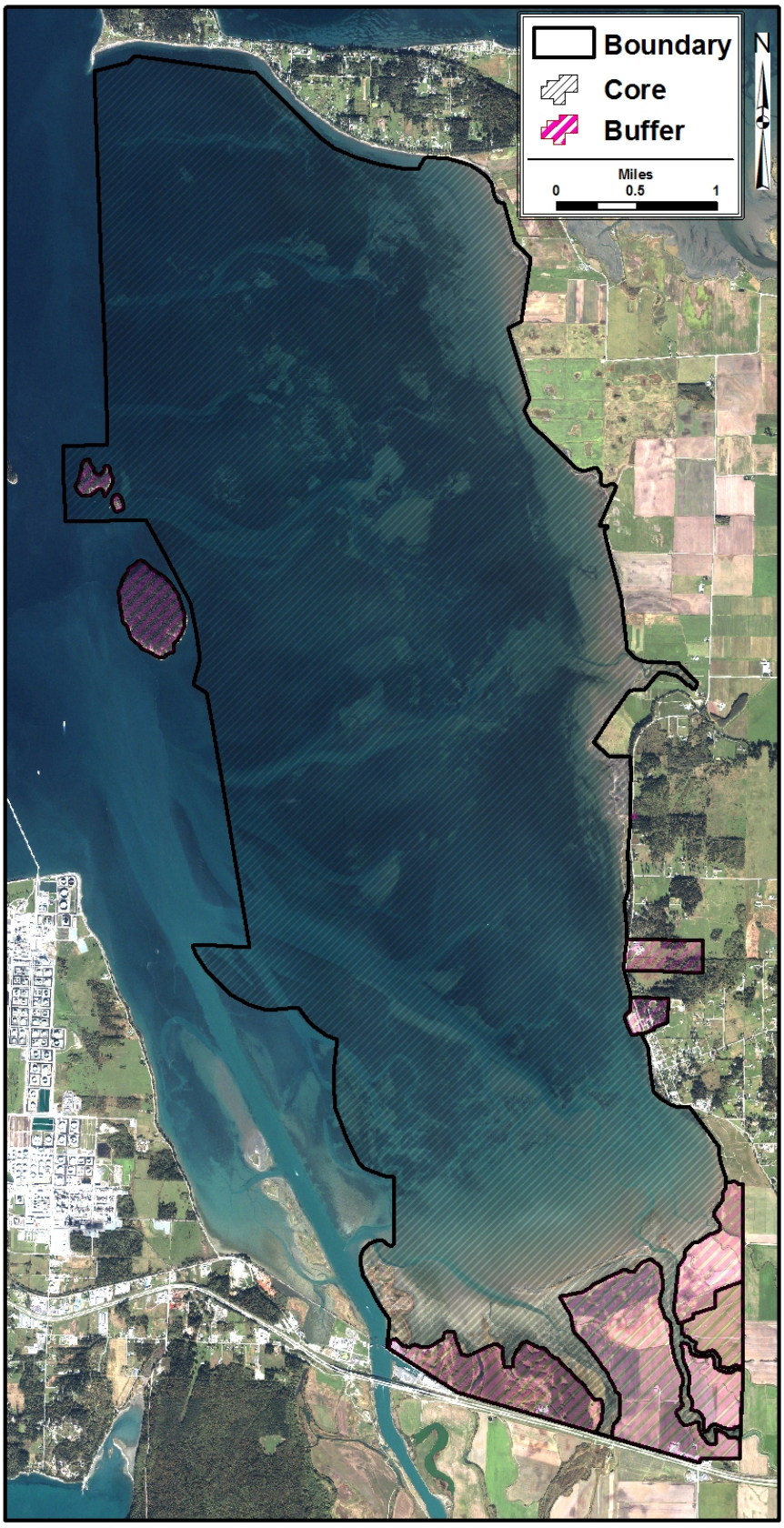

Figure 4.1 – PBNERR Boundary, Core, and Buffer Map.

There are eight basic groupings of real property within the Reserve, described as follows.

1. Padilla Bay Tracts

The Padilla Bay Tracts total 846 parcels extending from the northern part of the Reserve near western Samish Island to the southern area near Bay View. Ownership according to title reports comprise the second class tidelands that lie between the meander line and the line of extreme low tide. The tracts are numbered from one (at western Samish Island) clockwise to a point south of Bay View where the last tract is number 846. Most tracts have a baseline distance following the government shoreline meander line of approximately 64 feet. Each tract is a thin, triangular strip of tideland with a surveyors control point near Saddlebag, Dot and Hat Islands, where all 846 tracts converge. The length of each tract varies between approximately 12,814 feet and 17,200 feet. The tracts are completely submerged at high tide and the major portion exposed at extreme low tide. There is no direct access to the properties by public road. Adjacent upland property is either high bank residential, or diked agricultural lands.

2. Associated Oyster Lands

These tracts were platted in 1930 and include some 930 acres in the southwest portion of the Reserve area. There are 943 tracts in this platted parcel and the Reserve currently owns approximately 868 acres within the plat. Each tract is about one acre in size and is a long, thin triangular strip, about six feet wide at the baseline and approximately 14,600 feet long. These tidelands do not begin at the meander line, but rather of the meander line, leaving other tideland ownerships between the tracts and the uplands.

3. Other Tidelands

Other tideland areas are also within the proposed Reserve boundary area. Another triangular-shaped tideland tract and multiple ownership tracts lie between the Padilla Bay Tracts and the Associated Oyster Lands. This unplatted tract, like the Oyster Lands, has other tidelands between the meander line and its baseline. Other tideland parcels are located around the bay, often between the meander line and the existing dikes, or outside of platted property.

4. Marsh Areas

Two significant marsh areas on the eastern central shore of the bay exist where dikes have failed and have not been rebuilt. One of these, the former Sullivan-Minor property, is owned in total by the Reserve.

The other, known locally as the “Gun Club” property, has multiple ownership. The Reserve currently has a three-sevenths interest in this parcel and is discussing acquisition options with the other owners.

These two areas total approximately 47 acres.

5. Uplands

These areas include the donated Breazeale property (64 acres), a one acre parcel adjacent to the Sullivan-Minor marsh area, and approximately 990 acres of agricultural lands between the bay-front dike and the railroad in the south end of the Reserve. This latter

area contains the 100-acre Demonstration Farm, which was purchased in the mid-1990s for long-term study of agricultural non-point pollution control. The Reserve has, in the past, conducted an appraisal of these agricultural lands for the potential purchase of development rights and is currently coordinating with the Washington Department of Fish and Wildlife as they proceed with purchase of several of these parcels.

6. Other Areas

There are other small areas outside the bounds of the previously described properties. One major area is the subtidal (bedland) area located west of the seaward boundary line. This area surrounds Saddlebag, Dot, and Hat islands and is owned by Washington State Parks and the Washington State Department of Natural Resources.

7. Boundary Amendment Areas

The Reserve's proposed boundary area changed in 1984 to include a small (less than one acre) parcel adjacent to the Sullivan-Minor (marsh) property. This was also owned by the Sullivan-Minor family, but was across the road from the saltmarsh. They wished to sell all their holdings to the Reserve without the need to file a property subdivision with the county.

Hat Island (99 acres), owned by Washington Department of Natural Resources (WDNR) since 1991, was included in the Reserve's boundary in 1999 and is co-managed by WDNR and Padilla Bay NERR. The Natural Resources Stewardship Plan (Chapter 7) provides additional information and specific policies for Hat Island. The memorandum of agreement between WDNR and Ecology is provided in Appendix D.

Core and Buffer Areas and Adjacent State-owned Lands

In this document, the Reserve boundary is still referred to as "proposed" as Washington Department of Ecology does not own all the lands within this boundary and, due to the hundreds of small subdivided parcels, probably never will. The Padilla Bay NERR proposed boundary area (see Figure 4.1), as identified by the original Padilla Bay National Estuarine Reserve Steering Committee (1979) and presented in the draft and final environmental impact statements in 1980, contains an "adequate portion of the land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation" (15 CFR Section 921.11). The boundary area encompasses two zones: key land and water areas (core areas) and adjacent state-owned lands. The core area consists of the state-owned marshes, intertidal and subtidal habitats of the bay. This is the most ecologically productive and sensitive area, and includes the extensive eelgrass meadow and areas important for juvenile salmon and crab (see Figure 2.5). Buffer areas are the agricultural lands within the southern portion of the proposed boundary area; and other minor upland parcels.

Lands in state ownership that are adjacent to core areas include the upland areas where the Interpretive Center and other facilities are located, Bayview State Park, Saddlebag, Dot, and Hat Islands, and the recently purchased agricultural lands acquired by the Department of Fish and Wildlife.

Private Lands Status

Since establishment in 1980 the Reserve's proposed boundary area has included multiple private ownerships. Upon designation, the vast majority of tidelands and uplands within the area were in private ownership. As of 2008, the Reserve owns over 11,000 acres of tidelands and marshlands within this area. In addition, the Reserve owns (Breazeale property, demonstration farm) or co-manages (Hat Island) substantial acreage in the upland area. Nearly 12,100 total acres are in Reserve (state) ownership.

The agricultural (buffer) lands in the south end of the Reserve's proposed boundary (900 acres), with exception of the Demonstration Farm (100 acres), and recent purchases by the Department of Fish and Wildlife (300 acres) are totally in private ownership, as are small portions of the tidelands, both platted and unplatted areas (450-500 acres). The original major private owner of tidelands, the Orion Corporation, settled an eleven-year litigation effort with the State in 1993 and their 8,004 acres were transferred to the Department of Ecology in the settlement. This settlement brought the vast majority of the Reserve's tidelands under Reserve control.

It is highly probable that the Reserve will always contain some private in-holdings. However, even without 100% ownership of the core area, the State has a highly-viable estuarine reserve program. The lands in the bay remain subject to current environmental regulations and the public trust doctrine, and uses must conform to these codes. The purposes of education, research, monitoring, and public access can continue to be served upon those lands currently owned by the Reserve and other public entities.

Future Acquisition Needs and Opportunities

The Reserve will continue to purchase marshes and tidelands in the core boundary area as willing sellers are identified. An on-going purchase program is underway through the State Department of General Administration/Real Estate Division, and several small purchases are usually in process throughout the year. Approximately 450-500 acres of these lands, valued at $100 per acre, remain to be purchased.

Agricultural buffer lands (500 acres) within the boundary on the southern end of the Reserve remain in consideration for less-than-fee acquisition, or by fee-simple acquisition through the Department of Fish and Wildlife or other programs. We will continue to work on all strategies to provide long-term protection of these resources including major external funding programs such as the Coastal and Estuarine Land Conservation Program (CELCP).

Additional properties lying outside the Reserve Boundary, particularly wetlands south of Highway 20 and several critical habitat areas on Bayview Ridge, are important to the ecosystem of Padilla Bay and are under evaluation. These include aquifer recharge areas and wooded stream and drainage corridors of high wildlife value. The Reserve will work with the Skagit Conservation District and other local agencies to secure protective interests in key parcels.

Goals, Objectives, Actions and Policies

Goal: Protect and improve habitat and biological diversity within the Reserve and Puget Sound biogeographic region.

Objective: Obtain all available remaining private in-holdings within the Reserve's proposed boundary from willing sellers.

Action: Complete detailed mapping of all parcels within the boundary and identify private in-holdings.

Action: Retain the Department of General Administration's real estate staff and initiate offers at appraised value on remaining core (tideland and marsh) areas (approximately 500 acres).

Action: Meet with owners of buffers lands within the boundary and critical habitat areas in the watershed and discuss opportunities for easements or less-than-fee acquisition.

Action: Investigate the availability and priority of CELP funding for key purchases.

Goal: Utilize and increase the use of Reserve science and stewardship to address priority coastal management issues.

Objective: Obtain lands or conservations easements on properties in the watershed that have maximum value to the Reserve

Action: Complete habitat mapping throughout the PBNERR watershed and identify critical areas for purchase or protection, including aquifer recharge areas and wooded stream corridors.

Action: Coordinate acquisition activities with stewardship and GIS staff to investigate lands suitable for restoration activities.

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Local and regional agencies and environmental organizations will participate in protecting and preserving key watershed lands.

Action: Hold meetings and field visits with the local land trust and articulate the value of specific parcels and current threats from development.

Action: Form working partnership with land trust, PBF and regional businesses and funding organizations to obtain funds for purchase or other protection method

Policies

1. *The Reserve will obtain control of lands and tidelands from willing sellers and participants only. No condemnation procedures will be used.*
2. *Acquisition of real property that includes residences or businesses and the relocation of people will not be initiated by the state.*
3. *Where possible, agricultural, buffer, and other uplands will be acquired through purchase of conservation easements or development rights in cooperation with existing public programs and/or private non-profit organizations.*

5 Facilities and Construction Plan

The presence of adequate facilities and equipment are crucial to successful implementation of research, monitoring, education, interpretation, and public access programs at the Reserve. On-site facilities enhance visitor learning, provide unique viewing opportunities, enable quick processing of samples, prevent widespread damage to resources by concentrating visitors in pre-determined areas, and serve as a focal point for public support of estuarine-related issues.

Facility Status

Construction of Padilla Bay NERR facilities began in 1982 with the development of the Breazeale-Padilla Bay Interpretive Center. Since that time several additional facilities, trails, and other projects have been completed (see Figure 5.1). In 1997 a Comprehensive Facilities Plan was prepared, identifying the key functional areas needed for the next 15 years. Beginning in 2001, design and site work was completed for the major components of this plan, and the first construction work (Phase I) was completed in 2005 (Interpretive Center expansion and new research laboratory). Phase II, construction of a bunkhouse, remodeling of the Breazeale house and barn, began in 2005 and was completed in early 2007. A summary of all Reserve facilities includes the following:

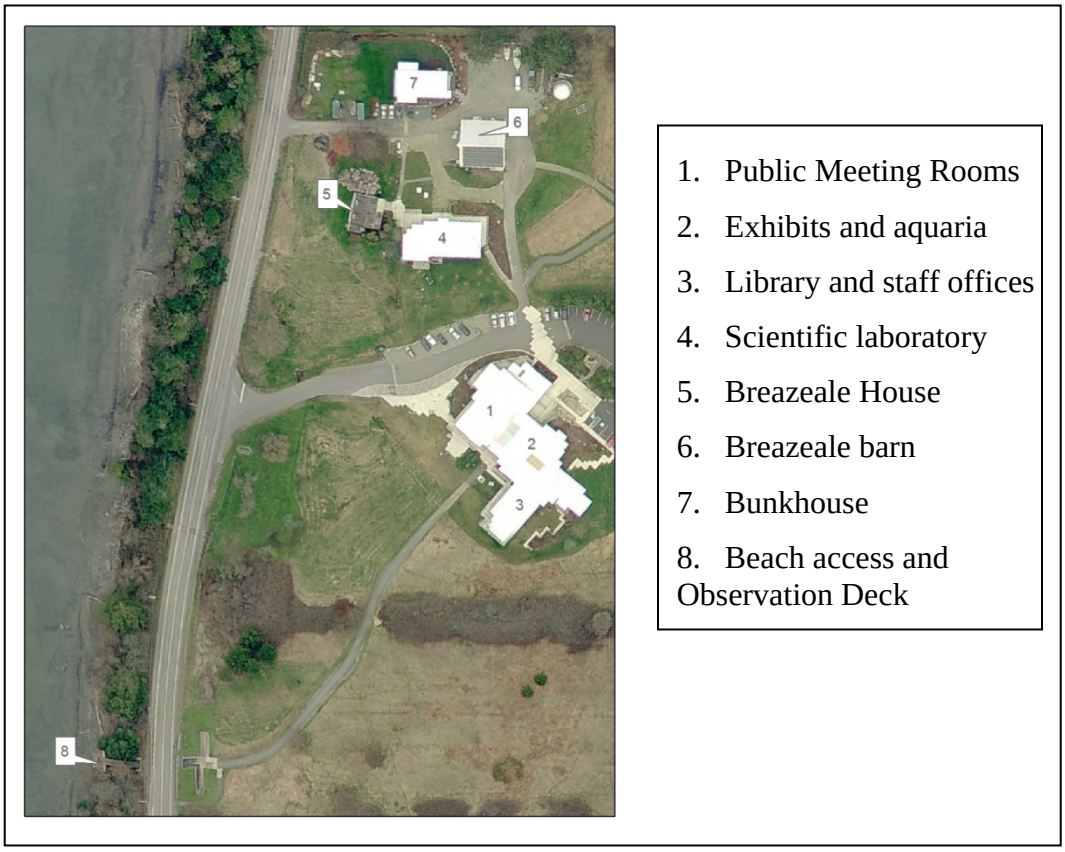

Figure 5.1 – PBNERR Facilities Map

Breazeale-Padilla Bay Interpretive Center

This public visitation center (after remodel and expansion) covers nearly 11,000 square feet and includes public exhibits and aquaria, classrooms, large (100 seat) meeting room, small teaching laboratory, theatre/lecture auditorium, library, children's hands-on room, staff offices and support areas. Constructed in 1982, it was expanded in 1985; additional parking areas added in 1995 and exhibits were revised in 1999. Consistent with the Facilities Master Plan, additions to the building in 2004-05 included a multi-purpose meeting room (divides into two classroom), kitchen, conference room area, central HVAC and storage facilities, new library, volunteer room, and workspace for staff, visitors, students and several interns. The remodeled Center is a multi-functional, energy-efficient facility in which the Reserve carries out the vast majority of its programs. The new multi-purpose room has provided space for many additional public programs, including many Coastal Training courses.

New Laboratory

One of the key elements of the Facilities Master Plan is dedicated space for research, monitoring (including the SWMP Program), and field science support. These functional areas have, until 2005, been carried out in a semi-remodeled portion of the barn. The new laboratory building is 3,400 square feet, houses 5 offices, GIS equipment, SWMP lab, wet lab, specimen preparation areas, computer room, volunteer lab, and a large multi-bench general lab area for staff, visiting scientist, and graduate student use. All available technology and data/communications services are provided to this building. These modern facilities now enable growth of the NERRS system-wide monitoring program, Padilla Bay NERR and regional research demands, and services for NOAA/ERD Graduate Research Fellows.

The new laboratory has space for visiting scientists and students as well as for research and monitoring staff.

Breazeale House

This 1,500 square foot (two story) house was donated to the Reserve by the Breazeale family and became available for Reserve use in 1987. Minor remodeling to meet general fire and building codes was completed in 1988 and a new roof completed in 1992. The house provides a dry storage area (basement) for archives, office space for Reserve research and stewardship staff and the Northwest Straits Commission, and a small

meeting room for 10-12 people. Under the Phase II construction program, the house saw significant interior and exterior upgrades including new windows, insulation, HVAC and electrical systems, new plumbing, flooring, paint and much- improved energy efficiency.

Barn

Located adjacent to the house, the 2,500 square foot (plus loft) barn was remodeled in 1985-86 to provide dry storage areas, maintenance workshop area, residential bunkrooms and kitchen area, laboratory space, and a large (unheated) group meeting and work area. Over the past 20 years the barn has been intensively used and many of these functions outgrew the space and infrastructure available in this structure. Under the Phase II construction program, remodeling work has improved storage capacity for research, upgraded maintenance areas (tool and wood shops and office), and created a day-use support area for visiting researchers and staff, including showers, locker room, and work counters. Earthquake stability modifications and energy conservation elements are included. Of particular note is the 112-panel photovoltaic solar generation system on the barn roof that is providing electrical consumption offsets to the Reserve's demand and costs. This project is also a valuable educational tool and an interpretive exhibit is being planned for the public to provide information on the feasibility of using solar power generation on the Pacific Northwest, including individual homes and businesses.

Photovoltaic solar generation system on the barn roof

Bunkhouse

Another key element of Phase II construction was development of a bunkhouse for 16 residents, which moved this function out of the barn into a facility consistent with revised safety, fire and security regulations. This facility serves both short-term (1-3 day) guest, and longer-term residents (1-4 weeks) with a mix of accommodation styles, work areas, and support infrastructure. It is available for a wide range of visitors, including graduate students, meeting and workshop participants, visiting scientists, and Coastal Training Program participants and instructors. Construction of this facility was given a very high priority by Padilla Bay NERR advisory committees.

Facility Infrastructure and Sustainability

The Padilla Bay NERR campus has undergone an upgrade of facility infrastructure during Phases I and II of the construction program between 2001 and 2006. In 2002-03

site development work was completed to modernize the septic system and establish all new water, power, data, and communication systems. A complete renovation of the existing water system was completed, including sufficient storage (60,000 gallons) for fire-suppression and summer landscape irrigation. In late 2006 public water was extended to the campus and fire hydrants installed. New data and communication lines (fiber optic and category 6 cable) were laid underground, and the entire campus electrical system has been upgraded to three-phase power.

A significant effort was made to include a large number of "green" and "sustainable" elements into both phases of the construction program. Starting with building orientation (south by south-west) we continue to utilize passive solar. Summer shade screens of recycled wood and native plants were added to reduce cooling costs. Metal roofing can be recycled and the HVAC system is a ground-loop heat-pump design for maximum energy efficiency. Turf-stone driveways provide water permeability and reduce runoff, and bio-filtration swales offer water purification opportunities where runoff does occur. Many interior components are made from recycled and/or recyclable materials, including flooring, tiles, and wallboard. Exterior wood siding is recycled material, and hand dryers reduce paper waste in restrooms. The photovoltaic system on the barn roof is perhaps the most visible of the efforts.

Boat Launch

The Padilla Bay Reserve boat launch ramp and parking area is located in Bay View, just one-half mile south of the Center. This concrete ramp was rebuilt by the Reserve and Washington Conservation Corps in 1984, providing a functional, high tide launch site for small craft. Over the next several years needed work at the site includes erosion protection, widening, and placement of ramp markers (flags) on either side of the ramp that are visible at high tides. Adding two or three piling and planning a float at the ramp would greatly increase safety and functionality.

Trails

Two trails provide visitors with interpretive opportunities in different habitats. The upland trail leaves the Center and wanders for 0.8 mile through forest and grassland. The 2 - 1/4 mile dike-top trail along the southern bay shore and slough was developed by the Skagit County Parks Department with assistance from the Reserve. Both trails have interpretive signs and brochures are available. The dike trail is maintained primarily by Skagit County with ADA access managed by the Reserve. Upgrading existing and adding additional interpretive signs along the route would increase the educational value and is planned in the next 2 years.

Observation Deck

This multi-purpose viewing and beach access facility was completed in 1989 and links the Center to the bay via a short pathway and stairwell. It provides excellent panoramic views of the bay, access to the beach during spring, summer and fall months, and is excellent in winter for waterfowl and raptor observation. Maintenance on this facility is substantial due to saltwater exposure and the physical forces of high tides and winds at the beach. Existing interpretive signs are in need of replacement.

Future Facility Needs and Opportunities

The aquarium room in the Interpretive Center is the most popular exhibit at Padilla Bay NERR. It was built in 1985 with a predicted equipment lifespan of ten years. Now some 22 years after installation and requiring intensive maintenance we are renovating this exhibit area in 2008-2009. This will include biological support systems and aquarium tanks and a host of new interpretive components focusing on the Padilla Bay ecosystem. It will also include interpretive displays featuring real-time data from the automated water sampling program (SWMP), interpretation of the Padilla Bay Reserve science program, A/V interactive LCD screens, several large tanks exhibiting eelgrass and mud flat habitats, video macroscopy, interpretation of water quality and shellfish issues, and local bird life. This exhibit will be located in the west wing of the Interpretive Center, which underwent minor construction during the Phase II construction program to add drains and water service.

The Reserve has five boats and maintenance machinery that are permanently stored outdoors or in an old shed, which is nearing collapse. A new cost-efficient building is necessary to house these assets. This new garage-style building would be located adjacent to the barn and laboratory facilities and include parking for boats and vehicles, a small workshop area, and protection for research, monitoring and field equipment. This project is critical to operations, and it will offer security and protection for highly valuable Reserve equipment. We will request NOAA/ERD construction funds for this project in 2008-2010.

Upland and waterfront trails at the Reserve, including related interpretive signage, are in need of repair and upgrading. This includes the trail from the Interpretive Center to the beach, the upland trail and trail shelter, and interpretive signage along these two plus signage on the dike-top trail. This work is planned in the 2010-2012 time frame.

The popularity of PBNERR public programs and the new and remodeled facilities has identified another issue, the lack of adequate vehicle parking. With space for only 32 visitor vehicles, crowds of well over 200 are often on site attending programs. With a goal toward sustainability and no additional impervious surfaces PBNERR is reviewing alternatives, including additional turf-stone “overflow” parking areas. This work will be conducted in 2009-2011.

The boat launch ramp in Bayview is in need of new public signage and repairs to protective rip-rap. This work, along with ramp markers, and possibly a float, is planned during 2009-10.

Goals, Objectives, Actions and Policies

Goal: Protect and improve habitat and biological diversity within the Reserve and Puget Sound biogeographic region.

Objective: Facilities and construction activities will have a low impact on Reserve natural resources.

Action: New facilities and remodeling will include sustainable and "green" design and construction concepts and materials.

Action: Damages from construction activity will be mitigated wherever possible.

Goal: Utilize and increase the use of Reserve science and stewardship to address priority coastal management issues.

Objective: Disturbance from construction activity will not impact on-site wetland systems.

Action: Reserve staff will utilize wetland rating systems and site reviews as a part of determining where facilities can be located.

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: PBNERR facilities, by their design and construction methods and materials, should serve as educational tools for sustainability and low impact.

Action: Exhibits will be established on-site to educate visitors about sustainable buildings and materials, reducing carbon emissions, the use of solar energy, and permeable parking lot surfaces.

Objective: The local community will become a partner in development and maintenance of PBNERR facilities.

Action: Encourage the Bayview Community Association to partner with the Reserve in re-development of the boat launch ramp and related recreational facilities.

Objective: Projects will be completed that are necessary for Reserve programs and visitors.

Action: Exhibits and aquaria will be replaced and updated in the Interpretive Center (2008-2009).

Action: A design and site location will be determined for the boat garage (2009) and construction completed in 2010.

Action: A review of on-site parking needs will be conducted in 2009, with recommended tasks completed in 2010.

Action: Improvements to the boat launch ramp will occur in 2009.

Policies

1. Reserve facilities shall be free of barriers to the handicapped. ADA standards shall be met and reasonable accommodation shall be provided.

6 Public Access Plan

The Reserve owns, manages or has easements for a wide variety of public access sites within its boundary for the purposes of education, research, monitoring, interpretation, and recreation. These sites provide the public, staff and visitors with ample opportunities to reach and/or view the natural resources of the Reserve without creating significant disturbances to the habitat and species. Public access to selected research and monitoring locations is provided to scientists and visiting graduate students. Protection of critical resource areas is necessary to guard their integrity for long-term study. Some sites are reserved only for use by groups during "guided" activities, such as interpretive hikes.

Access Areas

The Reserve provides a variety of public access opportunities which incorporate many habitat types, plus the Breazeale-Padilla Bay Interpretive Center, viewing platform, boat launch ramp, upland and waterfront trails, and nearby public park facilities. Many of these sites and/or facilities are utilized by Padilla Bay NERR education, training and research/monitoring programs. Specific rules and/or guidelines for use are posted at the sites, noted in applicable Padilla Bay NERR brochures, and/or posted in the Interpretive Center. A description of these areas follows. Figure 6.1 identifies the location of these sites.

Interpretive Center

The Breazeale-Padilla Bay Interpretive Center, located adjacent to the bay on 64 acres donated by the Breazeale family, provides approximately 11,000 square feet of public space for a variety of programs. Open to the public five days a week (Wednesday-Sunday), visitors enjoy estuarine exhibits, aquaria, the library, and media programs in the theatre. The entire facility is handicapped accessible. The Center and adjacent facilities are the focal point for all education, research, and administrative activities at the Reserve. The Center is also a resource for community and environmental groups, including Audubon, the Skagit Land Trust, and various regional service organizations.

Upland Trail

Starting from the parking lot at the Interpretive Center, this short (0.8 mile) trail loops through the upland meadow and cedar-fir forest. Views from the trail include panoramic scenes of the entire bay and Mt. Baker. A self-guiding trail brochure is available for public interpretation. The trail is handicapped accessible up to the wildlife viewing shelter.

Observation Deck and Beach Access

From the trailhead at the Center, this handicapped accessible pathway winds down the hill, through the tunnel under the road, and opens onto an observation deck overlooking the bay. During spring, summer and early fall access to the beach area is provided via a spiral staircase from the deck. In winter it is a unique viewing station for the thousands of migratory waterfowl which rest and feed on the bay and the raptors that prey upon them.

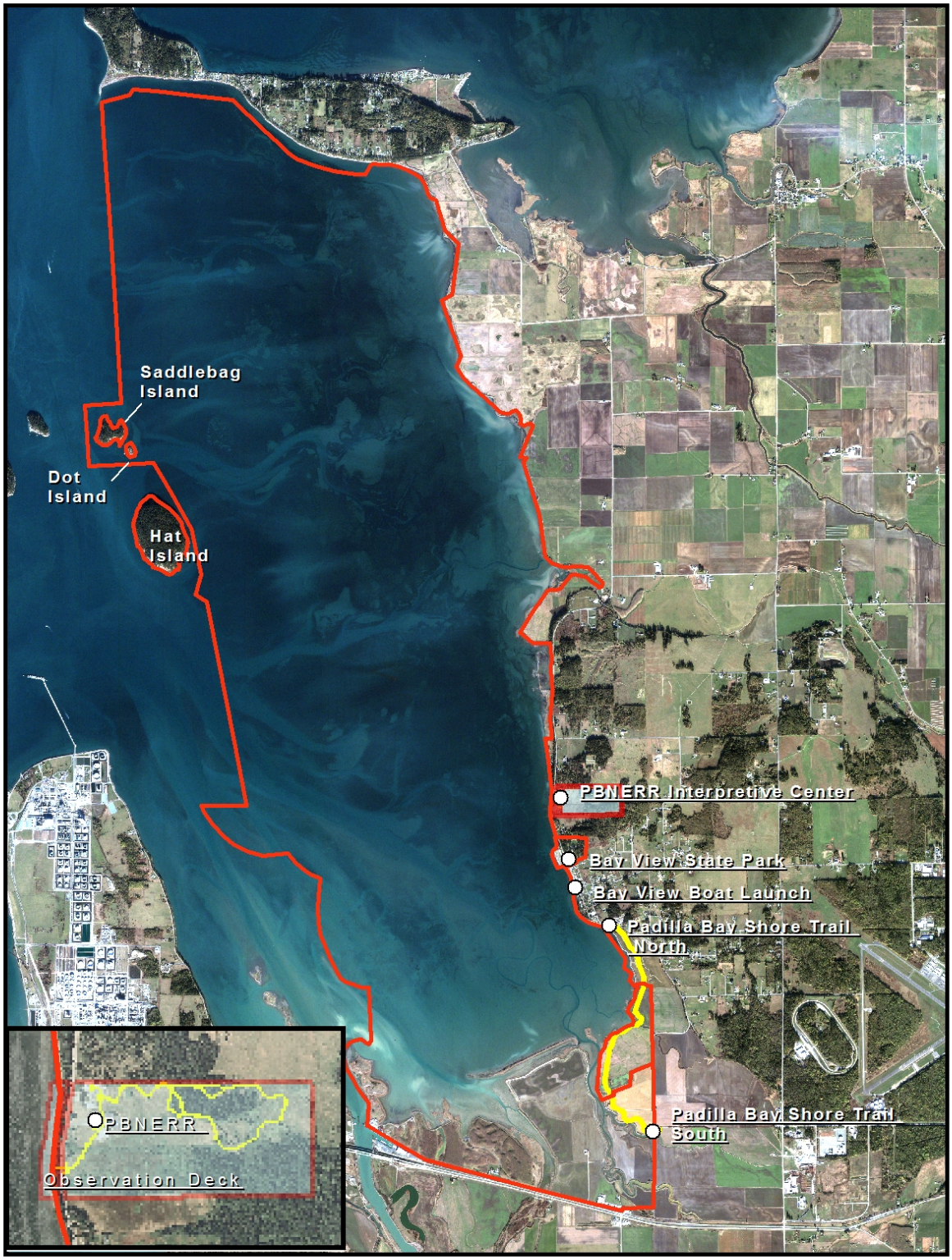

Figure 6.1– Public Access Areas Map

Bay View State Park and Beach

Within the Reserve boundary but owned and operated by the Washington State Parks and Recreation Commission, this park provides overnight campsites and picnic areas, plus a recreational beach. The beach area is extensively utilized for Padilla Bay NERR educational and interpretive field programs.

Bay View Boat Launch

Owned by Ecology and managed by Padilla Bay NERR, this public boat launch site can be used only during high tides due to the short ramp and extensive tide flats here. It is located within the community of Bay View.

Padilla Bay Shore Trail

This scenic 2.2-mile trail can be hiked or biked as it wanders along the southern bay shore and Indian and Little Indian Sloughs. Interpretive signs explain the natural history while benches and picnic sites provide places to rest. The trail is managed by the Skagit County Parks and Recreation Department under a lease from the local diking district. Construction funding for the project was provided by several cooperating agencies, including NOAA and Ecology/Padilla Bay NERR. During waterfowl hunting season this area is open to the public for harvest and signs are posted to alert non-hunters of this fact. The trail is handicapped accessible.

The Shore Trail is a portion of Skagit County's road-side trail system, which is a 4 - 6 foot wide designated (paved) shoulder along selected county roadways. Originally established to enhance pedestrian and bicycle traffic along narrow roads during the annual Tulip Festival, the Parks Department has expanded this system and it now connects many popular tourism sites, including the Breazeale Interpretive Center, LaConner, Anacortes, and Highway 20.

Rocky Islands

Saddlebag, Dot, and Hat Islands, on the central, western edge of the Reserve, are accessible only by boat. Saddlebag and Dot are managed by the Washington State Parks and Recreation Commission and low intensity recreational facilities are provided, including several mooring buoys. Hat Island, owned by the Washington State Department of Natural Resources and amended into the Reserve boundary (1998), is suitable only for very limited public access in order to protect sensitive habitats and species, and possible cultural resources.

Other

Several other specific sites around the bay have also been established as *limited access areas* due to the type of easements held by the State. These sites are accessible either by obtaining direct permission from the landowners/caretakers, or by accompanying Reserve personnel. These areas are mainly used for research and monitoring access, or for staff-guided educational programs. All have been obtained by purchase or gift of easement. These sites are not publicly advertised due to access restrictions but can be made available for allowed uses after consultation with relevant Reserve staff.

Future Public Access Needs and Opportunities

Padilla Bay NERR is working with the Washington State Department of Fish and Wildlife to evaluate resource protection/enhancement measures and public access opportunities on their newly-acquired agricultural lands in the southeast areas of the Reserve. Their acquisition in this region could enhance waterfowl hunting opportunities and provide improved habitat for juvenile salmon. Planning and/or developing opportunities in this area are in the 2008-2012 time frame.

The Padilla Bay Shore Trail is a unique and popular resource in the region and is heavily utilized by the public. Extensions of this system, either along other dikes adjacent to Padilla Bay or along inland sloughs, are subjects of discussion by the Skagit County Parks Board and other resource management agencies. While providing outstanding recreational opportunities, a balance must be achieved in design and location of any additional facilities in order to limit disturbance of critical habitat areas and related species. Planning work will be done in 2011-2012 to review Shore Trail impacts, along with other comprehensive trail and access needs.

Consistent with Chapter 5 (Facilities and Construction), several upgrades to public facilities and interpretive signage are planned over the next five years. These include exhibits and aquaria in the Interpretive Center, and signage and access improvements at the boat launch ramp, upland trail, observation deck, and shore trail.

Goals, Objectives, Actions and Policies

Goal: Protect and improve habitat and biological diversity within the Reserve and Puget Sound biogeographic region.

Objective: Public access areas will be minimally damaging to valuable habitat areas.

Action: Assess beach dynamics and restoration opportunities at the boat launch site.

Action: Provide low-impact improvements to restricted access areas on Samish Island and at the Sullivan-Minor marsh.

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Agency and community cooperation will result in improvements to existing and planned public access sites.

Action: Coordinate with the WDF&W regarding their development of public access opportunities on agricultural lands adjacent to Reserve ownerships.

Action: Work with Skagit County Parks Department for environmentally safe maintenance practices on their dike-top trail.

Action: Involve the Bayview community in the upgrades to the boat launch ramp.

Policies

1. *Public access to sensitive biological sites or protected areas shall be limited to protect public safety, critical resources, or the integrity of research areas.*
2. *Major public access points (trails, observation deck, campus pathways) shall be barrier free to the handicapped.*

7 Natural Resources Stewardship Plan

Protection, conservation and, when necessary, restoration of the Reserve's resources is a cornerstone of the NERR mission, and involves cooperation with a variety of internal and external partners to accomplish the objectives. These actions are necessary in order to provide a consistent environment for research, monitoring, and education programs.

While the Reserve is not empowered with regulatory authority to directly protect its resources, protection is provided through a variety of federal, state, and county regulations and a broad enforcement network of regional employees from various agencies. Through staff participation in local land use and coastal planning and permitting processes in the watershed the Reserve is able to provide up-front input on current and potential issues and recommendations for changes and/or necessary mitigation.

Many of the broader Puget Sound management issues (see Chapter 1, Introduction) are highly relevant to the regional and local stewardship issues at Padilla Bay, and many are simply subsets of Sound-wide problems. Some of these are: water quality (sediment loading, toxics and fecal coliform from dairies and failing septics); water quantity (seasonal interruptions and excess from proposed flood diversions or upland development); invasive and exotic species (various flora and fauna); oil spills from nearby oil tanker docking and refining facilities; habitat loss and watershed land-cover change; and issues related to climate change and eventual sea-level rise.

Many of these issues are currently being addressed through the Reserve's stewardship activities and constitute a major workload for the stewardship coordinator, assistants, and volunteers. These are on-going tasks and some, such as reduction of invasive cordgrass (*Spartina*) acreage, have been very successful. Some issues, such as watershed development impacts, fecal coliform inputs, and sediment loading, require long-term approaches and close cooperation with other agencies. More recent issues, such as climate change and sea-level rise, are getting attention and stewardship and monitoring activities are in the planning and early implementation stages. New tools, such as those proposed in the NERRS Land Use, Land Cover and Habitat Change Initiative (LULCHC), are now being considered for both short and long-term program attention. The application of biogeographic data management and mapping is a key tool for the management of natural resources at the Reserve and allows for comparisons on many different levels and can help pinpoint where and what problems are likely to occur. It is a great tracking as well as predictive tool and its use will be expanded as work proceeds.

Our fundamental approach to stewardship at PBNERR is: 1) protect lands and resources, 2) conserve habitats, species, functions, and processes; and 3) restore habitats, species, functions and processes.

Framework for Stewardship

Natural Resources Advisory Committee and Staff

A Padilla Bay Natural Resources Advisory Committee was established in 2000 and consists of the Reserve Manager, Stewardship Coordinator, Research Coordinator, and

representatives from local, state, and federal resource agencies and local tribes. The committee meets on a periodic basis to review topical issues and exchange relevant information. The Stewardship Coordinator also provides an annual written update for the committee.

Outstanding stewardship staff provide a focus for all activities, both planning and implementation. One professional staff, a seasonal assistant or intern, and many project volunteers make up the team that works diligently throughout the year (see staff descriptions, Chapter 3).

Restoration Work Group

An internal Restoration Work Group consisting of the Stewardship Coordinator, Manager, Research Coordinator and GIS Specialist was formed in 2006 to develop conservation and restoration visions, goals, and objectives for the Reserve and watershed (see the "Natural Resource Protection, Conservation, and Restoration" section that follows). These goals and objectives will help guide our activities in this area in the coming years.

Integration with Other Sectors

Stewardship elements occur in both our education and research and monitoring programs. Local residents, watershed residents, and people that live in Puget Sound learn to be stewards through our educational offerings. Our educators offer a wide range of classes to raise awareness of the natural world and our role in caring for those resources. The Coastal Training Program (CTP) is teaching county planners, consultants, and state agency staff how to better manage natural resources. CTP seeks collaborations with research and stewardship to offer programs on current topics of interest such as eelgrass and invasive species.

The Stewardship Coordinator encourages and mentors students who are becoming scientists, offers educational programs for adult audiences on estuarine topics, coordinates with the research sector to accomplish tasks, and ensures all sectors are heard during stewardship planning efforts.

The stewardship sector contributes to the System-wide Monitoring Program through measurements of emergent salt marsh vegetation, and has participated in national-level monitoring for invasive crab.

Research and GIS staff raise awareness of estuarine science and the state of resources by presenting papers at scientific conferences and by offering occasional programs for the general public. The Reserve's GIS Specialist plays a critical role in mapping resources and tracking changes over time and this role will increase with development of tools noted in the new land use and habitat change initiative.

Partnerships

Stewardship activities enjoy the cooperation of many other agencies and organizations as most of the Reserve's issues are shared by other Puget Sound resource managers, and several of these sit on the Reserve's advisory committee. Some of the more important partners are the State Departments of Fish and Wildlife, Natural Resources, and

Agriculture; Skagit County Noxious Weed Board; the Swinomish and Samish Tribes, Skagit Conservation District, and NOAA.

Facilities and Resources

A wide range of facilities and resources are available to support stewardship activities, including watercraft, vehicles, laboratory space and equipment, power and hand tools, navigation and location devices, field radios and phones, and the resources of the GIS mapping lab and staff expertise.

Natural Resource Issues

As noted in the chapter introduction, several major and many minor issues relevant to the Reserve and Puget Sound as a whole are being addressed, and others need additional attention.

Water Quality

There are many potential threats to water quality in the bay. Failing septic systems and dairy waste (e.g. cow manure) introduce high levels of bacteria and possibly pathogens to sloughs and localized areas of the shoreline, forcing the closure of public recreational shellfishing. Farming practices allow surface runoff that carries sediment into ditches and sloughs and into the bay. Water quality monitoring within the watershed shows high levels of fecal coliform throughout the watershed (WDOE, 1995a). Occasional industrial runoff from uncovered stockpiles may enter sloughs and affect pH or dissolved oxygen. Bulthuis (1993) lists four areas of concern regarding water quality in Padilla Bay's watershed: high turbidity of influent sloughs, the rate of nutrient flow to Padilla Bay, the periodic influx of bacterial contamination and the low-level, widespread toxicity of the sediments.

Water Quantity

Inflow of fresh water to the bay is comprised of surface drainage and delivery should be maintained at appropriate seasonal and annual levels to maintain the existing ecological systems. Development in the watershed is increasing and water quantity becomes an issue as more surfaces are paved and more water runs off, often resulting in flash flows that cause erosion. Much of the forest that used to slow runoff and hold water in the watershed has been harvested. Major diversions of Skagit River flood waters to the bay pose the risk of losing significant acreage of eelgrass (see next section).

Skagit River Flood Diversion

With every local flood season discussion is often heard regarding construction of the "Avon Bypass" Fig. X, [11]. This Skagit River flood bypass channel, if built, would divert flood flows around the city of Mount Vernon and send them directly west to the south end of Padilla Bay or into the Swinomish Channel, just south of where it enters Padilla Bay. Effects of the inflow of water and sediments from an actual flood via this channel project could be significant to the present ecological structure of the bay. This project, and similar concepts to control flood waters, are currently under evaluation by

the Army Corps of Engineers as part of their Skagit River Study. The Department of Ecology, with input from the NOAA Estuarine Reserve Division, has informed the Corps of the problems such a bypass channel could create to the ecological status of the Bay, and has noted our operational policies and federal/state agreements which serve to avoid and prevent such impacts.

The Department of Ecology, with support from several state and federal agencies, strongly recommended that the Army Corps and Skagit County conduct research to identify the impact to the eelgrass beds and other resources of Padilla Bay as part of the environmental impact statement process. Initial portions of this research began during 2001-03, but are now on hold as the County and its planning committees investigate multiple flood control options (including the bypass) as they update their Comprehensive Flood Control Management Plan.

Oil Spills

Located near the town of Anacortes on March Point (on the western shore of Padilla Bay) are two major oil refineries (Shell and Tesoro). According to a published spill contingency planning document, Anacortes is an area of high risk and both Anacortes and Ferndale (to the north) have a significantly higher probability of port spills than all other ports in the region.

The habitats of Padilla Bay are particularly vulnerable and sensitive to the impacts of oil spills. The marsh, seagrass, and mudflat habitats are ranked high on indices used to estimate such impacts. Within seagrass communities there is a wide spectrum of sensitivity to oil by individual species. However, the presence of many early life stages, juveniles and eggs of a variety of species ensures that any oil reaching such communities will be devastating for at least some species. Cleanup of oil on or near seagrasses and intertidal flats can often have a greater effect on the community than the oil itself, due to compaction, removal, and disruption of the rhizome-sediment complex.

Studies on the use of dispersants on seagrasses indicate that dispersants plus oil generally are more damaging than oil alone. Also, dispersants are likely to have an even greater effect on the associated fauna than on the seagrasses, as they may be toxic to many of the larval and early life stages in the seagrass community.

For the past several years the Reserve has been participating in the regional “Oil Spill Contingency Planning Working Group,” initiated by the refineries. This organization, made up of oil industry representatives and various local, state, and federal agencies, has met many times to discuss the necessary planning and response in case of an actual spill. PBNERR has worked closely with this group and has prepared a comprehensive Padilla Bay habitat map to assist cleanup personnel with on-site decisions. The working group has also conducted major spill response scenarios where all responsible refinery and agency personnel took part in a two-day practice session. The last practice scenario was a spill event which threatened Padilla Bay, and provided an opportunity to develop many questions after the scenario was completed and the response evaluation got underway.

Based on PBNERR participation in spill response drills and in consideration of available technical information and recent studies, the Reserve’s general recommendations regarding oil spills in the bay are as follows:

- Preventing spills is the highest priority; all other actions will have some degree of impact on the environment.
- Divert spilled oil away from Padilla Bay. The habitats in the bay are highly sensitive and vulnerable to impacts from spilled oil.
- During spill response, a top priority should be given to protecting the intertidal sand and mudflats (with and without seagrasses) and salt marshes. These are the most sensitive habitats.
- Dispersants should not be used on or near the bay until further research is conducted to identify the impacts and damages associated with their use.
- During cleanup activity, the option of "not to clean" should be considered and carefully evaluated for each habitat involved.
- Should spills occur and reach Padilla Bay, research on a variety of topics should be conducted to improve the information base on which to make future decisions.

Toxins

Although spills from oil transport and refining pose significant risk of introducing toxins into the bay, a major concern is leachate from the abandoned Whitmarsh Landfill. This is located in the southwest corner of the bay, just outside the Reserve boundary, and was used by local oil and chemical processing industries for many years. Sampling by the Reserve and Ecology in the mid-1980s identified the presence and movement of toxic chemicals outside of the containment area. The site is currently listed by Ecology for monitoring and remediation as part of the Puget Sound Clean-up Initiative announced in late 2007.

Exotic Species

Two species of *Spartina* exist in Padilla Bay: *Spartina alterniflora* and *Spartina anglica*. The Reserve has maintained an Integrated Weed Control Program since 1994 for these species. Staff pulls seedlings, digs small clumps, mows and sprays larger clones and meadows. Repeated mowing with herbicide application has proven to be effective in reducing and/or eliminating the species. However, as seed is still traveling into the bay on ocean currents from points farther south, continued monitoring and control is necessary to keep the problem in check. The amount of *Spartina* in the bay has been reduced from 17 acres to a tenth of an acre. The amount varies with the kind of control we are able to do and the amount of seed that actually germinates each year.

We do not have a complete understanding of the extent of non-native species in the bay. Pacific oyster (*Crassostrea gigas*) were introduced to Samish Bay (north of Padilla Bay) in 1919 and were introduced to Padilla Bay in the 1930s with limited success.

A number of non-native invertebrates were introduced in the 1930s along with oyster culture including the Japanese littleneck (*Tapes phillipinarum*) and mud snail (*Batillaria attramentaria*). Japanese eelgrass (*Zostera japonica*) was probably introduced around that time as well. A more recent arrival, probably via ballast water, is the Purple Varnish Clam (*Nuttallia obscurata*).

Sargassum muticum is an introduced algae. More research in this area should be encouraged, beginning with identification of which species in the bay are introduced and leading to study of the possible impacts of introduced species on native species in the bay.

Noxious weeds are present in the upland area, including Scot's broom (*Cystisus scoparius*), Hairy cat's ear (*Hypochaeris radicata*), Canada thistle (*Cirsium arvense*), Bull thistle (*Cirsium vulgare*), Common tansy (*Tanacetum vulgare*), Climbing nightshade (*Solanum dulcamara*), and Queen Anne's Lace (*Daucus carota*). As time allows, staff should monitor these lands, locate and control species on the state and county noxious weed lists.

Current Programs and Activities

The stewardship program at Padilla Bay was started largely in response to the non-native salt marsh grass, *Spartina* in the mid-1990s. With program growth and the availability of GIS expertise the Reserve is now active across a broad range of activities. The following elements are current stewardship activities and efforts at the Reserve.

Protection

Tideland Acquisition. The Reserve has purchased or obtained by donation more than 11,000 acres of tidelands and bedlands (core areas) within its boundary since designation. This acquisition program is ongoing and offers are made on parcels as they become available.

Upland Acquisition. There are several hundred acres of uplands, mainly farmland, in the boundary (buffer areas) still in private ownership. The Reserve is working with owners and other agencies to acquire these lands through less-than-fee methods, such as conservation easements or development right purchase.

Conservation

Invasive Species. Annual surveys and control of *Spartina* were implemented in 1996 and continue to the present. The infestation peaked in 1997 at 17 acres and is now less than 0.1 acre, a feat that took several years of intensive field work. Many of our non-native invertebrates and some non-native estuarine plants arrived in the 1930s with oyster culture (prior to shell certification). Some invasive species are recent arrivals such as the purple varnish clam (*Nuttallia obscurata*), believed to be a ballast water introduction. We conducted annual monitoring for presence of European green crab (*Carcinus maenas*) from 2001-2007. We are currently implementing a survey that includes additional invasive species. European green crab occurs on the Washington coast, but has not yet been found in Puget Sound. We have also been working to control upland invasive species including: Canadian thistle, English ivy, Himalayan blackberry, Evergreen blackberry, English holly, and Reed canarygrass.

WCC/AmeriCorps assistant monitoring for invasive crabs, 2006.

Baseline Data. In order to measure change, it is necessary to collect baseline data. The stewardship sector does two baseline data collections presently: percent cover of emergent salt marsh vegetation at one location and native shore crabs (incidental to monitoring for European green crab). The salt marsh data is an important measure for possible oil spill, climate change, and sea level rise.

Historical Ecology. The GIS specialist maintains an on-going collection of maps and data for historical ecology applications.

Horizontal and Vertical Control Points. The GIS specialist maintains a database of horizontal and vertical control points around the bay and this will increase in significance consistent with elements of the new land use, land cover, and habitat changes initiative.

Hat Island. Hat Island is a Washington Department of Natural Resources Natural Resource Conservation Area (NRCA). The Reserve co-manages and monitors the island annually to denote recreational use and presence of wildlife. A photo record of

WCC/AmeriCorps assistant collecting baseline emergent salt marsh vegetation data points, 2006.

conditions is created using photos linked to GPS and GIS data.

Education. Stewardship staff conduct outreach programs as requested by state parks or other organizations. Programs are usually related to natural resources such as invasive species or eelgrass.

Volunteers. The stewardship sector uses the help of volunteers in implementing projects. Skagit Valley College has been one source of volunteers with their Learning Into Action program and Cooperative Education. These are mentoring programs as well. We have also recruited volunteers from the local community via flyers and our website.

Wetland Delineation. The wetlands on our 64-acre upland site were delineated and now serve as a basis for management efforts in this resource unit. This work could be expanded to other properties.

Restoration

Toxins. Creosote logs and treated lumber were surveyed on Padilla Bay shorelines in 2003 and removal efforts (several tons) took place in 2004-2005. A re-survey was done in 2007. Our state agency (Ecology) is currently in the planning phase for remediation at the old Whitmarsh Landfill, just outside the Reserve boundary on filled tidelands.

WCC/AmeriCorps crew hauling creosote log from salt marsh, 2004.

Sullivan-Minor Site. Dikes on the Sullivan-Minor salt marsh have failed and a passive restoration project is underway. Removal of *Spartina* has further restored this site. This area is returning to mud flat habitat with associated native plant species.

No-Name Creek Watershed. The Reserve conducted a feasibility study of restoration opportunities and habitat improvements throughout the No Name Creek/Slough watershed, a salmon-bearing stream. This included both upland properties on Bayview Ridge (outside the Reserve's boundary), and the 100-acre farmland area owned by Padilla Bay NERR. Of primary interest was solving water quality, quantity, and flow regimen in order to upgrade the classification of No Name Sough, which is on the State's Impaired Waters list. A citizen's committee worked with PBNERR and other agency staff to complete a watershed characterization, and identified potential actions to address the problems. They included tide gate relocation and upgrade, creation of wetlands, improved groundwater recharge in the upper watershed, pulling dikes back for creation of additional saltmarsh and floodwater storage, and several others.

Future Stewardship Opportunities

These are many necessary and potential opportunities in the coming years, including program elements consistent with the planned Habitat Mapping and Change Plan soon to be introduced by NOAA/ERD. Some of the major efforts include the following:

Protection

Watershed Planning Efforts. PBNERR staff should participate in watershed-level planning efforts as they arise. These efforts may be initiated by the County or local environmental groups or we might consider seeking funding to do a watershed-scale planning effort ourselves if there is significant benefit for the estuary.

Land Acquisition. Acquire lands adjacent to the bay that might have potential for restoration to salt marsh habitat as funding and state/federal regulations allow. Work with other agency landowners to examine feasibility of restoration.

Skagit River Flood Impacts. Reserve staff should stay involved in county planning efforts for Skagit River flood reduction. This includes participation in river basin planning programs, committee work, and coordination with many other entities.

Conservation

Identify Priority Species, Habitats, Ecosystem Processes & Functions. This is a necessary element to move our conservation and restoration planning effort forward.

Apply the System-wide Habitat Classification Scheme to Habitat Mapping Data (GIS). This will provide PBNERR data in a format consistent with the NOAA/ERD plan.

Baseline Water Quality at Selected Stormwater Inflows. Because of the development pressure (land use change) on Bay View Ridge and the projected growth in Skagit County, it would be prudent to gather some baseline water quality data at selected stormwater drainages to the bay in order to make future comparisons and track changes.

Answer "What is the value of intact habitat?". An answer to this question could help us when interacting with stakeholders to answer conservation or restoration questions. This might be a good project for a Social Sciences Graduate Research Fellow or Padilla Bay Research Assistantship.

Monitor Erosion of Salt Marshes & Nearshore Bluffs (Conservation). Using analysis of aerial photography and field observations, monitor the erosion of selected salt marsh or bluff areas and determine rates of loss.

Historical Ecology (GIS). Establish historic conditions from historically based GIS data for conservation/restoration activities. This information could also be used in an interpretive exhibit.

Restoration

Native Oyster Restoration. The native Olympia oyster (*Ostrea lurida*) populations have never recovered from fishing pressures in the 1800-1900s. Attempts to re-introduce the

species around Puget Sound were initiated in 1999 by 20 partners including the Washington State Department of Fish and Wildlife and the Washington State Department of Natural Resources (Puget Sound Restoration Fund, 2001).

Improve Functioning of Freshwater Wetlands (Restoration). Review the literature for a range of options for increasing the function of any of the freshwater wetlands on our 64-acre site upland site.

Priority Species, Habitat, Ecosystem Processes and Functions in the Watershed. Using maps created from data layers from the County and other sources, as well as using existing restoration plans for this area, the Restoration Work Group could determine the priority habitats from a Padilla Bay NERR perspective. Once identified, the Reserve can seek out partners and make decisions about whether purchase of land, development rights, or easements (or some other vehicle) would be the most effective strategy for conserving that habitat.

No-Name Creek. Several watershed projects to improve water quality and reduce flash-flooding could be implemented in cooperation with the Skagit Conservation District, County Public Works (Stormwater Division) and other agencies and landowners.

Restore Padilla Bay Connection to Braided Channels. Restoration opportunities exist in the south end of Padilla Bay, mainly from dike removal/relocation or allowing water to flow freely under Highway 20. This could include a reconnection of this stretch of the Swinomish Channel directly to Padilla Bay. Current landowner cooperation would be needed.

Re-connection of Padilla and Samish Bays. This has been proposed on at least one occasion and would return Samish Island to being a "true island" as it was prior to diking programs in the early 1900s. This proposal has had no formal study or environmental analysis, but introduces several issues, both positive and possibly negative. Re-establishing flow between the bays would open up Padilla Bay for increased access and foraging opportunity for juvenile salmon. Conversely, large quantities of silt and mud built up in the last 95 years in the lower reaches of Samish (Alice) Bay could be carried into the seagrass beds of Padilla Bay, causing a loss of seagrass. Extensive study would be required.

Farmland Restoration. The Washington State Department of Fish and Wildlife (WDFW) has acquired 300 acres of agricultural land adjacent to the Padilla Demonstration Farm and the Reserve will be working cooperatively with them as they proceed with a feasibility study to determine how to manage or restore this property.

Goals, Objectives and Actions

Goal: Protect and improve habitat and biological diversity within the Reserve and Puget Sound biogeographic region.

Objective: Reserve lands and habitat will be protected through acquisition or easements.

Action: Purchase remainder of tidelands within Reserve (core) boundary from willing sellers.

Action: Work with Skagit County, Skagit Land Trust, Skagitonians to Preserve Farmland and other groups to negotiate and obtain conservation easements on agricultural buffer lands adjacent to the Reserve and other critical watershed habitats.

Objective: Manage and improve Reserve habitats and resources.

Action: Conduct surveys for marine invasive species; implement *Spartina* control program.

Action: Implement control program for upland invasive species.

Action: Review and recommend options for increasing the functions of upland freshwater wetlands.

Objective: Take cooperative and pro-active measures to insure long-term integrity of Reserve resources.

Action: Participate in watershed planning activities at the local and state levels, including the Skagit Watershed Council, and Skagit County Planning and Zoning hearings and meetings.

Action: Encourage the Skagit County Board of Commissioners to adopt the latest stormwater management regulations throughout the Padilla Bay Watershed.

Action. Attend Skagit River Comprehensive Flood Management Committee meeting and provide data and input to consultants and the ACOE for EIS preparation.

Goal: Utilize and increase the use of Reserve science and stewardship to address priority coastal management issues.

Objective: Stewardship and monitoring data will become the basis for informed resource management decisions.

Action: Maintain current baseline data collections, particularly those that provide data for future needs such as possible oil spills, climate change, and sea level rise.

Action: Establish baseline water quality data at selected stormwater inflow sites to use for future land use change evaluations.

Action: Determine the priority species, habitat and ecosystem processes and functions in the watershed; seek local and regional partners for purchase or protection of critical areas.

Action: Continue cooperative project with Western Washington University utilizing Surface Elevation Tables (SET).

Action: Continue annual monitoring of Hat Island consistent with NRCA guidelines and PBNERR cooperative management agreement with WDNR.

Action: Monitor erosion of salt marshes and nearshore bluffs and determine rate of loss.

Action: Conduct wetland delineations on upland parcels.

Objective: Biogeographic (GIS) applications and tools will improve stewardship capabilities.

Action: Continue the inventory of vertical and horizontal control points around the Reserve consistent with elements of the planned Land Use, Land Cover, and Habitat Change Initiative (LULCHC).

Action: Integrate LULCHC elements into current work efforts. Apply the System-wide Habitat Classification Scheme to existing habitat mapping data.

Action: Maps and data for historical ecology application will be collected and preserved.

Action: Continue implementation of remote sensing of Reserve habitats on a 4-year time frame (LULCHC).

Action: Usable biogeographic data and tools will be available for all applicable staff needs.

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Improve exhibits and outreach initiatives to support Reserve programs

Action: Expand new interpretive exhibits to include stewardship information, including GIS-based historic ecology data.

Action: Incorporate Climate Change, Sea Level Rise, and LULCHC topics in exhibits and interpretive materials.

Objective: Engage citizens in stewardship activities.

Action: Continue recruitment and utilization of volunteers and internships.

Action: Provide outreach programs and materials in cooperation with the Reserve's Education and CTP programs.

Action: Utilize the Reserve's Research Assistantship or Social Sciences Graduate Research Fellowship program to address specific stewardship topics, such as, "What is the value of intact habitat".

Goal: Enhance Reserve resources through evaluation, assessment and/or restoration.

Objective: Restoration will be based on sound science and thorough evaluation and assessment techniques.

Action: Determine the health and biodiversity of Reserve habitats and assess which areas are exhibiting problems or degradation of function.

Action: Assess which habitats and resources are critical to the overall Reserve ecosystem function, including historic (pre-development) elements.

Action: Review Puget Sound species management literature and determine if endangered or threatened species can be enhanced by PBNERR restoration efforts.

Objective: Restoration will involve collaboration with multiple partners.

Action: Form work-groups of agency, tribal, community, and special-interest group representatives for all projects, starting with conceptual phase.

Objective: Manage or cooperate in restoration projects in the Reserve and throughout the watershed.

Action: Monitor the Sullivan-Minor salt marsh and document restoration progress.

Action: Cooperate with Ecology and other agencies involved in the Whitmarsh Landfill clean-up and restoration.

Action: Re-survey the Reserve for creosote logs and lumber every five years.

Action: Cooperate with Skagit Conservation District and the Dike and Drainage District in project implementation on No-Name Creek.

Action: Work with the Washington Department of Fish and Wildlife and Ducks Unlimited and the work group established to review feasibilities for various restoration alternatives on agricultural lands in the southeast corner of the Reserve.

Resource Units and Management Policies

The lands and resources within the Reserve can be separated into descriptive units. These units have specific resource and use policies due to their different habitat types, sensitivities, applied management practices, and ownerships. A summary of each unit and the applicable policies for each are covered below. See Figure 7-1 for the location of resource units mapped from Coastal Change Analysis Program (CCAP) data.

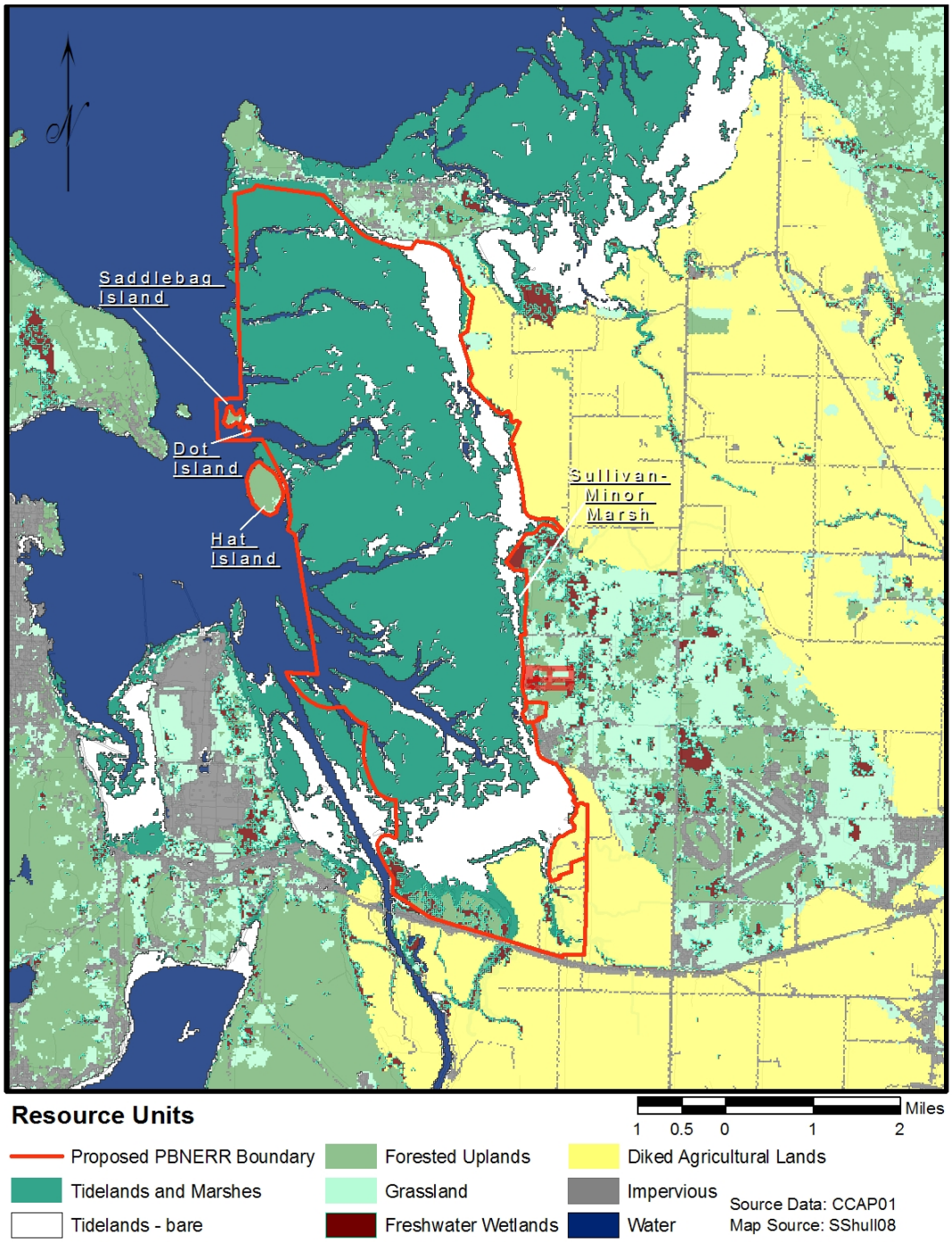

Figure 7−1. Resource Units Map.

Reserve Marshes and Tidelands

As shown in Figure 7-1, this extensive area covers all Reserve properties within the bay and its surrounding wetlands. This includes the eelgrass beds, mudflats, and existing or recovering marsh areas along the shoreline. These are the key (core) areas of the Reserve and are the most significant and productive biological regions. This is the intertidal area primarily utilized by waterfowl, marine mammals, shorebirds, and resident and migratory fishes. The policy of the Reserve is to provide long-term protection of this area for the purposes of research, monitoring, and education.

Rocky Islands and Adjacent Bedlands

This resource unit is an area composed of three islands along the extreme central western boundary of the Reserve and their surrounding bedlands. The islands lie just northeast of the Swinomish Channel/Guemes Channel intersection and lie between the intertidal flats of Padilla Bay to the east and the deeper water to the west. Access to the islands is limited to private watercraft (no public transportation). Oil tankers bound for the Shell and Tesoro refineries near Anacortes (March Point) often anchor in deep water to the west of the islands waiting for wharf space or for lightering.

The management policy for this unit is to protect and preserve the existing character and quality of the islands while allowing for limited and non-damaging access by the public subject to managing agency regulations.

Hat Island

The Reserve boundary was adjusted in 1999 to include Hat Island. The Washington State Department of Natural Resources (WDNR) received the title to this 92-acre island from the Nature Conservancy in 1991. Hat Island has limited accessibility as bedrock rises steeply 10-40 feet from the water's edge; only a couple small beach areas exist. Eagles nest on Hat Island with nesting activity recorded since 1975. Four alternate nest sites are recorded with all activity attributed to one territorial pair. Bald eagles and peregrine falcons use the island for perching and feeding.

The island is included within WDNR's Natural Areas Program. Prior to any management activities on Hat Island, Reserve staff contacts WDNR. The Department of Ecology entered into an interagency agreement with WDNR in 2000 to cooperatively manage Hat Island consistent with the mandates of Chapter 79.71 RCW (see Appendix D). According to the RCW, the site-specific management of Hat Island identifies the following:

<u>Significant Resources to be Conserved:</u>

- The key conservation goals for Hat Island are: conservation of existing native plants and trees, conservation of habitats in their natural states for wildlife, and conservation of soils. Ebaugh (1995) identified the grassy bald habitat on Hat Island as "sensitive to disturbance." This habitat is one of two plant communities on Hat Island that are tracked by the Washington Natural Heritage Program:

- Red fescue-great camas-gumweed grassland. This grassland community is critically imperiled (has a G1S1 ranking in the Heritage database) because of its extreme rarity. It has a very restricted range and occurs only in the San Juan Islands and some other islands in Puget Sound. This community is particularly vulnerable to extinction. The quality of this community on Hat Island is good.
- Douglas-fir/salal-oceanspray forest. This forest type is imperiled throughout the state. The quality at Hat Island is not very high because of previous logging activity on the island. The highest quality examples of this forest type on Hat Island are located along steep bluffs on the northwestern shore.

Areas with Potential for Low-impact Public and Environmental Education Uses:

- Because Saddlebag Island is already under Washington State Parks ownership and managed for public use, it is the logical choice for camping, picnicking, hiking and group activities. Hat Island, because of its steep banks, is not easily accessible. Public use appears to be minimal due to the natural limited accessibility of the island. In order to protect the sensitive grassy bald habitats, WDNR and PBNERR agree that additional public use will not be solicited or advertised.
- PBNERR will cooperate with WDNR to identify inventory and research needs. Research on the island will be conducted under WDNR/PBNERR supervision and may be funded through our Research Assistantship program.

Types of Permitted Management Activities:

- Management activities on Hat Island include but are not limited to: periodic visits to monitor public use and potential problems (PBNERR), fire control (WDNR), response to environmental emergencies, weed inventory, development of weed control plans (WDNR), noxious weed control (e.g. Canada thistle, Scot's broom, etc.), measures to control plant disease (such as gypsy moth or other equivalent threat), and restoration activities if deemed necessary or appropriate (WDNR).

Types of Permitted Public Uses:

- Due to the fragile nature of the grassy bald habitats, public use will not be encouraged through advertisement (e.g. brochures or signs). Minimal public use of the island also serves to protect cultural resources.
- The current Natural Resources Conservation Areas Statewide Management Plan provides further guidance for managing Hat Island (WDNR, 1992).

Saddlebag and Dot Island

Saddlebag and Dot Islands are owned by the Washington State Parks and Recreation Commission (Saddlebag State Park) and are managed through their Region Two offices in cooperation with the Reserve. Primitive camping, day use and hiking are allowed.

Shallow till covers portions of these islands, permitting conifers (some large), shrubs and grasses to cover the majority of the surface (except tiny Dot Island, which is predominantly exposed rock). No major lakes, ponds, or other surface waters exist. Saddlebag has two beach areas where access is possible and permitted.

Forested Uplands, Grasslands, and Freshwater Wetlands

A PBNERR Upland Habitat Management Plan was developed in 2004 (GeoEngineers, 2004). The vision for this 64-acre site is to create a more naturally functioning landscape for the benefit of local and migratory wildlife and the public. This vision includes: improving habitat function(s), increasing species diversity through site hydrology and vegetation management and providing educational and recreational opportunities. A wetland delineation was performed in 2004 that identified nine freshwater wetlands on this site (Graham-Bunting Associates, 2004). The largest is 11.8 acres and received a Category II rating. Category II wetlands: 1) provide habitat for very sensitive species or important wildlife or plants, 2) are either difficult to replace or, 3) provide very high functions, particularly for wildlife habitat. They need a "high level of protection."

This management unit includes areas that are highly developed with moderate-to-high intensity public use as well as low-use undeveloped habitat. This unit includes the donated Breazeale property with Interpretive Center, research laboratory, support facilities, and trails (upland and observation deck). Originally old-growth forest, then a working farm, the land is now a mixture of wetland slopes, meadow, hedgerows and mixed conifer forest. This unit also includes a two small wooded properties along the bluff of Bay View Ridge and Samish Island.

Bay View State Park is located just south of the Breazeale property and provides overnight camping in a wooded setting and a developed recreational beach area for swimming and beach combing. This area is managed according to the specific policies of the Washington State Parks and Recreation Commission. The Reserve's high tide boat launch ramp is just south of the state park.

Due to similar management goals, the public Shore Trail on the dike top along the southeast shoreline of the bay is also classified in this resource unit. This trail is maintained by the Skagit County Parks Department on land controlled by a local diking district.

Diked Agricultural Lands

These lands provide a buffer between residential and commercial development and the Reserve's key management units and are currently in private ownership, with the exception of 100 acres owned by the Reserve (Padilla Demonstration Farm) and 245 acres recently purchased by WDFW. Totaling approximately 900 acres in size, they are located adjacent to the southern end of the bay, behind dikes created to keep saltwater from intruding onto the farmland. The dikes themselves are vegetated with grasses. Croplands produce a large variety of grains, vegetables, fruits, and flowers. It is the intention of the Reserve to obtain conservation easements or other controls on these lands to allow farming to continue while not allowing more intensive uses of the land. Restoration activity is possible on portions of this property consistent with ownership consent.

Uses, Regulations and Enforcement

Allowable Activities

The Reserve advisory committees and managing and cooperating agencies have established a list of allowable activities. Activities approved for the general public on Reserve properties include the following:

- Public hunting, fishing, and non-commercial harvest of shellfish, subject to federal and state regulations and Tribal Treaty rights.
- Hiking on established trails and pathways.
- Swimming at beaches managed by Washington State Parks.

Prohibited Activities

Consistent with local, state and federal agencies, the Reserve has established activities that are prohibited to the general public on Reserve properties:

- Camping (except where specifically permitted by Washington State Parks)
- Hunting on the property donated by the Breazeale family.
- Fires (except where specifically allowed by Washington State Parks).
- Destruction or theft of natural resources as dictated by state and federal laws.
- Overnight parking outside the developed areas.
- Certain uses may be restricted on Reserve lands and tidelands to protect sensitive resources, the integrity of research areas, and to protect public safety.

Regulations Specific to Resource Units

Certain activities are not allowed on Reserve marshes and tidelands:

- *Expansion of existing channels or the creation of new navigation channels unless specifically authorized by statutes.*
- *New public works projects and projects that require dredging, filling, or the dumping of dredged spoils.*
- *Significant alterations of flow patterns, including circulation patterns.*
- *Any activity that will lead to significant degradation of water quality and/or biologic productivity.*

Regulated activities on Reserve rocky islands and adjacent bedlands:

- Resources of the islands and surrounding bedlands are protected through existing regulations enforced by the managing agencies.
- Non-damaging, low intensity use is allowed. Primitive-style camping, hiking, and day use is allowed on Saddlebag Island State Park.

- Recreational fishing and shell fishing on public-owned beaches, tidelands and adjacent bedlands is allowed, subject to applicable federal and state regulations and applicable Tribal Treaty rights.
- Power-driven vehicles are not allowed on the islands, except for emergency and approved maintenance purposes.
- The removal of vegetation, except for permitted scientific or management purposes, is prohibited.
- Hunting is prohibited on State Park lands (Saddlebag and Dot Islands).

Regulations in effect on Reserve forested uplands, grasslands, and freshwater wetlands:

- Resources and uses of the properties are governed by the recognized managing agencies according to their existing regulations and the cooperative agreement between the Department of Ecology and the Washington State Parks and Recreation Commission and any other agreement developed to address such issues.
- High intensity uses are allowed in designated areas. Control measures such as signs, developed trails and fencing are used to protect valuable resources where necessary.
- Vegetation may be managed to prevent succession and to provide habitat diversity.
- Hunting is prohibited on State Park lands and the 64-acre property where the Breazeale Interpretive Center is located.
- Activities on these areas shall not damage the key (core) area of the Reserve.

Enforcement

Enforcement of environmental regulations that protect the resources of the Reserve falls within applicable local, state, and federal agencies as noted below. Laws and regulations that relate to resource protection are included in Appendix C. While the creation of the Reserve did not establish any additional regulatory programs to govern uses and activities with its properties, the appropriate and timely enforcement of existing codes and regulations is important to the protection of the Reserve's resources.

Padilla Bay NERR

- PBNERR Reserve Manager and Stewardship Coordinator (compliance with Reserve policies; reporting violations of county, state, or federal laws to proper authorities)

Skagit County

- Skagit County Planning Department/Shoreline Administrator (shoreline issues)
- Skagit County Sheriff (local law enforcement)
- Skagit County Emergency Management (emergency response; oil spill response)

Washington State

- Washington Department of Ecology (water quality, hazardous materials, air pollution, shoreline management, oil spill response, natural resources damage assessment)
- Washington Department of Fish and Wildlife (enforcement of hunting, fishing and shellfishing regulations, permits for scientific collection and salvage, hydraulic permits)
- Washington Department of Health (shellfish health hazard issues)
- Washington Parks & Recreation Commission (law enforcement at State Parks)

United States

- U.S. Fish and Wildlife Service (enforcement of hunting regulations, marine mammal protection, permits for salvage of migratory birds, eagle permit)
- U.S. Coast Guard (marine traffic and spill response)
- U.S. Army Corps of Engineers (wetland protection, prevention of illegal dumping and filling in the bay)

8 Research Plan

The National Estuarine Research Reserve System (NERRS) was created in 1972 by the Coastal Zone Management Act (16 U.S.C. Section 1461) to increase our ability to responsibly manage estuarine ecosystems (see Chapter 2 The NERR System). The NERR 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 as stated in the mission of the NERRS in 15 C.F.R. Part 921.1(a) (see Chapter 2 The NERR System). NERR research and monitoring activities are guided by national plans that identify goals, priorities, and implementation strategies for these programs. 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.

Padilla Bay is located in the greater Puget Sound/Georgia Basin estuary and the research conducted in Padilla Bay has the greatest relevance and value for understanding and conservation of greater Puget Sound/Georgia Strait. As a National Estuarine Research Reserve, Padilla Bay was designated under the CZMA for the "Columbian Biogeographic Region" and the "Puget Sound Sub-region". Thus Padilla Bay research has responsibilities throughout the Columbian biogeographic region and particularly in Puget Sound. Research conducted in Padilla Bay is conducted in coordination with the scientific research conducted throughout Puget Sound by academic institutions, and federal, state, local, and tribal governments. In part the coordination is achieved by scientists who conduct research in Padilla Bay who are often conducting similar research in other parts of Puget Sound. In addition, the issues that are of importance in Puget Sound are issues that are studied in Padilla Bay.

The Padilla Bay Reserve, representing the larger Puget Sound ecosystem, has many management issues to address. Several of these issues are now the focus of the new Puget Sound Partnership (PSP), created by the Governor to clean up the Sound, making it "fishable, swimmable, and diggable" by the year 2020. The Department of Ecology (Coastal Management Office) is increasingly involved in these actions, with additional mandates for Puget Sound Health. Some of these issues of regional importance are: protection and restoration of habitat, reduction of toxic inputs, reduction of human and animal waste inputs, protection of ecosystem biodiversity and imperiled species, controlling invasive species and understanding the impacts of climate change.

Management issues that provide a context for the research in Padilla Bay include subsets of several of those noted above. Some of these include winter runoff from the predominately agricultural watershed, residential and commercial development in the Padilla Bay watershed, various proposals to divert part of the Skagit River flood waters to Padilla Bay, potential threats to the eelgrasses in Padilla Bay, the interaction between the non-native Japanese eelgrass and the native eelgrass, spread of the non-native *Spartina*

on the intertidal flats, effects of chronic hydrocarbon pollution, effects of potential oil spills drifting into Padilla Bay, and the effects of future climate change and sea level rise on habitats, shorelines, biota, and water quality.

Padilla Bay NERR is located institutionally in the Washington State Department of Ecology in the Shorelands and Environmental Assistance (SEA) Program. In this setting Padilla Bay supports research on priority issues of Ecology and of the SEA Program, including issues related to broader coastal zone management. In addition, conservation and environmental quality in Puget Sound is and has been the concern of federal and state agencies. Padilla Bay research has supported the priorities and issues of the E.P.A. Puget Sound Estuary Program, the Washington State Puget Sound Water Quality Authority, the Puget Sound Action Team, and beginning in late 2007, the Puget Sound Partnership (PSP). Support for the priorities of these many organizations has included funding, conducting, or supporting research in Padilla Bay that is consistent with their funding priorities. In late 2008 the PSP is expected to release a report detailing research and scientific needs in support of their mission; PBNERR will respond with applicable staff and resources as funding allows. Research conducted in and by Padilla Bay NERR will continue, both formally and informally to advance scientific knowledge to address the issues of importance in Puget Sound and other organizations within the Padilla Bay organizational landscape.

The Value of Padilla Bay National Estuarine Research Reserve for the Research Community

Padilla Bay and the National Estuarine Research Reserve designation and operation contribute to the value of research in Puget Sound/Georgia Basin and estuarine research in Washington State in numerous ways. Specific factors that contribute to Padilla Bay NERR's value to estuarine research include:

- The protected status of Padilla Bay and its habitats as part of the National Estuarine Research Reserve System that is protected both by federal and state agreements.
- The extensive areas of eelgrass in Padilla Bay that provide a laboratory in which to better investigate eelgrasses, the eelgrass community, and the role and functioning of eelgrasses in the larger estuarine system.
- The mosaic of other habitats in Padilla Bay such as native salt marsh, sand flats and mud flats devoid of macro-vegetation, rocky shores, and an extensive channel network.
- Padilla Bay can serve as a "control" site or reference site for a variety of studies because the bay and its communities are relatively unimpacted directly by anthropogenic activities.
- Baseline data and studies that have been conducted because Padilla Bay is set aside as a research reserve provide background and context for research projects, including short-term studies.

- Monitoring data of basic water quality, nutrients and weather are collected by Padilla Bay NERR and available to scientists to assist in the understanding and interpretation of their studies.
- Padilla Bay NERR has a new laboratory with space for a variety of different types of studies, bunkhouse facilities for overnight or short-term stays at Padilla Bay, and a library with copies of most reports and publications on Padilla Bay and the North Puget Sound area.
- NERRS Graduate Research Fellowships and Padilla Bay Research Assistantships provide funding for graduate students conducting research in Padilla Bay.
- The variety of studies conducted in Padilla Bay and the connections with other National Estuarine Research Reserves provide opportunities for collaborative studies.

Framework for Research

This section includes a discussion of the committee and staff involved in research, facilities, equipment and support; an indication of the research that has been conducted in Padilla Bay; the biological setting for research; and the elements of the research program at Padilla Bay.

Research Advisory Committee and Staff

Research Advisory Committee. The Padilla Bay Research Advisory Committee includes academic and agency estuarine scientists in the Pacific Northwest. The Research Advisory Committee is active in providing guidance for the research and monitoring program at Padilla Bay, promoting Padilla Bay as a place for research, reviewing applications of Padilla Bay Research Assistantships and Graduate Research Fellowships, and providing advice on research priorities for Padilla Bay.

Padilla Bay staff. The research program is supported by a variety of Padilla Bay staff including a Research Coordinator, two monitoring specialists, a GIS specialist, and AmeriCorps volunteers and GRF fellows. In addition, various aspects of the research program are supported by other Padilla Bay staff, including the Stewardship Coordinator, Facilities Manager, and other AmeriCorps staff.

Integration with Other Sectors

Integration with Padilla Bay stewardship. Research staff will continue to work with stewardship staff in mutual projects, collaborations, and support of stewardship priorities. Examples include obtaining baseline data on benthos in Padilla Bay, water quantity data for selected inflows into Padilla Bay, contaminants in the sediments of freshwater sources to Padilla Bay, surveys for forage fish spawning areas in Padilla Bay, and research on the feasibility and possible impacts of re-introducing Olympia oyster in Padilla Bay.

Integration with Padilla Bay education. Padilla Bay research staff will continue to work with education staff on mutual projects, assist in the development of materials based on Padilla Bay research, improve the Padilla Bay web site for public information, contribute articles for the Padilla Bay newsletter, and incorporate interpretive displays on research and monitoring, including a display on the monitoring program.

Integration with CTP at Padilla Bay. Padilla Bay research staff will work with CTP staff in development and implementation of training classes using both Padilla Bay staff and other researchers in Padilla Bay. Padilla Bay staff will work with CTP staff in other CTP projects such as assisting the installation of water quality monitoring sites outside Padilla Bay, collaborating on the shellfish grower project, and adding further real-time data collection sites in Padilla Bay.

Facilities, Equipment and Support for Research

An important element of the Padilla Bay NERR research program includes the support and facilities for research and promotion of research in Padilla Bay (also see Chapter 5, Facilities Plan).

Padilla Bay NERR provides a **laboratory** where students and visiting scientists are able to sort field samples and conduct preliminary analyses or prepare samples to analyses in their home institutions. The laboratory includes basic instruments for analysis of water samples, space and facilities for cleaning and sorting biological and sediment samples, ovens and balances for drying and weighing biological and sediment samples, scopes for sorting and identification, GIS capabilities, and GIS data.

Padilla Bay NERR also provides **field support** for research with field instruments, GPS instruments, safety gear, and vessel support. Field instruments can be used for basic water quality measurements. Access to sites in Padilla Bay for research is often difficult and vessel support is provided on a limited basis. (Padilla Bay NERR is not able to provide support for research projects that require substantial vessel support.) PBNERR plans to construct a storage build for vessels and equipment in 2009.

Padilla Bay NERR provides **overnight accommodation** for research students and scientists conducting research in Padilla Bay. New facilities were opened in 2007 that provide for a greater range of services and opportunities for researchers.

Geographic information system capabilities have been developed at Padilla Bay in support of the research program. These have been particularly important in mapping and tracking the distribution of vegetation, but have also been important in helping many investigators locate appropriate study sites, place in a wider context their study sites, or locate their sites relative to other research sites.

Past Research in Padilla Bay

The earliest record of research in Padilla Bay is in a paper by Shelford *et al*. (1935). Later, the lack of success of an oyster industry in Padilla Bay prompted investigations of pollution sources. The construction of oil refineries on March Point prompted the first extensive attempt to survey the plants and animals in Padilla Bay (Sylvester and Clogston 1958). An oil spill near Anacortes in 1971 resulted in several reports on the effects of the spill. Washington State agencies such as the Department of Fish and Wildlife have conducted various surveys that have included some data from Padilla Bay, and the possibility of oil pipelines and shipment of oil to and through northern Puget Sound prompted numerous surveys and baseline studies of the area and many studies included one or more sampling sites in Padilla Bay (Bulthuis and Stevens 1991).

Since the establishment of Padilla Bay as a National Estuarine Research Reserve, the NOAA sponsored research during the 1980s specific to Padilla Bay on seagrasses and tidal flat plants, crabs, and water quality. Padilla Bay research staff mapped the vegetative communities and habitats of Padilla Bay and studied flood currents into Padilla Bay (Bulthuis 1991a, 1995, Bulthuis and Conrad 1995a, 1995b, Bulthuis and Shull 2002, 2006). The establishment of a Research Assistantship in Estuarine Science and Coastal Zone Management at Padilla Bay National Estuarine Research Reserve has resulted in numerous Master of Science theses and student reports on the Padilla Bay ecosystem. Started in 1997, the NOAA Graduate Research Fellowship program has supported graduate student research in Padilla Bay. Bibliographies of reports that include these studies on Padilla Bay have been published as Padilla Bay National Estuarine Research Reserve Technical Reports (Bulthuis 1989, Bulthuis 1993a, Bulthuis & Shull 1998) and a general review of these studies was published as a U.S. Army Corp of Engineers Technical report (Bulthuis 1996a). All of these studies provide an indication that Padilla Bay is a productive and important estuarine system, but also indicate the gaps in our knowledge of the bay and the need for further studies to provide a basis for good research that can assist coastal and estuarine management. The main gaps in our knowledge are addressed in the issues and topics for research in Padilla Bay later in this plan.

Biological Setting for Research in Padilla Bay

The physical and biological settings for Padilla Bay have been described in Chapter 4 of this Management Plan. In this section the estuarine resources that are important for the present research and monitoring plan are summarized.

Padilla Bay contains extensive beds of seagrasses, mainly *Zostera marina* (Webber et al. 1987, Bulthuis 1991a, 1995, Bulthuis and Shull 2002, 2006). These seagrasses are a critical biological resource of the bay. They are the major producer (Thom 1988, 1989, 1990); they provide direct food supply for the resident and migratory black brant (Jeffrey 1976, Jacobs et al. 1989, Reed et al. 1989a); they directly and indirectly support a diverse and productive invertebrate infauna and epifauna that, in turn, are the major food organisms for fish (Simenstad et al. 1988, Caine 1991, Thom et al. 1991) and avifauna; they provide habitat and shelter for resident and transitory fish including juvenile salmon (Fresh 1979; Simenstad et al. 1988); and they are the preferred habitat for young Dungeness crab (Dinnel et al. 1990). Intertidal flats that lack macroscopic vegetation are rich in benthic diatoms (Thom 1989) and are important as habitat for crustaceans and other invertebrates that are important prey items for juvenile salmon and wading birds (Simenstad et al. 1988).

Padilla Bay is an important nursery and feeding area for fish such as juvenile chum and Chinook salmon, surf smelt, Pacific sand lance and threespine stickleback (Simenstad et al. 1988). Dungeness crabs appear to use the bay as a nursery area, with high populations of young crabs in the seagrasses and larger crabs in the channels (Dinnel et al. 1986, McMillan et al. 1995).

Padilla Bay contains extensive populations of resident and migratory black brant (Reed et al. 1989a), other waterfowl and wading birds (Jeffrey 1976). The abundance of waterfowl

supports several peregrine falcons (endangered), and the bald eagle (threatened) uses the bay and surrounding uplands for feeding and nesting.

Land and water-based impacts that threaten these biological resources include agricultural practices in the watershed, potential diversion of Skagit River flood water, potential oil spills associated with the refineries on the western shore of Padilla Bay, and residential and commercial development in the watershed.

Issues and Topics for Research at Padilla Bay

Padilla Bay NERR is a good site to address a wide diversity of research issues. Among those many issues, the following research topics have been identified as high priority for the next several years at Padilla Bay through discussions with Padilla Bay staff, the Research Advisory Committee, academic scientists and staff in Ecology and natural resource agencies and consistent with the NERRS Research and Monitoring Plan (15 C.F.R. Part 921.50; see Chapter 2 The NERR System).

- Eelgrasses, their seasonal and interannual variation, their productivity, the factors controlling their growth and survival, interactions with other flora and with fauna.
- Faunal community associated with eelgrasses, including the many juvenile and early life stages that are part of the eelgrass community, salmon and other fish, birds, invertebrates.
- Non-native species and their role and impacts in the estuary. Examples of non-native species needing research in Padilla Bay are *Spartina* spp., *Zostera japonica*, and *Batillaria*.
- Stewardship issues for which research is needed in order to make appropriate decisions for natural resource management of Padilla Bay. Examples include historical conditions and ecology of Padilla Bay to assist in restoration plans, human impacts on fauna and flora in Padilla Bay, climate change, and sea level rise. Specific issues may arise such as the effects of proposed diversion of Skagit River floodwater to Padilla Bay either directly or indirectly.
- Watershed-estuary interactions including agriculture-estuary interactions and effects of development in the watershed on the estuary. Examples of issues include effects of storm water, water quality, agricultural practices, and tidal restrictions.
- Contaminants and nutrients such as hydrocarbons, toxins, and nitrogen. Examples of contaminant issues include the Whitmarsh Landfill over former marsh in the southwest corner of Padilla Bay and the Inman Landfill with potential for leachate in groundwater that flows to Joe Leary Slough and Padilla Bay.
- Species of special concern such as salmon (including Puget Sound Chinook) Dungeness crab, herring, and scoters.

Current Research Program Elements

The research program at Padilla Bay NERR includes student-supported research, cooperative research with other institutions, agencies and scientists; research conducted

by Padilla Bay NERR; and support for research, monitoring, GIS, and stewardship activities in Padilla Bay.

Research opportunities

Student Research

The **Padilla Bay NERR Research Assistantships in Estuarine Science and Coastal Zone Management** are awarded ($5000 in 2007) to students conducting research in Padilla Bay as part of their Master's or Ph.D. thesis work or occasionally outside of their thesis research. Research on coastal zone management issues that have been identified as important issues may be conducted anywhere in Puget Sound and funded by Padilla Bay Research Assistantships. Funding for the assistantships are sought from a variety of sources including private foundation grants, coastal zone management grants to the states, and reserve operations funds. Proposals are requested from students, reviewed by the Padilla Bay Research Advisory Committee and other scientists and agency staff, and awarded as contracts to the students.

Research Assistantships in Estuarine Science and Coastal Zone Management provide support for student thesis research in Padilla Bay.

The **NERRS Graduate Research Fellowship** Program provides $20,000 a year (in 2007) for up to three years for Ph.D. or Master's thesis research in Padilla Bay NERR. Two fellowships are funded each year so that there may be two, one, or no openings at Padilla Bay in any particular year. Padilla Bay NERR promotes the fellowship opportunities, arranges for reviews of the proposals, and works with the students to promote the best possible research in the bay. The students provide assistance to Padilla Bay NERR in some aspect of monitoring or research.

Cooperative Research

Another element of the Padilla Bay NERR research program is cooperative investigations with other scientists or institutions. Many research issues require multiple investigators and funding sources often prefer or require multiple investigator teams. Padilla Bay research staff work cooperatively with scientists from a variety of institutions with differing levels of involvement including principle investigator, field investigations, field or laboratory support, or scientific advice or context. These projects are principally funded through another institution and necessarily vary widely from year to year for Padilla Bay depending on the issues being investigated and the opportunities for involvement. Padilla Bay also promotes cooperative research through the provision of facilities and field support at Padilla Bay, including laboratory space and equipment, field instruments, GIS support, overnight facilities, and vessel support.

Planktonic stages of many estuarine species are found in plankton tows in Padilla Bay.

Research by Padilla Bay Staff

A third element of the Padilla Bay NERR research program is research conducted by Padilla Bay staff. These projects may include cooperation with other scientists and institutions, but Padilla Bay NERR is the principle research institution. These projects are funded by a variety of sources. In the past funding has been received from organizations such as CICEET, ESDIM, NOAA, and Ecology. The specific projects change from year to year depending on the projects that are funded.

Information Dissemination

A **Padilla Bay NERR Technical Report** series and **Reprint** series are produced by Padilla Bay NERR. These series are produced both as printed copies and as digital copies in PDF format. These series provide a mechanism for thesis research and other research at Padilla Bay to be made available to a wider audience.

Conferences. Research results are presented at regional and national conferences by Padilla Bay staff, student researchers and visiting scientists.

Web site. Through the Padilla Bay web site, we provide information about the research program, student research opportunities, and reports on research in Padilla Bay.

Future Research Opportunities

There are many opportunities for future research at Padilla Bay NERR, particularly with the value of the reserve as outlined in the previous section, and with the variety of important issues and topics requiring research listed above. Some of the actions to

maintain, improve, and expand the research at Padilla Bay and some of the opportunities for future research at Padilla Bay are listed below.

Padilla Bay Research Assistantships in Estuarine Science. The program of annual awards of Padilla Bay Research Assistantships in Estuarine Science and Coastal Zone Management will be continued with funding sought from a variety of sources. Awards will be given for graduate thesis research in Padilla Bay or meeting important Puget Sound and Coastal Zone Management issues.

Support of Puget Sound Partnership. Padilla Bay NERR will support, promote, and conduct research addressing issues identified by the Puget Sound Partnership in their late-2008 report and other priorities identified by the Department of Ecology.

Coastal Zone Management in Washington State. Padilla Bay research staff will continue to work with the Shorelands and Environmental Assistance Program (CZM Office) by providing scientific advice and supporting research that addresses important coastal zone management issues.

Graduate Research Fellowships. The NERRS Graduate Research Fellowship Program will continue to be supported by Padilla Bay including promotion of opportunities, advising of Padilla Bay research priorities, reviews of proposals, scientific advice to fellows, and supervision of the "estuarine monitoring" requirement.

Padilla Bay Technical Reports and Reprints. Research and monitoring data from Padilla Bay will be made more available by publication of the Padilla Bay NERR Technical Reports and by reprinting of less available data and reports, particularly student theses.

Eelgrass science in the Pacific Northwest. Padilla Bay research staff will work with other eelgrass scientists in the Pacific Northwest in a variety of workgroups, expert panels, and committees to provide the best possible scientific information in guiding policy and management for eelgrasses in the region.

Padilla Bay laboratory and bunkhouse. The new laboratory and the new bunkhouse at Padilla Bay provide opportunities to promote Padilla Bay research priorities through use of these facilities. The availability of these facilities will be advertised and promoted to assist research in Padilla Bay and supporting Puget Sound Partnership and coastal zone management research priorities.

Web page development. In coordination with other sectors at Padilla Bay, improve the research, monitoring, and GIS web pages including display pages of current researchers, download page for GIS datalayers and metadata, mapping project methods and results, and aerial photo of Padilla Bay with illustrations of habitats.

Funding for research priorities. Padilla Bay research staff will seek opportunities to promote high priority research topics through research grants, partnerships, and collaborative investigations with other institutions, including the topics listed in "Issues and topics for Research in Padilla Bay" earlier in the chapter.

Non-native species in Padilla Bay. Padilla Bay research staff will seek opportunities to conduct and promote research on non-native species and their interaction with native species.

Build GIS capacity in support of research. Padilla Bay staff will seek funding and collaborative opportunities to develop and build a GIS database of research and monitoring studies in Padilla Bay.

Native and Japanese eelgrass. The interaction between the Japanese eelgrass, *Zostera japonica,* and the native eelgrass, *Zostera marina,* has important implications for native estuarine fauna and flora throughout Puget Sound and Washington State. There is increasing concern that *Z. japonica* may have a deleterious effect on *Z. marina*. Padilla Bay is the location of one of the early introductions of *Z. japonica* and recent vegetation mapping projects indicate that it is spreading into areas that had been covered by *Z. marina*. Padilla Bay research staff will seek funding and other opportunities to promote and conduct research on the interaction of these two species and on the ecological impacts.

Boat for visiting researchers. Padilla Bay has an extensive area of shallow flats with distributary channels that impose a challenge for access to research sites in the bay. Padilla Bay NERR has a few vessels to support reserve operations and programs and occasional support for visiting researchers. The addition of a boat specifically for the use of visiting researchers would facilitate research in Padilla Bay and promote the use of research sites that may be most appropriate for the question being addressed, rather than sites determined by accessibility.

Goals, Objectives, Actions and Policies

Goal: Protect and improve habitat and biological diversity within the Reserve and Puget Sound biogeographic region.

Objective: Research at PBNERR will improve the scientific knowledge of PBNERR habitats, species, diversity and ecosystem functions.

Action: Establish a list of priority annual research topics consistent with the 5-year goals of the Reserve, including input from the Stewardship and Monitoring sectors and GIS staff, and SEA/CZM needs. A workshop will be scheduled to develop these topics.

Action: Utilize the list to develop an annual research program; solicit university assistantship and internship positions, and prepare proposals for internal and external submittal in cooperation with agency and university staff.

Goal: Utilize and increase the use of Reserve science and stewardship to address priority coastal management issues.

Objective: Resources, data and support will be provided to approved, independent research projects within the Reserve's boundary and watershed.

Action: Projects will be reviewed and evaluated to determine consistency with Reserve goals and possible interference with other projects.

Action: Implement Research Assistantship and GRF programs annually.

Action: Provide equipment, watercraft, and staff support as available.

Action: Integrate biogeographic data capabilities into research projects and utilize new data sets for the PBNERR GIS data archive.

Action: Work with external partners to develop research projects to support laboratory infrastructure.

Objective: PBNERR research efforts will coordinate with the needs of broader Puget Sound research programs.

Action: The PBNERR research coordinator will collaborate with the PSP staff to determine how the Reserve can assist with Puget Sound research priorities.

Action: The PBNERR research coordinator will meet regularly with the Ecology/SEA Technical Team and coordinate research needs for coastal management issues and preparation of related proposals.

Action: The research coordinator will utilize the Research Advisory Committee in making decisions regarding program direction, allocation of student funding, and proposal review.

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: PBNERR scientific data and findings will be disseminated to applicable resource management agencies and the scientific community.

Action: Reserve technical reports and reprints, including student theses, will be made available on the web and at the Reserve library.

Action: Reserve staff will attend relevant scientific and professional conferences and present papers, posters and findings; important papers will be submitted to peer-reviewed journals for publication.

Objective: Research findings will be made available to Reserve visitors and students and CTP participants.

Action: Key research information will be presented in the Interpretive Center via posters or electronic media (information kiosk).

Action: Research findings and data bases will be made available to Reserve education and CTP coordinators for integration into appropriate classes and workshops.

Policies

1. Research projects in PBNERR will be conducted with a Research Permit issued by the research coordinator for the purposes of coordination, tracking, and protection of resource integrity.

2. All field and laboratory activities, including watercraft operation, will be carried out consistent with applicable safety plans and manuals.

3. Research in PBNERR will be carried out in a manner designed to minimize impact to the bay's biological communities and resources.

9 Monitoring Plan

Monitoring at Padilla Bay NERR includes both implementation of the NERRS System-wide Monitoring Program and implementation of Padilla Bay NERR specific monitoring. The NERRS System-wide Monitoring Program includes a set of physical water quality parameters at four sites with datasondes, a standard suite of weather parameters near the shore of Padilla Bay, and nutrients and chlorophyll at water quality four sites.

An Environmental Monitoring Plan for Padilla Bay National Estuarine Research Reserve was developed in 1996, updated in 2004, and this section outlines some of the main elements of that plan. Further detail can be found in that plan (Bulthuis 1996b). The institutional framework of Padilla Bay NERR includes, 1) its role as a National Estuarine Research Reserve and participation in the System-wide Monitoring Program (SWMP), 2) its management by the Washington State Department of Ecology, and 3) its cooperative links with many institutions including universities and research groups in government agencies. In particular, Padilla Bay is located in greater Puget Sound and was designated as a NERR in the Puget Sound Sub-region within the Columbian Biogeographic Region. Within Puget Sound, the Padilla Bay monitoring program is coordinated with and supports the monitoring conducted by Ecology and provides important temporal balance to the Puget Sound Ambient Water Quality Monitoring Program. Coordination with the new Puget Sound Partnership will also be important as they unfold their new science plan in late 2008.

Major issues facing the Reserve, and in a broader sense all of Puget Sound, include water quality, especially non-point pollution from agricultural sources and residential septic tanks and runoff from hobby farms. These latter two have resulted in periodic closure of shellfish beds, both recreational and commercial, throughout the region. Newly discovered substances in septic outflow from improper disposal of human medications, such as hormones and antibiotics, are getting strong attention, especially as they may impact species harvested for human consumption. Toxic substances, mainly from atmospheric deposition and a nearby abandoned landfill are additional areas of interest. Invasive species, found in many Reserve habitats, are discussed at length in Chapter 7.

The Monitoring Plan addresses long-term monitoring efforts from both a scientific perspective as well as a management and stewardship perspective, and in that sense has links with both the Research Plan and the Natural Resources Stewardship Plan. Monitoring of Padilla Bay is included both in this chapter and in the Natural Resource Stewardship Plan (Chapter 7). Several aspects of the monitoring plan will be integrated with the elements of the Land Use, Land Cover and Habitat Change Program currently being prepared by NOAA/ERD (see Chapter 7).

Framework for Monitoring

Staff and Advisors

The monitoring program is supported by a variety of Padilla Bay staff. The Research Coordinator provides overall management and oversight for monitoring at Padilla Bay.

The NERRS System-wide Monitoring Program is implemented primarily by two monitoring specialists funded through the annual operations award to Padilla Bay NERR. The monitoring specialists are assisted by AmeriCorps volunteers, particularly with field work and collection of samples and exchange of datasondes. Other elements of the monitoring program are implemented by a variety of Padilla Bay staff. Aerial coverage of eelgrasses, salt marsh, and macroalgae has been implemented by the GIS specialist, Research Coordinator, monitoring specialists, AmeriCorps volunteers, and summer interns. Zooplankton monitoring has been conducted by GRF Fellows as part of their monitoring assistance to Padilla Bay and by one of the monitoring specialists. Monitoring of vegetative characteristics of salt marshes has been carried out by Stewardship Coordinator and AmeriCorps volunteers or short-term Stewardship staff. In addition, various aspects of monitoring are supported by other Padilla Bay staff, including the Stewardship Coordinator, Facilities Manager, and other AmeriCorps staff.

At times it is necessary to coordinate with external parties to design, correct, and implement monitoring activities. Datasondes and other equipment, such as weather station equipment, can be prone to occasional problems and manufacture representatives and personnel at the CDMO are particularly helpful. Water quality specialists at the Ecology Water Quality and Environmental Assessment offices have years of expertise in monitoring and data management.

Integration with Other Sectors

Linkages between education, Coastal Training Program, stewardship, research, and monitoring at Padilla Bay National Estuarine Research Reserve take on numerous forms, involve various staff and researchers, and are both formal and informal. Formal attempts to link research and education include displays about research in the public exhibit areas of the Breazeale Interpretive Center. In the exhibits, there are stations showing various researchers and students working in Padilla Bay with short descriptions of their research projects. In the Aquarium Room, a wall mounted poster display was developed jointly by the Padilla Bay Education Coordinator and Research Coordinator. The display includes a description of management oriented research at Padilla Bay and the various audiences and users of Padilla Bay research. There are 10 to 12 "posters" of various research studies in Padilla Bay with titles to catch public interest, a description of the findings, and where to get further information.

Natural resource and stewardship at Padilla Bay requires monitoring of many species and other natural resources at several spatial and temporal scales. Research, monitoring, and stewardship staff work closely together on many of these efforts. Examples include aerial distribution of salt marsh in Padilla Bay that is determined by GIS and research staff as part of estuarine vegetation monitoring. Salt marsh vegetative characteristics are measured by stewardship staff using modified SAV/emergent monitoring protocols.

Research staff, both Reserve staff and visiting research scientists, give lectures to public groups and students. In one unusual setting a Padilla Bay Research Assistantship recipient gave a presentation on rocky intertidal ecology at Saddlebag Island (in Padilla Bay) to a group of kayakers that had been organized through the Padilla Bay education staff. Various research scientists have given public lecture programs to the public as part of the Padilla Bay education program. With the Padilla Bay CTP program, research staff

have been involved in the planning and presentation of a class dealing with eelgrass from a planning and permitting perspective.

Another aspect of research, monitoring, and education linkage at Padilla Bay involves staff assisting across these activities. Education staff help out with field work in monitoring and research and learn first hand about these projects. Research staff help planning and interpretation of data in volunteer monitoring programs in which the goal is education of the volunteers. Similarly, research staff assist with the High School Outreach program at Padilla Bay.

With the CTP program, Padilla Bay monitoring has been a participant in an IOOS shellfish demonstration project. In this project SWMP near-real time data from Padilla Bay, Kachemak Bay and South Slough NERRs along with near-real time data collected by the University of Washington are displayed on the web for ease of use by shellfish growers.

Another type of research-education linkage occurs in the Padilla Demonstration Farm Advisory Committee. The Committee and operation of the Demonstration Farm are aimed, in part, at educating the farmers as coastal decision makers. Data from the monitoring program and results of water quality investigations are provided to the farmers so that they can better understand the effects of their agricultural practices on water quality.

PBNERR Monitoring Program

Outlined below is the basic design for the Padilla Bay Monitoring Program. This design will be changed and refined as data analyses or practical difficulties indicate changes are needed, and as the plan is peer reviewed both internally and externally.

Monitoring of Abiotic Parameters

NERRS System-wide Monitoring Program

Padilla Bay participates fully in the NERRS System-wide Monitoring Program (SWMP) which is summarized in 15 C.F.R. Part 921.50; see Chapter 2 The NERR System). The NERRS System-wide Monitoring Program includes three broad phases or components:

1. Abiotic parameters (such as physical and nutrient water quality parameters, meteorological, sediment quality)
2. Biological (including biodiversity and fluctuations in populations and communities)
3. Land-use and land-cover (in the NERR watershed)

The NERR system has initially focused on the first phase, abiotic monitoring, and recently has conducted trials and pilot studies in the second phase, biological monitoring. In coordination with the rest of the NERRs, Padilla Bay is implementing physical water quality monitoring, water column nutrient monitoring, and meteorological monitoring as part of the first phase (abiotic parameters) of the NERRS SWMP. As additional portions of the NERRS System-Wide Monitoring Program are adopted the site-based (Padilla Bay) program will change to incorporate these elements.

Water quality monitoring sites. Four water quality sites have been established in Padilla Bay: one in the southern half of the bay (Bay View Channel site), one in the northern half of Padilla Bay (Ploeg Channel site), one west of Padilla Bay between Samish and Guemes Islands (Gong buoy site), and one near the mouth of Joe Leary Slough (Figure 9.1). The Bay View Channel site was placed to monitor water quality in the main body of Padilla Bay. The Ploeg Channel site was placed to monitor water quality in the northern part of Padilla Bay in contrast to Bay View Channel in the southern part of Padilla Bay. The Gong buoy site was placed to monitor the water that flows into Padilla Bay with each tidal cycle. The Joe Leary Slough site was placed to monitor the quality of the freshwater that flows into Padilla Bay from the largest sub-basin in the Padilla Bay watershed. One of the objectives of long-term monitoring at the Joe Leary Slough site is determining the effectiveness of implementation of the Skagit County watershed planning process for the Padilla Bay/Bay View watershed. In addition to the above rationale for placement of the monitoring sites, the four sites also monitor a gradient of water from the freshwater in Joe Leary Slough, to mid-bay water quality (Bay View Channel and Ploeg Channel), to the "marine" end of the gradient at Gong buoy. The Padilla Bay sites (Bay View Channel and Ploeg Channel) will be in small channels that drain eelgrass-covered tidal flats, and thus will reflect water quality over the eelgrass. The Joe Leary Slough site will be located near the mouth of the slough on the freshwater side of the tide gates to indicate long-term changes in water quality as a result of changes in the watershed. The site west of Padilla Bay (Gong buoy site) will indicate the quality of water flowing into Padilla Bay during the semi-diurnal tides.

NERRS physical water quality. One element of SWMP data collection is basic physical water quality measured with multi-parameter data loggers. A few basic physical parameters (temperature, salinity/conductivity, turbidity, dissolved oxygen, and pH) will be measured at 15-minute intervals continuously, except for equipment calibration, downloading and malfunction.

NERRS water column nutrients. Nutrients and chlorophyll *a* in the water column will be measured at two spatial and temporal scales. Semi-monthly throughout the year nutrients and chlorophyll will be sampled at four water quality sites. Hourly for 26 hours at one water quality site in the bay, nutrients and chlorophyll will be sampled once a month. Parameters to be measured include nitrate, nitrite, ammonia, total nitrogen, soluble reactive phosphate, total phosphorus, chlorophyll and phaeophytin.

NERRS meteorological. Weather related factors will be measured at a weather station located at the Padilla Demonstration Farm at the southeast corner of Padilla Bay. Parameters that will be measured include rainfall, wind speed, and direction, air temperature, relative humidity, barometric pressure, and photosynthetically active

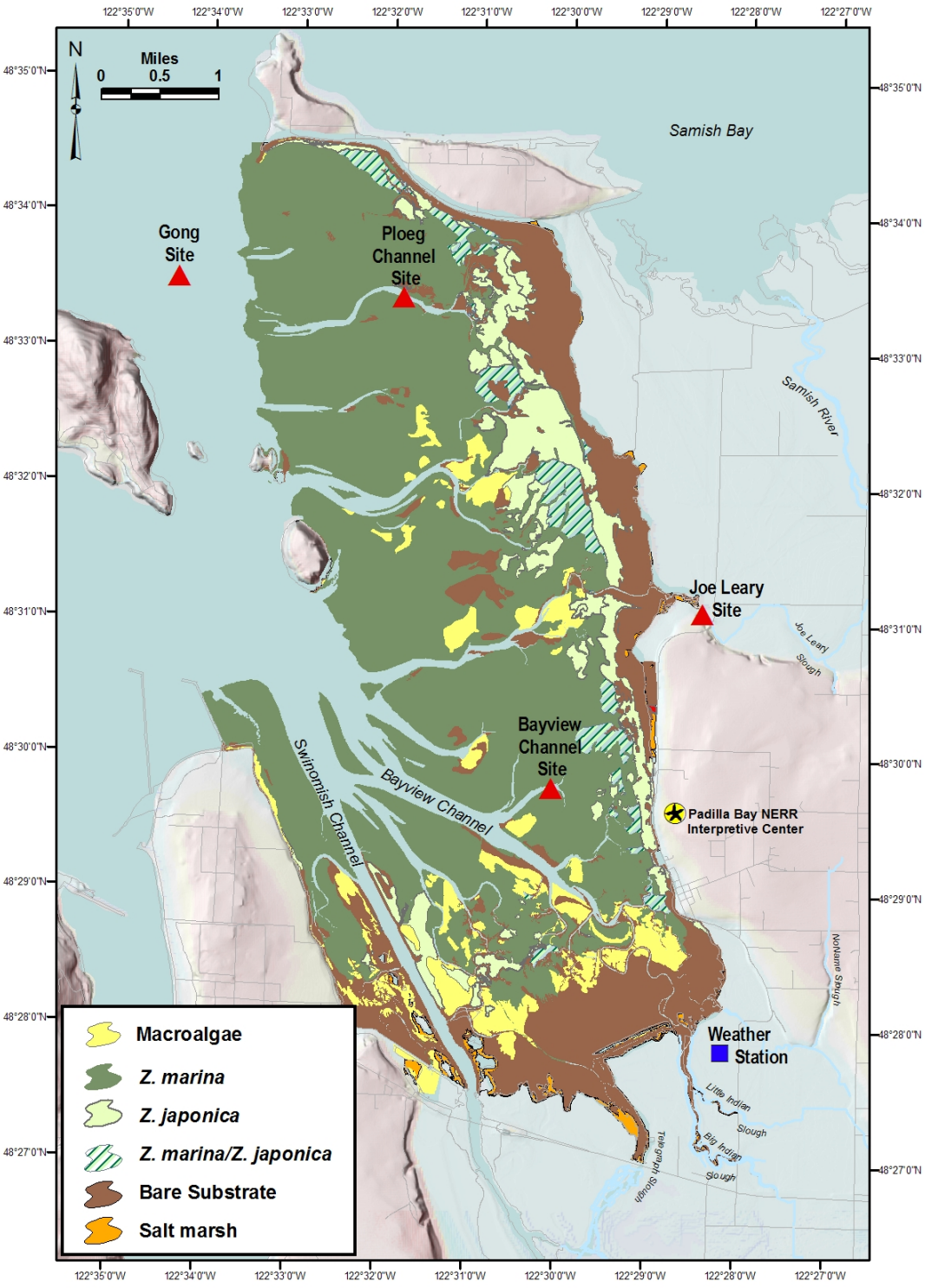

Figure 9.1 – Sites in Padilla Bay and watershed where water quality and nutrients are measured in the NERRS System-wide Monitoring Program. The weather station is located on the Padilla Demonstration Farm near the southeast corner of Padilla Bay.

radiation (400-700 nm). Protocols for frequency of data collection, data entry and management will be implemented as recommended by the system-wide program.

The weather station is located near the southeast shore of Padilla Bay on the Padilla Demonstration Farm.

Watershed water quality

The water quality in the sloughs and streams that flow into Padilla Bay will be periodically monitored for various purposes. Water quality and quantity in No Name Slough is being monitored in association with studies on the Padilla Bay Demonstration Farm. This farm, located in the proposed boundaries of the Padilla Bay Reserve and owned by the Washington Department of Ecology as part of the Reserve, is being used to demonstrate agriculture/development/water quality/water quantity issues. Part of the ongoing operation of the farm will be monitoring of some water quality parameters and flow in No Name Slough and in drainage ditches on the farm. Monitoring will be designed on a project specific basis each year or season. Another watershed water quality monitoring project is the Skagit Stream Team. These teams of volunteers monitor fecal coliform and physical water quality parameters in Joe Leary Slough, No Name Slough, and other streams and rivers in Skagit County.

Biological Monitoring

Areal coverage of eelgrass. Monitoring the areal coverage of eelgrass will be conducted with the Padilla Bay GIS specialist using remote sensing as completed for the year 2004 with funding as a SWMP Biomonitoring pilot site (Bulthuis and Shull 2006, Figure 9.2). True color aerial photos will be taken near mid-summer once a year. When possible, ground reference sites will be monitored throughout the bay during summer. Coverage of estuarine vegetation will then be delineated on screen using methods outlined in Shull and Bulthuis (2002) and Bulthuis and Shull (2006). Other vegetative communities that will be monitored with these methods include *Spartina spp.*, native salt marsh, and macroalgal mats.

In addition to monitoring the coverage of eelgrasses, salt marshes and macroalgal mats in Padilla Bay, other biological monitoring will be conducted for specific purposes.

Zooplankton. Monitoring for zooplankton in the water column was initiated in 2007, in particular for larval stages that may indicate the role of Padilla Bay in the life cycle of these invertebrates. Zooplankton monitoring will be started with monthly sampling at the three water quality monitoring sites in Padilla Bay.

Barnacle settlement. Barnacle settlement will be monitored at the three water quality sites in Padilla Bay (Bay View Channel site, Ploeg Channel site, and Gong buoy site). At each site, settlement plates are set out for 3 to 5 weeks and the number of barnacles that settled during the interval measured.

Non-native species monitoring. Non-native species will be monitored in Padilla Bay as part of the Stewardship program. Monitoring for presence of *Spartina spp.* for annual control and monitoring for green crab are outlined in Chapter 8 Natural Resource and Stewardship of this Management Plan. The objectives of this monitoring include detection of non-native species, evaluation of the effectiveness of control efforts, and planning for future control efforts.

Other biological monitoring. Other biological monitoring will be conducted for specific purposes as funding and special projects are started. Growth and morphological characteristics of eelgrasses may be monitored, both seasonally and interannually. The boundary and mixed growth areas between Zostera marina and Zostera japonica may be monitored in the future. Saltmarsh vegetative characteristics will be monitored using modified SWMP emergent methods in coordination with stewardship at Padilla Bay. Saltmarsh monitoring has been conducted by Padilla Bay stewardship staff for several years as time and resources allow.

Cooperative Monitoring Projects

Padilla Bay NERR will also conduct water quality and other monitoring in coordination and cooperation with other agencies and organizations. These opportunities may involve cooperative projects, sharing of data, monitoring similar sites for quality assurance, joint planning of monitoring sites to broaden coverage and avoid duplication, and data exchange. Some recent examples include the following. The Skagit Stream Team is implemented in cooperation with Skagit Conservation District. Results of monitoring from SWMP and Stream Team in Joe Leary Slough were shared with Ecology's NWRO to assist in dissolved oxygen problems in Joe Leary Slough. Padilla Bay NERR works with Skagit County Public Works Department to monitor leachate from the closed Inman Landfill that may add contaminants to Joe Leary Slough and Padilla Bay. Padilla Bay NERR provided a Research Assistantship to a student who conducted research on leachate coming from the closed Whitmarsh Landfill on the shore of Padilla Bay. The results were shared with Ecology staff who followed up with further monitoring. The selection of the Joe Leary Slough monitoring site in the SWMP was based on the objective of determining the effectiveness of implementation of the Skagit County watershed planning process for Padilla Bay/Bay View watershed. Padilla Bay conducted joint sampling with Skagit County in Swinomish Channel to determine low pH issues. Padilla Bay will continue to develop cooperative monitoring with the Puget Sound Partnership, Ecology, and other monitoring by local, state, and tribal agencies.

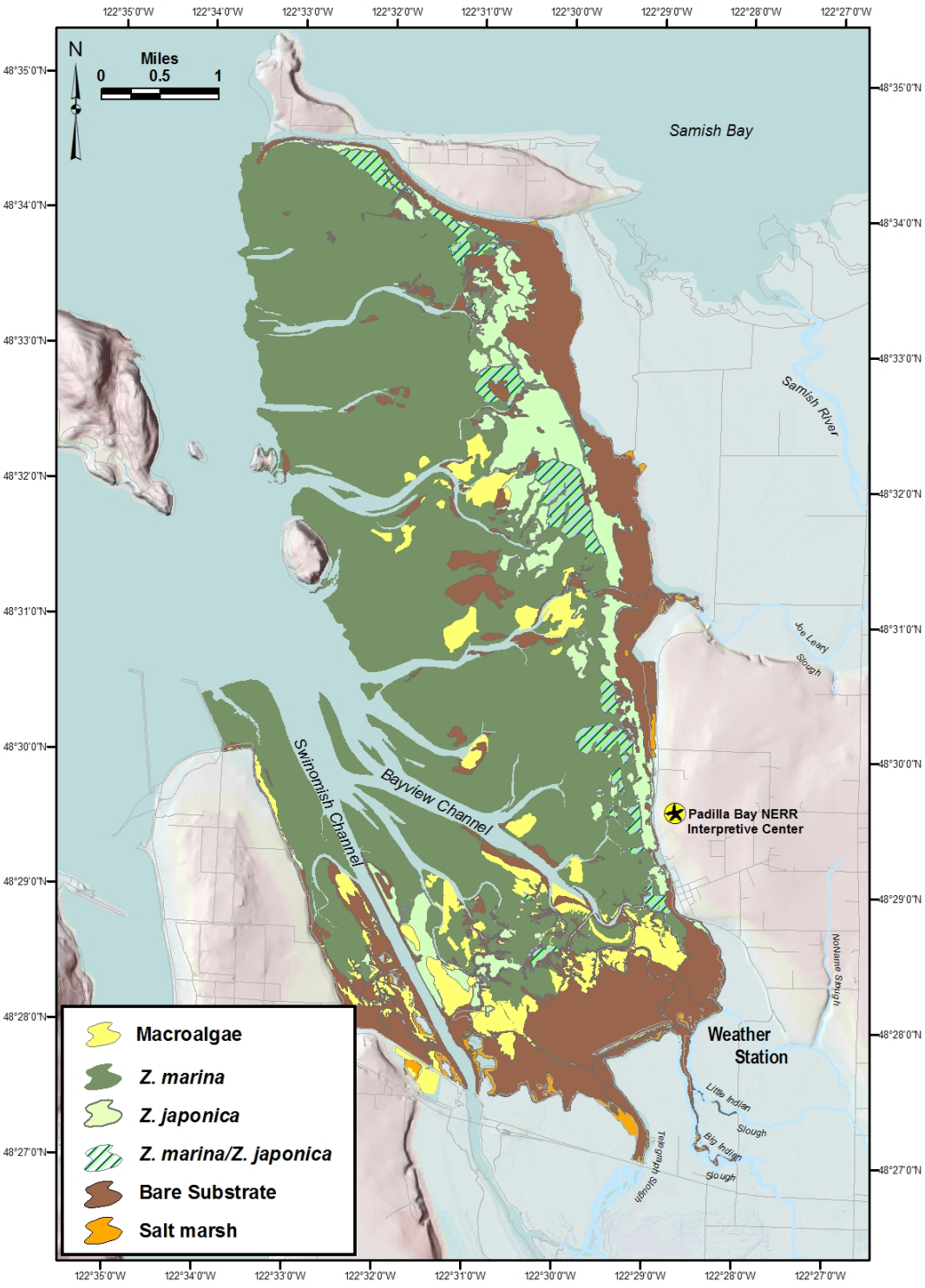

Figure 9.2 – Submerged and emergent eelgrass, macroalgae, and salt marshes in Padilla Bay as delineated from aerial photos taken during summer 2004 as part of the NERRS/SWMP biomonitoring pilot site project (Bulthuis & Shull 2006).

Data Management, Reporting, and Review

An objective of the Padilla Bay Monitoring Program and data management system will be ease of data entry, maintenance and access. Manpower and budget realities at Padilla Bay require a system that can be set up, maintained and accessed by the research staff, visiting scientists, and student interns. The data management system will be integrated with GIS at Padilla Bay enabling monitoring data from eelgrasses, macroalgae, and saltmarsh distribution to be stored and accessed along with tabular and graphic data from Padilla Bay. All data collected for the System-Wide Monitoring Program fall under the protocols of that system. Chapter 2, The National Estuarine Research Reserve System, presents a comprehensive review of these elements.

The results of the Padilla Bay Monitoring Program will be disseminated with at least three types of reports that will be distributed both in a printed format and digital format. The first type of report will be an annual data report that will indicate what data has been collected during the previous calendar year, how it is stored and may be accessed, and summaries of that data, including figures of spatial and seasonal trends and tables of data and data summaries. The second type of report will include some interpretation and analyses of the data, in particular long-term trends and relationships among variables being monitored. This second, interpretive report will be produced at irregular intervals and may focus on one aspect of the monitoring program, e.g., light or interannual variation in eelgrass coverage. The third type of reporting will be interpretive reports or publications that use the monitoring data in conjunction with collection of other data.

Monitoring programs should be reviewed regularly (Chesapeake Bay Panel 1988, Puget Sound Water Quality Authority 1995) and at least three levels of review of the Padilla Bay Monitoring Program are planned.

Future Monitoring Opportunities

NERRS System-wide Monitoring Program.

SWMP basic physical water quality. The basic physical water quality monitoring (temperature, salinity, dissolved oxygen, turbidity, and pH) will be maintained at four sites in Padilla Bay, ensuring good quality data and making the data available in a timely manner via CDMO and via database at Padilla Bay NERR. Data collection, calibration, and submission will be modified in keeping with NERRS protocols.

SWMP water column nutrients. Sampling and analyses for water column nutrients will be continued at four sites in Padilla Bay, including both the NERRS Tier 1 parameters and selected Tier 2 parameters. Data will be submitted to the CDMO and made available via database at Padilla Bay NERR. Chlorophyll analyses will be conducted at the Padilla Bay laboratory. Data collection, calibration, and submission will be modified in keeping with NERRS protocols.

SWMP meteorological. Meteorological data will continue to be collected at the Padilla Demonstration Farm and the data made available via CDMO and via a Padilla Bay database. Data collection and submission will be modified in keeping with NERRS protocols.

An automatic sampler collects 24 water samples for nutrient analyses over one 26-hour tidal cycle each month.

NERRS System-wide Monitoring Program modifications. The NERRS System-wide Monitoring Program continues to evolve and data collection methods are modified or new elements are added. Padilla Bay NERR will continue to fully implement the NERRS System-wide Monitoring Program. The two Padilla Bay water quality sites (Bay View Channel site and Ploeg Channel site) will be surveyed for vertical control so that water height measured in the bay can be related to tidal datum and standard vertical datum.

Water Quality Monitoring.

Dataflow. Dataflow capabilities will be developed at Padilla Bay. This system, using YSI datasondes, measures water quality parameters while underway in a vessel. This enables a wide geographic area to be covered in a short period of time and provides a "snapshot" of surface water quality. These "snapshots" of water quality will be used to place in spatial context the water quality that is being monitored at the three SWMP water quality sites. Dataflow will also be used to indicate the distribution of the water that flows out of Padilla Bay with the semi-diurnal tides.

Water column light transmission. Photosynthetically active radiation (PAR) will be collected at the water quality sites to monitor changes in the light environment for eelgrasses in Padilla Bay. Additional funding will be sought for this monitoring.

Near-bottom water quality at Gong site. The Gong water quality site is located in 60 feet of water and physical water quality is currently monitored near the water surface. The near-bottom (1-2 meters above the bottom) water quality will be monitored with YSI datasondes for comparison with surface data.

Padilla Bay Stewardship Monitoring and watershed water quality. A range of water quality parameters and biota in Padilla Bay and watershed will be monitored in coordination with stewardship including water quality and quantity of storm water flowing into Padilla Bay and erosion of salt marshes and bluffs. In coordination with education and stewardship at Padilla Bay NERR, water quality in the streams and sloughs in the Padilla Bay watershed, including fecal coliform, will be monitored in cooperation with other agencies, institutions and programs, including the Skagit County water quality monitoring program, the Skagit Stream Team, and the Department of Ecology. These

will be pursued with a combination of Padilla Bay staff, AmeriCorps and temporary staff, and new funding for specific projects.

Biological Monitoring

Distribution of estuarine vegetation. Padilla Bay will seek to add annual or biennial monitoring of the distribution of eelgrasses, salt marshes, and macroalgae. Various funding sources will be investigated in addition to NERRS SWMP Biomonitoring, including collaborative projects with other agencies or institutions. The boundaries of the distribution of *Zostera marina* and *Z. japonica* will be monitored annually to determine whether or not *Z. japonica* is spreading into areas of previous *Z. marina* coverage. Additional funding will be sought for this monitoring. Mats of macroalgae that vary widely from year to year will be monitored for intra-annual as well as inter-annual presence and distribution. Basic ground information about the mats will be collected. Research needs to be conducted to determine the effects of these algal mats on salt marsh vegetation, eelgrasses, and fauna associated with these vegetative communities. Additional funding will be sought for this monitoring and for research on the interaction of macroalgal mats with other estuarine biota.

Non-native species distribution. In coordination with stewardship at Padilla Bay, the presence and/or distribution of selected non-native species will be monitored. Additional funding will be sought for this monitoring.

Fish in Padilla Bay. Juvenile and adult fish will be monitored in Padilla Bay and the eelgrass meadows in Padilla Bay in collaboration with other agencies, institutions and programs, including Skagit River Systems Cooperative, NOAA Fisheries, and Washington Department of Fish and Wildlife. In coordination with stewardship at Padilla Bay NERR, monitor forage fish spawning at the one known location in Padilla Bay.

Puget Sound Partnership and Ecology. Padilla Bay will seek opportunities to advance the priorities of the Puget Sound Partnership and the Department of Ecology through the monitoring program at Padilla Bay by modifying or adding to the parameters that Padilla Bay monitors and/or reporting existing monitoring in their formats. Padilla Bay will seek opportunities to participate in cooperative monitoring projects with regional and watershed monitoring programs of the Department of Ecology. Padilla Bay will seek opportunities to participate and assist toxic clean-up efforts in Padilla Bay watershed and region, such as the Whitmarsh landfill.

Climate impacts. The various parameters being measured at Padilla Bay in ongoing and planned new monitoring will be evaluated for their ability to monitor changes that may come as a result of climate changes. In the Pacific Northwest, climate change is most likely to alter the timing of precipitation and result in milder winter temperatures. This may in turn alter water quality in the watershed as well as in Padilla Bay. Changes in air and water temperatures may result in spread of non-native species and of warmer water species whose range is currently south of Padilla Bay, Puget Sound, and Washington State.

Data Dissemination

Monitoring Reports. Data reports and interpretive reports on the results of the monitoring will be written and published both in printed form and digital form, with a goal of annual data reports and interpretive reports as appropriate.

Expand GIS capability for web presentation of GIS data and capability to map distribution of estuarine vegetation. In cooperation with GIS staff at Padilla Bay, web pages will be developed to present and display distribution data from the monitoring projects in Padilla Bay, including the distribution of eelgrasses, macroalgae, and salt marshes. On-line mapping capability will be developed so that Padilla Bay data can be displayed with Google imagery. The GIS capability at Padilla Bay will be upgraded and various automated methods for determining estuarine vegetation and for making interannual comparisons will be developed and tested. These include use of Feature Analyst to map vegetation from imagery, LPS to rectify/orthorectify imagery, and comparison of Feature Analyst with Stereo Analyst as means of mapping vegetation from aerial photographs.

Near real-time data transmission and data display of water quality data. Near real-time data transmission will be installed on piles at Bay View and Ploeg Channel water quality sites. A buoy system will be purchased and established at the Gong site to transmit water quality data and basic meteorological data. Additional funding will be sought for this monitoring. With education staff, a public display will be developed and installed in the interpretive center displaying the methods of data collection for near real-time data and display of selected parameters of near-real time data from Padilla Bay and watershed. Additional funding will be sought for this project.

Goals, Objectives, Actions and Policies

Goal: Protect and improve habitat and biological diversity within the Reserve and Puget Sound biogeographic region.

Objective: Monitoring at PBNERR will improve the scientific knowledge of PBNERR habitats, species, diversity and ecosystem functions and assist stewardship actions and decisions.

Action: Monitoring/research and stewardship coordinators, together with GIS staff, will coordinate annual work programs and data needs.

Actions: Data sets, to the extent possible, will be put into biogeographic (GIS) files for use by all staff and other agencies.

Goal: Utilize and increase the use of Reserve science to address priority coastal management issues.

Objective: Monitoring data will form the basis of decisions for resource management.

Action: Maintain current baseline data collections, particularly those that provide data for future needs such as possible oil spills, climate change, and sea level rise.

Action: Establish baseline water quality data at selected stormwater inflow sites

Action: Monitor juvenile and adult fish (salmon) in collaboration with other agencies and Tribes to determine utilization of Reserve habitat.

Objective: SWMP Programs will be implemented consistent with NOAA/ERD guidelines and plans.

Action: Implement SWMP Phase I at a minimum of 4 sites using NERRS protocols.

Action: participate in design and planning for SWMP Phase II (biological).

Action: Together with the Stewardship coordinator, review the Land use, Land Cover, and Habitat Change (LULCHC) plan; initiate plan elements as funding is provided.

Action: Continue cooperative project with Western Washington University utilizing Surface Elevation Tables (SET).

Action: Maintain and operate the meteorological station at the Demonstration Farm consistent with NERRS protocols.

Objective: Monitoring data will be collected and archived for future reference and decisions.

Action: Monitor and document, at least every four years, the distribution of estuarine vegetation.

Action: Monitor a range of water quality parameters in the Reserve's watershed in coordination with the Stewardship program and volunteer monitoring programs (Stream Team).

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Monitoring data will be translated and disseminated to local, state and federal participating agencies and other users through education, outreach and CTP programs.

Action: SWMP data and methods will be presented in an exhibit in the Interpretive Center.

Action: SWMP and Volunteer-collected data will be submitted to applicable agencies for consideration and action.

Action: Provide monitoring and research data at workshops, CTP events and professional meetings.

Policies

1. All field and laboratory activities, including watercraft operation, will be carried out consistent with applicable safety plans and manuals.

2. Monitoring in PBNERR will be carried out in a manner designed to minimize impact to the bay's biological communities and resources.

10 Education and Interpretation Plan

Hands-on education encourages stewardship of estuaries and coastal resources.

The National Estuarine Research Reserve System (NERRS) provides a vehicle to increase understanding and awareness of estuarine systems and improve decision-making among a variety of audiences. Each reserve is responsible for developing and implementing a program that links education to scientific research and stewardship. Each reserve's education program functions independently, but shares goals with other education programs in the NERRS, such as implementation of the full national K-12 Estuary Education Program (KEEP) as federal funding becomes available. Reserve staff and volunteers work with regional and local schools and organizations to address important coastal management issues, such as non-point source pollution, habitat protection, toxic waste, invasive species, biodiversity, and individual behaviors that can impact the environment. Award-wining formal and informal education programs target regional K-12 students, teachers, university students and faculty and myriad organizations, utilizing the resources of PBNERR to enhance awareness of the issues facing Puget Sound. Beginning in 2007, efforts began to develop and implement curricula materials on climate change and sea level rise, issues important to the resources and population of the Puget Sound coastal lowlands, and a topic of emphasis to our managing agency.

Framework for Education, Interpretation, and Outreach

Education Advisory Committee and Staff

An Education Advisory Committee of regional and statewide experts in various educational professions assists the Padilla Bay Reserve in reviewing, evaluating, planning, and prioritizing educational programs and objectives. Membership includes university specialists, teachers and administrators, scientists, and staff from the State Superintendent of Public Instruction.

Outstanding educational staff allow programs at PBNERR to be delivered expertly and efficiently. Three professional staff and one or two interns provide coordination and direct programming for over 10,000 participants each year (see staff descriptions, Chapter 3).

Cooperative Agencies and Institutions

Efforts to protect Puget Sound are strengthened by working with other educational institutions, regional marine centers and governmental agencies. Assistance comes

through working together to plan and present programs, staff exchange, sharing expertise, supportive marketing and in the sharing of facilities and equipment. Of specific importance is coordination with the Department of Ecology, the Puget Sound Partnership in their new mission to enhance the health of Puget Sound, and the Padilla Bay Foundation. Other primary cooperators include the Skagit Conservation District, People for Puget Sound, WSU Beach Watchers, Washington Sea Grant, Skagit Land Trust, and numerous school districts.

Facilities and Resources

A wide range of facilities and resources are available to support educational programs offered through the Reserve. These include the Breazeale Interpretive Center with its multiple exhibits, displays, aquaria, teaching rooms and library; upland dike-top trails and the observation deck; outdoor interpretive signs, and many others (see Chapter 5, Facilities). The focus of existing exhibits is on species and habitats, watersheds and water quality. New exhibits and aquaria are in the planning phase and will support curricula content at the K-12 and citizen visitor levels so that participants can see what they cannot easily get to in the field.

Geographic Range

Educational programs target people in the watershed of Puget Sound in Washington State. These programs teach about the Salish Sea (includes Puget Sound, Straits of Georgia and Juan de Fuca and the waters around the San Juan and Gulf Islands). Strategies for reaching these communities includes press releases, events, regional teacher workshops, professional conferences, and direct advertising. Information dissemination is accomplished through email, newsletters, outreach and special events, community presentations, etc.

Audience

General Public: The Interpretive Center receives thousands of visitors each year, coming from most states and many foreign countries to tour the indoor interpretive exhibits. In addition, hundreds of citizens attend special programs taught by experts. Additional thousands use the interpretive trails.

Schools: A professional staff of educators teaches programs designed for all school grade levels from preschool through college students, as well as for educators. The majority of visitors to the Interpretive Center in the spring and fall are from public, private, and home-schools. About 20% of this audience is parent volunteers required to attend as chaperones. Teachers are a distinct and related audience eligible for professional services including technical assistance (i.e. curriculum development), certification credits (Clock Hours), and in-service and pre-service workshops.

Other Youth Groups: Programs are also offered to groups such as scouts, home schools and summer youth groups.

Recreational Users: There is a wide range of opportunities available for the recreation-oriented visitor including, but not limited to: hunting, hiking/walking, boating, kayaking, wind surfing, sport fishing, birding, and beach combing. Resources to encourage such use include: Interpretive Center with knowledgeable staff, Bay View State Park with

picnicking and camping available, Saddlebag Island State Park with boat moorage and camping sites, a boat launch ramp, dike top trail, upland trail, and observation deck overlooking Padilla Bay with beach access and seasonal waterfowl viewing. Tens of thousands of visitors take part in these opportunities annually. Outdoor interpretive exhibits are maintained for these audiences.

Families: Some programs are designed especially for families with children such as the Mini Explorers, Junior Ecologists, Mud Flat Safaris and Beach Seines described below.

Adult Groups: Many groups (including college classes, senior citizens, community and environmental groups) receive estuarine education from professional staff. Others use the facilities as a gathering place and for professional meetings.

Cultural Diversity: Some audiences benefit from specially focused attention as they may not utilize these services in numbers representative of the general population. These include Spanish speakers, Native Americans and others.

Local Residents: People who live in the immediate vicinity of Padilla Bay are specially targeted for community outreach services to strengthen the Reserve's participation in neighborhood issues and to strengthen the participation of residents in the stewardship of Padilla Bay.

School field trips include a visit to the beach at low tide to observe mud flat organisms.

Current Programs and Activities

There are many ways to involve the above-mentioned audiences in learning about the importance of estuaries. All of the learning that radiates from the Interpretive Center and the staff focuses on estuaries, why they are critically important and how human behaviors affect such ecosystems. The following is a description of the types of activities offered at the Reserve.

- On-site school programs for preschool through high school are offered for groups of 10 to 60 students. The typical program for preschool to third grade is an hour and a half presentation introducing students and their parents to estuaries and estuary inhabitants and includes creative dramatics, stories, film, and a tour of the exhibits.

The fourth through eighth grade program lasts up to five hours and includes outdoor exploration of the estuary, work with microscopes, a historical look at human interaction with estuaries, and a discussion of personal decisions that affect estuaries. High school programs are tailored to the specific needs of each group. At every level, an effort is made to connect the students with the estuary and focus on their own behaviors that affect estuaries. Species, biodiversity, climate change, pollution, habitat protection, and related key Puget Sound themes are used in all programs. The International Brant Monitoring Program integrates students with citizens and wildlife managers from Alaska to Mexico in monitoring the migration of a sea goose called the brant. Padilla Bay provides international coordination for the program and implements the program at a local school. Students take weekly field trips to monitor brant populations in Padilla Bay. Observations and other data are available on the Internet.

- Staff educators and other professionals provide professional pre-service and in-service teacher training. Storming the Sound is an annual conference organized by the Reserve and partners for environmental educators in the counties of the Northwest Straits. Continuing education credits (Washington State Clock Hours) are offered to teachers attending all qualifying education programs. Expanding the knowledge and environmental literacy of teachers on key coastal and estuarine issues is a high priority.
- Adults are trained and participate in citizen science called Stream Team. They monitor water quality in priority watersheds, sharing the data with local and state agencies. Teams of adult volunteers take monthly samples measuring water flow, dissolved oxygen, and fecal coliform. The Reserve coordinates with other agencies to provide training, guidance, facilities, and coordination for the program. Non-point pollution is a key management issue in Puget Sound and data from Stream Team sampling is provided to appropriate agencies.
- Presentations, lectures and audiovisual programs are offered to the public two to three times a month. Speakers are drawn from the abundant pool of expertise found in local residents and statewide personnel. Presentations generally look at estuary topics from the perspective of natural history, ecology, arts, and current coastal management. Experts in topics such as raptors, beginning birding, and native plants teach extended classes (four to eight sessions) in cooperation with other organizations such as Audubon, the Native Plant Society, and the Falcon Research Group. Key management issues related to Puget Sound are topics for special workshops and speakers are drawn from state and local agencies and universities.
- Families participate in a variety of regularly scheduled programs. Monthly programs are offered on various estuarine-related topics for Mini Explorers (3-5 year olds) and Junior Ecologists (6-9 year olds). Programs are advertised in our quarterly activity calendar, and are open to the public. A different topic is covered each month, focusing on estuary biology and ecology. “Mud Flat Safari” explorations of Padilla Bay tide flats take participants right into the estuary as they seek plants and animals of the intertidal flats. “Beach Seines” investigate fish populations in the bay as

educators use a small boat and seine net to sample fish inhabiting the eelgrass meadow.

- Senior citizens, scout groups, special needs audiences, environmental organizations (Audubon, National Wildlife Federation), and professional organizations (National Association of Interpreters, Northwest Association of Marine Educators) are offered specially tailored programs to meet their diverse needs and interests.
- Additional educational opportunities are used to reach distant audiences and these include the Reserve's quarterly newsletter (published jointly with the Padilla Bay Foundation), our Web Site, and live or filmed telecasts.

Future Needs and Opportunities

The following are programs and projects being considered by Reserve staff and the Education Advisory Committee for possible development and implementation:

Programs

K-12 Estuary Education Program (KEEP). This system-wide program will support development and implementation of estuary education programs for students and teachers in the kindergarten through high school range. This includes several components including Estuary Live, an opportunity to produce live Internet video (virtual field trips) from estuary field sites. The Reserve should consider developing the technical capability for live "direct to the Internet" broadcasting for this and other programs (CTP, stewardship, research translation and dissemination).

Offshore Programs. Currently the Reserve works with a local outfitter to offer sea kayak programs. Occasional offshore educational programs are offered when groups can arrange their own vessels but these are very limited in number. Additional opportunities for on-the-water programs need to be explored.

Citizens Involved in Research. Getting citizens involved in research projects, much like they are in "Stream Team" monitoring, is another practical and innovative method of educating the public and building stewardship behaviors.

Curriculum Development. In 2006 a new curriculum development project was initiated to create lessons that are responsive to current science education reform in the state (EALR, WASL and GLE). This program should be expanded and the Reserve should be intimately involved in educational efforts associated with new initiatives such as the Puget Sound Partnership. The Reserve should provide resources to high school students as they plan and complete senior culminating projects.

Current Environmental Issues. The Reserve should continue to develop new programs in response to changing and emerging environmental issues such as the recent interest in global climate change, sea level rise, invasive species, toxic contaminants, and threatened species.

Resources

New Aquarium Exhibits. The aquarium exhibits in the Interpretive Center are at the end of their functional lives and the aquarium exhibit room needs a compete renovation. Funds have recently been secured to initiate this project in 2008-09.

Audio/Visual Aids. The Reserve should continue to upgrade audio/visual presentations for the best possible projection technology and infrastructure in all presentation rooms.

Volunteers. Volunteers program expansion is anticipated with assistance from the Padilla Bay Foundation (see Chapter 3, Administration).

Geographic Information Systems. Visitors would benefit from better access to GIS resources being developed at the Reserve. Possible examples include setting up GIS capabilities in the library and GIS exhibits that could display land use and water quality information or show changes in vegetation.

Integration with Reserve Stewardship Program. As opportunities arise, educators will coordinate with the Stewardship Program to implement projects in the Reserve Conservation and Restoration Plan that have an education component.

Goals, Objectives and Actions

Goal: Utilize and increase the use of Reserve science and stewardship to address priority coastal management issues.

Objective: GIS and stewardship program tools and projects will be integrated into educational and interpretive programming.

Action: GIS-based exhibits on habitat and watershed land use change will be featured in new public exhibits.

Action: Lectures and presentations on key resource (stewardship) issues will be developed and implemented.

Action: Real time data from SWMP will be featured in the new aquaria exhibits.

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Key positions need stable funding for program development and success.

Action: Write grants to support education specialist positions and volunteer coordinator.

Objective: Target audiences will gain substantial knowledge and awareness of estuaries and coastal systems and make informed decisions.

Action: Implement current educational program curricula and activities for at least 10,000 participants each year.

Action: Develop and implement new educational programming to address important emerging issues (climate change, sea level rise).

Action: Integrate applicable components of KEEP as they become available and funding provided.

Action: Conduct teacher-training workshops on key topics; arrange for continuing education credit (minimum of 50 teachers per year).

Action: Implement the Senior Culminating Project program; investigate the scholarship element of the program with possible involvement of the Padilla Bay Foundation.

Objective: Programs should be evaluated and needs assessments conducted.

Action: Develop and implement evaluation tools on public school programs (Level II in 2009, Level I in 2011).

Objective: Educational tools and resources will be updated.

Action: New aquaria exhibits and electronic media kiosks will be updated in 2008-09 with themes that tie to PBNERR curricula and important coastal management issues.

Objective: PBNERR education program staff will be involved in regional planning and decision-making regarding the direction and content of Puget Sound education efforts.

Action: Education staff will participate in meetings and planning committees with education staff from the new PSP, Ecology, and other relevant organizations, integrating critical Puget Sound issues into PBNERR curricula.

Action: PBNERR will host an annual Sound-wide educational workshop.

11 Coastal Training Program

In 2001 the National Oceanic and Atmospheric Administration established the Coastal Training Program (CTP) as a nation-wide initiative. Its broad goal was "...to improve decision-making related to coastal resources management at the local and regional levels." This initiative evolved from the Coastal Decision-makers program, which had been administered by each National Estuarine Research Reserves. Accordingly, the Padilla Bay NERR carried out the required market analysis, needs assessment, and other planning processes to develop and implement this program in partnership with several regional organizations.

The Coastal Training Program plays an important role in addressing major Reserve goals and management issues. Through collaborative planning with stakeholders, professional training programs can be designed and implemented to focus on key Puget Sound problems, such as habitat restoration and protection, damages from improperly placed bulkheads on sensitive shorelines, and methods to identify and protect critical areas. The CTP can also serve as a vehicle for group communication and problem solving between coastal planners throughout Western Washington.

Framework for the Coastal Training Program

Program Description

The Coastal Training Program is based on a "course catalog" model. As classes are developed, they are offered on a regular basis until the demand diminishes. Several classes are developed and taught by Department of Ecology agency staff, and other classes are developed and taught by consultants, staff from Padilla Bay NERR, or staff from other state and local agencies. Most classes are reviewed by the CTP Advisory Group. Email announcements sent out to the CTP listserv (~1500 members to date) are the main form of publicity. Registration is done online and payments are sent to the Department of Ecology.

Coastal Training Program Advisory Group

The CTP Advisory Group is a technical committee that offers guidance on the development of classes and the direction of the program. Members represent Washington State Department of Ecology, the Puget Sound Partnership, Washington Sea Grant, Washington Dept of Community, Trade, and Economic Development, and local government planners. Meetings are held approximately every six months and focus on strategies and decisions. They last three hours and are typically held in Olympia. Between meetings, the CTP Coordinator may contact individual members for assistance and direction with certain projects. This has been an extremely helpful and effective group. They are cooperative and action-oriented, with practical ideas based on experience.

Partnerships

The Coastal Training Program Advisory Group has benefited from strong partnerships with the following agencies: Department of Ecology (Shorelands and Coastal

Management Office), Puget Sound Water Quality Action Team, Washington Sea Grant, and the WA State Department of Community, Trade, and Economic Development.

The **Department of Ecology** is the Reserve's state managing agency which provides oversight and training to the counties - particularly shoreline planners through its Shorelands and Environmental Assistance Program (SEA Program). This office implements the State Coastal Management Act and has several employees who have taught various training classes and will continue to be excellent instructors for some of our courses.

The **Puget Sound Partnership** represents the former Puget Sound Action Team. It has county liaisons around the state and offers technical training on many subjects related to care of the state's marine resources.

Washington Sea Grant offers training and technical publications on many scientific and environmental topics. They are also a link to instructors at the University of Washington. They are offering major support to the Coastal Training Program by placing a Marine Resource Specialist at PBNERR to assist with programming and program expansion.

The **Office of Commerce and Economic Development** offers regular courses to planners on state environmental laws and regulations. The representative on our Advisory Group is particularly helpful in providing and recommending instructors and course content suggestions.

Washington State Department of Fish and Wildlife has developed training classes on implementing Washington State's stream habitat restoration guidelines. Since this was one of the high priority topics on the last needs assessment, we partnered with the Washington Department of Fish and Wildlife on the training classes.

Northwest Association of Networked Ocean Observing Systems (NANOOS) is the regional association connected to the Integrated Ocean Observing System (IOOS) project. We have partnered with NANOOS to bring water quality data products to shellfish growers in the Pacific Northwest.

Geographic Range

The Coastal Training Program is a state-wide program, primarily focusing on Western Washington. To ensure that the training programs are accessible to the greatest number of people, classes are offered in several locations. Most classes are held in Olympia (south Puget Sound), Bellevue (central Puget Sound), and Mount Vernon at Padilla Bay NERR (north Puget Sound). However, some classes are held in Vancouver, Longview, and Kelso, towns near the Columbia River, as well as in Eastern Washington (Yakima,

Coastal Processes and Shoreline Stabilization Class

Ellensburg, Wenatchee, and Spokane).

Audience

Trainings are geared toward City and County shoreline planning and permitting staff; consultants who advise local government and private clients in planning issues; staff from state regulatory agencies who advise local planners, process permit applications, and enforce environmental regulations; and tribal biologists and resource managers who manage aquatic lands. These professionals need to understand how to properly implement the environmental regulations in Washington State, how to effectively update city and county shoreline management plans, and how to think about the science that underlies the resources over which they have jurisdiction. The training programs also attract many professionals who are connected to the planning field, such as biologists, engineers, tribal managers, and non-profit representatives.

Current Programs and Activities

All of Washington's coastal counties and cities are mandated to update and implement their shoreline master programs (which carry out the tenants of the State Shoreline Management Act). The Coastal Training Program offers many classes that assist them in this effort. CTP is committed to offering classes that are practical, pertinent, and scientifically based. The classes reflect a variety of instructors who are well versed in state policy, best available science, and have direct experience with shoreline planning issues. There is also an effort to integrate with staff from Padilla Bay NERR and draw on their expertise in estuarine issues. Most classes are designed to combine classroom time with field time so that students can have a hands-on learning experience. Class topics include:

Wetland Rating Class Field Exercise

- Protecting Aquatic Ecosystems: A Guide for Puget Sound Planners to Understand Watershed Processes
- Planning for Protection and Restoration of Eelgrass Habitats
- Using the Revised Wetland Rating System in Western Washington
- Using the Revised Wetland Rating System in Eastern Washington

- Grass, Sedge, and Rush Identification for Western Washington Puget Lowland Habitats
- Tree and Shrub Identification for Western Washington Puget Lowland Habitats
- How to Determine the Ordinary High Water Mark
- Reviewing Wetland Mitigation and Monitoring Plans
- Shoreline Management and Stabilization Using Vegetation
- Puget Sound Coastal Processes and Shoreline Stabilization Measures
- Managing Shoreline Drainage for Slope Stability, Habitat, and Water Quality

Managing Shoreline Drainage Class

- Understanding Washington State's Stream Habitat Restoration Guidelines
- Preparing Shoreline Characterizations for SMP Updates to Understand Watershed Processes
- How to Administer Development Permits in Washington 's Shorelines
- Developing Critical Area Ordinances for Wetlands Using the Best Available Science
- Reviewing Wetland Ratings in Western Washington
- Reviewing Wetland Ratings in Eastern Washington
- Protecting and Managing Wetlands Using the Best Available Science

Future Needs and Opportunities

Increase program coordination and effectiveness

- Coordinate with Washington Sea Grant to hire a Marine Resource Specialist who will assist with this program.
- Work with the Marine Resource Specialist and Ecology staff to explore approaches to resurrecting the temporarily defunct Coastal Planners Group (which was previously coordinated by Washington Sea Grant and Ecology).
- Partner with Padilla Bay Research Coordinator and Stewardship Coordinators on trainings that address nearshore habitat (eelgrass), invasive species, and nearshore restoration, such as creosote log removal;

- Partner with Padilla Bay's GIS Specialist in offering a GIS/Remote Sensing course taught by the Coastal Services Center at the Western Washington University computer lab;
- Host a retreat for the CTP Advisory Group to reassess program and think strategically about the future;

Improve Program Administration

- Create a manual for the Coastal Training Program that outlines procedures.
- Hire a consultant to do a formal evaluation of Washington's Coastal Training Program.
- Evaluate all programs, including mini needs assessments as part of the evaluation process;
- Implement a comprehensive needs assessment and update the strategy document for CTP every three years;
- Explore the opportunity to partner with the American Planning Association in becoming certified for continuing education credits;

Expand Program Course Offerings

- Explore additional partnering and funding opportunities with the new Puget Sound Partnership, addressing key issues on their action plan.
- Offer 25-30 training programs a year to current target audience, including 2 new courses each year.

Goals, Objectives, and Actions

Goal: Protect and improve habitat and biological diversity within the Reserve and Puget Sound biogeographic region.

Objective: CTP participants gain increased knowledge in habitat issues, especially critical areas identified in the PSP action plan.

Action: Expand CPT classes to include trainings on nearshore habitat (eelgrass) and remote sensing.

Action: Meet with PSP staff and coordinate on priority issues and new or revised courses.

Goal: Utilize and increase the use of Reserve science and stewardship to address priority coastal management issues.

Objective: CTP courses will incorporate science and resource information gained from Reserve research and stewardship experience.

Action: Provide training in partnership with the Coastal Services Center and Reserve GIS staff to focus on biogeographic data use for habitat mapping, climate change, sea level rise, and emerging technology.

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Develop and implement core CTP coursework to address key management and resource issues.

Action: Provide 25-30 trainings each year on priority topics, maintaining necessary core courses.

Action: Utilize the advisory committee and CTP participant feedback to identify important new class topics.

Action: Develop a process to provide continuing education credits through the American Planning Association.

Action: Retain a consultant to evaluate the PBNERR CTP program.

Action: Utilize the advisory committee in development a comprehensive procedures manual for the program.

Action: Implement a comprehensive needs assessment and update the strategy document

Appendix A Bibliography

This chapter is a compilation of the source material referenced in this management plan or consulted in its preparation. In addition, Appendix C lists the laws, regulations, and formal policies which affect operation of the Padilla Bay NERR.

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Appendix B
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Appendix C: Summary of Relevant Federal, State, and Local Regulations Relating to Resource Protection

Establishment of the Padilla Bay National Estuarine Research Reserve in 1980 did not include the passage of any new regulatory programs directed to water or other environmental quality issues. The Reserve depends upon the implementation of existing codes to protect its resources. The following federal, state and local regulatory and administrative programs protect the Reserve and surrounding properties.

Federal

Coastal Zone Management Act (CZMA)

Section 315 of the Coastal Zone Management Act of 1972 established the National Estuarine Research Reserve System, the purpose of which is to establish representative estuarine sites suitable for long-term research and education throughout the coastal United States and U.S. Territories. The CZMA makes it national policy to "preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations." The CZMA is implemented by the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management. The full text of the CZMA is provided on a NOAA/NOS/OCRM web site at http://www.ocrm.nos.noaa.gov/czm/czm_act.html

Endangered Species Act (ESA)

The Endangered Species Act of 1973 (16 USC 1531; 16 USC 1541) is a complex piece of legislation that contains specific prohibitions as well as general goals intended to protect and rebuild populations of diverse life-forms threatened with extinction because of human actions (Miller and Broches, 1993). The listing in 1999 of Puget Sound Chinook salmon as "threatened" could affect salmon fisheries in and around Padilla Bay. NMFS and/or USFWS could intervene in activities on private and public land deemed critical for listed fish populations and could impose more stringent guidelines for tree buffers along streams. Information on the listing of salmon species in Puget Sound is available on a NOAA web site at http://www.nwr.noaa.goc/1salmon/salmesa/. The ESA is jointly administered by the National Marine Fisheries Service (marine species and habitats) and the US Fish and Wildlife Service (non marine species and habitats). The full text of the ESA is provided on a US Fish and Wildlife Service web site at http://endangered.fws.gov/ESA.html.

Department of the Army Permit

The Department of the Army Permit, colloquially known as a "Corps Permit," is actually a packaging of various permit authorities into a single permit application. The principal permits involved are Sections 9 and 10 of the Rivers and Harbors Act of 1899, administered by the Army Corps of Engineers, and Section 404 of the Federal Water

Pollution Control Act, which is administered by the Corps with Environmental Protection Agency oversight. Section 9 governs dikes, and Section 10 governs all other construction and activity waterward of the mean high water line. Section 404 applies to discharge of dredge material in water, including responsibility for wetlands above the mean high water line. Each of the permit programs is implemented through the issuance of permits and policies on wetlands. For Puget Sound, the program is administered by the Corps' Seattle District Office which provides comprehensive information on the regulations, the underlying statutes, and its relation with the Endangered Species Act at their web site at http://nws.usace.army.mil under the "Regulatory/Permits" menu item.

National Environmental Policy Act (NEPA)

The National Environmental Policy Act of 1969 (40CFR Part 1500.1) is "intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment." Any federal project, or a private or state project requiring a permit from a Federal agency must meet the NEPA requirements. Over all, NEPA is administered by the federal Council on Environmental Quality. Each federal agency required to implement the provisions of NEPA on its public actions or private, permitted projects adopts its own regulations for implementation, including a NEPA environmental impact statement (EIS). Comprehensive information on NEPA laws, regulations, and implementation is available from a CEQ NEPA Task Force web site at http://ceq.eh.doe.gov/nepa/nepanet.htm

Washington State

Growth Management Act

The Growth Management Act states that "uncoordinated and unplanned growth, together with a lack of common goals expressing the public's interest in the conservation and the wise use of our lands, pose a threat to the environment, sustainable economic development, and the health, safety, and high quality of life enjoyed by residents of this state."

Under this act, thirteen planning goals were adopted to guide the development of county comprehensive plans. Included in the goals are: property rights, permits, natural resource industries, open space and recreation, environment, public facilities and services. The act provides the framework for establishing controls on development or land use and provides regulations to protect natural resource lands and critical areas such as wetlands.

State Environmental Policy Act (SEPA)

The State Environmental Policy Act "is intended to ensure that environmental values are considered (in addition to technical and economic considerations) by state and local government officials when making decisions." SEPA has four primary purposes: 1) to declare a state policy which will encourage productive and enjoyable harmony between people and their environment, 2) to promote efforts which will prevent or eliminate damage to the environment, 3) to stimulate the health and welfare of people, and 4) to enrich the understanding of ecological systems and natural resources important to the state and the nation.

State Hydraulics Code

This act, administered by the Washington State Department of Fish and Wildlife, governs the obstruction or diversion of any stream and the placement of materials in any body of water of the state. This agency reviews permit applications to ensure that actions will not harm fish populations.

State Implementation of Federal Clean Water Act

Under delegated authority from the U.S. Environmental Protection Agency, the Department of Ecology regulates the point source discharge of pollutants into the state's surface waters through these "national pollutant discharge elimination system permits". There is currently only one such regulated discharge directly into Padilla Bay. Also, under Section 401 of this Act, a "water quality certification" is required of any applicant for a federal license or permit to conduct any activity that may result in any discharge into surface water. The federal agency is provided a certification from the state that the discharge complies with the discharge requirements of federal law and the aquatic protection requirements of state law.

Shoreline Management Act

The Shoreline Management Act of 1971 established regulations requiring the protection of the State's valuable shoreline resources and required local governments, overseen by the Department of Ecology, to prepare and adopt management programs addressing specific use policies. The Act (RCW 90.58) also established certain bodies of water, including Padilla Bay, as "Shorelines of Statewide Significance." By this designation the Washington State Legislature declared that the interests of all the people shall be paramount in the management of shorelines of statewide significance. The legislature determined that in order to fulfill the goal of statewide public interest in shorelines of statewide significance, local programs must give preference to uses that are consistent with the policies applied in the following order, pursuant to RCW 90.58.020:

- The statewide interest should be recognized and protected over local interest.
- The natural character of shorelines of statewide significance should be preserved.
- Uses of shorelines of statewide significance should result in long term benefits to the people of the state.
- The natural resources and ecological systems of shorelines of statewide significance should be protected.
- Public access to publicly owned areas in shorelines of statewide significance should be increased.
- Recreational opportunities for the public should be increased on shorelines of statewide significance.

The Shoreline Management Act is a comprehensive tool for control of shoreline uses. By requiring a use permit system and mandating a solid environmental planning program as its base, the legislature accepted State responsibility for shoreline quality. The Act serves as the main protection program for the resources of Padilla Bay. The control and

permitting of actual and specific uses in the Padilla Bay shoreline falls within the immediate control of the Skagit County Shoreline Management Master Program.

Washington Natural Resources Conservation Areas

This is an administrative act that describes the need for conservation of natural areas and defines how these lands are acquired, managed, and funded. Hat Island is currently under this designation. (RCW 79.71)

Washington State Noxious Weed Law

This law directs state agencies to: 1) ensure that state lands set an example of excellence in noxious weed control and eradication on state lands, 2) halt the spread of noxious weeds from state to private lands, 3) recognize that state agencies are ultimately responsible for noxious weed control on state land, regardless of type, timing, or amount of use, and 4) recognize that the public is not well served by the spread of noxious weeds on state lands, in part, because of the decrease in wildlife habitat and loss of land productivity. The law also states that every owner must eradicate all class A noxious weeds and control and prevent the spread of all class B and C noxious weeds on the county noxious weed list.

Skagit County

Skagit County Shoreline Master Program

In 1976 the Skagit County Board of Commissioners adopted the Skagit County Shoreline Management Master Program. This document, prepared in accordance with RCW 90.58 (the State Shoreline Management Act), provides goals, policies, and specific use regulations for various activities on the county's shorelines, including Padilla Bay. It also established a permit system (consistent with State Regulations), for development activities in the shoreline area. The shoreline around Padilla Bay is classified as either rural, rural residential, or conservancy, with each classification carrying a different level of allowable uses. The "aquatic" classification is given to the areas of the bay lying seaward of the ordinary high water mark. Within each of these classifications specific land or water uses are governed by Master Program policy and regulation. A summary chart (matrix) of allowable uses within each of the shoreline classification areas is found in Appendix D. Activities, development, and projects with the shoreline areas of Padilla Bay may require permits under the county program, or written exemption from its application.

Skagit County Critical Areas Ordinance

This ordinance was developed in response to the Growth Management Act for the purpose of conserving and protecting wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas and fish and wildlife habitat conservation areas. It was drafted to provide regulatory structure for the identification, designation and protection of critical areas in the county and provides incentives to landowners for conservation programs such as open space, conservation easements, density credits and a conservation futures fund (Skagit County, 1996).

Conservation Futures Tax Fund Ordinance

This ordinance establishes a tax of $6.25 on every $100,000 of the assessed value of real estate in Skagit County. Annually, it will generate $30,000-$400,000 in revenues which can be used to back a bond of $4 million or more. This pool of money can then be used to acquire rights and interests in farmland and critical areas. The County will probably purchase easements rather than land to spread the funds further.

Doctrines and Court Cases

Public Trust Doctrine

The Public Trust Doctrine is firmly established in Washington state law and comes from the need for public access to and protection of waters, tidelands, and shorelines (Boyle, 1993). It is a tool to protect the public's interest in instream flows, navigation, commerce, fisheries, recreation, environmental quality and non-appropriative water rights (Lean, 1993). The public trust doctrine covers both state-owned and private lands. It has not yet been challenged regarding the public's rights in areas of non-navigable waters, access across dryland to navigable water, taking of shellfish on privately owned tidelands, and protection of the environment against general harm (Lean, 1993).

Boldt Decision (1974, U.S. V. Washington, Div. No. 9213)

This decision concerns the nature and extent of off-reservation fishing rights enjoyed by Tribes pursuant to treaties with the United States Government and how these rights affect both non-Indian access to fish and the state's powers and duties regarding regulation of the fisheries resource (Ehlke, 1974). The Indian's rights to fish in off-reservation "usual and accustomed" sites are not exclusive and must be shared with non-Indians. However, the state cannot diminish the rights of the Indians nor can it regulate Indian fishing to the same degree it can non-Indian fishing (Ehlke, 1974). Nineteen western Washington tribes were listed as plaintiffs in the case.

Rafeedie Decision (1994)

Judge Edward Rafeedie's ruling in December 1994 re-affirmed the right of 15 western Washington tribes to take up to half of the harvestable shellfish from beaches within their usual and accustomed harvest areas. This ruling covered all shellfish species, including clams, oysters, mussels, and all deep-water and free-swimming shellfish species — including geoduck, shrimp, crab, scallops, sea cucumber and sea urchin. The Swinomish tribe was one of the 15 tribes whose rights were re-established (NIFC, 1995a, 1995b).

Appendix D:
Hat Island Cooperative Agreement

Interagency Agreement Concerning the Management of Hat Island Natural Resources Conservation Area

THIS AGREEMENT, by and between the Washington State Department of Natural Resources (DNR) and the Washington State Department of Ecology (Ecology), concerns the cooperative management of the Hat Island Natural Resources Conservation Area (Hat Island NRCA).

Whereas, the Hat Island NRCA is an island of approximately 92 acres in size located in Padilla Bay, Skagit County. The Department of Natural Resources received title to this property from the Nature Conservancy in 1991, but has only been able to perform minimal management activities since that time. As a natural resources conservation area, the Hat Island NRCA is to be managed for conservation purposes which allow appropriate low-impact public use, consistent with the mandates of Chapter 79.71 RCW.

Whereas, the Department of Ecology manages the Padilla Bay National Estuarine Research Reserve (Padilla Bay NERR) in accordance with the State of Washington's coastal zone management program under the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1465. The Padilla Bay NERR was established in 1980, and while Hat Island was not included in the original boundaries of the Padilla Bay NERR because it could not be economically purchased at that time, two smaller, nearby islands which were already owned by the State (Saddlebag Island and Dot Island) were included in the boundary. Hat Island was eventually included in the Padilla Bay NERR boundary in 1998, after review and mutual agreement by both the Departments of Ecology and Natural Resources. The Padilla Bay NERR is managed primarily for the long-term maintenance of the natural estuarine ecosystem, low impact public use, and for long-term research, education, and interpretation. 15 C.F.R. § 921.1.

Whereas, Hat Island is ecologically connected -to the areas within the Padilla Bay NERR.

Whereas, the management plans and management goals of both the Hat Island NRCA and the Padilla Bay NERR are consistent with each other.

IT IS HEREBY RESOLVED that the Departments of Ecology and Natural Resources agree as follows:

1. As of the date of all parties’ approval of this agreement. the Department of Ecology shall assume the primary day to day management responsibilities for the Hat Island NRCA. The purpose of this transfer of primary management responsibility shall be to jointly manage the Hat Island NRCA with the surrounding Padilla Bay NERR. The Department of Ecology shall have management authority over all aspects of the Hat Island NRCA unless such responsibility is specifically reserved to the Department of Natural Resources in this agreement.

2. In assuming these management responsibilities, the Department of Ecology agrees that it will adhere to all requirements in the deed for the Hat Island NRCA, which includes by reference the requirements of Chapter 79.71 RCW. The deed, attached as Exhibit A hereto, may also be found in Skagit County land records at volume 992, pages 384-386. The deed is Skagit County Auditor's file number 9107100006.

3. The Department of Ecology agrees that its management of the Hat Island NRCA shall be consistent with the Department of Natural Resources' statewide NRCA Management Plan, as periodically updated. The Department of Natural Resources shall provide the statewide NRCA Management Plan, and any updates, to the Department of Ecology, and agrees to specifically point out any significant changes in any amendments to the plan to the Department of Ecology.

4. The site specific management plan requirements to describe "significant resources to be conserved, areas with potential for low-impact public use and environmental education, and types of management activities and public uses permitted" for Hat Island NRCA will be addressed in the Padilla Bay National Estuarine Research Reserve Management Plan which will be prepared consistent with federal regulations governing national estuarine research reserves. If one or more parts of the Padilla Bay National Estuarine Research Reserve Management Plan (PBNERRMP) is not consistent with the requirements of Chapter 79.71 RCW or the NRCA Statewide Management Plan, DNR staff shall propose to Ecology changes in the PBNERRNIP which will result in consistency. Ecology and the DNR must jointly agree to the changes before the PBNERRMP will be altered.

5. The Department of Ecology shall supply the necessary staff to carry out its management responsibilities under this agreement.

6. The parties understand the Department of Ecology may receive additional federal grant monies in exchange for their-management of the Hat Island NRCA as part of the Padilla Bay NERR- The Department of Natural Resources also gains from this agreement by reducing its management costs and responsibilities while continuing to meet the management goals for the Hat Island NRCA. Moreover, the Hat Island NRCA benefits from receiving the added protection of being considered within the management area and plan for the Padilla Bay NERR.

7. The Departments of Ecology and Natural Resources agree. to share the control and responsibility for any signage to be placed on Hat Island, including the expenses related thereto. The Department of Natural Resources shall retain control over all management activities related to fire control on Hat Island. The Department Ecology and Natural Resources agree to consult and work cooperatively on all major efforts to protect, mitigate, and/or restore the natural conditions of Hat Island NRCA. This

would include but not be limited to efforts related to oil spills, severe storms, and/or invasive weeds.

8. The Departments of Ecology and Natural Resources agree that any construction of facilities on Hat Island (including but not limited to docks,, landing areas, or storage facilities) shall be negotiated on a project by project basis and that a project lead from the appropriate agency will be designated. The Departments agree that the expenses n projects on Hat Island shall be shared as appropriate and negotiated.

9. Should any intergovernmental disputes arise in the course of the Department of Ecology's management of the Hat Island NRCA, the Department of Ecology agrees to inform and involve the Department of Natural Resources in the resolution of such disputes. The term "intergovernmental disputes" is here used to mean disputes with local, state, or Tribal entities, and does not include any dispute the Department of Ecology may have with the National Oceanic and Atmospheric Administration regarding other aspects of the Padilla Bay NERR.

10. The Department of Ecology shall have no ownership interest in the Hat Island NRCA.

11. In the event that a dispute arises under this agreement, it shall be determined by a dispute board in the following manner: Each party to this agreement shall appoint a member to the dispute board. The members so appointed shall jointly appoint an additional member to the dispute board. The dispute board shall evaluate the facts, contract terms and applicable statutes and rules and make a determination of the dispute. The determination of the dispute board shall be final and binding on the parties hereto. As an alternative to this process, either of the parties may request intervention by the Governor, as provided by RCW 4'). 1 7.')30, in which event the Governor's process will control.

12. Any and all amendments to this agreement shall be made in writing, and shall be signed by both the Departments of Ecology and Natural Resources.

13. This agreement can be terminated after the authorized representatives of the Departments of Ecology and Natural Resources have met in person to discuss the reasons for termination. After such meeting, the agreement can be terminated upon thirty (30) days written notice by either party.

Exhibit A

Deed of Right to Use Land For Natural Area Purposes

The Grantor, Washington State Department of Natural Resources, for and in consideration of monies coming in whole or in part from the Habitat Conservation Account of the General Fund of the State of Washington and in fulfillment of terms of the Project Agreement identified below, conveys and grants to the State of Washington individually and as the representative of all the people of the State, the right to use the real property described below forever for the natural area purposes described in RCW 43.98A and managed in accordance with RCW 79.71 and the Project Agreement entered into between the Grantor and the State of Washington through the Interagency Committee for Outdoor Recreation entitled Washington Wildlife and Recreation Coalition Multi-Site Acquisitions, Project Number 91-712A, signed by the Grantor on the 24th day of August, 199,0 and by the Interagency Committee on the 31st day of May, 1990 and the application and supporting materials which are on file 'with the Grantor and the State in connection with the Project Agreement.

The Grantor will not make or permit to he made any use of the real property described in this deed, or any part of it), which is inconsistent with the right to use for natural area purposes herein granted unless the State, through the Interagency

Committee for Outdoor Recreation or it successors, consents to the inconsistent use,, which consent shall be granted only upon conditions which will ensure that other natural area land of at least equal f air market value at the time of change of use and of as nearly as feasible equivalent usefulness and location for the natural area purposes for which State assistance was originally .granted, will he substituted in the manner provided in RCW 43.99.100 for marine recreation land, whether 'or. not the real property covered by this deed is marine recreation land. RCW 43.99.100 reads as follows:

“Marine recreation land with respect to which money has been expended under RCW 43.99.080 shall- not, without the approval of the committee, be converted to uses other than those for which such expenditure was originally approved. The committee shall only approve any such conversion upon conditions which will assure the substitution of other marine recreation land of at least equal fair market value at the time of conversion and of as nearly as feasible equivalent usefulness and location.”

The real property covered by -this deed is described as follows:

Government -Lot 2 in Section 9, Township 35 North, Range 2 East, W.M.; Government Lot I in Section 10, Township 35 North, Range 2 East, W.M. ; Government Lot I in Section 15, Township 35 North, Range 2 East, W.M.; and Government Lot I in Section 16, Township 35 North Range 2 East, W.M. Property is also known as Hat or Blanca Island. This property is situated in the County of Skagit, State of Washing ton.

This deed shall in no way modify Or extinguish the functions of the Grantor under the Project Agreement, including the Grantor's functions to operate and maintain the land for natural area purposes.

Appendix E:

Memorandum of Agreement

Between the

National Oceanic and Atmospheric Administration

And the

Washington State Department of Ecology

Detailing the State-Federal Roles in the Management of the Padilla Bay National Estuarine Research Reserve

This Memorandum of Agreement states the provisions for the cooperative management of the Padilla Bay National Estuarine Research Reserve in the State of Washington between the Washington State Department of Ecology and the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource Management.

WHEREAS, the State of Washington has determined that the waters and related coastal habitats of the Padilla Bay National Estuarine Research Reserve provide unique opportunities for study of natural processes and human interactions occurring within the estuarine ecosystems of the State to contribute to the science of estuarine ecosystems, provide environmental education opportunities, and provide scientific information for effective coastal zone management in Washington State; and

WHEREAS, the State of Washington has determined that the resources of the Padilla Bay National Estuarine Research Reserve and the values they represent to the citizens of Washington State and the United States will benefit from the management of these resources as part of the National Estuarine Research Reserve System; and

WHEREAS, the National Oceanic and Atmospheric Administration has concurred with that finding and pursuant to its authority under section 315 of the Coastal Zone Management Act of 1972, as amended (CZMA, 16 U.S.C. 1461) and in accordance with implementing regulations at 15 CFR 921.30 has designated the Padilla Bay National Estuarine Research Reserve; and

WHEREAS, the Washington State Department of Ecology, as the agency designated by the Governor of Washington State, is responsible for managing the Padilla Bay National Estuarine Research Reserve and acknowledges the value of state-federal cooperation for the long-term management of the reserve in a manner consistent with the purpose of its designation; and

WHEREAS, the management plan describes the goals, objectives, strategies/actions, administrative structure, and institutional arrangements for the Reserve, including this MOA and others;

NOW THEREFORE, in consideration of the mutual agreements herein, NOAA and Washington State Department of Ecology agree to the following:

ARTICLE I: STATE-FEDERAL ROLES IN RESERVE MANAGEMENT

A. Washington State Department of Ecology Role in Reserve Management

The Washington State Department of Ecology shall:

1. be responsible for compliance with all federal laws and regulations, and ensure that the Padilla Bay National Estuarine Research Reserve management plan is consistent with the provisions of the CZMA and implementing regulations;

2. ensure protection of the natural and cultural resources of the Reserve, and ensure enforcement of the provisions of state law, including rules and regulations of the Washington State Coastal Management Program (if applicable);

3. ensure adequate, long-term protection and management of lands included within the reserve boundary;

4. annually apply for, budget, and allocate funds received for Reserve operations, research and monitoring, education, coastal training and stewardship; and as necessary, land acquisition and Reserve facility construction;

5. conduct and coordinate research and monitoring programs that encourage scientists from a variety of institutions to work together to understand the ecology of the reserve ecosystem to improve coastal management;

6. conduct and maintain programs that disseminate research results via materials, activities, workshops, and conferences to resource users, state and local agencies, resource managers, school systems, general public, and other interested parties;

7. provide staff and secure state funding for the manager and core positions;

8. secure facilities and equipment required to implement the provisions within the Reserve management plan;

9. ensure adequate funding for facilities operation and maintenance;

10. maintain effective liaison with local, regional, state, tribal, and federal policy makers, regulators and the general public;

11. serve as principal contact for issues involving proposed boundary changes and/or amendments to the Reserve management plan;

12. respond to NOAA's requests for information, particularly cooperative agreement and grant progress reports and evaluation findings, including necessary actions and recommendations, made pursuant to Section 312 of the CZMA; and

13. expend funds in accordance with federal and state laws, the Reserve management plan, and annual funding guidance from NOAA.

B. Federal Role in Reserve Management

NOAA's Office of Ocean and Coastal Resource Management shall:

1. administer the provisions of the Sections 315 and 312 of the CZMA to ensure that the Reserve operates in accordance with goals of the reserve system and the Padilla Bay National Estuarine Research Reserve management plan;

2. review and process applications for financial assistance from the Washington State Department of Ecology, consistent with 15 CFR 921, for management and operation, and as appropriate, land acquisition and facility construction. Funding provided shall be on a cost-sharing formula of 70/30 (federal/state) for management, operations, and facility construction, and 50/50 for land acquisition;

3. advise the Washington State Department of Ecology of existing and emerging national and regional issues that have bearing on the Reserve and reserve system;

4. maintain an information exchange network among reserves, including available research and monitoring data and educational materials developed within the reserve system;

5. to the extent possible, provide and/or facilitate NOAA resources and capabilities in support of Reserve goals and programs.

C. General Provisions

1. Nothing in this agreement or subsequent financial assistance awards shall obligate either party in the expenditure of funds, or for future payments of money, in excess of appropriations authorized by law.

2. Upon termination of this agreement or any subsequent financial assistance awards to the Washington State Department of Ecology, any equipment purchased for studies to further this agreement will be disposed of in accordance with 15 CFR 24.32.

3. A free exchange of research and assessment data between the parties is encouraged and is necessary to ensure success of cooperative studies.

D. Other Provisions

1. Nothing in this agreement diminishes the independent authority or coordination responsibility of either party in administering its respective statutory obligations. Nothing in this agreement is intended to conflict with current written directives or policies of either party. If the terms of this agreement are inconsistent with existing written directives or policies of either party entering this agreement, then those portions of the agreement which are determined to be inconsistent with such written directives and policies shall be invalid; but the remaining terms not affected by the inconsistency shall remain in full force and effect. At the first opportunity for revision of this agreement, all necessary changes shall be made by either an amendment to this agreement or by entering in a new superseding agreement, which ever is deemed expedient to the interested parties. Should disagreement arise on the interpretation of the provisions and/or amendments of this agreement that cannot be resolved by negotiations at the operating level of each party, the area(s) of disagreement shall be stated in writing by each party and promptly presented to a mutually approved mediator for non-binding mediation. If the parties cannot agree on the choice of a mediator or if the mediation does not resolve the dispute to the mutual approval of the parties, the parties are free to pursue any other legal remedies that are available.

ARTICLE II: REAL PROPERTY ACQUIRED FOR PURPOSE OF THE RESERVE

As well as acknowledging the rest of the requirements set forth at 15 CFR 921, the Washington State Department of Ecology specifically acknowledges and will fully comply with 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

The Office of Ocean and Coastal Resource Management Division of NOAA will schedule periodic evaluations of Washington State Department of Ecology's performance in meeting the terms of this agreement, financial assistance awards, and the Reserve management plan. Where findings of deficiency occur, NOAA may initiate action in accordance with the designation withdrawal or interim sanctions procedures established by the CZMA and applicable regulations at 15 CFR 921.40-41.

ARTICLE IV: EFFECTIVE DATE, REVIEW, AMENDMENT AND TERMINATION

A. This agreement is effective on the date of the last signature on this agreement and shall be in effect until terminated by either party.

B. This agreement will be reviewed periodically by both parties and may only be amended by the mutual written consent of both parties.

C. This agreement may be terminated by mutual consent of both parties, or by NOAA if NOAA withdraws designation of the Reserve within the reserve system, pursuant to applicable provisions of the CZMA and its implementing regulations as described under 15 CFR 923 Subpart L, or if NOAA finds that the Washington State Department of Ecology fails to comply with this MOA. The agreement may be terminated by the Washington State Department of Ecology with or without cause. Should this agreement be terminated, reimbursement of unexpended funds from financial assistance awards shall be determined on a pro rata basis according to the amount of work done by the parties at the time of termination. Additionally, reimbursement for land purchased and facilities constructed with NOAA funds shall be consistent with terms and special award conditions of financial assistance awards.

D. If any clause, sentence or other portion of this MOA shall become illegal, null or void for any reason, the remaining portions of this MOA shall remain in full force and effect.

E. No waiver of right by either party of any provision of this MOA shall be binding unless expressly confirmed in writing by the party giving the waiver.

IN WITNESS THEREOF, the parties have caused this agreement to be executed.

_____	_____
David Kennedy	Jay Manning
Director	Director
Office of Ocean and Coastal Resource Management	Washington State Department of Ecology
National Ocean Service	
National Oceanic and Atmospheric Administration	
U.S. Department of Commerce	
_____	_____
Date	Date

Appendix F:
NERRS 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 SYSTEMREGULATIONS

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.

SubPart A - General

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 carrier 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.

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

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.

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

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-then-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).

Subpart D--Reserve Designation and Subsequent Operation

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.

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

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.

Subpart F--Special Research Projects

Sec. 921.50 General.

(a) To stimulate high quality research within designated National Estuarine Research Reserves, NOAA may provide financial support for research projects which are consistent with the Estuarine Research Guidelines referenced in Sec. 921.51. Research awards may be awarded under this subpart to only those designated Reserves with approved final management plans. Although research may be conducted within the immediate watershed of the Reserve, the majority of research activities of any single research project funded under this subpart may be conducted within Reserve boundaries. Funds provided under this subpart are primarily used to support management-related research projects that will enhance scientific understanding of the Reserve ecosystem, provide information needed by Reserve management and coastal management decision-makers, and improve public awareness and understanding of estuarine ecosystems and estuarine management issues. Special research projects may be oriented to specific Reserves; however, research projects that would benefit more than one Reserve in the National Estuarine Reserve Research System are encouraged.

(b) Funds provided under this subpart are available on a competitive basis to any coastal state or qualified public or private person. A notice of available funds will be published in the Federal Register. Special research project funds are provided in addition to any other funds available to a coastal state under the Act. Federal funds provided under this subpart may not exceed 70 percent of the total cost of the project, consistent with Sec. 921.81(e)(4) (``allowable costs''), 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.

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

Sec. 921.51 Estuarine research guidelines.

(a) Research within the National Estuarine Research Reserve System shall be conducted in a manner consistent with Estuarine Research Guidelines developed by NOAA.
(b) A summary of the Estuarine Research Guidelines is published in the Federal Register as a part of the notice of available funds discussed in Sec. 921.50(c).
(c) The Estuarine Research Guidelines are reviewed annually by NOAA. This review will include an opportunity for comment by the estuarine research community.

Sec. 921.52 Promotion and coordination of estuarine research.

(a) NOAA will promote and coordinate the use of the National Estuarine Research Reserve System for research purposes.
(b) NOAA will, in conducting or supporting estuarine research other than that authorized under section 315 of the Act, give priority consideration to research that make use of the National Estuarine Research Reserve System.
(c) NOAA will consult with other Federal and state agencies to promote use of one or more research reserves within the National Estuarine Research Reserve System when such agencies conduct estuarine research.

Subpart G--Special Monitoring Projects

Sec. 921.60 General.

(a) To provide a systematic basis for developing a high quality estuarine resource and ecosystem information base for National Estuary Research Reserves and, as a result, for the System, NOAA may provide financial support for basic monitoring programs as part of operations and management under Sec. 921.32. Monitoring funds are used to support three major phases of a monitoring program:

1. Studies necessary to collect data for a comprehensive site description/characterization;
2. Development of a site profile; and
3. Formulation and implementation of a monitoring program.

(b) Additional monitoring funds may be available on a competitive basis to the state agency responsible for Reserve management or a qualified public or private person or entity. However, if the applicant is other than the managing entity of a Reserve that applicant must submit as a part of the application a letter from the Reserve manager indicating formal support of the application by the managing entity of the Reserve. Funds provided under this subpart for special monitoring projects are provided in addition to any other funds available to a coastal state under the Act. Federal funds provided under this subpart may not exceed 70 percent of the total cost of the project, consistent with Sec. 921.81(e)(4) (``allowable costs''), 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.

(c) Monitoring projects funded under this subpart must focus on the resources within the boundaries of the Reserve and must be consistent with the applicable sections of the Estuarine Research Guidelines referenced in Sec. 921.51. Portions of the project may occur within the immediate watershed of the Reserve beyond the site boundaries. However, the monitoring proposal must demonstrate why this is necessary for the success of the project.

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

Subpart H--Special Interpretation and Education Projects

Sec. 921.70 General.

(a) To stimulate the development of innovative or creative interpretive and educational projects and materials to enhance public awareness and understanding of estuarine areas, NOAA may fund special interpretive and educational projects in addition to those activities provided for in operations and management under Sec. 921.32. Special interpretive and educational awards may be awarded under this subpart to only those designated Reserves with approved final management plans.

(b) Funds provided under this subpart may be available on a competitive basis to any state agency. However, if the applicant is other than the managing entity of a Reserve, that applicant must submit as a part of the application a letter from the Reserve manager indicating formal support of the application by the managing entity of the Reserve. These funds are provided in addition to any other funds available to a coastal state under the Act. Federal funds provided under this subpart may not exceed 70 percent of the total cost of the project, consistent with Sec. 921.81(e)(4) (``allowable costs''), 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.

(c) Applicants for education/interpretive projects that NOAA determines benefit the entire National Estuarine Research Reserve System may receive Federal assistance of up to 100% of project costs.

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

Subpart I--General Financial Assistance Provisions

Sec. 921.80 Application information.

(a) Only a coastal state may apply for Federal financial assistance awards for preacquisition, acquisition and development, operation and management, and special

education and interpretation projects under subpart H. Any coastal state or public or private person may apply for Federal financial assistance awards for special estuarine research or monitoring projects under subpart G. The announcement of opportunities to conduct research in the System appears on an annual basis in the Federal Register. If a state is participating in the national Coastal Zone Management Program, the applicant for an award under section 315 of the Act shall notify the state coastal management agency regarding the application.

(b) An original and two copies of the formal application must be submitted at least 120 working days prior to the proposed beginning of the project to the following address: Sanctuaries and Reserves Division Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, 1825 Connecticut Avenue, NW., suite 714, Washington, DC 20235. Application for Federal Assistance Standard Form 424 (Non-construction Program) constitutes the formal application for site selection, post-site selection, operation and management, research, and education and interpretive awards. The Application for Federal Financial Assistance Standard Form 424 (Construction Program) constitutes the formal application for land acquisition and development awards. The application must be accompanied by the information required in subpart B (predesignation), subpart C and Sec. 921.31 (acquisition and development), and Sec. 921.32 (operation and management) as applicable. Applications for development awards for construction projects, or restorative activities involving construction, must include a preliminary engineering report, a detailed construction plan, a site plan, a budget and categorical exclusion check list or environmental assessment. All applications must contain back up data for budget estimates (Federal and non-Federal shares), and evidence that the application complies with the Executive Order 12372, ``Intergovernmental Review of Federal Programs.'' In addition, applications for acquisition and development awards must contain:

1. State Historic Preservation Office comments;
2. Written approval from NOAA of the draft management plan for initial acquisition and development award(s); and
3. A preliminary engineering report for construction activities.

Sec. 921.81 Allowable costs.

(a) Allowable costs will be determined in accordance with applicable OMB Circulars and guidance for Federal financial assistance, the financial assistant agreement, these regulations, and other Department of Commerce and NOAA directives. The term ``costs'' applies to both the Federal and non-Federal shares.

(b) Costs claimed as charges to the award must be reasonable, beneficial and necessary for the proper and efficient administration of the financial assistance award and must be incurred during the award period.

(c) Costs must not be allocable to or included as a cost of any other Federally- financed program in either the current or a prior award period.

(d) General guidelines for the non-Federal share are contained in Department of Commerce Regulations at 15 CFR part 24 and OMB Circular A-110. Copies of

Circular A-110 can be obtained from the Sanctuaries and Reserves Division; 1825 Connecticut Avenue, NW., suite 714; Washington, DC 20235. The following may be used in satisfying the matching requirement:

1. Site selection and post site selection awards. Cash and in-kind contributions (value of goods and services directly benefiting and specifically identifiable to this part of the project) are allowable. Land may not be used as match.
2. Acquisition and development awards. Cash and in-kind contributions are allowable. In general, the fair market value of lands to be included within the Reserve boundaries and acquired pursuant to the Act, with other than Federal funds, may be used as match. However, the fair market value of real property allowable as match is limited to the fair market value of a real property interest equivalent to, or required to attain, the level of control over such land(s) identified by the state and approved by the Federal Government as that necessary for the protection and management of the National Estuarine Research Reserve. Appraisals must be performed according to Federal appraisal standards as detailed in Department of Commerce regulations at 15 CFR part 24 and the Uniform Relocation Assistance and Real Property Acquisition for Federal land Federally assisted programs in 15 CFR part 11. The fair market value of privately donated land, at the time of donation, as established by an independent appraiser and certified by a responsible official of the state, pursuant to 15 CFR part 11, may also be used as match. Land, including submerged lands already in the state's possession, may be used as match to establish a National Estuarine Research Reserve. The value of match for these state lands will be calculated by determining the value of the benefits foregone by the state, in the use of the land, as a result of new restrictions that may be imposed by Reserve designation. The appraisal of the benefits foregone must be made by an independent appraiser in accordance with Federal appraisal standards pursuant to 15 CFR part 24 and 15 CFR part 11. A state may initially use as match land valued at greater than the Federal share of the acquisition and development award. The value in excess of the amount required as match for the initial award may be used to match subsequent supplemental acquisition and development awards for the National Estuarine Research Reserve (see also Sec. 921.20). Costs related to land acquisition, such as appraisals, legal fees and surveys, may also be used as match.
3. Operation and management awards. Generally, cash and in-kind contributions (directly benefiting and specifically identifiable to operations and management), except land, are allowable.
4. Research, monitoring, education and interpretive awards. Cash and in-kind contributions (directly benefiting and specifically identifiable to the scope of work), except land, are allowable.

Sec. 921.82 Amendments to financial assistance awards.

Actions requiring an amendment to the financial assistance award, such as a request for additional Federal funds, revisions of the approved project budget or original scope of work, or extension of the performance period must be submitted to NOAA on Standard Form 424 and approved in writing.

Appendix I to Part 921-- Biogeographic Classification Scheme.

Acadian
1. Northern of Maine (Eastport to the Sheepscot River.)
2. Southern Gulf of Maine (Sheepscot River to Cape Cod.)

Virginian
3. Southern New England (Cape Cod to Sandy Hook.)
4. Middle Atlantic (Sandy Hook to Cape Hatteras.)
5. Chesapeake Bay.

Carolinian
6. North Carolinas (Cape Hatteras to Santee River.)
7. South Atlantic (Santee River to St. John's River.)
8. East Florida (St. John's River to Cape Canaveral.)

West Indian
9. Caribbean (Cape Canaveral to Ft. Jefferson and south.)
10. West Florida (Ft. Jefferson to Cedar Key.)

Louisianian
11. Panhandle Coast (Cedar Key to Mobile Bay.)
12. Mississippi Delta (Mobile Bay to Galveston.)
13. Western Gulf (Galveston to Mexican border.)

Californian
14. Southern California (Mexican border to Point Conception.)
15. Central California (Point Conception to Cape Mendocino.)
16. San Francisco Bay.

Columbian
17. Middle Pacific (Cape Mendocino to the Columbia River.)
18. Washington Coast (Columbia River to Vancouver Island.)
19. Puget Sound.

Great Lakes
20. Lake Superior (including St. Mary's River.)
21. Lakes Michigan and Huron (including Straits of Mackinac, St. Clair River, and Lake St. Clair.)
22. Lake Erie (including Detroit River and Niagara Falls.)
23. Lake Ontario (including St. Lawrence River.)

Fjord
24. Southern Alaska (Prince of Wales Island to Cook Inlet.)

25. Aleutian Island (Cook Inlet Bristol Bay.)

Sub-Arctic
26. Northern Alaska (Bristol Bay to Damarcation Point.)

Insular
27. Hawaiian Islands.
28. Western Pacific Island.
29. Eastern Pacific Island.

[GRAPHIC] [TIFF OMITTED] TC12SE91.000.

Appendix II to Part 921-- Typology of National Estuarine Research Reserves.

This typology system reflects significant differences in estuarine characteristics that are not necessarily related to regional location. The purpose of this type of classification is to maximize ecosystem variety in the selection of national estuarine reserves. Priority will be given to important ecosystem types as yet unrepresented in the reserve system. It should be noted that any one site may represent several ecosystem types or physical characteristics.

Appendix G

Public Involvement in Management Plan Revision

The public process for developing this management plan revision had two distinct areas. The management plan committee and stakeholder input process took place during the lengthy plan writing and development period. The public comment period was conducted as the draft plan was released and the final ready to being finished. Both processes attempted to engage local and regional participants.

Committee and Stakeholders

Preparation of this plan, including meetings and discussions with agency cooperators and stakeholders, occurred over the past few years and resulted in several plan drafts. Meetings were held and draft content was reviewed by relevant agency and organizational staff. Members of the advisory committees for the PBNERR functional sectors provided input as well. The Reserve Manager and Sector Coordinators (Research, Education, Stewardship, Coastal Training) used this guidance to develop the relevant sections of this plan. An internal and external review process then took place, including review by NOAA/ERD for plan conformance with NERRS guidelines.

Public Review and Comment

At the conclusion of the draft management plan development process, any interested parties were invited to comment. This was accomplished by making a copy of the plan available at the Padilla Bay/Breazeale Interpretive Center, the State Coastal Management Office, and on the web at Padillabay.gov. In July 2008, an advertisement was placed in the Skagit Valley Herald (regional newspaper) stating that interested parties could access the plan at the Reserve's website and that written comments could be submitted to the Reserve Manager. Also in July, an evening public meeting was held for interested parties to make comment in person. All comments received, written and oral, were taken under advisement and, if relevant, applied to the plan.