SNOHOMISH RIVER WETLANDS MANAGEMENT PLAN

FINAL REPORT

U.S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413

Prepared for:

Snohomish County
Department of Planning and Community Development

Funded by:

Washington State Department of Natural Resources and the
Washington State Department of Ecology

Department of Ecology funds were obtained from
the National Oceanic and Atmospheric Administration,
and appropriated for
Section 306 of the Coastal Zone Management Act of 1972

Prepared by:

Shapiro and Associates, Inc.
The Smith Tower, Suite 1400
506 Second Avenue
Seattle, Washington 98104

Property of CSC Library

June 1989

S932.W2 S66 1989
APR 16 1997

TABLE OF CONTENTS

		Page
1.	INTRODUCTION	1
2.	WETLAND RESOURCE VALUES	
	2.1 Methodology	4
	2.2 Evaluation of Individual Units	10
	2.3 Comparison of Wetland Units	29
3.	MANAGEMENT PLAN GOALS	
	3.1 Roles of Unit I	37
	3.2 Roles of Unit II	38
	3.3 Roles of Unit III	38
	3.4 Roles of Unit IV	38
	3.5 Roles of Unit V	39
	3.6 Roles of Unit VI	39
	3.7 Roles of Unit VII	39
	3.8 Roles of Unit VIII	39
	3.9 Roles of Unit IX	40
	3.10 Alternative Management Scenarios and Possible Additional Areas	40
4.	MANAGEMENT OBJECTIVES AND STRATEGIES	
	4.1 Objectives and Strategies for Unit I	49
	4.2 Objectives and Strategies for Unit II	49
	4.3 Objectives and Strategies for Unit III	50
	4.4 Objectives and Strategies for Unit IV	51
	4.5 Objectives and Strategies for Unit V	51
	4.6 Objectives and Strategies for Unit VI	52
	4.7 Objectives and Strategies for Unit VII	52
	4.8 Objectives and Strategies for Unit VIII	53
	4.9 Objectives and Strategies for Unit IX	55
5.	SITE PLANS	
	5.1 Unit II	56
	5.2 Unit IV	59
	5.3 Unit VII	63
	5.4 Unit VIII	65

TABLE OF CONTENTS (Continued)

	Page
6. REFERENCES	74
APPENDIX A: Resource Agency Correspondence	

List of Figures

Figure 1	Wetland Units Map	2
Figure 2	Overall Wetland Units Site Plan	35
Figure 3	Site Plan-Unit II	57
Figure 4	Site Plan-Unit IV	61
Figure 5	Site Plan-Unit VII	64
Figure 6	Site Plan-Unit VIII	66
Figure 7	Character Sketch Dike Trail near Boat Launch	68
Figure 8	Interpretative Structure Options	70

List of Tables

Table 1	Unit I Wetland Values	12
Table 2	Unit II Wetland Values	14
Table 3	Unit III Wetland Values	16
Table 4	Unit IV Wetland Values	18
Table 5	Unit V Wetland Values	20
Table 6	Unit VI Wetland Values	22
Table 7	Unit VII Wetland Values	24
Table 8	Unit VIII Wetland Values	26
Table 9	Unit IX Wetland Values	28
Table 10	Comparison of Wetland Values	30
Table 11	Matrix of all Possible and Recommended Management Roles for the Wetland Units	36

1. Introduction

1. INTRODUCTION

In a process that began in 1974 with the "Mediated Agreement" identifying the Snohomish Estuary as a significant environmental and cultural resource to be protected and preserved, Snohomish County has designated nine areas within the estuary, comprising approximately 1,400 acres of wetland habitat, for special protection. Based on the mediated agreement, Governor Daniel J. Evans, in 1975, requested the U.S. Army Corps of Engineers (Corps), to conduct a reconnaissance study (1976). Governor Evans appointed a group of interested citizens to the Interim Snohomish Basin Coordinating Committee (IBCC) for the purpose of working with the Corps and other agencies during the reconnaissance study. In 1978, the IBCC was replaced with the Snohomish Basin Coordinating Council (BCC), formed by an intergovernmental agreement among the federal government, the State of Washington, Snohomish County, King County, 13 incorporated cities and towns, and the Tulalip Tribe.

As part of a report prepared by the University of Washington for the Corps (1981), it was recommended that an appropriate governmental agency take the lead in implementing the preservation concept described in the Snohomish Mediated Agreement. The Snohomish County Department of Planning and Community Development has accepted this responsibility and with a grant from the Washington Department of Ecology under the Coastal Zone Management Act of 1972, a preservation management plan was prepared for the nine wetland units (Shapiro, 1985).

These units include the mudflats at the mouth of the Snohomish River on Smith Island (Unit I), the Quilceda Creek wetland (Unit II), North Ebey Island (divided into Units III, IV, and V), the middle portion of Spencer Island (Unit VI), Otter Island (Unit VII), the northern portion of Ebey Island (Unit VIII), and an area adjacent to Highway 2 near the junction of Snohomish River and Deadwater Slough (Unit IX). Figure 1 illustrates the location of each unit as they are presently delineated. The 1985 report, prepared using resource information for each unit and input from a technical advisory committee made up of affected landowners, agencies, and interest groups, updated previous preservation recommendations and developed an approach to retain the wetland units in their existing and/or enhanced condition.

Units VI, VII, VIII, parts of Unit V, and a few small parcels of land outside of the nine wetland units have been recently acquired by Snohomish County. With the acquisition of these parcels, the need has been recognized for a detailed plan to update previous management recommendations for the wetlands units (Shapiro, 1985) in a manner that identifies and maximizes the public benefit.

In 1988, Snohomish County and the Washington State Department of Natural Resources (DNR) entered into an intergovernmental agreement with an objective ". . . to develop site specific Snohomish River wetland units management policies and procedures through consideration of unique site characteristics, wetland enhancement opportunities, compatible public uses, and appropriate administrative responsibilities." Phase I of the project,

SNOHOMISH RIVER WETLAND UNITS

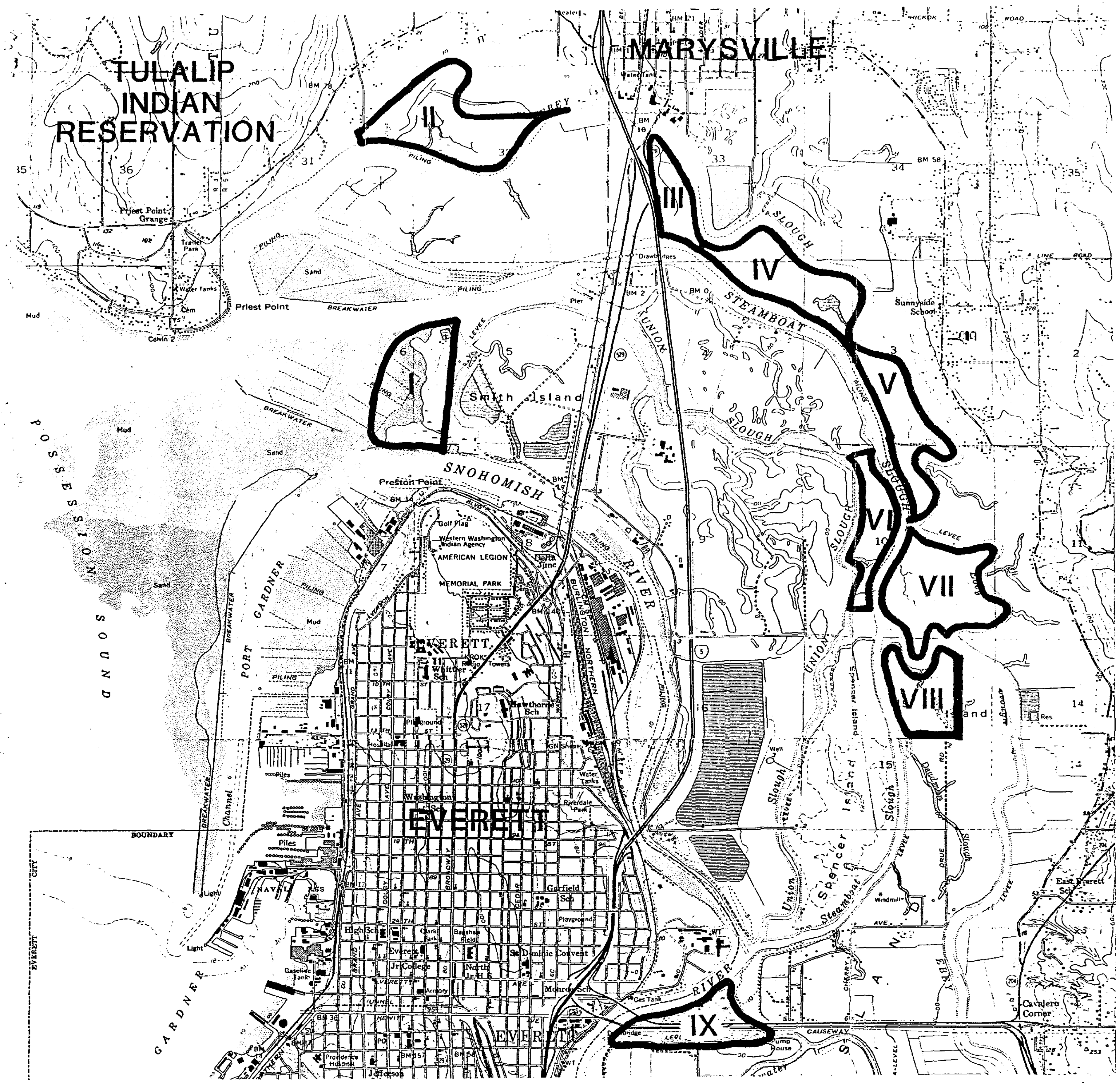
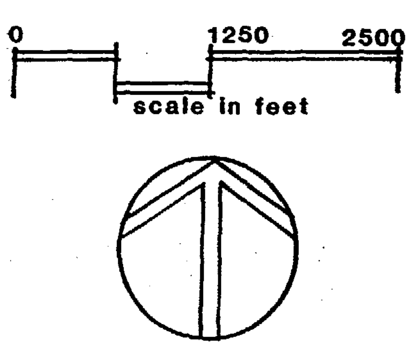


Figure 1

Source: U.S. Army Corps of Engineers, 1981.



funded jointly by DNR and Snohomish County, was to address site specific needs of the units owned at the time by Snohomish County. Phase II, not part of the agreement between DNR and the County and funded separately by the Washington State Department of Ecology, was to address wetland areas acquired in late 1988 or proposed for future acquisition by the County. This report is the combination of the Phase I and Phase II studies, covering the overall management plan for the Snohomish River wetlands.

Specific goals for various uses of the wetland units have been established by the Snohomish River Wetlands Citizen Advisory Committee and Snohomish County. These goals include preservation of wetland habitat and culturally significant areas, enhancement of wetland habitat where appropriate, and the opportunity for public use. Public uses considered include the opportunity for public access, recreation, research, and interpretive education.

This report addresses what capacity or "role" each wetland unit can play in fulfilling the management goals as defined by the County and technical committee. These suggested roles are intended to be used by the County in determining the management goals for each wetland unit. Decisions regarding the management roles of each unit may be influenced by the method of acquisition, as well as the resource values and desired use of the unit since some funding sources may require purchased land to be used for specific purposes. For instance, some agencies may provide funds for the express purpose of preserving wetland habitat. In this case, for any units purchased with funds from that source, management roles would necessarily be compatible with preservation of existing habitat.

2. Wetland Resource Values

2. WETLAND EVALUATION METHODOLOGY

In order to accomplish the goal of developing a management plan for the Snohomish estuary wetland units, the resource values of each wetland unit have been evaluated. Using information collected from existing literature (Burrell, 1978; Shapiro and Associates, Inc. 1978), field visits, discussion with knowledgeable residents and agency staff, and aerial photographic interpretation, a brief description of the habitats and historical use of each wetland is given. In addition, values for nine wetland functions have been determined for each of the wetland units using a methodology developed by the Army Corps of Engineers (Reppert, et al., 1979). The determination of the functional values of each wetland unit is intended as a tool to provide a basis for determining the management goals and objectives for each unit.

2.1 METHODOLOGY

A modification of the system for wetland values assessment developed by the U.S. Army Corps of Engineers (Reppert et al., 1979) was used to identify the functional values of the nine designated wetland units. Reppert's methodology evaluates eight wetland functions, including (1) natural biological function; (2) aquatic study areas, sanctuaries, refuges; (3) hydrologic support function; (4) shoreline protection; (5) storage of storm and flood water; (6) natural groundwater recharge; (7) water purification; and (8) cultural values. A ninth function, recreational opportunity, has been added to this evaluation since recreation is a key element in management decisions to be made regarding the wetland units. The individual functions and values for which the wetland units were evaluated are described below.

Natural Biological Function of Wetlands

Wetlands are productive aquatic ecosystems that are comprised of complex food chains used for nesting, spawning, rearing, and feeding by a wide variety of aquatic and terrestrial species, many of which are economically important. Since wetlands form the basis for so many food chains and habitats, their natural biological functions are assessed by their food chain production and the general and specialized habitats they provide.

Food chain production in the Snohomish wetland units can be evaluated according to their net primary productivity, mode of transport, and food chain support. Primary productivity is defined as the rate at which green plants assimilate the energy of the sun and store it as potential food sources. Since those wetlands comprised of marsh habitat produce large amounts of vegetative biomass faster than other types of wetland plant communities, they are given a high rating for primary productivity. Wetlands comprised primarily of shrub and forested swamp are given a moderate rating. Wetland systems that lack vegetation, such as some lakes and rivers, are given a low rating.

Transport of nutrients is strongly based on the hydrologic characteristics of the particular ecosystem. Wetlands that export more vegetative material, such as intertidal marshes and swamps, marshes associated with rivers, and seasonally flooded swamps associated with riverine systems, are given a high rating for transport of nutrients. A moderate rating is given to wetlands that consist of uppertidal marsh, freshwater wetlands adjacent or linked to intermittently flooded riverine systems, and some lakes. Wetlands that export very little vegetative material, such as hydrologically isolated lakes and marshes, inland swamps and bogs, and freshwater wetlands adjacent or linked to ephemeral riverine systems, are given a low rating.

Food chain support refers to the secondary productivity values or the number of higher organisms, such as ducks and fish, a wetland can support. Those wetlands supporting a high number and diversity of animals and fish are given a high rating. A moderate rating is assigned to wetlands with fewer animals and fish, and a low rating to wetlands with little or no higher organisms.

Wetlands provide habitat, the place where a particular plant or animal lives, for aquatic and terrestrial species. Some species spend their entire lives in a single environment, while other species need multiple habitats with more complex requirements to successfully complete their life cycles. Wetlands are important as general wildlife habitat, providing single or multiple habitat requirements for a large number of species. Criteria used to assess the general habitat value of wetlands include diversity of habitat types in the wetland, diversity of plant communities, and special habitat features. Special habitat features include the presence of snags, downed logs, and banks with cover. These features increase the diversity of the area and attract a wider range of wildlife species to the area. Wetlands comprised of three or more habitat types, with special habitat features, and a diversity of plant and animal species are considered of high value. Where some, but not all, of these characteristics are present, the wetlands are considered to be of moderate habitat value. Where most of these characteristics are absent, the wetlands are rated as low. Since wetlands with a monotypic habitat type or plant community tend not to support a wide diversity of animal species, these areas are generally considered low in value as wildlife habitat. Monotypic areas that are very large, however, are considered of moderate to high value since these areas can serve as habitat to a large number of individuals of a given species using that habitat type.

Wetlands also can provide specialized habitat. Those wetlands with specialized habitat values support plant and/or wildlife species that are either designated as threatened, endangered or sensitive, or species that are entirely dependent on wetlands. This includes nesting, rearing, spawning, resting, feeding, and wintering habitat for special wildlife species. Wetlands that do presently support or have supported these species in the past are given a high rating. A moderate rating is given to wetlands that could potentially, but do not now, support these species. A low rating is given to wetlands that do not offer habitat that could support special species.

Wetlands Valued as Aquatic Study Areas, Sanctuaries, and Refuges

Wetlands throughout the nation have been set aside by federal and states agencies, and non-profit and other interest groups for scientific study, education, and the protection of aquatic and terrestrial habitats. These areas are often used for research due to their specialized flora and fauna, energy budgets, nutrient cycling, and population dynamics. Many of these areas are used for public educational centers oriented towards wildlife observation and nature study. In addition, wetlands provide wildlife habitat for populations of both migratory and non-migratory species of birds, mammals, amphibians, and fish. Wetlands that are recognized, or that possess values that could be recognized, as a study area, refuge, or sanctuary are rated high.

In determining the scientific, educational, and/or public interest value of other wetlands, the habitat value, potential for public education, and ecosystem functioning should be evaluated. For instance, a large wetland with a variety of habitats that is hydrologically connected to a river or creek would recieve a higher rating than a small, isolated wetland with little or no habitat diversity.

Hydrologic Support Value of Wetlands

Hydrologic support is defined as the role a wetland plays in maintaining the hydrologic stability and integrity of the entire system to which it is physically related. Hydrologic periodicity is a measure of the frequency of inundation by tides, river flow, runoff, or precipitation. This interaction results in a regular interchange of nutrients, and chemical and organic constituents between the main water body and the adjacent wetland. Typically, marine and intertidal wetlands are given a high rating for periodicity; riverine and lakeshore wetlands a moderate to low rating; and hydrologically isolated marshes, bogs, and potholes, a low rating.

The extent and degree of flooding that a wetland is subject to is dependent on the elevation of the wetland. Those wetlands that flood to the greatest depth or are nearest an associated open water system lend the greatest hydrologic support to the surrounding areas. A high rating is given to wetland systems characterized by low gradient and proximity to an open water system; a moderate rating is given to wetlands that are flooded less regularly and a low rating to hydrologically isolated systems.

Shoreline Support Value of Wetlands

Wetlands that lie along shorelines of large bodies of water and rivers can absorb the initial impact of storm waves. Marsh vegetation causes waves to break, dissipating wave energy and reducing storm damage by preventing severe erosion. Three physical characteristics determine the value of wetlands for shoreline protection. These include vegetation structure and density, magnitude of fetch, and wetland width.

The taller and more rigid the wetland vegetation, the more turbulence is caused when waves pass through it resulting in dissipation of wave energy. Vegetation roots bind and stabilize the shoreline substrate, thus, the more dense and developed the root systems, the more effective the erosion control function. Wetlands with dense, woody vegetation provide more shoreline protection than areas with sparsely growing, flimsy grasses. The magnitude of fetch, or the distance at which the wind can blow unimpeded across water, determines the importance of shoreline wetlands. A long fetch allows high volumes of water and wave energy to batter the shoreline, thus, a wetland located on a body of water with a long fetch has greater value for shoreline protection. The amount of shoreline protection a wetland can provide is also determined by width of the wetland or the distance the wetland extends from the shoreline. In general, wetlands that extend over two hundred yards from shore are considered to have a high value for erosion control, while wetlands extending less than one hundred yards from shore are considered of low value. The overall value for shoreline protection afforded by a particular wetland can be determined by considering all three of these characteristics.

The location of the wetland relative to development can modify the shoreline protection value of a wetland. Nominal shoreline wetlands located in a highly developed area can provide important erosion control for the area. Conversely, large and densely vegetated wetlands located along completely undeveloped shorelines have limited value for shoreline protection, even though they may provide substantial erosion control.

Value of Wetlands in Storage of Storm and Flood Water

Many wetlands, especially those hydrologically linked to rivers, may be important for water storage and flow retardation during periods of flood or storm discharge. By retaining water that otherwise might be channeled into open flow systems, wetlands can significantly reduce or modify potentially damaging effects of flood flows. Depending on the nature and density of vegetation in the wetland, these areas can decrease the velocity of overland flows to varying degrees. In most cases, the physical characteristics of a particular wetland or wetland system must be directly compared with the flood damage potential in relation to locally developed areas, thus, even nominal wetlands located in highly developed areas could afford flood protection. Conversely, very large wetlands in completely undeveloped watersheds provide limited storm water storage value, even though they may provide substantial storm water storage. High ratings for flood storage are given to wetlands greater than 10 acres in size; moderate ratings to wetlands of 5 - 10 acres; and low ratings to wetlands of less than 5 acres in size. High ratings for flood retardation are given to wetlands with greater than 30% aerial coverage of woody vegetation; moderate ratings to wetlands with 10 - 30% coverage, and low ratings to wetlands with 0 - 10% coverage.

It should be noted than an important factor in a wetlands ability to perform storm and flood water storage is its location in the watershed. Those wetlands located in the upper portions of the watershed have a higher value for this function. The lower in the watershed a wetland is located,

the more reduced the value of its ability to store stormwater. Thus, even though a wetland may be large with dense, woody vegetation cover, if it is located at the mouth of a large watershed basin its storm and flood water storage value would be low.

Groundwater Recharge Value of Wetlands

The groundwater recharge function of wetlands is determined by a complex system of interactions between the underlying geology, soils, and surface topography. Wetland features that provide an indication of the wetland value for groundwater recharge include the wetland size, periodicity, and depth of water. Wetlands that are given a high rating for groundwater recharge are characterized as large wetlands (over 10 acres in size), and are permanent, open systems with a water depth of several feet. Moderate ratings are given to seasonal wetland systems of moderate size (5 - 10 acres). Small isolated depressions that are temporarily inundated provide little or no value as groundwater recharge sites. Generally, tidal wetlands are not considered to have important groundwater recharge values.

Water Purification Value of Wetlands

Through a variety of physical, biological, and chemical processes, wetlands function to naturally purify water by removing organics and mineral particulate matter from rivers and streams. Wetlands, by recycling pollutants, may be significant in minimizing some of the harmful effects of pollutants introduced into natural ecological systems by human activities. Although it is somewhat difficult to generalize about the water purification functions that wetlands perform, three key wetland characteristics can be used to assess the level of water quality improvement performed. These characteristics include the wetland type, its areal extent, and geographic factors of its location.

One measure of the type of wetland is the hydroperiod or rate at which water flows into and out of a wetland. Regular exposure of bottom materials to aerobic decomposition processes increases the breakdown of organic matter. A regularly inundated wetland, such as an estuary or perennial river, is given a high rating for hydroperiod. A moderate rating is assigned to lakes and irregularly flooded estuarine systems, and a low rating is assigned to intermittently flooded rivers, lakes, swamps, and marshes. The nature and density of plant cover also define the type of wetland and are important factors in estimating the water purification function of a particular wetland. High plant density provides a greater surface area for the processes of water purification. Wetlands with a high rating for vegetation density have plant coverage greater than 80%. A moderate rating is given for plant coverage between 50 and 80%; and a low rating for coverage between 0 to 50%.

Areal and waste loading relationships of a wetland can be estimated by determining the total wetland size, proportion of water to wetland, and proportion of runoff retained in the wetland. Since a larger wetland provides more surface area for water purification processes, a high rating for wetland size is given to wetlands that are greater than 100 acres in size. A moderate rating for size is assigned to 10 to 100 acre wetlands; and a low rating to 1 to 10 acre wetlands. Too small a proportion of

surface water area to wetland area tends to inhibit aeration, while too large a proportion retards the natural water purification processes. A high rating for surface water proportion is given to wetlands with 40 to 60% surface water coverage; moderate rating is given for 60 to 75% coverage; and a low rating for less than 40% and greater than 75% water coverage. The greater the proportion of runoff retained in the wetland, the more efficient that system will be in terms of waste load assimilation; thus, a high rating is given to wetlands that retain greater than 50% of the total overland runoff entering the system. Wetlands that retain 25 to 50% of the runoff are given a moderate rating; and those retaining less less than 25% are given a low rating.

Location factors affecting water purification functions of a wetland include the number of frost-free days and the location of the wetland relative to a source of pollution discharge. In general, the rates at which most chemical reactions occur increase with rising temperature; thus, a high rating is given to wetlands in locations having greater than 250 frost free days per year. Wetlands in locations having 175 to 250 frost free days are given a moderate rating, and those in locations with less than 175 frost free days are given a low rating.

The location of a wetland relative to a pollution source also is an important aspect in assessing water purification functions of a wetland. A high rating is given to wetlands situated below a known source of municipal waste discharge (because of the wetland's nutrient uptake capabilities) or above water intakes (because of the wetland's water purification capabilities). If the wetland is situated below areas of non-point pollution sources, it is given a moderate rating. A low rating is given when a wetland is situated below known industrial discharges presumably for the wetland's limited ability to uptake such discharge. A low rating is also given to a wetland when it is not in proximity to point and non-point pollution sources.

Cultural Values of Wetlands

In addition to their biological and physical functions, many wetlands exhibit important socio-economic and/or unique cultural values that merit recognition. The major socio-economic benefits pertaining to wetlands include commercial fisheries, renewable resources, and agriculture. Cultural values also include aesthetics such as visual diversity in the landscape. In addition, some wetlands may have special value as historic and archeological sites. Due to the numerous variables and subjective characteristics involved in cultural values, ratings for these values are difficult to assess. In general, wetlands are assessed on an individual, site-specific basis in accordance with cultural and social perceptions.

Recreational Opportunity

Recreational opportunities offered by the Snohomish wetland units are important to consider in designing a management plan. Bird watching, canoeing, and hiking are examples of passive recreational activities. Traditionally, several of the units are also used for active recreation, such as hunting. There are several variables which affect the recreational oppor-

tunities for any given wetland within the system. For instance, wetlands which are large in size, with a variety of habitat types that support a diversity of plants and animals, and which have visual diversity could provide opportunities for passive activities. Wetlands with these characteristics may be given a high rating for recreation. Wetlands that already contain physical elements readily adapted to passive recreation (such as dikes that would provide walking trails or waterways and channels for canoeing) and that offer opportunities for hunting, may be considered of high value in terms of recreation. Correspondingly, wetlands that are small, with little diversity of plants and animals may be given a low rating.

Recreational values may be modified (from what might be initially expected) upon consideration of surrounding land uses and the effect of recreational opportunities on other functional values of the wetland. For example, a small wetland that is located in or adjacent to urban areas may be considered valuable for recreation, regardless of size or diversity. Recreation activities would have a greater effect on wetlands rated high for other functions than on wetlands with low functional ratings. Thus, if recreational use of a wetland would adversely impact other functional values with high ratings the recreational value would be reduced.

Although some guidelines for determining the recreational value of wetlands exist, each wetland must be assessed on a case-by-case basis according to possible recreational opportunities, surrounding land use, and other the wetland performs.

2.2 EVALUATION OF INDIVIDUAL UNITS

Each wetland unit has been evaluated for the nine wetland functions described above. A brief description of each wetland unit is presented below and includes a table listing the values assigned for the various wetland functions of that unit.

Unit I - West Smith Island

The wetland area designated as Unit I is located on the western portion of Smith Island and is approximately 256 acres in size. This area, located north of the mouth of the Snohomish River and south of the mouth of Steamboat Slough, has not yet been purchased by Snohomish County as part of their wetland management program.

Brackish marsh dominates Unit I with sedge, saltgrass, bentgrass, silverweed, and aster as the principal plant species. Freshwater marsh habitat is located higher in elevation between the brackish marsh and the small area of Sitka spruce swamp on the east-central portion of the unit. A corridor of broad-leaved deciduous trees exists along the eastern border and an open water pond is located at the northeast portion of the unit.

Historically, much of Smith Island has been diked for agricultural purposes. More recently, timber industry activities have affected upland

areas adjacent to Unit I. Wood product waste treatment ponds were constructed on the southeast portion of this unit between 1947 and 1955, resulting in increased sediment deposition along the eastern portion of the unit. A log storage area presently exists in the southern portion of the unit. Mudflats on the western end have not been diked, but the shoreline has been modified through discharge of dredge material to improve access and log storage. Mudflats also have traditionally been used for log rafting. In order to determine if the habitats present on Unit I (as well as on all the other units) have changed noticeably over the last ten years, aerial photographs dated 1984, 1985, and 1988 were reviewed, as were habitat maps completed in 1978 (Burrell, 1978). Other than expansion of the log storage facilities, no observable changes have occurred in the habitats of Unit I over the past ten years.

The marshes in this unit provide high primary productivity important to the entire food chain in the estuary. Intertidal flats provide habitat to invertebrate benthos which in turn feed salmon, shad, other marine fish; shorebirds such as sanderling, dunlin, and sandpiper; and waterfowl such as mallard, northern shoveler, and northern pintail. Small mammals, such as raccoon and vole, feed and nest in the freshwater marsh, as do songbirds like red-wing blackbird, wren species, and song sparrow. Deer graze along the edge of the upland woodlands and rest in the upper reaches of the marsh. Waterfowl use the open water pond and marshes for feeding and resting. There have been unpublished reports of bald eagles resting in the Sitka spruce forest. The abundance of waterfowl in the marsh habitat of this unit has made this a favorite hunting area. Hunters generally hunt the marshes by tying their boats to pilings or walking the dikes.

Table 1 shows the value ratings assigned for the wetland functions of this unit based on the Reppert methodology. Included in Table 1 is the basis for the values assigned. Most of the of the wetland functions were assigned a moderate to high value, with the exception of biological function which was given a high value, recreational opportunity which was given a moderate value, and groundwater recharge given a low value. Although the potential for storm and flood water storage received a relatively higher value, the actual value of storm water storage would be of low value due to the location of the unit within the watershed.

Unit II - Quilceda Creek Wetland

Quilceda Creek bisects the approximately 395 acre Unit II which lies to the west of Interstate 5 and the City of Marysville. This unit is bounded by 14th Avenue N.E. and 19th Avenue N.E. to the west, Ebey Slough to the south, and Tulalip Road to the north. Snohomish County has not yet purchased this unit.

In a representative cross-section beginning at the edge of where it meets open Puget Sound water and extending finally to upland habitat, this unit represents the only habitat transition of its kind in the estuary where a brackish marsh merges into a brackish swamp, which merges into a fresh marsh, which finally merges into uplands. Brackish marsh is dominated by a variety of plant species including salt tolerant bulrush and sedge, arrowgrass, silverweed, bentgrass, and saltgrass. Bulrush and cattail

Table 1
EXISTING WETLAND VALUES EVALUATION FOR UNIT I, WEST SMITH ISLAND
(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	High	Marsh and mudflat habitat dominates wetland.
2. Mode of Transport	High	Tidally influenced with numerous channels, exports material to Steamboat Slough, Snohomish River and Possession Sound.
3. Food Chain Support	High	High productivity and diverse plant species support a diversity of wildlife.
B. General Habitat	High	Three habitat types with a diversity of plant communities and wildlife species.
C. Special Habitat	High	Wintering habitat for bald eagles.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	Moderate-High	Large wetland, hydrologically linked to sloughs, Snohomish River, Possession Sound, diversity of plant communities.
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	High	Tidally influenced, regularly flooded.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	High	Long fetch, dense marsh vegetation, large width, protects industrial area.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	High	Greater than 10 acres in size.
B. Flood Retardation Factor (Vegetative Cover)	Moderate	10 to 30% coverage of woody vegetation.
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	High	Regularly flooded.
2. Vegetation Density	Moderate	50-80% vegetation density.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	High	Approximately 265 acres in size.
2. Proportion of Water to Wetland	Moderate	Greater than 75% water coverage at high tide, but tidal fluctuation allows regular aeration.
3. Proportion of Runoff Retained in Wetland	Low	Less than 25% of runoff retained in wetland.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days/year.
2. Location Related to Pollution Sources	Moderate-High	Located downstream from agricultural fields, Everett sewage lagoon, and wood waste treatment ponds.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	Moderate-High	Provides habitat for fisheries resources, used by the Everett School District as a study area.
9. RECREATIONAL OPPORTUNITY	Moderate	Large wetland with diverse plants, traditionally used for hunting, high to moderate values for other functions discourage heavy human use.

dominate the fresh marsh plant community and Sitka spruce dominates the swamp community. An unusual stand of juniper is also found within this unit. Numerous tributaries of Quilceda Creek and Ebey Slough occur throughout this unit.

Historically, the center of this unit has remained undisturbed because the few industrial activities present have occurred only along the unit's boundaries. The existing land uses include paper and metal manufacturing to the east, log rafting and an abandoned railroad to the south, residences to the north, and a boat works operation along the western shore of Quilceda Creek. The only observed change in the habitat of this unit over the past ten years is the expansion of the shrub-scrub habitat in the southern end of the unit farther south. Construction of the new Tulalip Road Bridge and expansion of industrial facilities to the southeast have also affected the wetland.

The variety of habitat types in Unit II provides food, shelter, and nesting for a diversity of wildlife species including waterfowl, wading birds, and fish species. This unit is a favorite hunting area in the estuary, especially along the southern shore of the unit and along Quilceda Creek, due to the abundance of waterfowl in the marshes. Upland habitat provides food and cover for mammals, such as deer, raccoon, and small rodents. Intertidal marsh in this unit provides important habitat for the invertebrate benthos that contribute to the food chain in the estuary, feeding numerous wildlife species including salmon. Juvenile salmon run down Quilceda Creek and school in the vicinity of Ebey Slough. Additionally, the Washington State Department of Wildlife and Washington Natural Heritage Program have identified this unit as specialized habitat. This area serves as nesting territory of osprey and supports black lily, a state sensitive plant species (see Appendix A).

Unit II also has significant cultural values. The salmon runs in this unit are important to the livelihood and cultural traditions of the Tulalip Tribes. In addition to the salmon runs, this unit also has archaeological and cultural significance for the Tulalip.

Value ratings assigned for Unit II wetland functions are shown in Table 2. This table also gives the basis for those ratings based on the Reppert methodology. High values were assigned for natural biological function; hydrologic support function; cultural values; and for aquatic study areas, sanctuaries, and refuges. Shoreline protection received a moderate rating. The functions for storage of storm and flood water and water purification received moderate to high values; however, due to the location of this unit, the potential for stormwater storage would be of little value. A low to moderate rating was assigned to recreational opportunity and a low rating was assigned to natural groundwater recharge.

Unit III - North Portion of North Ebey Island

Unit III, approximately 57 acres in size, is located at the north end of North Ebey Island immediately adjacent to Interstate Highway 5. This unit has not yet been purchased by Snohomish County as part of their wetlands preservation plan.

Table 2
EXISTING WETLAND VALUES EVALUATION FOR UNIT II, QUILCEDA CREEK
(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	High	Marsh habitat dominates wetland.
2. Mode of Transport	High	Tidally influenced and associated with Quilceda Creek, exports material to Steamboat and Ebey sloughs.
3. Food Chain Support	High	Diversity of habitats support a diversity of wildlife.
B. General Habitat	High	Four habitat types with a diversity of wildlife species.
C. Special Habitat	High	Nesting territory of osprey, wintering habitat of bald eagles, presence of black lily, only example of brackish marsh to brackish swamp to fresh marsh to upland zonation in the estuary.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	High	Large wetland, hydrologically linked to sloughs, Snohomish River, Possession Sound, diversity of wetland and upland habitat.
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	High	Tidally influenced, regularly flooded.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	Moderate	Short fetch, dense marsh vegetation, large width, protects few developed areas.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	High	Greater than 10 acres in size.
B. Flood Retardation Factor (Vegetative Cover)	Moderate	10 to 30% coverage of woody vegetation.
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	High	Regularly flooded.
2. Vegetation Density	High	Vegetation density over 80%.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	High	Approximately 395 acres in size.
2. Proportion of Water to Wetland	Moderate	Greater than 75% water coverage at high tide, but tidal fluctuation allows regular aeration.
3. Proportion of Runoff Retained in Wetland	Low	Less than 25% of runoff retained in wetland.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days/year.
2. Location Related to Pollution Sources	Moderate-High	Located downstream from agricultural fields, Lake Stevens sewage lagoon, and Marysville sewage lagoon.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	High	Provides habitat for fisheries resources important to the livelihood and cultural traditions of the Tulalip Tribes, has archeological and cultural significance for the Tulalip Tribes, provides visual diversity in view from interstate highway 5 and residences to the west.
9. RECREATIONAL OPPORTUNITY	Low-Moderate	Quilceda Creek and numerous channels for canoe users, wildlife viewing opportunities, large wetland with diverse plants, traditionally used for hunting, high to moderate values for other functions discourage heavy human use.

The dominant habitat in this unit is emergent marsh. A cattail/bulrush plant community comprises the majority of the wetland with a sedge community interspersed in the southern portion of the unit. A narrow band of forested swamp habitat exists on the dike at the south edge of the wetland. Broad-leaved deciduous trees dominate the tree layer in this habitat, with Sitka spruce interspersed. Rose dominates the understory layer. Breaks in the dike at the northeast portion of the unit serve as inlets and outlets for water entering and exiting the marsh.

This unit, the first portion of North Ebey Island to be diked, was diked and farmed prior to 1875. The area reverted to wetland vegetation after the dikes were breached in the early 1950s. There have been minimal changes. Physical changes observed in the habitat of this unit over the past ten years include several new breaks in the dike along the northern shore, addition of several new channels along the eastern border of the unit, and the formation of several small, open water areas within the wetland.

Marsh habitat in this unit offers high primary productivity to the area. Plant species observed in this large marsh, including cattail, bulrush, and sedge, provide food sources for waterfowl and small mammals. Unvegetated intertidal flats near breaches in these dikes provide feeding and resting areas for waterfowl and wading birds. Large numbers of songbirds and small mammals use the habitat on this unit for shelter and nesting. This unit, in conjunction with with the two other North Ebey Island units (Units IV and V), comprise the largest single cattail/bulrush marsh in the estuary.

Table 3 shows the value ratings assigned for the wetland functions of this unit based on the Reppert methodology and includes the basis for the values assigned. Hydrologic support was the only wetland function assigned a high value. A moderate to high rating was assigned to natural biological function, and water purification. Moderate values were assigned for storage of storm and flood water; cultural values; recreational opportunity; and for aquatic study areas, sanctuaries, and refuges. Natural groundwater recharge and shoreline protection were assigned a low value. As with other units, the stormwater storage function may be moderate-high due to physical conditions, but is of limited value due to the unit's location.

Unit IV - Mid-North Ebey Island

Unit IV, approximately 132 acres in size, is located in the middle lobe of North Ebey Island to the east of Interstate Highway 5. This wetland unit has not yet been purchased by Snohomish County.

The dominant habitat in this unit is emergent marsh with a mosaic of two plant communities. These communities consist of a cattail/bulrush community and a sedge community. A narrow band of forested swamp habitat exists on the dikes along the periphery of the wetland. Broad-leaved deciduous trees dominate the tree layer in this habitat, with Sitka spruce interspersed. Rose dominates the understory layer.

Table 3
EXISTING WETLAND VALUES EVALUATION FOR UNIT III, NORTH EBEY ISLAND (NORTH)
(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	High	Marsh habitat dominates wetland.
2. Mode of Transport	High	Tidally influenced, exports material to Steamboat and Ebey sloughs.
3. Food Chain Support	High	Open water/marsh supports a diversity of waterfowl.
B. General Habitat	Moderate	Two habitat types, large cattail marsh.
C. Special Habitat	High	Wintering habitat of bald eagles.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	Moderate	Large wetland, hydrologically linked to sloughs, Snohomish River, Possession Sound; however, is in close proximity to interstate highway 5.
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	High	Tidally influenced, regularly flooded.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	Low	No development located in area.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	High	Greater than 10 acres in size.
B. Flood Retardation Factor (Vegetative Cover)	Low	Less than 10% coverage of woody vegetation.
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	High	Regularly flooded.
2. Vegetation Density	High	Vegetation density over 80%.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	Moderate	Approximately 57 acres in size.
2. Proportion of Water to Wetland	Moderate	Greater than 75% water coverage at high tide, but tidal fluctuation allows regular aeration.
3. Proportion of Runoff Retained in Wetland	Moderate	25-50% of water retained in wetland.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days/year.
2. Location Related to Pollution Sources	Moderate-High	Located downstream from agricultural fields, Lake Stevens sewage lagoon, and Marysville sewage lagoon.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	Moderate	Provides habitat for fisheries resources and waterfowl, provides visual diversity in view from interstate highway 5.
9. RECREATIONAL OPPORTUNITY	Moderate	Existing dikes could serve as trails, numerous channels for canoe users, wildlife viewing opportunities, large wetland with diverse plants, high to moderate values for other functions discourage heavy human use.

Historically, this area was diked sometime after 1911. These dikes were breached between 1950 and 1963, and the area reverted to wetland vegetation. Overall, there has been little change in the habitat on Unit IV over the past ten years. The only observed change appears to be the formation of several small, open water areas within the wetland. Most of these open water areas are connected to numerous channels that occur within the wetland and serve as inlets and outlets to the marsh at breaks in the dike.

The high productivity of marsh habitat in this unit provides food sources for waterfowl and small mammals. The variety of waterfowl that use this area attract hunters who hunt the interior of the unit by boat. Large numbers of songbirds and small mammals use the marsh habitat for shelter and nesting. This unit, in conjunction with with the two other North Ebey Island units (Units III and V), comprise the largest single cattail/bulrush marsh in the estuary.

Value ratings assigned for Unit IV wetland functions are shown in Table 4. The Table also gives the basis for those ratings based on the Reppert methodology. High values were assigned for hydrologic support and water purification functions. Natural biological function and aquatic study areas, sanctuaries and refuges were assigned moderate to high values. Functions for storage of storm and flood water; cultural values; and recreational opportunities were all assigned moderate values. A low value was given to natural groundwater recharge and shoreline protection. As with other units, the stormwater storage function may be moderate-high due to physical conditions, but is of limited value due to the unit's location.

Unit V - South Portion of North Ebey Island

Unit V, approximately 116 acres in size, is located at the south end of North Ebey Island just north of Otter Island between Steamboat and Ebey Sloughs. Parcels 1-002 and 1-005, totaling approximately 20 acres, in the southern end of Unit V, have been jointly purchased by Snohomish County and the Washington Department of Natural Resources as part of the wetlands preservation program.

Overall, the southern portion of North Ebey Island is dominated by cattail marsh, with bulrush intermixed. Sitka swamp dominates the southern tip of Unit V and forms a corridor, with scattered broad-leaved deciduous trees, along the eastern border of the unit. Shrub swamp habitat, interspersed with spruce swamp, also is present on this unit. Numerous channels within the wetland occur throughout the northern portion of the unit, with a few channels opening onto Steamboat and Ebey Sloughs where the unit's peripheral dikes have been breached.

Aside from the gradual spreading of the Sitka swamp in the southern portion, there have been no significant changes in the habitat in this unit. This unit, like other portions of North Ebey Island, was diked sometime after 1911. The dikes in Unit V were breached between 1941 and 1947, before breaching of dikes in Units IV and III located farther to the north on the island.

Table 4
EXISTING WETLAND VALUES EVALUATION FOR UNIT IV, NORTH EBEY ISLAND (MIDDLE)
(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	High	Marsh habitat dominates unit.
2. Mode of Transport	High	Tidally influenced, exports material to Steamboat and Ebey sloughs.
3. Food Chain Support	High	Open water/marsh supports a diversity of waterfowl.
B. General Habitat	Moderate	Two habitat types, large cattail marsh.
C. Special Habitat	High	Wintering habitat of bald eagles.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	Moderate-High	Large wetland, hydrologically linked to sloughs, Snohomish River, Possession Sound, diversity of plant communities.
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	High	Tidally influenced, regularly flooded.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	Low	No development located in area.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	High	Greater than 10 acres in size.
B. Flood Retardation Factor (Vegetative Cover)	Low	Less than 10% coverage of woody vegetation.
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	High	Regularly flooded.
2. Vegetation Density	High	Vegetation density over 80%.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	High	Greater than 100 acres in size.
2. Proportion of Water to Wetland	Moderate	Greater than 75% water coverage at high tide, but tidal fluctuation allows regular aeration.
3. Proportion of Runoff Retained in Wetland	High	50% of water retained in wetland.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days/year.
2. Location Related to Pollution Sources	Moderate-High	Located downstream from agricultural fields and Lake Stevens sewage lagoon.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	Moderate	Provides habitat for fisheries resources and waterfowl, provides visual diversity in landscape for residences to the east.
9. RECREATIONAL OPPORTUNITY	Moderate	Existing dikes could serve as trails, numerous channels for canoe users, wildlife viewing opportunities, large wetland with diverse plants, high to moderate values for other functions discourage heavy human use.

This unit, along with Units III and IV, comprise the largest single cattail/bulrush marsh in the estuary. This habitat provides high primary productivity, supplying nutrients and a food source for the wetland and surrounding areas. Nesting waterfowl, wading birds, songbirds, and small mammals find shelter and food in the marshes. The spruce swamp and shrub swamp provide habitat for a diversity of wildlife, including wood duck, raptors such as red-tail hawk and marsh hawk, songbirds, deer, muskrat, and other herbivores. Unit V also is located within the nesting territory of bald eagles that have established a nest in the area and serves as specialized habitat for this species. Traditionally known as 'Big 40' or Big Marsh' by hunters, this unit is a popular area for waterfowl hunting when hunting pressure on Units I and II is heavy.

Table 5 shows the value ratings assigned for the wetland functions of Unit V and gives the basis for those ratings based on the Reppert methodology. High value was assigned to hydrologic support. A moderate to high rating was given to natural biological function; aquatic study areas, sanctuaries, refuges; and water purification. Cultural values and recreational opportunity were assigned moderate ratings. The remaining functions, natural groundwater recharge, shoreline protection; storage of storm and flood water; were assigned a low rating. As with other units, the stormwater storage function may be moderate-high due to physical conditions, but is of limited value due to the unit's location.

Unit VI - Mid-Spencer Island

Unit VI, located in the middle portion of Spencer Island, is approximately 87 acres in size. Recently, about 83 acres of this unit have been jointly purchased for wetlands preservation by Snohomish County and the Washington Department of Natural Resources. The area purchased excludes the northernmost and southernmost lobes of Unit VI as defined in the Snohomish River Wetlands Units Preservation Management Plan (Shapiro, 1985).

Freshwater marsh, dominated by cattail and bulrush, covers the majority of this wetland unit. Forested habitat of broad-leaved deciduous trees, scattered Sitka spruce, and rose (in the understory) occurs along the dikes surrounding the unit. Numerous channels and shallow ponds occur throughout the central portion of the unit in the marsh and adjacent to the dikes. Forested swamp dominates the northwestern lobe of this unit.

No major changes in habitat have been noted for Unit VI over the past ten years. Historically, this area was diked in the late 1800's and early 1900s. By 1969, the dikes were breached and the area reverted to wetland. In addition, a channel was dredged from Steamboat Slough to Union slough between 1955 and 1963, dividing the southernmost three acres from the remainder of the unit.

The highly productive marsh habitat in this unit, interspersed with open water channels and ponds, provides feeding, nesting, and resting habitat for waterfowl species. Heron and shorebirds feed along the breached dikes and shoreline of the unit. Forested habitat along the dikes provide feeding and resting habitat for raptors and nesting and feeding habitat for

Table 5

EXISTING WETLAND VALUES EVALUATION FOR UNIT V, NORTH EBEY ISLAND (SOUTH)

(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	High	Marsh and forested swamp dominate unit.
2. Mode of Transport	High	Tidally influenced, exports material to Steamboat and Ebey sloughs.
3. Food Chain Support	High	Habitat can support diversity of animals.
B. General Habitat	High	Three habitat types, large cattail marsh.
C. Special Habitat	High	Nesting territory and winter habitat of bald eagles.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	Moderate-High	Large wetland, diversity of habitats, hydrologically linked to sloughs, Snohomish River, Possession Sound.
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	Moderate-High	Regularly flooded.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	Low	No development located in area.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	High	Greater than 10 acres in size.
B. Flood Retardation Factor (Vegetative Cover)	Moderate	Between 10-30% coverage of woody vegetation.
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	Moderate-High	Regularly flooded.
2. Vegetation Density	High	Vegetation density over 80%.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	High	Greater than 100 acres in size.
2. Proportion of Water to Wetland	Moderate-High	60-70% water coverage at high tide, tidal fluctuations.
3. Proportion of Runoff Retained in Wetland	Moderate	25-50% water retained in wetland.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days/year.
2. Location Related to Pollution Sources	Moderate-High	Located downstream from agricultural fields and Lake Stevens sewage lagoon.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	Moderate	Provides habitat for fisheries resources and waterfowl, provides visual diversity in landscape for residences to the east.
9. RECREATIONAL OPPORTUNITY	Moderate	Existing dikes could serve as trails, some channels for canoes, wildlife viewing opportunities, large wetland with diverse plants, traditionally used for hunting, high values for other functions discourage heavy human use.

small mammals and songbirds. This area also serves as specialized habitat. It provides habitat for wintering bald eagles and is located within the nesting territory of a bald eagle nest. Known as 'Hole in the Wall', waterfowl hunting is popular in this unit when hunting pressure on Units I and II is heavy.

Value ratings for Unit VI, along with the basis for those ratings, are shown in Table 6. A high value was assigned to natural biological function and hydrologic support for this unit. Aquatic study areas, sanctuaries, and refuges; storage of storm and flood water; and water purification were given a rating of moderate to high. Shoreline protection; cultural values; and recreational opportunity received a rating of moderate. The remaining function, natural groundwater recharge, received a low rating. As with other units, the stormwater storage function may be moderate-high due to physical conditions, but is of limited value due to the unit's location.

Unit VII - Otter Island

Wetland VII is the 164-acre Otter Island, bounded by Ebey and Steamboat Sloughs between Ebey and North Ebey Islands. This area has been purchased by Snohomish County as part of the wetlands preservation plan.

Forested swamp, dominated by Sitka spruce, covers approximately half of Otter Island and occurs along the western portion and around the periphery of this unit. Rose dominates the understory in the forested swamp. The remaining wetland habitat, located in the central portion of the unit, is comprised of marsh habitat and is dominated by cattail and bulrush. Shrub swamp interspersed in the marsh habitat, is dominated by rose.

There has been minimal change in the habitat on Otter Island over the past ten years, however, it appears that marsh areas in the central portion of the island are slowly succeeding to shrub swamp. Approximately four acres of shrub swamp exist on the southwest edge of this unit, where an apparently unsuccessful attempt to use the area for agriculture was made many years ago. Several ditches, located along the perimeter of the abandoned agricultural area, and some larger natural channels, on the west and north sides, serve as inlets and outlets to tidally influenced river water within this wetland.

The diversity of the marshes and swamps on the island provides an abundance of nesting, breeding, and feeding habitat for a wide variety of birds and mammals. Marsh habitat on the unit serves as feeding and nesting habitat for a variety of marsh birds including red-wing blackbirds, bitterns, rails, and waterfowl. These areas also provide food for muskrats and small rodents. Hawks, owls, and minks use the marsh for hunting grounds. The mature Sitka spruce swamp is considered sensitive habitat since regrowth of this community is slow. Mink, raptors, and wood duck use the swamp for nesting and breeding. Deer, muskrat, and other herbivores use it for feeding. Otter Island also serves as specialized habitat; it is located within the nesting territory of bald eagles and provides wintering habitat for them. The isolation of this unit creates wildife habitat that is relatively secure from human disturbance.

Table 6

EXISTING WETLAND VALUES EVALUATION FOR UNIT VI, MID-SPENCER ISLAND

(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	High	Marsh habitat covers most of unit.
2. Mode of Transport	High	Channels move nutrients into sloughs.
3. Food Chain Support	High	Open water/marsh can support a large number of waterfowl and raptors.
B. General Habitat	High	Three habitat types, large cattail/bulrush marsh.
C. Special Habitat	High	Nesting territory and winter habitat for bald eagles.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	Moderate-High	Large wetland, hydrologically connected to sloughs, variety of habitats.
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	Moderate-High	Tidally influenced, regularly flushing, hydrologically linked to Possession Sound via sloughs.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	Low	No development located in area.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	High	Greater than 10 acres in size.
B. Flood Retardation Factor (Vegetative Cover)	Moderate	Between 10-30% coverage of woody vegetation
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	High	Regularly flooded.
2. Vegetation Density	Moderate	Plant coverage of 50-80%.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	Moderate	Between 10 to 100 acres in size.
2. Proportion of Water to Wetland	Moderate	Greater than 75% water coverage at high tide, but tidal fluctuation allows regular aeration.
3. Proportion of Runoff Retained in Wetland	Moderate	25-50% water retained in wetland.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days/year.
2. Location Related to Pollution Sources	Moderate-High	Located downstream from agricultural fields and Lake Stevens sewage lagoon.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	Moderate	Provides habitat for fisheries resources and waterfowl, provides visual diversity in landscape view from highway.
9. RECREATIONAL OPPORTUNITY	Moderate	Existing dikes could serve as trails, numerous channels for canoe use, excellent wildlife viewing opportunities, traditionally used for hunting, high values for other functions discourage heavy human. use.

Table 7 shows the value ratings assigned for wetland functions on Otter Island and gives the basis for those ratings based on the Reppert methodology. Otter Island has a high value for natural biological functions; aquatic study areas, sanctuaries, and refuges; hydrologic support functions; storage of storm and flood water; and water purification functions. A moderate to high value was assigned to this unit for cultural values. Natural groundwater recharge and shoreline protection received a low rating. Overall, this wetland has moderate to high functional value for nearly all the wetland characteristics. Due to such high functional values, recreational opportunity on this wetland unit was given a low value in the interest of protecting and maintaining the status of other functions. As with other units, the stormwater storage function may be moderate-high due to physical conditions, but is of limited value due to the unit's location.

Unit VIII - Northwestern Portion of Ebey Island

Unit VIII, is located south of Otter Island and is bounded by Steamboat Slough to the west and Ebey Slough to the east and north. Snohomish County has purchased 70 acres at the northwestern end of the island. The area that has been evaluated in this report includes that portion of Ebey Island that has been purchased.

Although most of the 70 acres of Unit VIII is diked and separated from tidal influence and minor floods, much of it would probably be considered wetlands under the current U.S. Army Corps of Engineers definition. An area which is transitional between wetland and upland is located in the northwest portion of this unit. The area is dominated by blackberry and red alder. Much of the remainder of the unit is grassland dominated by reed canarygrass and soft rush with interspersed patches of blackberry and spirea. The area is currently being used as pastureland for a small number of cattle. Two small, seasonally ponded areas occur in the pasture and include a small, open-water, intermittent marsh located in the south central portion of the unit. A narrow band of wetland exists on the landward side of the flood control dike along the western and northern boundary of Unit VIII. This wetland is composed of an open-water channel with associated shrub swamp and marsh habitat. Historically, the original marsh and shrub swamp wetland communities were more extensive, but diking, ditching, and vegetative clearing have reduced these habitats.

The area between the dike and Steamboat and Ebey Sloughs on the north and west sides of Unit VIII are also wetland communities. These areas are composed of broad-leaved deciduous forest and shrub swamp habitats. In the northeastern portion of the unit is an area of coniferous forest dominated by Sitka spruce.

Although the wetland habitat that occurs inside the dikes is considered to be fairly low in value due to its use as agricultural land, habitat on this unit represents the only non-tidal wetland habitat included in the wetlands management plan. Most of the habitat types observed on the unit occur relatively rarely, less than 100 acres total of each habitat, in the Snohomish River basin below the confluence of Ebey Slough with the Snohomish River (Burrell, 1979). The inland shrub communities and open water pond offer habitat types, transitional habitat and isolated wetland habitat,

Table 7
EXISTING WETLAND VALUES EVALUATION FOR UNIT VII, OTTER ISLAND
(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	Moderate-High	Majority of wetland comprised of marsh habitat.
2. Mode of Transport	High	Channels in wetland move nutrients into Ebey and Steamboat Sloughs.
3. Food Chain Support	High	Diversity of plants supports a variety of wildlife, nesting territory and winter habitat for bald eagles.
B. General Habitat	High	Three habitat types, with special habitat features.
C. Special Habitat	High	Wintering and nesting territory for bald eagles.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	High	Large wetland, hydrologically linked to Snohomish River, diverse habitats - one of few units with Sitka Swamp. Presence of bald eagles, peregrine falcons.
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	Moderate-High	Tidally influenced, regular flushing, hydrologically linked to Snohomish River and Possession Sound.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	Low	No development located in area.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	High	Greater than 10 acres in size.
B. Flood Retardation Factor (Vegetative Cover)	Moderate-High	Approximately 30% coverage of woody vegetation.
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	High	Regularly flooded.
2. Vegetation Density	High	Plant coverage greater than 80%.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	High	Greater than 100 acres in size.
2. Proportion of Water to Wetland	High	Approximately 50% surface water coverage at high tide.
3. Proportion of Runoff Retained in Wetland	Low	Most of water entering wetland exits at low tide.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days.
2. Location Related to Pollution Sources	Moderate-High	Located below agricultural fields and the Lake Stevens sewage lagoon.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	Moderate-High	Provides fisheries resources habitat, visual diversity in landscape, is only wetland in area that has never been extensively diked and used for agriculture, midden located on island.
9. RECREATIONAL OPPORTUNITY	Low	Large size, visual diversity, and diverse habitat provides high potential for recreation, but high values for other functions precludes intrusion of wetland.

respectively, not found elsewhere on the wetland units. The habitat values for Unit VIII reflect the relatively rare occurrence of these habitats within the proposed management area.

Based on a review of historical aerial photographic interpretation, the habitat of Unit VIII appears to have changed considerably. Wetland habitat mapping completed in 1978 shows the majority of this site to have been comprised of shrub and forested habitat, with only two small areas of pasture dominated by rushes and one small open water pond. Presently, the unit is dominated by pastureland with areas of shrub and forest interspersed. The open water area, as delineated in the 1978 mapping, does not appear to have changed. These habitat changes may have been due to a ditch and drainage program implemented in 1980 to improve the agricultural potential of the unit.

Transitional habitat on this unit supports wildlife species that would not occupy wetland habitats, such as pheasant and coyote. Pastureland provides food for rodents and, in turn, coyotes, hawks, and owls. Shrub areas serve as feeding and shelter habitat for coyotes, other small mammals, deer, and a variety of birds. Raptors use the forested habitat for nesting and roosting. Deer use it for resting and foraging. Unit VIII serves as specialized habitat. Pileated woodpeckers, a sensitive species, have been observed in the forested habitat (Thompson, 1987). The northern portion of the unit is located within the nesting territory of bald eagles and is expected to be used by wintering bald eagles.

Value ratings, based on the Reppert methodology, for Unit VIII are shown in Table 8. All wetland functions were evaluated for the wetland areas on the unit. Upland areas were not evaluated except for the recreational opportunity function. This unit was given low functional values for aquatic study area, sanctuaries, and refuges; natural groundwater recharge; and shoreline protection. Low to moderate values were assigned for storage of storm and flood water. Moderate values were assigned to natural biological function, hydrologic support function, and water purification. A moderate to high value was assigned to cultural values. Generally, low to moderate value ratings were given for most of the functions evaluated for the wetlands on Unit VIII. For this reason, human use of the site would have less of an impact on the functional values of the unit and, thus, potential recreational opportunity received a high rating.

Unit IX - Ebey Island Highway 2

Unit IX, approximately 83 acres in size, is located on the east side of the Snohomish River just outside the city limits of Everett. The unit is bisected by Highway 2. This unit has not been purchased by Snohomish County for wetlands preservation.

The wetland habitat in Unit IX is composed primarily of shrub swamp with scattered areas of emergent marsh. The shrub swamp occurring along the perimeter of the unit is dominated by young red alder and willow with sparse Sitka spruce scattered throughout. Other areas of shrub swamp in this unit are composed of a spirea/cattail community. Cattail dominates the emergent

Table 8

EXISTING WETLAND VALUES EVALUATION FOR UNIT VIII, EBEY ISLAND (NORTHWEST)
(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	Moderate	Comprised of marsh, shrub and forested swamp.
2. Mode of Transport	Low-Moderate	Isolated system, but is adjacent to Ebey Slough.
3. Food Chain Support	Low	Some intermittent waterfowl use expected.
B. General Habitat	High	Four habitat types.
C. Special Habitat	High	Nesting territory and wintering habitat for bald eagles.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	Low	Small size, hydrologically isolated,
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	Low	Hydrologically isolated.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	Low	No development located in area.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	Low-Moderate	Less than five acres in size, hydrologically isolated from sloughs.
B. Flood Retardation Factor (Vegetative Cover)	Low-Moderate	10 - 30% woody vegetation in western wetland.
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	Low	Seasonal wetland habitat.
2. Vegetation Density	Moderate	50-80% vegetative cover.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	Moderate	Approximately 95 acres in size.
2. Proportion of Water to Wetland	Low	Greater than 75% water coverage during wet season, less than 40% during dry season.
3. Proportion of Runoff Retained in Wetland	Low	Retains less than 25% of run-off.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days.
2. Location Related to Pollution Sources	Moderate-High	Located below pasture lands.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	Moderate-High	Socioeconomic value as agricultural land used for grazing.
9. RECREATIONAL OPPORTUNITY	High	Has dikes for trails, small wetlands provide some visual diversity, plant diversity, diversity of upland and wetland habitat serves opportunity for public education.

marsh habitat on the unit with bulrush interspersed. Numerous channels along the southeastern and northwestern portions of Unit IX act as inlets and outlets for river water to enter and exit the wetland.

Historically, the southern edge of this unit was diked, separating it from the agricultural lands on Ebey Island. In addition, the boundary along Deadwater Slough has been at least partially diked. The Highway 2 bridge which bisects the unit, was originally constructed farther south before 1895, and moved to its present location prior to 1910. It should be noted at the time of this writing that the expansion of Highway 2 has been proposed and may result in construction impacts to Unit IX wetlands in the future. Several easements exist on the unit, including the City of Everett water pipelines easements and Burlington Northern and the Central Minnesota and St. Paul railroad easements. Several structures are located on the north-central portion of the unit along the Snohomish River. There have been no observed changes in the habitat of this unit over the past ten years.

Marsh vegetation on this unit provides high productivity to the wetland and surrounding areas. The diverse marsh and swamp vegetation provides feeding, nesting, and breeding habitat for a variety of waterfowl, wading birds, songbirds, and small mammals. Although bald eagle use of this unit has not been documented, some of the spruce scattered along the outer portion of the unit could potentially be used as perch sites for wintering eagles.

Value ratings assigned for Unit IX wetland functions are shown in Table 9. The table also gives the basis for those ratings based on the Reppert methodology. High values were assigned for hydrologic support function and storage of storm and flood water. As with other units, however, the storm-water storage function may be moderate-high due to physical conditions, but is of limited value due to the unit's location. Moderate to high values were assigned to natural biological function; water purification; and aquatic study areas, sanctuaries, and refuges. Recreational opportunity and cultural values received a moderate value rating, and natural groundwater recharge and shoreline protection received a low rating.

Other Areas

Snohomish County has recently acquired several small parcels of land in the vicinity of the nine wetland units. These "other areas" are outside of the boundary of any specific unit, but lie within the Snohomish River Estuary and are considered elements of the same general wetland system. Although these areas are important because they contribute to the program of wetland procurement and preservation by Snohomish County, they will generally have only minor parts in the development of a wetlands management plan at the current time. Consequently, an in-depth wetland evaluation will not be made for these individual small parcels. If, as the management plan is developed, any of these areas appears to play a significant role in the utilization of the wetlands as a whole, then detailed evaluations can be made on those areas. It was not within the scope of this study to tabulate the wetland values for additional wetland areas which are proposed for possible acquisition and which lie outside the originally proposed nine wetland units.

Table 9
EXISTING WETLAND VALUES EVALUATION FOR UNIT IX, EBEY ISLAND, (HIGHWAY 2)
(BASED ON A MODIFIED REPPERT ET AL., 1979)

	Value	Basis for Evaluation
1. NATURAL BIOLOGICAL FUNCTION		
A. Food Chain Support		
1. Net Primary Production	Moderate	Shrub swamp habitat dominates wetland.
2. Mode of Transport	Moderate-High	Tidally influenced, exports material to Deadwater and Steamboat Sloughs and the Snohomish River.
3. Food Chain Support	High	Diverse habitats and plant species support a diversity of wildlife.
B. General Habitat	Moderate-High	Two habitat types, cattail/spirea community.
C. Special Habitat	Moderate	Potential wintering habitat for bald eagles.
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	Moderate	Large wetland, hydrologically linked to sloughs, Snohomish River, Possession Sound, diversity of plant communities. Unit bisected by Highway 2.
3. HYDROLOGIC SUPPORT FUNCTION		
A. Hydrologic Periodicity	High	Tidally influenced, regularly flooded.
B. Elevation in Basin	High	Located near base of Snohomish watershed basin, associated with Snohomish River.
4. SHORELINE PROTECTION	Low	No development located in area.
5. STORAGE OF STORM AND FLOOD WATER		
A. Flood Storage Factor	High	Greater than 10 acres in size.
B. Flood Retardation Factor (Vegetative Cover)	High	Greater than 30% coverage of woody vegetation.
6. NATURAL GROUNDWATER RECHARGE	Low	Does not contribute to local groundwater table due to location within Snohomish estuary.
7. WATER PURIFICATION		
A. Wetland Type		
1. Hydroperiod	High	Regularly flooded.
2. Vegetation Density	High	Greater than 80% vegetation density.
B. Areal and Waste Loading Relationships		
1. Total Wetland Size	High	Approximately 83 acres in size.
2. Proportion of Water to Wetland	Moderate	Greater than 75% water coverage at high tide, but tidal fluctuation allows regular aeration.
3. Proportion of Runoff Retained in Wetland	Moderate	25-50% of water retained in wetland.
C. Location Factors		
1. Frost Free Days	High	Over 250 frost free days/year.
2. Location Related to Pollution Sources	Moderate-High	Located downstream from agricultural fields.
8. CULTURAL VALUES (Economics, Aesthetics, Archaeologic Sites)	Moderate	Provides habitat for fisheries resources, provides visual diversity for views from Highway 2 and the west side of the Snohomish River.
9. RECREATIONAL OPPORTUNITY	Moderate	Large wetland with diverse plants, wildlife viewing opportunities, high to moderate values for other functions discourage heavy human use.

2.3 COMPARISON OF WETLAND VALUES

Using the Reppert methodology, it is possible to compare the functional values of each of the nine wetland units. Table 10 presents the values for each unit. The following comparison of wetland units is intended as a tool to be used in determining the roles best suited for each of the units. Those roles are identified in Sections 3.1 through 3.9. Each of the following paragraphs presents a comparison of the wetland units for a single wetland function. This comparison allows for the development of a heirarchy identifying the units with the highest to lowest value for that function.

Wildlife Habitat

Of the nine units considered for preservation, Units I, II, VI, and VII are considered to currently have the highest values for wildlife habitat. These units all have high ratings for their natural biological function due to their high to moderate-high values for the factors that contribute to valuable wildlfe habitat. These factors include primary productivity, food chain support, and general and special habitat features. Units I, III, IV, V, and IX have a moderate-high rating for natural biological function with moderate to high ratings for factors contributing to valuable wildlife habitat. Unit VIII has a moderate value for natural biological function.

Aquatic Study Areas, Sanctuaries, and Wildlife Refuges

Most of the nine wetland units evaluated were assigned generally high values for potential use as aquatic study areas, and sanctuaries or refuges for wildlife. The large size, diversity of plant communities, and hydrologic connection to surrounding waters of these wetlands contribute to their value for this purpose. Units II and VII have the highest value and Units I, IV, V, VI, and IX have moderate-high value. Unit III received a rating of moderate due to its proximity to Highway 5 and Unit VIII received a low rating due to the hydrologic isolation and seasonal water regime of much of its wetland habitat.

Hydrologic Support

Nearly all of the units have a high value for hydrologic support due to their location in the Snohomish watershed basin and the fact that they are regularly flooded. The one exception is Unit VIII with a moderate value for this function. This unit received a lower rating because the dikes surrounding it are maintained and most of the wetland area on this unit is hydrologically isolated from the main river channels.

Shoreline Protection

Unit I received a high rating for its function in shoreline protection due to its location facing Puget Sound and the protection it provides to industry in the area. Unit II received a moderate rating since developed areas it could protect are fairly limited. The remaining wetland units received moderate to low ratings for this function due primarily to the lack of development in those areas.

Table 10.
A COMPARISON OF WETLAND UNIT VALUES

	Smith Island Unit I	Quilceda Island Unit II	North Ebey Island Unit III	North Ebey Island Unit IV	North Ebey Island Unit V	Mid-Spencer Unit VI	Otter Island Unit VII	Ebey Island Unit VIII	Ebey Island Unit IX
1. NATURAL BIOLOGICAL FUNCTION	**Moderate-High**	**High**	**Moderate-High**	**Moderate-High**	**Moderate-High**	**High**	**High**	**Low-Moderate**	**Moderate-High**
A. Food Chain Productivity									
1. Net Primary Production	High	High	High	High	High	High	High	Moderate	Moderate
2. Mode of Transport	High	High	High	High	High	High	High	Low-Moderate	Moderate-High
3. Food Chain Support	High	High	High	High	High	High	High	Low	High
B. General Habitat	High	High	Moderate	Moderate	Moderate	High	High	High	Moderate-High
C. Special Habitat	High	High	High	High	High	High	High	High	Moderate
2. AQUATIC STUDY AREAS, SANCTUARIES, REFUGES	**Moderate-High**	**High**	**Moderate**	**Moderate-High**	**Moderate-High**	**Moderate-High**	**High**	**Low**	**Moderate-High**
3. HYDROLOGIC SUPPORT FUNCTION	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**Moderate**	**High**
A. Hydrologic Periodicity	High	High	High	High	Moderate-High	Moderate-High	Moderate-High	Low	High
B. Elevation in Basin	High	High	High	High	High	High	High	High	High
4. SHORELINE PROTECTION	**High**	**Moderate**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**
5. STORAGE OF STORM AND FLOOD WATER*	**Low**	**Low**	**Low**	**Low**	**Low**	**Low-Moderate**	**Low-Moderate**	**Moderate**	**Moderate**
A. Flood Storage Factor	High	High	High	High	High	High	High	Moderate	High
B. Flood Retardation Factor (Vegetative Cover)	Moderate	Moderate	Low	Low	moderate	Moderate	Moderate-High	Low-Moderate	High
6. NATURAL GROUNDWATER RECHARGE	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**
7. WATER PURIFICATION	**Moderate-High**	**Moderate-High**	**Moderate-High**	**High**	**Moderate-High**	**Moderate-High**	**High**	**Moderate**	**Moderate-High**
A. Wetland Type									
1. Hydroperiod	High	High	High	High	High	High	High	Low	High
2. Vegetation Density	Moderate	High	High	High	High	Moderate	High	Moderate	High
B. Areal and Waste Loading Relationship									
1. Total Wetland Size	High	High	Moderate	High	High	Moderate	High	Moderate	High
2. Proportion of Water to Wetland	Moderate	Moderate	Moderate	Moderate-High	Moderate-High	Moderate	High	Low	Moderate
3. Proportion of Runoff Retained in in Wetland	Low	Low	Moderate	High	Moderate	Moderate	Low	High	Moderate
C. Location Factors									
1. Frost Free Days	High	High	High	High	High	High	High	High	High
2. Location Related to Pollution Sources	Moderate-High	Moderate-High	Moderate-High	Moderate-High	Moderate-High	Moderate-High	Moderate-High	Moderate-High	Moderate-High
8. CULTURAL VALUES (Economics, Aesthetics, Archeologic Sites)	**Moderate-High**	**High**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Moderate-High**	**Moderate-High**	**Moderate**
9. RECREATIONAL OPPORTUNITY	**Moderate**	**Low-Moderate**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Low**	**High**	**Moderate**

* Overall values for this function have been modified to reflect the location of each unit within the watershed.

Storm and Flood Water Storage

High values were assigned to Units VII and IX for storm and flood water storage since these are large wetlands with a high percentage of woody vegetation which slows the velocity of floodwaters. Most of the remaining wetland units have moderate to moderate-high values for storm and flood water storage. These large wetlands have a lower rating due to the lower proportion of woody to herbaceous vegetation occurring in the wetlands. Unit VIII received a low rating for this function since most of the unit is hydrologically isolated from the sloughs, except in extreme cases of high flood levels. It should be noted that the overall value for each wetland unit has been modified to reflect its location in the watershed. Taking the factor of location into consideration, the overall values for the units are as follows: low value assigned to Units I, II, III, IV, and V; low-moderate value to Units VI and VII; and moderate value to Units VIII and IX.

Groundwater Recharge

All of the wetland units received a low rating for natural groundwater recharge. The location of the wetland units within the Snohomish estuary prevents them from contributing to the local groundwater table.

Water Purification

Units IV and VII received a high rating for the water purification function. A moderate-high rating was given to Units I, II, III, V, VI, and IX. Unit VIII received a low-moderate rating. All the units, except Unit VIII, have consistently high values for the wetland type and location factor characteristics.

Cultural Values

The highest rating for cultural values was given to Unit II since this wetland has archeological and cultural significance and provides fisheries resources important to the livelihood and cultural traditions of the Tulalip Tribes. Moderate-high values were assigned to three of the wetlands units including Unit I for use as a study area by the Everett School District, Unit VII for an archeologically significant midden, and Unit VIII for its active use as agricultural land. The remaining units received moderate ratings for the fisheries resources and/or visual diversity they provide to the regional landscape.

Recreational Opportunity

Values for potential recreational opportunity for each unit were based on three factors: 1) the ratings for the other wetland functions within the unit; 2) present recreation use of the unit, such as hunting; and 3) the observable potential for recreation within the unit. While a few of the units are presently being used for waterfowl hunting, all of the units have some opportunity for recreation such as dike trails for hiking and open water channels for canoeing. While the potential for recreation exists on nearly every unit, heavy recreational use could have an adverse affect on units that have a high value for wildlife habitat. Thus, the unit with the

lowest ratings for its other functional values, Unit VIII, was assigned a high value for recreational opportunity. Units II and VII received a relatively low rating for recreation because of very high values for other wetland functions. The remaining units received a moderate rating for recreational opportunity.

Overall Functional Values

Based on the Reppert Functional Value methodology, Units II and VII received the highest functional value ratings overall and Unit VIII received the lowest overall. All the remaining units (I, III, IV, V, VI, and IX) have moderate to moderate-high value overall for wetland functions. This wetland evaluation process is intended to compare the units to each other for various wetland functions, rather than to provide an absolute rating system. The goal of this process is to provide a basis for the development of appropriate management roles for each of the units. Management roles for the units are presented in Sections 3.1 through 3.9.

3. Management Plan Goals

3. MANAGEMENT PLAN GOALS

A primary goal of the Management Plan is to develop specific management recommendations for all of the units. To do this, it was first necessary to identify overall goals for the management of all nine wetland units as a whole and then determine how each of the nine units could be managed to meet these goals. Because of the diversity, and sometimes conflicting nature, of the goals, an individual wetland unit cannot fulfill all of the goals. A unit can meet several management goals, however, if it contains a variety of habitat types and if the proposed goals are compatible.

The seven management plan goals identified by Snohomish County and the Snohomish River Wetland Advisory Committee include wildlife habitat preservation, wildlife habitat enhancement, public access, recreation, interpretive education, scientific research, and cultural resource preservation. The number of goals each wetland unit can meet, or the number of "roles" it can fulfill in meeting goals depends upon that unit's natural, geographic, and cultural features.

For each role assigned to a wetland unit, a set of "objectives" has been established to provide measureable accomplishments towards meeting the designated goal. A more specific "strategy" details a method of attaining each objective. Specific objectives and strategies are discussed in Section 4, while an overview of the management plan goals and the potential roles each of the wetland units could fulfill in meeting these goals is discussed below.

Wildlife habitat preservation refers to the primary preservation of wetland habitat as it currently exists. While a main focus of the management plan for all the units is to preserve existing wetland habitat, some of the units have lower values for wildlife habitat than others and are more appropriate for roles which permit a certain amount of controlled disturbance (e.g., hiking, habitat enhancement activities, etc.). Those areas that exhibit the greatest diversity and uniqueness in habitat and the least amount of past disturbance have been considered most strongly for strict habitat preservation. Those units are proposed to fill other roles only where those other roles do not conflict with strict habitat preservation.

Wildlife habitat enhancement opportunities exist on units where marginal wetland habitat occurs or where a single habitat type dominates the unit. In wetland areas dominated by a single or few habitat types, enhancement opportunity exists through diversification of the wetland by creation of other habitat types. For example, open water habitat can be introduced into large areas dominated by cattails. In areas of marginal wetland habitat, the creation of marsh habitat or forested wetland can greatly enhance the existing habitat value. Areas of native wetland shrubs and trees could be planted along the edges of large expanses of marsh, again to create greater structural and habitat diversity within the plant community and, therefore, in the wildlife habitat provided. Enhancing existing wetland habitat generally increases the wildlife habitat value and aesthetic value of a wetland.

A primary goal of the management plan is to provide public access to the wetlands for various sanctioned uses. Two types of public access need to be considered. One type of access would be to provide public entry into a particular unit. This could consist of a road and parking lot or, in the case of access to islands, a dock or observation deck accessible via boat from the sloughs. Another type of access would be the provide entry to the general wetland system via a particular wetland unit or focused access point.

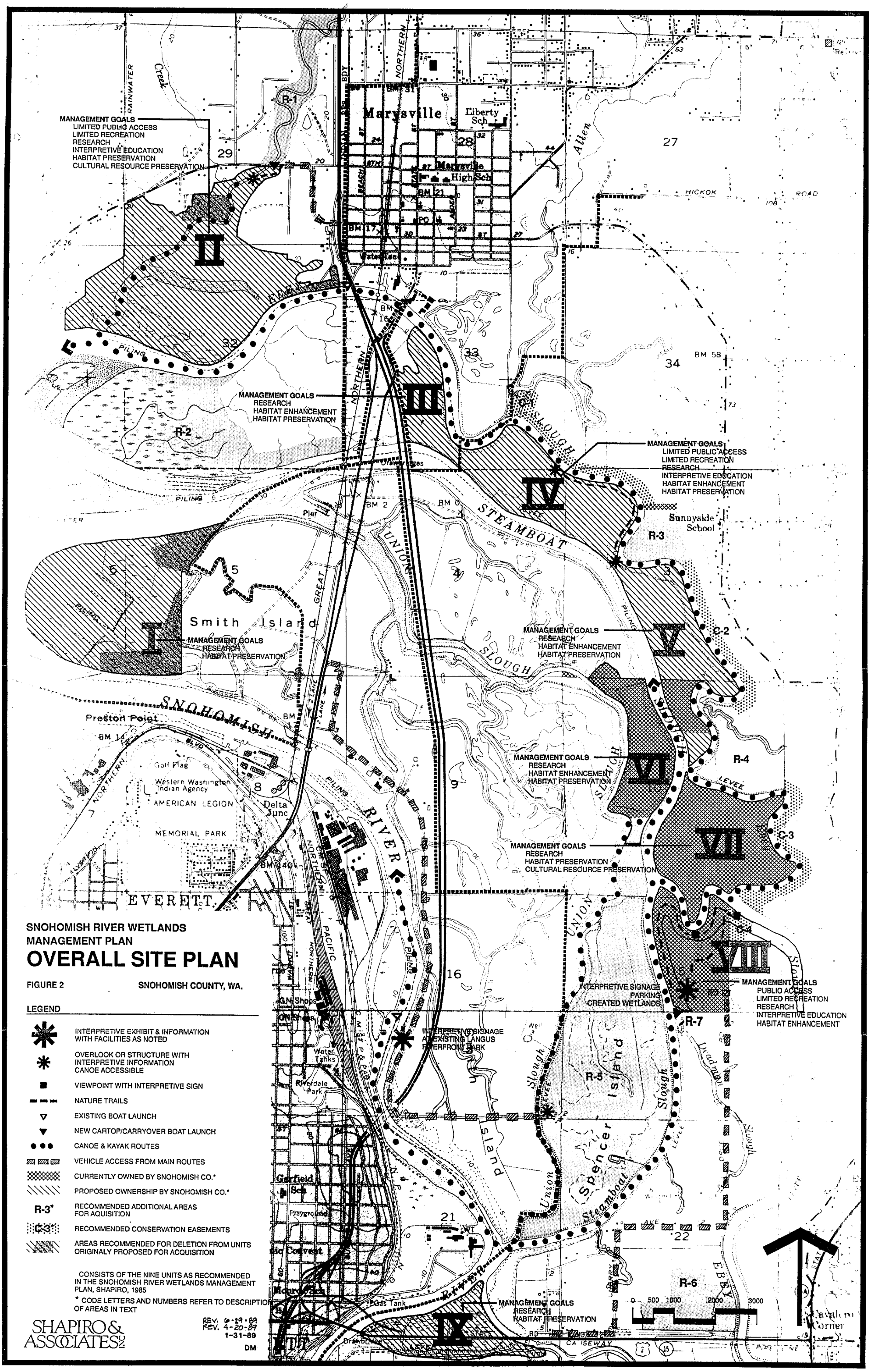
Appropriate recreational uses of the wetland units include low impact activities compatible with the general goal of preserving wetland habitat and other wetland functions. Examples of such uses include hiking, canoeing, kayaking, and bird watching. Access for use of the wetland units by fishermen and hunters could also be considered as appropriate uses of certain wetland units. Decisions regarding recreational uses of the units need to take into account the fact that not all recreational activities are compatible. For example, hunting activities on a unit would interfere with other passive uses and would require closing the unit for other uses besides hunting during designated seasons of the year.

Provision for interpretive education is paramount if respect for the wetland resource is to be gained. It is only as a result of such respect that the public will value the functions the wetlands provide and, therefore, want to protect them from destruction. Educational information should be provided to the public covering topics ranging from a broad orientation to the Snohomish County Wetlands Preservation Plan to specific elements of wetland functions. Interpretive stations should be established throughout the wetland units and include structures ranging from an open interpretive kiosk with graphics on display walls to small signs placed along hiking trails. An even less intrusive form of interpretive opportunity is the placement of numbered posts along hiking or canoe trails corresponding to a descriptive pamphlet useful for self-guided tours.

Use of the wetland units for scientific research is another important role the wetland system as a whole can fulfill. Research opportunities exist for the study of a wide range of subjects including wetland ecology, plant succession, water quality, fisheries resources, ornithology, and other wildlife.

Cultural resource preservation is an appropriate role for those units containing archeologically and culturally significant features or resources. The Snohomish Estuary has been used, both in the past and present, by Indian tribes and has cultural resources appropriate for preservation.

While no single wetland unit is suited to all the roles, taken together, the units can fulfill all of the goals of the management plan. Figure 2 provides a general site plan for all of the wetlands as a system and includes descriptions of selected roles assigned for each unit. Table 11 presents a matrix of possible and recommended management roles for the wetland units. All of the possible roles a wetland unit can play are shown in this table based on the opportunity of a unit to fulfill that particular role. Specific roles were recommended for those units exhibiting high opportunity and the lowest number of constraints to fulfill that role.



SNOHOMISH RIVER WETLANDS MANAGEMENT PLAN

OVERALL SITE PLAN

FIGURE 2 SNOHOMISH COUNTY, WA.

LEGEND

- INTERPRETIVE EXHIBIT & INFORMATION WITH FACILITIES AS NOTED
- OVERLOOK OR STRUCTURE WITH INTERPRETIVE INFORMATION CANOE ACCESSIBLE
- VIEWPOINT WITH INTERPRETIVE SIGN
- NATURE TRAILS
- EXISTING BOAT LAUNCH
- NEW CARTOP/CARRYOVER BOAT LAUNCH
- CANOE & KAYAK ROUTES
- VEHICLE ACCESS FROM MAIN ROUTES
- CURRENTLY OWNED BY SNOHOMISH CO.*
- PROPOSED OWNERSHIP BY SNOHOMISH CO.*
- R-3* RECOMMENDED ADDITIONAL AREAS FOR AQUISITION
- C-3 RECOMMENDED CONSERVATION EASEMENTS
- AREAS RECOMMENDED FOR DELETION FROM UNITS ORIGINALY PROPOSED FOR ACQUISITION

CONSISTS OF THE NINE UNITS AS RECOMMENDED IN THE SNOHOMISH RIVER WETLANDS MANAGEMENT PLAN, SHAPIRO, 1985

* CODE LETTERS AND NUMBERS REFER TO DESCRIPTION OF AREAS IN TEXT

SHAPIRO & ASSOCIATES

REV. 6-29-89
REV. 4-20-89
1-31-89
DM

Table 11
Matrix of All Possible and Recommended Management Roles
for the Wetland Units

	Goals						
	Limited Passive Public Access	Recreational Opportunity	Research Opportunity	Interpretive Education	Habitat Enhancement	Primarily Habitat Preservation	Cultural Resource Preservation
Unit I West Smith Island	X(a)	X	(X)	X		(X)	
Unit II Quilceda Creek	(X (a,b))	(X)	(X)	(X)		(X)	(X)
Unit III North Ebey Island (North)	X (a,b)	X	(X)	X	(X)	(X)	
Unit IV North Ebey Island (Middle)	(X(a))	(X)	(X)	(X)	(X)	(X)	
Unit V North Ebey Island (South)			(X)		(X)	(X)	
Unit VI Mid-Spencer			(X)		(X)	(X)	
Unit VII Otter Island			(X)			(X)	(X)
Unit VIII Ebey Island (Northwest)	(X (a,b))	(X)	(X)	(X)	(X)		
Unit IX Ebey Island (Highway 2)	X		(X)	X		(X)	

a: access into a particular wetland unit
b: access into the general wetland system via a particular wetland unit
X : Possible Management Role
(X) : Recommended Management Role

As indicated in Table 11, Units I, II, III, IV, VII, and IX are identified as being possible areas for public access to the wetlands, however, only Units II, IV, and VII are recommended for the role of supplying public access at this time. It should be noted that roles which are recommended, compared with roles which are listed only as possible in Table 11, bear more importance in determining the overall proposed management of any given unit.

Limited recreational opportunity is identified as being possible for Units I, II, III, IV, and VII, however, only Units II, IV, and VII are recommended for the role of supplying recreational opportunity at this time. Research opportunity exists on all of the units and is identified as being compatible with all other roles for which each unit is recommended.

Interpretive education is identified as being a possible role of Units I, II, III, IV, VIII, and IX, however, only Units I, II, IV, and VIII are recommended for filling that role. Interpretive educational facilities would have low visual impact and be able to withstand flooding that may occur in the area. Habitat enhancement is recommended for Units III, IV, V, VI, and VIII.

Preservation of the existing habitats on all the units is recommended, with Unit VIII being the only unit on which extensive alteration of the existing habitats is proposed. Such alteration will result from habitat enhancement activities and the creation of public access and passive recreational facilities. Consequently, primary habitat preservation is recommended on all the units except Unit VIII, although preservation of much of the habitat on Unit VIII will occur regardless of construction of the proposed facilities. Cultural resources are found on Units II and VII and are recommended for preservation.

The following sections in this report identify and discuss the unique set of roles recommended for each of the nine wetland units. The assignment of roles for each unit was based on the wetland resource evaluation completed for that unit and presented in Section 2.2 of this report.

3.1 ROLES FOR UNIT I

Unit I is relatively isolated from many of the other wetland units and, based on the wetland resource evaluation completed for this unit, is recommended for roles including habitat preservation and the provision of research opportunity. The unit is closely adjacent to heavily industrialized areas in the estuary and, primarily for aesthetic and logistical reasons, is considered only marginally appropriate for public access, recreational and interpretive educational roles. As detailed on Figure 2, certain portions within the originally proposed boundaries of Unit I have now been recommended for elimination for acquisition by Snohomish County because they are currently under heavy industrial use.

3.2 ROLES OF UNIT II

Recommended management roles for Unit II include the provision of public access; recreational and research opportunities; interpretive education; and habitat and cultural resource preservation. Unit II, located just west of Marysville and adjacent to an unused (but not vacated) portion of Tulalip Road, offers ideal public access both to the unit itself, and (via non-motorized boats using a proposed launch) to other wetland units. Section 5.1 of this report presents a site plan for Unit II and presents detailed descriptions of the access, recreational and interpretive facilities proposed for the unit.

Recreational opportunities are proposed to include a boardwalk with observation platforms, and interpretive signs. A non-motorized boat launch is proposed where the portion of Tulalip Road currently meets Quilceda Creek on its east side.

The land encompassing Unit II is currently owned by the Tulalip Indian Tribe and presents a unique opportunity for cultural interpretation on the current and historic use of Quilceda Creek and its wetland resources by the Tribe.

3.3 ROLES OF UNIT III

Recommended roles for Unit III include the provision of opportunity for research, and the enhancement and preservation of existing wetland habitats. It may be useful to note that habitat preservation and habitat enhancement are not mutually exclusive roles for a single wetland unit. For example, much of the existing wetland habitat in a given unit may be highly functional and worthy of strict preservation while allowing, at the same time, for habitat enhancment in certain areas of the unit where the habitat values may be lower. Unit III is less appropriate for recreational, access, and interpretive purposes because of its close proximity to Interstate 5 with its high and distracting noise levels.

3.4 ROLES OF UNIT IV

Recommended roles for Unit IV include the provision of public access, recreational and research opportunities, interpretive educational opportunity, and habitat preservation. Section 5.2 of this report presents a site plan for Unit IV and describes the proposed facilities for the unit. Located roughly in the geographic center of the wetland units, Unit IV provides an opportunity for supplying recreational and educational opportunities to the public in a relatively remote and only marginally accessible portion of the preserved wetlands.

The unit is proposed for access only by boat and will provide a short span of hiking trail along the top of the dike which remains intact. Two platforms, one on either end of the trail, are proposed as viewing points

and will exhibit interpretive signs. Both other wetland units (II and VIII) proposed for the provision of public access, recreational and educational opportunities are located closer to the geographic "ends" of the preserved wetlands, and both are adjacent to public roads. Unit IV will allow limited opportunity for those individuals wishing to access the wetlands by boat only - away from roads, houses and other developed facilities. Because the unit contains large areas of monotypic stands of cattails, the introduction of areas of open water could enhance the existing waterfowl habitat values of the unit.

3.5 ROLES OF UNIT V

Recommended roles for Unit V include the provision of research opportunity, and opportunities for both habitat preservation and enhancement. Recreational, educational and public access opportunities were identified as roles inappropriate for this unit due to its relatively high wetland values, and to the fact that the unit is isolated from roads or other terrestrial (non-water) access points. Additionally, the unit's dikes are heavily breached rendering them inappropriate for hiking trails. Much of the wildlife habitat on this unit exists as extensive stands of emergent vegetation. These plant communities should be preserved and include some habitat enhancement resulting from the creation of open water areas or wetland tree and shrub plantings (on dikes) where appropriate.

3.6 ROLES OF UNIT VI

Unit VI, like Unit V, has relatively high wetland and habitat values; large, monotypic stands of emergent vegetation; and is isolated from roads or other terrestrial access. Therefore, Unit VI is recommended to serve only those roles including the provision of research opportunity and the enhancement and preservation of wetland habitat.

3.7 ROLES FOR UNIT VII

Based on the functional value determined using the Reppert Methodology this unit has relatively high values for nearly all the wetland functions evaluated, and particularly for wildlife habitat and cultural resources. Because of these high values, it is important to limit human impact on this unit. Thus, no recreational facilities, public access, or interpretive stations have been proposed for the island. The roles this unit can fulfill in the overall management goals of the County's preservation plan include habitat and cultural resource preservation.

3.8 ROLES FOR UNIT VIII

This unit has relatively low value for most of the wetland functions evaluated as based on the Reppert Methodology (see Table 8). This was one of the primary reasons Unit VIII was considered an ideal location for the

main interpretive, parking, and non-motorized boat launch facilities necessary for inclusion somewhere into the overall management plan. Unit VIII is also currently owned by Snohomish County and, therefore, presents immediate opportunity for development. In addition, Unit VIII is directly accessible via existing roads on Ebey Island. It should be noted, however, that these county roads would need improvement in order to safely convey increased levels of traffic to the wetland unit. These considerations, in combination with the relatively low wetland habitat values on much of Unit VIII, were primary considerations in the selection of the unit as the location for public access and use.

In addition to the public uses recommended above, habitat enhancement was also determined to be an appropriate role for Unit VIII. Opportunity for habitat enhancement on this unit is high due to the relatively low habitat value of the wetlands that currently exist.

Potential recreational uses of the unit include access to canoeing and kayaking (via the boat launch) in the sloughs of the Snohomish River, a loop trail along the dikes for hiking and bird watching, and interpretive facilities in the forms of signs and self-guided nature walks.

3.9 ROLES OF UNIT IX

Based on the wetland evaluation completed for Unit IX, possible roles for this unit include the provision of public access, research opportunity, interpretive education, and habitat preservation. Recommended roles include the provision of research opportunity and habitat preservation. Public access and educational opportunity are largely discounted as roles for this unit because of the unit's location - closely adjacent to U.S. Highway 2. Vehicular access is currently dangerous from the highway and may be eliminated as a result of proposed impovements to the roadway. Additionally, traffic noise emminating form the highway could be distracting to many visitors wishing to enjoy a natural wetland ecosystem. Recreational, public access and educational roles are all better served by other wetland units.

3.10 ALTERNATIVE MANAGEMENT SCENARIOS AND POSSIBLE ADDITIONAL AREAS

The management plan roles for the wetland units as presented above is one possible scenario incorporating the functional values information as generated in the resource values assessment of each unit. Various alternatives to this management plan are possible and may be influenced by several factors.

One such factor is the possible purchase of additional areas outside of the nine units described herein, thus providing additional management opportunities not currently presented by the nine identified units. For instance, the possible joint purchase of Spencer Island by the Washington State Department of Wildlife and Snohomish County would provide additional resources for incorporation into the management plan.

Another factor influencing the management plan is the actual availability of all nine units for acquisition by Snohomish County. If certain units become unavailable for acquisition, the individual roles of the units may change from those recommended herein. Overall, management opportunities presented by various land ownership combinations could affect the locations of various elements including the interpretive center, areas of habitat enhancement, hiking trails, boat launches, interpretive platforms and overlooks, etc. Some of these alternatives are detailed below.

Possible Additional Areas for Purchase or as Conservation Easements

Additional areas could be purchased outside of the nine units. There are several reasons why this may be desirable and why this would affect the management plan. The reasons for such additional acquisitions include 1) a desire the preserve valuable wetland habitat not originally identified for acquisition in earlier studies, and 2) the desire to buffer valuable wetlands from external disturbance by separating those wetlands from such disturbance through the preservation of open or undeveloped space. Acquisition of buffer areas could be achieved through the direct purchase of land or the establishment of "conservation easements." Land owners would be restricted on the type of development possible on land with a conservation easement designation. Several areas that could be acquired to serve these purposes have been identified on Figure 2. A brief description of the location and potential use of these areas is given below.

Additional areas recommended for acquisition include all those indicated of Figure 2 with an "R" code (R-1 through R-6). The following paragraphs describe those areas.

1) R-1: Acquisition of the floodplain of Quilceda Creek between Interstate Highway 5 and the north end of Unit II at Marina Drive could protect valuable wetlands and the downstream reaches of the creek in Unit II.

2) R-2: A large expanse of saltwater marsh exists between Units I and II, north of Steamboat Slough and south of Ebey Slough at the mouth of the Snohomish River estuary. This area is west of an area which was used years ago as a dump site for garbage originating from local municipalities. This saltwater marsh was not originally identified as a wetland unit for preservation, however, because of its high wetland resource value, it is now being recommened for acquisition and preservation. The area appears to exhibit habitat and other wetland values of quality equally high to those found in Units I and II.

3) R-3: Acquisition of the lobe of land located east of Ebey Slough between Units IV and V. The County has already acquired approximately 0.5 acres along the northern portion of this area. Most of the area consists of forested wetland. This area could potentially serve as access to the general wetland system by using the created slough along the area's northern border for boat access

to Ebey Slough. A means of public access (pedestrian or vehicular) to the slough would need to be established since none presently exists across the private property that separates the slough from public roads. Acquisition of this area and preservation of its habitats would also serve to buffer the south portion of Unit IV and the north portion of Unit V. This recommended area is currently vegetated with forested wetland of high wetland value.

4) R-4: Acquisition of the lobe of land located east of Ebey Slough roughly located between Units V and VII would add high value forested wetland habitat to the wetlands preservation and management plan. Acquisition of this area would serve to buffer Otter Island (Unit VII) and the southern portion of Unit V from potential development of agricultural lands to the east. Acquisition would also serve to protect a bald eagle nest located in this lobe of wetland.

5) R-5: Spencer Island is another possible acquisition area. Located between Steamboat and Union Sloughs to the south of Unit VI, this area would serve as a buffer for Units VII and VIII. In addition, it would serve a number of other valuable functions within the wetland system.

   Marshes of grasses and bulrush dominate the area and stands of red alder and Douglas fir at the periphery of the island surround the emergent wetland in the center of the island. These habitats attract a wide variety of wildlife. Species known to use the site include deer, pileated woodpecker, marsh wren, coyote, quail, and a variety of small mammals, raptors, and waterfowl. The high wildlife habitat value of the island makes this an ideal area for wildlife viewing and provides an area for public hunting. In addition, the northern portion of the island is located within bald eagle nesting territory. Hiking trails also could be established throughout the interior and along the dikes of this area. Trails could be linked to the hiking trail system designed to be placed in the Langus Riverfront Park by the City of Everett. There is also potential for wetland enhancement and interpretive education on this site.

6) R-6: Existing in the northwest quarter of the intersection of U.S. Highway 2 and Ebey Slough, is an area of forested wetland and open fields which has been recommended for acquisition by Snohomish County. This area was not formerly an area recommended for acquisition in past studies, but presents opportunities for wetland preservation consistent with the objectives for the management plan.

   The area, in part, is known as the "Posel Property" and includes approximately 22 acres of forested area - all or most of which is forested wetland. A portion of the wetland was recently logged by the owner of the property with the objective of planting cottonwood trees for later harvest. The property is currently available to Snohomish County for purchase as part of the County's wetlands preservation program. The remaining forested wetland areas provide

valuable wildlife habitat. The open field existing between the forested wetland and Ebey Slough provides a physical connection between the forested wetland and the waterways of the estuary, and because of this, the field is also recommended for acquisition.

7) R-7: As shown in Figures 2 and 6, the most appropriate location for the boat launch recommended at the southwest portion of Unit VIII requires the acquisition of a small piece of land currently outside of County ownership. Purchase of the land will allow for the construction of the launch in a small backwater of Steamboat Slough rather than on the main channel of the river which would be required if the County uses only land currently owned for the launch. Construction of the launch in the backwater will make for a safer and more convenient means of launching the non-motorized boats for which the launch is designed. A property line adjustment at the southwestern corner of Unit VIII (to include the backwater) would allow the County to acquire the area without having to purchase a large piece of land for which it has no anticipated need or use.

Acquisition of these additional areas outside the original nine units would increase the amount of wetland habitat to be preserved by the County, as well as buffer the designated wetland units. Some of these areas also could be used to fulfill various management goals for the wetland system. For example, Spencer Island has the potential to fulfill goals for recreational use, habitat enhancement, interpretive education, research, and public access. In addition, the floodplain of Quilceda Creek could play a role in strict habitat preservation and the lobe of land between Units IV and V could provide public access to the general wetland system.

Several areas which have not been proposed for acquisition by Snohomish County for wetlands preservation are proposed to be included as "conservation easements" in the management plan. These areas are identified on Figure 2 as those areas with "C" codes (C-1 through C-4). These areas could be managed to act as buffers separating the wetlands from possible future nearby development in the Snohomish River valley. Outright purchase by Snohomish County of the conservation easements is not recommended because of the expense and because the areas are generally all upland habitat. However, acquisition of easement rights by the County, preventing certain uses of (or activities on) the properties, could well support the goals of the wetlands preservation plan. Prohibited uses of the easement properties could be the construction of buildings or parking facilities, and a prohibited activity could be the cutting of native woody vegetation. If any of these areas are currently agricultural, that ongoing use could be compatible with the preservation of adjacent wetlands. The planting of native woody vegetation could be encouraged on the easements to further buffer the wetlands from possible adjacent disturbance.

There are currently many variables which make it difficult if not impossible to accurately prioritize the order in which the County should begin to pursue acquisition of the recommended additional purchase areas and the conservation easements. Those variables include 1) the willingness of

any given land owner to sell or grant easement to the County, 2) the asking price for a piece of property on the open market, 3) the threat of development existing on any given piece of land being considered, 4) the relative wetland or upland resource values on the properties in question, and 5) the proximity of additional areas or conservation easements to wetland units which the County anticipates purchasing in the near future.

There would probably be little disagreement that areas R-1 through R-7 all exhibit high wetland resource values - the primary reason why they have been recommended for additional acquisition. However it is difficult to prioritize them relative to habitat values alone without additional, in-depth study of their wetland resource values.

Proximity to County owned wetland units could help prioritize acquisition of additional wetland areas outside of the original nine units. For example, area R-4 might well be the current highest priority additional acquisition area because of its proximity to Units V, VI, and VII - all or parts of these units which Snohomish County currently owns.

Our recommendation is that the County carefully evaluate the potential acquisition of these areas as each becomes available on the market. Approaching the current owners to assess willingness to sell and at what price would also establish a base of information useful in prioritizing the areas for purchase. As with the recent purchases of wetland units the County has made, each purchase should be based on careful evaluation of price per acre, existing habitat and other wetland values, and the contribution the purchase would make toward reaching the goal of preserving valuable wetlands.

Prioritizing the order of acquisition of the conservation easements is also difficult because all represent an important step in buffering areas currently or potentially owned by the County. Perhaps acquisition of easement rights on areas C-3 and C-4 should be current priorities because the County owns Units VII and VIII - the units closest to C-3 and C-4.

Alternative Interpretive Center Locations

Several different locations were investigated for establishment of a central interpretive center for the wetland preserve. Factors that were considered in evaluating the alternative sites described below include: 1) the desire for minimal impact to wetland habitat in the construction and human use of the center; 2) concerns for potential flood damage to the facility; 3) aesthetics concerns; and 4) consideration of public access to the location and to the wetland system overall via the facility. Units II, IV, V, VI, and VII were not considered as potential locations for the facility due to difficult access to the island units and the disturbance to wetland habitat that such a facility would create on those units.

Several sites that could serve as interpretive center locations include Units I, III, VIII, IX, Langus Riverfront Park, the additional purchase areas located east of Ebey Slough, and Spencer Island. Each of these areas present certain opportunities and constraints for development as a central interpretive/access facility. These opportunities and constraints are described below.

Unit I has been proposed as an alternative interpretive center because of direct access to the unit via existing roads through the industrial area to its east. The area is currently being used by City of Everett schools for interpretive course work. Use of the upland habitat along the eastern portion of the unit as an interpretive area would minimize impact to the wetland habitat to the west. Placement of an interpretive station on the upland area also would be expected to minimize impacts due to periodic flooding. The major drawback to using this unit as an interpretive center is the proximity of heavy industrial uses including log storage areas, wood waste treatment ponds and the landfill to the north. These industrial uses in the vicinity of the unit have a deleterious effect on the aesthetics of the area and contribute unpleasant odors to the unit.

Unit III also has been proposed as an alternative interpretive center. Proximity of the site to Highway 529 could facilitate access to this site. The open water area at the northeast corner of the unit could be used a boat launch. The majority of this unit consists of marsh habitat. Placement of an interpretive station on this unit would affect some of this habitat, the amount of habitat affected would depend on the size of the interpretive center. Aesthetically, this unit is undesirable for a public interpretive facility because of the noise and visual disturbance of nearby Interstate Highway 5.

Unit VIII is an alternative choice for the location of an interpretive center. Wetland habitat on this unit is considered marginal and so establishing an interpretive station in this area would not disturb valuable wetland habitat. Although this area is subject to flooding, the structure of interpretive stations on this unit can be designed to minimize impact from flood waters. This unit could be useful as an educational area because it is located in the heart of the estuary and is surrounded by diverse wetland habitat types. Other advantages to use of this unit include the fact that the County currently owns the site and that there is existing access to the unit via public roads. Constraints to the use of Unit VIII include the fact that the site is periodically flooded and local residents are concerned by the possible increase of traffic on Ebey Island roads. Additionally, the local diking district has expressed concern over the use of the dikes as public access hiking trails.

Unit IX has an existing area of fill on which an interpretive center could be placed. A boat launch on Deadwater Slough could provide access to the wetland system. An access road to this unit from Highway 2 presently exists; however, the State of Washington may have future plans to close this access for safety interests during proposed expansion of State Highway 2. If this road is closed, the unit would be inaccessible to vehicular traffic. Noise and visual disturbance from Highway 2 negatively affect the aesthetics of this unit.

Putting a wetland interpretive center at Langus Riverfront Park has also been proposed. This would eliminate impacts to wetland habitat in the wetland units and maximize the public facility already existing, or proposed, at Riverfront Park. The park already has existing vehicular access and parking facilties as well as a motorized boat launch useful also for non-motorized watercraft. However, its location on the Snohomish River

and its distance from the wetland units diminish its usefulness for access to the wetland system existing generally east of the park. Riverfront Park has been determined to be an appropriate location of an interpretive facility orienting the public to the resources of the Snohomish River Wetland Preserve. Unit VIII, if developed as the central access and interpretive focus of the wetland preserve, would seem a better location for interpretive information specific to concepts of wetland ecology, and to the roles individual wetland units have in the overall management of the wetland preserve.

Two possible additional purchase areas (R-3 and R-4) could be used as an interpretive center. An interpretive center and centralized access facilities could be placed on the adjacent upland portion of the areas, minimizing disturbance to wetland habitat and reducing possible impacts from floods. Impacts to wetland habitat would occur, however, if access to Ebey Slough were established for a boat launch. In addition, neither of these areas has existing access to them. Another drawback to the use of the southern area near Otter Island would be disturbance from human use of the area to the bald eagle nest.

Spencer Island also has been proposed as an alternative site for an interpretive center. A road, running across the south end of Smith Island, already provides access onto Spencer Island. Any interpretive structure could be placed on the upland area where the road ends, minimizing impacts to wetland habitat. It has been suggested that the old barn in this area be used as an interpretive facility; however, the structure of the building would need to be investigated for safety and a determination made as to whether any improvements to it would be cost effective. Hiking trails could be established throughout the island and along the dikes. The existing dikes would require some repair where the underlying hog fuel has deteriorated. Trails on the island could be linked to the hiking trail system proposed on Smith Island as part of the Langus Riverfront Park. A boat launch could be placed on Union Slough, with access to the wetland system via the channel just south of Unit VI. From an aesthetics perspective, Spencer Island lends itself to use as an interpretive center; however, drawbacks to using this area for this purpose include the aesthetics of the access road onto the island. The road runs between two wastewater treatment ponds, which are visually unappealing and could contribute to unpleasant odors on the island. In addition, plans are presently being considered which include using the island as a hunting area. In this case, uses other than hunting would be restricted for certain seasons of the year, limiting the interpretive education function for this area.

Habitat Enhancement Alternatives

An alternative to the habitat enhancement options presented for Units III, IV, V, and VI would be to eliminate recommendations for wetland enhancement on certain units. Elimination of wetland enhancement would preclude the creation of open water habitat in the marshlands or the planting of wetland shrubs and trees on the dikes surrounding these units. Enhancement may not be desirable due to the costs of such activity or to the disturbance enhancement activities may have on the existing habitats.

Alternative Purchase Options For Unit VIII

Several options for additional land purchase adjacent to County-owned portions of Unit VIII have been investigated. These options include: 1) no further acquisition, 2) acquisition of access rights to all or a portion of the dike along the western portion of Ebey Slough, or 3) acquisition of all the land east of the existing unit and west of Ebey Slough, essentially extending the southern property boundary of County-owned land to the east all the way to Ebey Slough.

Snohomish County currently owns approximately 70 acres on the northwest end of Ebey Island. By acquiring access rights to the dike along the northwestern portion of the island, a walking trail could be extended along Ebey Slough with a pleasant view of agricultural lands to the east. An easement along the southern portion of the land to the east of the existing County-owned land could provide a means to create a loop trail. The option to purchase the land east of the existing County-owned land and west of Ebey Slough would also allow creation of a loop trail, as well as creation of a more extensive trail system throughout the unit, however much of this area is upland habitat.

The recommendation made as a result of this study is to gain easement rights to the area identified on Figure 2 as C-4. This will allow for extension of the dike trail from County-owned portions of the north end of the island, and for the preservation of the large grove of spruce trees partially outside County-owned land. It is recommended, therefore, that the County not purchase the northeastern portion of Ebey Island for inclusion into its wetland preservation program. Although there are some wetlands on the unowned area, they are of low habitat and functional value as compared to other wetland areas in the vicinity. It is felt that funds appropriated for wetland purchase would be better spent purchasing areas of wetland which have higher values.

If the land east of the existing unit is not acquired, it may be desirable to create a barrier fence along the eastern edge of the County-owned land to separate it from grazing activities which will probably continue on the northeastern portion of Ebey Island. Native wetland shrubs and trees could be planted along the fence to create an aesthetically pleasing barrier.

Possible Loop Trails on Units IV

A current proposal under a management plan for Unit IV includes construction of a short section of walking trail on portions of the dike (see Figure 2). An alternative to this trail would be to create more extensive loop trails that would allow pedestrians to walk completely around this and even other units such as V and VI. Clearing of vegetation along the tops of the dikes to create trails would have to be minimal. Sufficient amounts of overhanging shrubs and trees should be retained in order to preserve existing habitat for juvenile salmon and other fishes. Since the dikes around these units are currently breached in many places, developing

loop trails would require bridges to span the breaches. Construction of bridges would have to be accomplished with as little impact to the dikes, channels, and surrounding vegetation as possible. Bridge structures should be made with as little visual and environmental impact as possible, while still maintaining structural soundness for their intended use. It is not known at this time how many bridges would be required or if they could withstand floodwaters.

The Citizens Wetlands Advisory Committee requested that only those trails shown on Figure 2 be recommended. It was felt that impacts to the wetlands would be too great if additional trails where recommended.

Additional Boat Loop Route

An additional route to create an alternative boat route along the sloughs could be established by linking Ebey and Steamboat Sloughs at the most narrow portion of North Ebey Island between Units IV and V. This link would allow boaters a loop "trail" around Unit V when accessed from the proposed boat launch on Unit VIII. The loop could also be achieved by building a boardwalk on the existing cross dike that boaters could use to portage canoes and kayaks between the sloughs. This possibility, however, is not recommended at this time due to the physical and financial constraints present.

4. Management Objectives and Strategies

4. MANAGEMENT OBJECTIVES AND STRATEGIES

Recommended management plan goals for the Snohomish estuary, as discussed in Section 3, can be reached by establishing objectives for each unit. These objectives consist of specific actions for which results can be measured. The results will determine the success in achieving the stated goals. Strategies are approaches, or a collection of actions, that are taken to implement those objectives. In addition to the actions to be taken, strategies include options for implementation of those actions, and a monitoring plan to measure the success of the action in reaching the objective.

Potential objectives and strategies for the wetland units have been determined. They include specific actions to be taken in order to reach the stated goals, implementation options, and a monitoring plan where appropriate.

4.1 OBJECTIVES AND STRATEGIES FOR UNIT I

The primary management role for Unit I is to preserve the existing, relatively high value habitats on the unit. This should be accomplished indirectly by limiting or preventing public access along with the habitat disturbance which can result from such access. By proposing or developing no access or recreational facilities on the unit, a strategy for limiting disturbance to the natural habitats on the unit is achieved. As with all the wetland units for which habitat preservation is a primary goal, periodic monitoring, perhaps twice a year by a qualified biologist, should occur. Such monitoring will identify any disturbances which may be negatively affecting the wetland habitats. Monitoring can be done by Snohomish County personnel familiar with the objectives of the wetlands preservation plan, or by qualified biologists hired to monitor the wetlands. An additional resource for such monitoring could be members of volunteer conservation organizations who undertake a monitoring program which is sanctioned or supervised by the County.

An objective for all of the wetland units is to supply the opportunity for research in wetland ecology. A strategy for achieving that objective is to retain an "open door" policy allowing access to all the wetland units for approved research projects undertaken by qualified scientists, educators, or naturalists. A special committee could be assembled and supervised by Snohomish County to screen applications for such research and establish the standards by which research projects can be approved.

4.2 OBJECTIVES AND STRATEGIES FOR UNIT II

A primary objective for Unit II is the preservation of the existing high value wetlands on the unit. A strategy for achieving such preservation is to allow only limited public access to the wetlands. Allowing for

limited access satisfies other objectives for Unit II by supplying recreational and educational opportunities on the unit. By careful placement of access facilities which control the ease of foot traffic in the wetlands, habitat preservation and public access can both be achieved on Unit II. Figure 3 (the site plan for the unit) depicts a boardwalk accessing only a portion of the wetlands. It would be difficult to walk further into the wetlands than the end of the boardwalk because of wet, muddy soil conditions beyond the boardwalk.

Another strategy for allowing for public access and recreation in the wetlands is to develop a non-motorized boat launch at the end of the currently unused Tulalip Road where it formerly crossed Quilceda Creek. Additional description of this proposed facility is given in Section 5.1. Snohomish County would be responsible for the construction and maintenance of the public access facilities, both the trails and the boat launch. Services of volunteers, supplying labor and/or materials, could be used by the County in constructing, maintaining, and monitoring the facilities.

The objective of promoting cultural preservation on Unit II could be achieved by installing interpretive signs which educate the general public as to the current and historic use of Quilceda Creek and its wetlands by the Tulalip Indians. The Tribe could be contacted for useful information, and even construction skills, in the development of such interpretive signs. The signage should also describe the natural features of the wetlands so that the objective for public education in wetland ecology could also be met for Unit II.

4.3 OBJECTIVES AND STRATEGIES FOR UNIT III

The primary objectives for Unit III are the preservation of existing wetland values and, where appropriate, the enhancement of existing habitats. Because much of the unit exists as emergent wetland dominated by a limited number of plant species, enhancement of the existing habitats could be accomplished by creating areas of open water. Such habitat would attract waterfowl in potentially larger numbers than currently use the wetlands on the unit.

Strategies for creating such open water areas include dredging or blasting "potholes" in the emergent wetland. The use of dredging or blasting to remove areas of wetland soil and herbaceous vegetation to a depth adequate to create permanent open water would require careful study and permitting by the resource agencies under whose jurisdiction the wetlands may lie. Both of these excavation techniques would also be publically controversial because of the obvious short term disturbances to the wetlands during excavation. Monitoring of any enhancement activity in any of the wetland units will be useful in determining the success of the techniques used, and therefore the applicability of those techniques to the enhancement of other wetland units. Such enhancement monitoring could be accomplished by County staff biologists; by biologists employed by Snohomish County; or by volunteers supervised by the County personnel.

4.4 OBJECTIVES AND STRATEGIES FOR UNIT IV

Primary objectives for Unit IV include provisions for habitat preservation, public access, interpretive education, and recreation. These are not necessarily incompatible objectives, but they must be considered carefully together in order to create a working balance among them. The single most direct strategy to preserve the existing high wetland values on the unit will be to limit public access to only a small portion of the unit. This will be accomplished by creating a short stretch of hiking trail along the top of that portion of the dike which currently does not contain breaches. The naturally occurring breaches on the dike create a barrier to foot traffic because of the inconvenience of walking through the mud or deep water in the breaches. Additionally, because of the wet, muddy conditions found in the interior of the unit, the dike allows the only convenient and "clean" pedestrian corridor, thus also limiting public access to the majority of the unit.

Access to the unit will be by boat only and will therefore limit the number of people capable of using the limited recreational facilities proposed. Observation platforms on either end of the hiking trail will allow for the placement and use of interpretive signs, thereby affecting a strategy for incorporating educational information into the recreational facility.

As with all the proposed structures on the wetland units, Snohomish County may elect to use County personnel and materials purchased by the County in the construction of the proposed facilities. A less costly alternative for the County is to use donated materials and volunteers, supervised by either County personnel or hired professional contractors in the construction of the facilities.

4.5 OBJECTIVES AND STRATEGIES FOR UNIT V

The primary objective for the management of Unit V, preservation of existing habitats, can best be accomplished by limiting public access to the unit. A strategy to accomplish this is to discourage public access by developing no access points on the shores of the unit. Unit V is essentially an island except for an very narrow connection with Unit IV, and as such the unit is accessible only by boat. By creating no designated boat landing facility on the unit, public access will be difficult. As a result, the existing habitats on the unit should be preserved in their current state. Some habitat enhancement may be possible in the creation of areas of open water (see Section 4.3). Monitoring of Unit V should be done periodically to make sure that no "unofficial" boat landing spots begin to develop, and if they do, signs should be placed discouraging such landings. Such signs should take the opportunity to educate the public on the values of the undisturbed wetlands to wildlife, and explain the reasons why public access in the wetlands is discouraged other than in those areas sanctioned for such access.

4.6 OBJECTIVES AND STRATEGIES FOR UNIT VI

Like Unit V, Unit VI will be managed for the preservation of the existing relatively high wetland values which it exhibits. Public access, the major threat to the preservation of existing wetland values, will be discouraged by developing no boat landing facilities.

4.7 OBJECTIVES AND STRATEGIES FOR UNIT VII

Management goals for Unit VII concentrate on preservation of cultural resources and wildlife habitat. It is apparent these goals could be best achieved by limiting, to the extent possible, public access to the island.

The desire to prohibit public access is of special interest due to the sensitivity of the wetland habitat on this unit. Several strategies could be implemented to reduce the potential impacts to the island from human disturbance. The strategies are oriented toward educating the public about the sensitive nature of the unit in order to encourage individual regulation to avoid disturbance to the island. They include 1) placing interpretive signs throughout the wetland system to identify Unit VII as sensitive habitat which should not be disturbed; 2) placing signs on the island itself to notify the public not to enter in order to protect wildlife habitat; and 3) placing a barrier at the mouth of the channel on the west side of the island to prevent boat entry. Detailed plans for design and location of these features are discussed in Section 5.

Snohomish County would be responsible for construction of these features. The County could use its own resources for placement of the signs or it could supervise placement of the signs by volunteers. It is recommended that the services of qualified professionals be used to design and place the barrier at the mouth of the channel. Implementation of this action would require special knowledge of sensitive areas to avoid disturbance that could affect the habitat value of the channel, i.e., changing the configuration of the channel bottom or blocking channel flows.

Monitoring of the island should be conducted twice a year. In general, a period of time has to pass before the public uses a new park or public access area to its full potential. In order to ensure that Unit VII is not being adversely affected by public use of surrounding areas, monitoring the unit should continue until the number of visitors to surrounding areas has reached fairly stable numbers. The monitoring program should consist of field surveys of the island by a qualified biologist to determine whether it is being disturbed by humans or domestic pets. These surveys would determine whether the strategies employed are adequately protecting the island; and, if not, to what extent is the island being disturbed. One survey should be conducted immediately prior to hunting season, and the second conducted immediately afterward. This would help determine whether disturbance, if any, was due to general use of the wetland system or specifically to hunting uses in surrounding areas. A report describing any impacts to the wetland should be submitted to Snohomish County after each survey.

If disturbance to the island is high at any time during the monitoring program, steps should be taken to target the cause and establish additional measures to remedy the disturbance. After five years, an analysis of the impact of public use of the surrounding areas on Otter island should be completed and decisions made whether to continue monitoring the unit and whether implementation of more measures to ensure the protection of the island are appropriate.

4.8 MANAGEMENT OBJECTIVES AND STRATEGIES FOR UNIT VIII

Five management goals have been suggested for Unit VIII. These goals include public access, recreational opportunities, research opportunity, interpretive education, and habitat enhancement. These goals can be achieved by providing public access to the wetland system via Unit VIII, as well as to the unit itself; providing a variety of primarily passive recreational uses of the unit; providing an avenue for academic research; providing an opportunity to educate the public about wetlands; and diversifying the habitat types that presently exist on the unit.

Numerous strategies are recommended to achieve public access. The existing public road to the south of the unit, Drue Road, terminates at the southeast corner of the unit and could be used to access the site. Use of Drue Road for this purpose would require improvements such as grading and placement of gravel or pavement. Vehicular access into the unit could be achieved by providing a roadway and parking lot on the unit. The amount of impervious surface on the unit should be limited to preserve as much of the existing wetland habitat as possible. In addition to vehicular access, it is recommended that the unit provide pedestrian and boat access to the system. These include trail systems which could be constructed throughout the unit, and a launch for non-motorized boats which could provide an avenue into the larger wetland system.

Strategies for recreational opportunities include construction of hiking trails throughout the unit and along the dikes such that observation of wildlife and wetlands could occur and potential impacts to sensitive habitat areas would be reduced. A launch for non-motorized boats could be constructed, allowing canoe and kayak access into Steamboat Slough. Diversifying the existing wetland is a strategy for enhancing the existing wetland functional values on the unit. This could be accomplished by creating areas of open water, emergent marsh, shrub swamp, and forested swamp on the unit where relatively low value, overgrazed wetlands currently exist. The opportunity for research is low at present; however, enhancement of wetland areas on the unit would open opportunities to study the success in creation and diversification of wetland habitat.

Given that this unit has been proposed to serve as the central interpretive area for the wetland units, various strategies for public education are suggested. An open kiosk could be built in an area with low flood impact. Graphics and narrative descriptions pertaining to the Snohomish Wetlands Preservation Plan and elements of wetland and wildlife ecology could be displayed on the walls. Numbered posts along the hiking

trails, in conjunction with a printed pamphlet distributed from the kiosk, could be used as a self-guided nature tour. In addition, interpretive signs along the dike trail could detail the sensitivity of Otter Island (Unit VII) and discourage access to it. Detailed plans for design and location of these features are discussed in Section 5.

Snohomish County could be responsible for constructing some of the features suggested for Unit VIII; however, it is suggested that professional services also be used where appropriate. The County could use its own resources for placement of the kiosk, numbered posts, hiking trails, construction of the parking lot and roads, and road improvement. Services of volunteers also could be used, under the supervision of the County, for placement of the interpretive and recreational features.

It is recommmended that professional services be used for implementing design and construction of the boat launch. Special care would be required in placement of the boat launch to ensure that the integrity of the dike would not be affected, that the main drainage ditch on the inland side of the dike would continue to function as it does at present, and that there is minimal disturbance to the hydrology of the inlet.

Services of qualified biologists also should be used for wetland enhancement and creation on Unit VIII. The biologist should be directly involved in all elements of this feature; including design, construction management, plantings, and monitoring. For best results, a qualified landscape contractor should be used to implement planting recommended plant species. Alternatively, volunteers can used to help with the plantings; however, volunteers should be under the strict supervision of the biologist and landscape contractor if this alternative is used.

Wetland enhancement could be funded by Snohomish County. Funds also may be available from the Port of Everett serving as wetland mitigation for work completed on the Port. Funds should be adequate to cover, not only the cost of the design and implementation of wetland enhancement, but also the cost of contingency plans should measures such as replanting be necessary.

Qualified biologists could be used to provide technical information for the interpretive kiosk and nature trail signage. An alternative to this approach would be to offer an internship to college students to complete this task.

A monitoring plan is an important element in ensuring the success in achieving stated objectives for this unit. Monitoring of the hiking trails should be conducted at least once a year to determine the impact of human use of the area on the trail system and whether the trail is effective in discouraging pedestrians from entering wetland habitats on the site.

The boat launch and interpretive center and signage can be monitored for the same elements as the hiking trails. Periodic surveys of the area can determine whether these features are successful in discouraging human disturbance to wetland habitat, i.e., the boat launch in directing people onto established trails and the interpretive features in educating people about the sensitive nature of wetlands. These areas also can be monitored for the impact of general public use and for vandalism.

Since a period of time usually passes before a new park becomes used on a regular basis, monitoring of the unit should continue until the number of visitors to the area has become fairly stable. Monitoring of the boat launch, interpretive features, and hiking trails could be carried out by Snohomish County personnel or by volunteer organizations. An annual report should be completed and submitted to Snohomish County. If disturbance to the wetlands or degradation of the trails, launch, or interpretive features is high, steps should be taken to remedy the disturbance. After five years, an analysis of the impact of public use on the unit and built features should be completed and decisions made whether to continue monitoring the unit and, if so, which features to continue to monitor. In addition, decisions can be made whether additional measures are appropriate to achieve the objectives for the unit.

At least a three year monitoring program should be implemented for wetland creation and/or enhancement. The site should be evaluated by a qualified biologist once a year using standardized procedures to measure the survival and growth of plant materials. Procedures that could be used include establishment of of photographic points and cover transects. An annual report of results should be prepared and submitted to Snohomish County to track the success of the enhancement project. If plantings do not survive or are destroyed, a contingency plan should be implemented to revegetate these areas. At the close of the monitoring program, data collected should be compared to project objectives and a recommendation made as to the success of the project. If, for example, the vegetative cover in the planted areas is less than 80%, it may be determined that a contingency plan of replanting is necessary.

4.9 OBJECTIVES AND STRATEGIES FOR UNIT IX

The primary objective in the management of Unit IX is for the preservation of the existing wetland values on the unit. An indirect strategy to accomplish this will be to discourage public access to the unit. There is currently an area along the only existing access road on the unit where trash and refuse has been dumped in the past. A general "clean-up" of this area could enhance the aesthetics of the unit and discourage further dumping. This clean-up could be accomplished by County maintenance personnel; people serving garbage pick-up duty as a result of drunken driving or other convictions; or could result from the efforts of concerned and organized volunteers.

5. Site Plans

5. SITE PLANS

This chapter presents writen descriptions and graphic representations of site plans developed for the four wetland units on which constructed facilities are proposed. Those units are II, IV, VII, and VIII. Site plans for Units II, IV, and VIII depict the locations of the proposed recreational, access, and interpretive facilities, while the site plan for Unit VII (Otter Island) depicts the locations of an access barrier and signs discouraging access to the unit. Site plans are not presented for those units on which no facilities have been proposed. Snohomish County will need to do environmental analyses, where required, prior to any major construction activity in any of the wetland units. The analyses will assess the impacts of implementation of the facilities recommended on the site plans.

5.1 UNIT II SITE PLAN

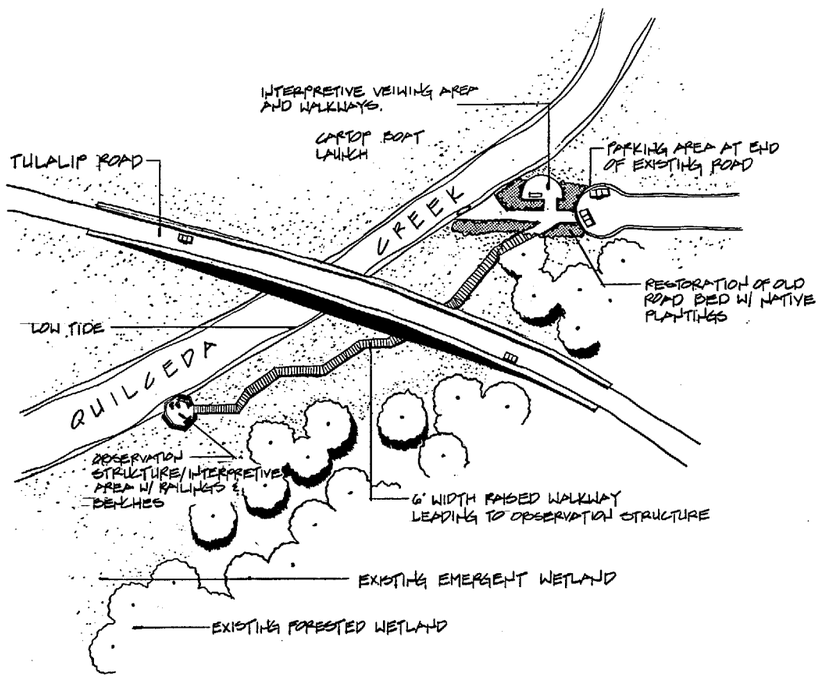
For Unit II, Quilceda Creek, the management goals consist of providing 1) public access; 2) recreational opportunities; 3) research opportunities; 4) interpretive education; 5) habitat preservation; and 6) cultural resource preservation. Figure 3 depicts the site and in part details the facilities proposed to meet each goal. The following is a discussion of those facilities and their relationship to the goals.

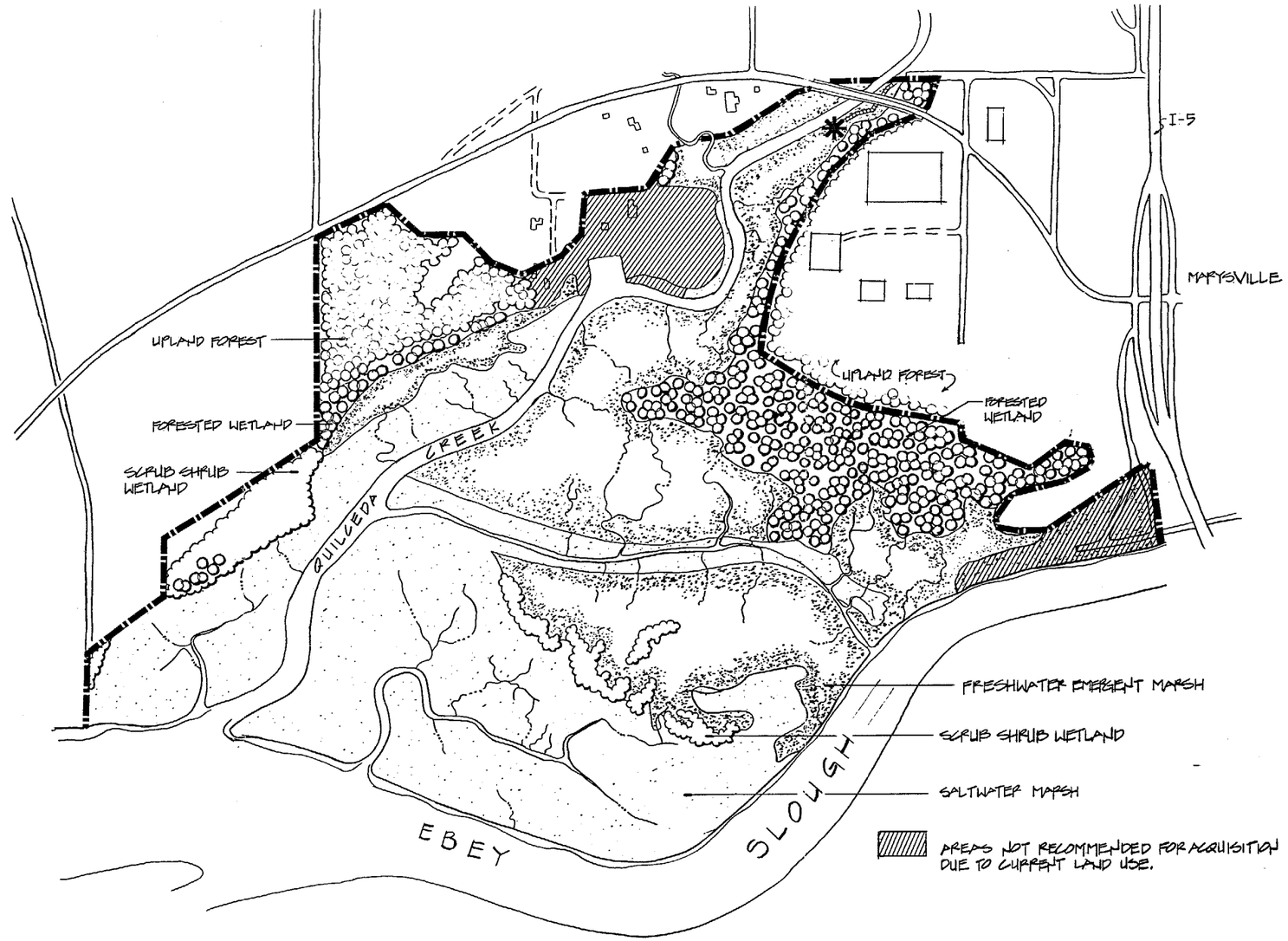
Public Access

Public access is proposed via a portion of the spur of Tulalip Road remaining after construction of new bridge over Quilceda Creek. This "spur" provides an ideal public access point since it is currently available to vehicles and pedestrians. Use of the existing right-of-way minimizes penetration into Unit II, and utilizes a relatively unused section of the existing County road. The road remains in County ownership and has not been vacated.

Parallel parking in the cul-de-sac and along the edges of the road would be encouraged since the area is not anticipated to be used heavily. For this reason, costly improvements to the roadway and the creation of a parking lot are not deemed necessary.

Access from the road-end parking to the wetland unit is proposed through use of a gravel walkway placed above high tide levels. The walkway connects the parking area to an interpretive viewing area and a cartop boat launch. An elevated boardwalk extends from the roadhead to an observation deck to the south of the bridge. This latter deck would serve as an interpretive platform with views oriented away from the bridge to the downstream and more scenic portion of the wetland. Some habitat enhancement plantings could be done in the area of the right-of-way associated with the public access improvements.





SNOHOMISH RIVER WETLANDS MANAGEMENT PLAN

SITE PLAN UNIT II QUILCEDA CREEK

FIGURE 3

SNOHOMISH COUNTY, WASHINGTON

0 200 400 800 1200 1600

5-89 RH

SHAPIRO & ASSOCIATES

Another means of access to and from the site is by water. Canoes, kayaks, and other similar small craft are able to use Quilceda Creek both for site specific purposes as well as connections to and from other wetland units via Ebey and Steamboat Sloughs and the Snohomish River. Access at Quilceda Creek would consist of a small non-motorized boat launch located within the county right-of-way associated with 66th Street Northeast.

Recreational Opportunities

Though limited by a variety of constraints, some opportunities for recreation do exist on Unit II. These include wildlife observation, hiking, small scale boating. Through the use of the proposed walkways and observation areas, visitors would be able to view wildlife and gain information from interpretive facilities as discussed below. Quilceda Creek and numerous channels are available to users of canoes and kayaks. Heavy use of Unit II, however, is discouraged both by the unsuitability of the terrain and by the fact that almost all of the area is prime high value habitat that should not be disturbed.

Research Opportunities

Because of its great diversity of habitats, Unit II offers excellent opportunities for scientific studies. This unit could serve as a field classroom for the local grade schools, high schools, and universities. Research in a variety of disciplines could examine diverse natural systems and their relationship to each other and to the adjacent agriculture and urbanization.

Interpretive Education

In conjunction with the public access to Unit II, the opportunity for interpretive education could be provided. Interpretive facilities would relate information both specific to the site and to the entire wetland preserve and surroundings. Small in scale, the actual interpretive structures would resemble those depicted in Figure 8, particularly the signboards and observation deck.

Information conveyed through the interpretive process could include that regarding tidal influence, plant communities, wetland functions and wildlife habitat, as well as cultural values.

Habitat Preservation

One of the most important goals in the management of Unit II is habitat preservation. This unit has a number of unique features and high value diverse habitats that make continued lack of disturbance a high priority. With human intrusion limited to a small area little or no impact to high value habitats is anticipated.

Cultural Resource Preservation

Unit II provides habitat for fish important to the livelihood and cultural traditions of the Tulalip Tribes. With the proposed minimal public use of this unit, the salmon runs should continue unaffected. Similarly, archeological and other cultural components of significance will remain undisturbed.

Estimate of Construction Costs

The proposed facilities for Unit II have been designed to fulfill their purpose simply and efficiently while blending as much as possible with the natural surroundings. In addition, their design and placement will minimize impact both to the entire unit and to the area immediately adjacent to the improvement. The parking area will utilize the existing road end, the existing guardrail will be replaced with a more aesthetic and functional structure, allowing access to the walkway. Observation structures and elevated walkways are proposed for construction from wood, as are any interpretive signs. The old roadbed could be filled and planted with native species to match surroundings.

Construction costs shown below are represented in current dollar amounts and reflect the use of professional contractors and purchase of all materials. Costs could be considerably lower, however, with the use of volunteer labor and donated materials.

Restoration and reintroduction of native plant species could take place in the area formerly occupied by Tulalip Road. Such plantings would significantly enhance the appearance of this area and any proposed improvements such as the boat launch and observation area. Proposed plantings would cover roughly one-quarter of an acre with estimated cost of about $15,000 per acre. Costs savings could be realized through the use of bareroot plant material, and even further reductions in cost could be achieved through donations of nursery stock from interested organizations.

5.2 UNIT IV SITE PLAN

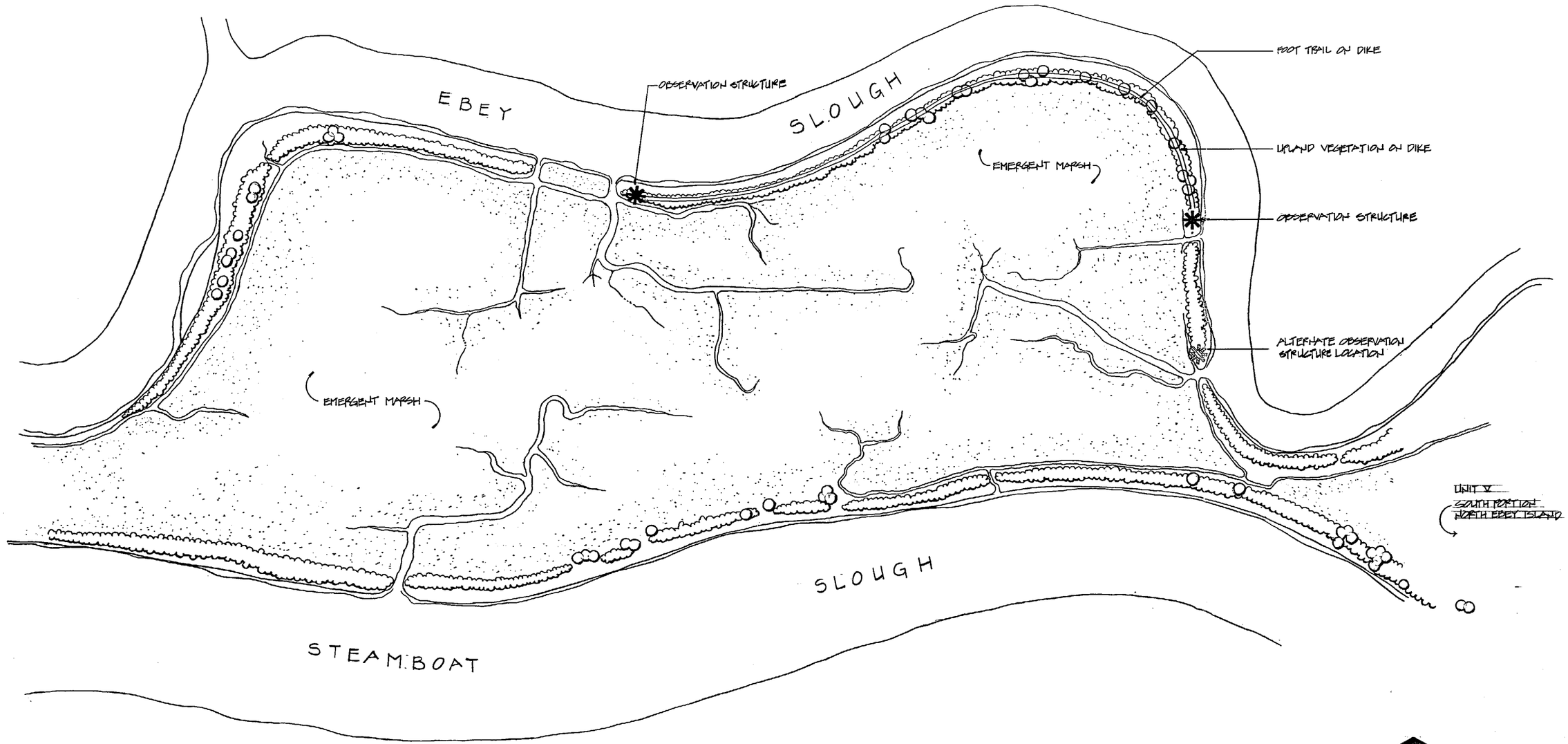
The site plan for Unit IV, North Ebey Island (Middle), represents incorporation of a variety of goals into the management of this unit. These goals will provide for limited public access; limited recreation; research opportunities; interpretive education; and habitat preservation with limited enhancement. Figure 4 depicts the site and its limited improvements designed to meet each goal. The following is a discussion of those facilities.

Public Access

Access by the public to Unit IV is gained only through the use of water craft via Ebey Slough. Boats can be beached below two proposed dike top observation structures (see Figure 8). These structures have been placed on top of the dikes to maximize viewing opportunities and to protect the decks from normal flooding. Proposed access to the structures is through the use of other wood or metal stairways.

UNIT II
ESTIMATED CONSTRUCTION COSTS

Item	Cost	Subtotal
Restoration of Old Roadbed		
fill soil	$ 1,500.00	
topsoil	3,000.00	
native plantings	2,500.00	
		$ 7,000.00
Gravel Paving		
walkway and observation area	1,500.00	
		1,500.00
Interpretive Facilities		
raised walkway	14,400.00	
observation deck	4,800.00	
signage	1,000.00	
		20,200.00
Boat Launch		
concrete ramp	2,000.00	
		2,000.00
Misc. Signage, Bollards, benches, waste recepticles	2,000.00	2,000.00
	TOTAL:	$32,700.00



SNOHOMISH RIVER WETLANDS MANAGEMENT PLAN

SITE PLAN UNIT IV MID - NORTH EBEY ISLAND

FIGURE 4

SNOHOMISH COUNTY, WASHINGTON

0 100 200 400 600 800

5-89 RH

SHAPIRO & ASSOCIATES

After arrival by boat to either deck, pedestrian access along a stretch of dike-top trail is possible. Preliminary reconnaissance of the dike areas indicated that a dike-top trail between the two observation decks could be established simply by the limited removal of brush. The trail should be feasible without the use of bridges. Extension of the trail in either direction beyond that shown in Figure 4 did not appear to be possible because of major breaches in the dikes. If upon closer inspection of the proposed trail area it is found that major obstacles are present, then an alternative proposal is to establish only one observation deck in one of the locations shown and to delete the foot trail. Further study is needed of the historic changes in the dike resulting from flooding and breaching. Such a study will help document the probable stability of a trail along the currently intact stretch of dike.

Recreational Opportunity

Recreation on Unit IV is limited due to both physical constraints and the desire to protect wildlife habitat, but a few opportunities do exist. Hunting has been a traditional form of recreation on this unit, and is proposed to continue, through use of boats on the many small waterways. The proposed observation decks and dike top foot trail will allow wildlife viewing and hiking. At higher tides, the numerous waterways become accessible to small boats, while the surrounding sloughs are navigable at any time.

Research and Study Opportunity

The opportunities for research and study of the wetland ecosystem on Unit IV appear to be excellent. Access to the wetland by boat is relatively easy, especially during higher tides, and a proposed dike top trail (as discussed above) could allow some study of that area as well. Research in a variety of fields relating to wildlife and natural processes would be possible, and available to field classes from the local schools and universities.

Interpretive Education

One of the opportunities provided through public access to the unit is interpretive education. Information about the island's ecosystem and its function within the entire wetland system could be provided as well as a brief history and explanation of the effects on the unit of prior agricultural use. Facilities used for interpretive purposes would resemble the observation deck in Figure 8, with small signs placed on handrails.

Estimate of Construction Costs

The limited improvements proposed for Unit IV have been designed for a minimum of impact to the area while at the same time fulfilling their assigned function. As such, they should be visually unobtrusive, aesthically pleasing, and durable. Observation decks are proposed to be made out of wood, as are the frame for the interpretive signs (the actual sign itself could be fabricated from wood, metal or other material). Access

ladders to observation decks could be made from either wood or metal. The dike top trail would need to be cleared of brush along a narrow corridor but no other improvements should be necessary except for possible minor hand grading of the foot path.

Construction costs shown below reflect current market value of items provided by a professional contractor and assumes purchase of all materials. Costs could be considerably lower, however, with the use of volunteer labor and donated materials.

Item	Cost	Subtotal
Observation Decks	$8,000	$ 8,000
Trail	2,000	2,000
Interpretive Signage	800	800
TOTAL		$10,800

The cost of the observation decks includes an access ladder to each. Trail cost figures are for a four foot cleared width along the top of the dike between and connecting the two observation decks.

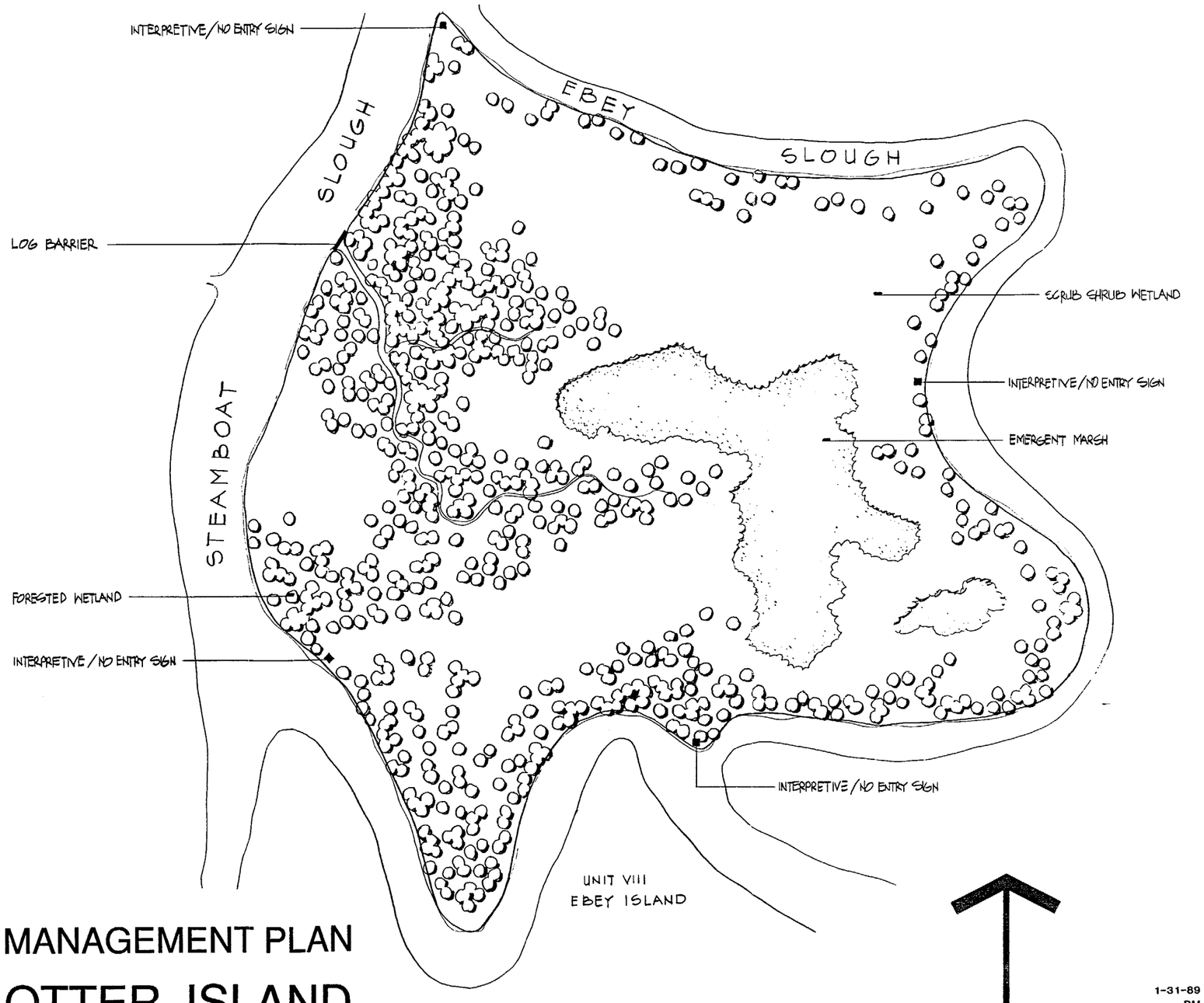
5.3 UNIT VII

The goal for Unit VII, Otter Island, is primarily the preservation of existing wetland habitat, both for wildlife use and for cultural resource values. Therefore, the site plan for this unit is relatively simple and is aimed at limiting public access in order to preserve the existing resources of the island. The possibility of closing the island to hunting year-round should also be considered.

Interpretive signs are recommended to educate the public about the sensitive nature of the habitat in Unit VII and the need to protect the island by limiting human disturbance. Such signs would be placed on the closely adjacent and more publically used Unit VIII (see Section 5.4), and on Otter Island itself. The signs on Otter Island would be designed to notify the public not to enter the island and would be placed at strategic points around its perimeter (see Figure 5). The signs on Unit VII are planned to be relatively small and unobtrusive but obvious enough to boat traffic passing by the island.

A barrier is recommended for the mouth of the small channel entering the west side of the island from Steamboat Slough to prevent boat entry into the central portion of Otter Island. This barrier is recommended to be constructed of floating logs tied end-to-end and anchored on shore.

Features presented on the site plan for Otter Island are conceptual in nature and may be modified due to site specific conditions and public use patterns observed in the overall wetland system over time. For example, the interpretive signs designed to be placed throughout the overall wetland



SNOHOMISH RIVER WETLANDS MANAGEMENT PLAN

SITE PLAN UNIT VII OTTER ISLAND

FIGURE 5

SNOHOMISH COUNTY, WASHINGTON

1-31-89
DM

SHAPIRO & ASSOCIATES

system could be installed as a first step in discouraging public entry into Otter Island, and if they prove to be effective in limiting access to the island, the channel barrier and/or sign placement on the island itself may be deemed unnecessary.

Maintenance of the signs and the channel barrier would be the responsibilty of Snohomish County. Regular surveys of the area would need to be conducted to check for vandalism and misuse of the island. If signs or the log barrier are vandalized, these would need to be repaired or replaced.

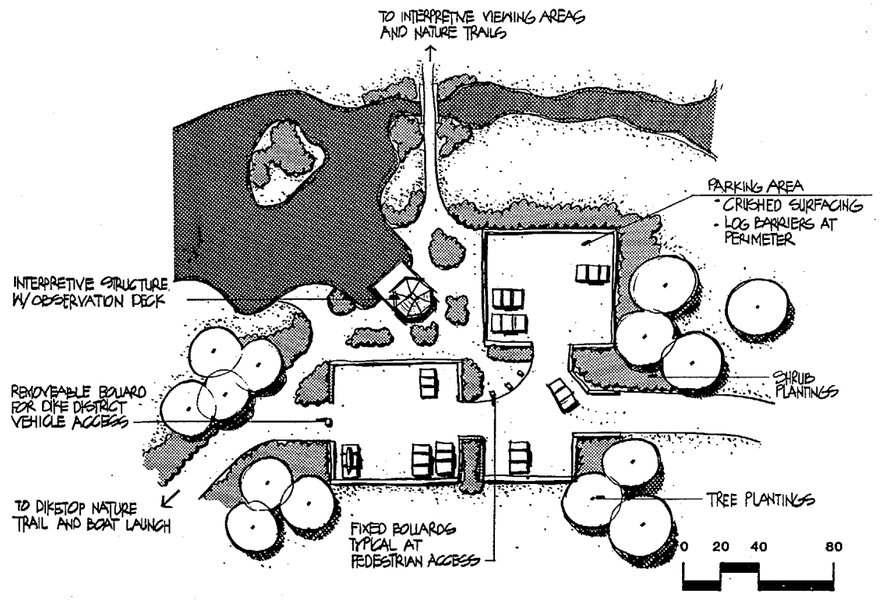
5.4 UNIT VIII

The site plan for Unit VIII on the north end of Ebey Island has been designated to satisfy five of the seven goals within the overall wetlands management plan. Those five goals include allowing for: 1) public access (both to the unit and to the wetland system as a whole); 2) public recreation; 3) research and study; 4) public interpretive education; and 5) habitat enhancement. Figure 6 depicts the site plan for the unit and details in part the facilities incorporated into the plan to meet each goal. The facilities are further described in the paragraphs below.

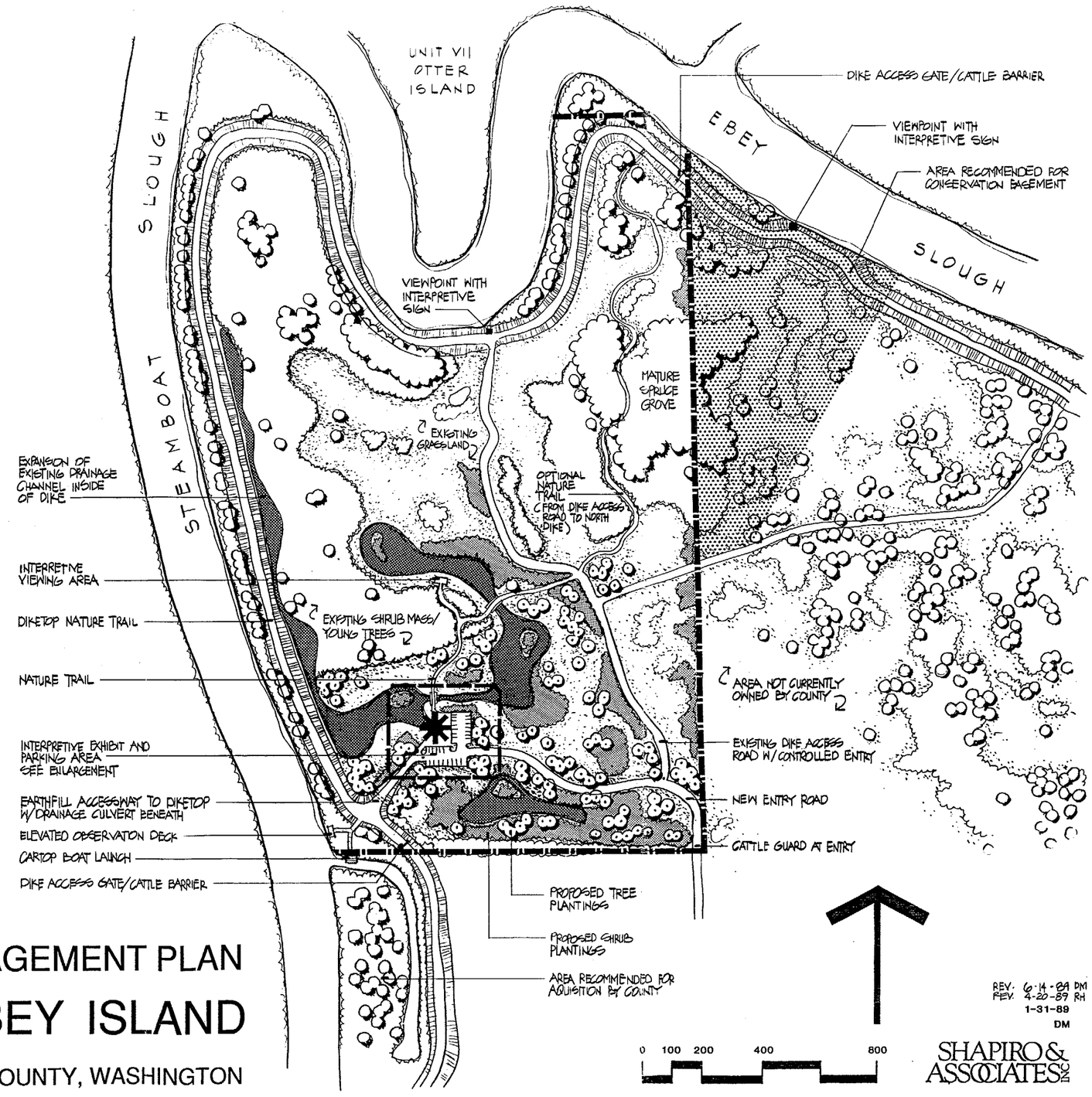
Public Access

Public access to Unit VIII is proposed via the small, currently unimproved Drue Road running in a north/south direction in the central part of the north end of Ebey Island. This County road will need some improvement before it is useful for public access. Road widening and paving would allow safe transit for vehicles arriving from U.S. Highway 2 to the south of Unit VIII. The County will need to do an environmental analysis assessing the impacts of the road upgrade. A gravel drive is planned to provide access from the entrance gate on the south property boundary of the unit to a small gravel parking lot planned in the southwestern corner of the unit. The design of the drive will provide the public with an interesting introduction to the unit by its indirect approach to the parking facility and by the fact that the drive will pass through the system of proposed, created wetlands.

Once vehicles are parked in the parking lot, visitors can gain access to other areas of the unit using a system of hiking trails. These trails have been designed to follow the existing flood-control dike on the northern and western sides of the unit. Careful interaction with the Ebey Island Diking District will be necessary to coordinate use of (and possible improvements to) the top surface of the dike so it can be used as a hiking trail. Currently the dike is covered with grass kept low by grazing cattle. As the unit is developed for public use, the cattle will need to be kept out of the unit; the placement of fences with gates across the dikes could achieve this. With the removal of grazing, the dike will need seasonal mowing to remove trees and shrubs. Such woody vegetation on the dikes is a concern of the Diking District for its possible negative effect on the structural integrity of the dike. Snohomish County would be responsible for mowing the dike, while the Diking District would be responsible for maintaining the physical integrity of the dike.



INTERPRETIVE EXHIBIT AND PARKING AREA ENLARGEMENT



SNOHOMISH RIVER WETLANDS MANAGEMENT PLAN

SITE PLAN UNIT VIII EBEY ISLAND

FIGURE 6

SNOHOMISH COUNTY, WASHINGTON

REV. 6-14-89 DM
REV. 4-20-89 RH
1-31-89
DM

SHAPIRO & ASSOCIATES INC

An agreement between Snohomish County and the Diking District will be necessary to specify appropriate construction and general maintenance standards for the facilities on or adjacent to the dikes on Unit VIII. Design and construction of the dike trail and canoe launch facilities shown on Figures 6 and 7 will require careful coordination between the County and the Diking District so that each agency is able to continue to fulfill their differing responsibilities to the publics they serve. For example, dredging and widening of the existing drainage ditches along the inside of the dikes (and excavation of the ponds elsewhere on Unit VIII) can be accomplished, serving the needs of both the County and the Diking District. The dredged or excavated soil can be used to strengthen the dikes - a priority of the Diking District, and the ponds will serve to enhance the wetlands on the County's land. Construction activities should occur only when adverse impact to nesting waterfowl will not result.

In addition to the trails on the dike, trails are also proposed in the level, central portion of the unit. These will connect the parking lot with peripheral areas of the unit and allow for pedestrian circulation throughout the unit. One of the trails will pass near the created wetlands and allow the public opportunity for education using signage detailing the purpose and function of the created wetlands. All of the trails, whether they are located on the dikes or on the level interior of the unit, will have bollards incorporated into their design to prevent other than authorized service vehicles from driving on the trails.

Access to the other units in the wetland system as a whole will be provided through the non-motorized boat launch proposed for the southwestern corner of Unit VIII. Canoes, kayaks and small rowboats can be hand carried from the parking lot to the boat launch across the dike using an earthen ramp as shown in Figure 7. The land proposed for the boat launch facility is not currently owned by Snohomish County and will need to be purchased prior to any development. A property line adjustment may be a cost effective way for the County to gain access to the area by not having to purchase the large tract of privately owned land of which the proposed boat launch area is only a small part.

Recreational Opportunity

Recreational opportunities are provided on the Unit VIII in a variety of forms. The hiking trails, as detailed above and shown on the site plan, will provide opportunities for hiking, bird-watching, nature study, etc. The loop trails shown should be monitored to study the impacts of foot traffic on wildlife. If the wildlife is disturbed too much, especially during breeding season, the loop trails can be seasonally closed. The boat launch structure will allow direct access to the water for canoeing and kayaking. In general, only passive recreation is being encouraged directly on the unit, and as such this type of recreation will impact the habitats and wildlife present as little as possible.

Research and Study Opportunity

By allowing easy access to the unit, opportunity will be gained for research and study of the wetland ecosystem. Field classes from local

DIKE TRAIL NEAR BOAT LAUNCH

CHARACTER SKETCH

SHAPIRO & ASSOCIATES

FIGURE 7

grade schools, high schools, and universities would be possible on Unit VIII. Students and professional researchers could be encouraged to conduct studies on a variety of disciplines appropriate to the natural resources present on the unit. Research in botany, ornithology, aquatic/wetland ecology, fisheries, wildlife biology, etc. would be possible. Once funds for the created wetland ponds are allocated, research in wetland landscape design and the culture of native plants will be possible, furthering the growth of knowledge in these developing disciplines.

Interpretive Education

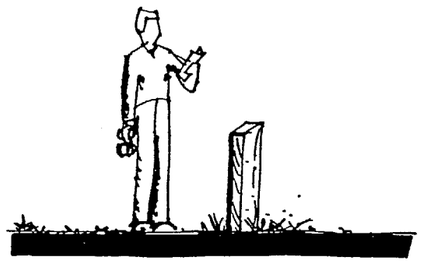
Unit VIII has been given the role of supplying educational opportunity to the public. The information presented to the public would relate to the wetland preserve as a whole (all of the units), and in particular to the resources present on Unit VIII. A diversity of interpretive structures is proposed, with the range of facilities depicted in Figure 8. The most elaborate structure is the kiosk which is proposed to be closely associated with the parking facility on Unit VIII. The kiosk will have the most detailed interpretive information of all the interpretive facilities proposed on the unit. The kiosk will be covered with a roof-like structure helping to identify it as the key orientational and educational element within the unit.

Other types of interpretive structures can be placed in strategic locations along the trails of Unit VIII. Signboards, covered signboards, and observation decks are appropriate on unit VIII or any other unit shown in Figure 2 proposed for interpretive signage or overlooks. The horizontal signs shown on the illustration for the observation deck in Figure 8 could be a useful response to concern that signs in the wetlands may be prone to gunshot vandalism. The horizontal signs present little or no apparent target for vandals wielding hunting rifles. The interpretive marker post illustrated in Figure 8 is appropriate for marking locations relating to a self-guided interpretive brochure which could be developed as part of the interpretive program for Unit VIII.

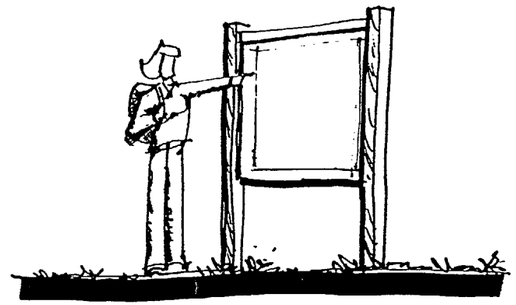
Figure 8 has been included to show a broad range of interpretive signage and structures. Each unit proposed in Figure 2 for educational signage should be considered on a case-by-case basis for selection of the most appropriate type of interpretive structure.

Habitat Enhancement

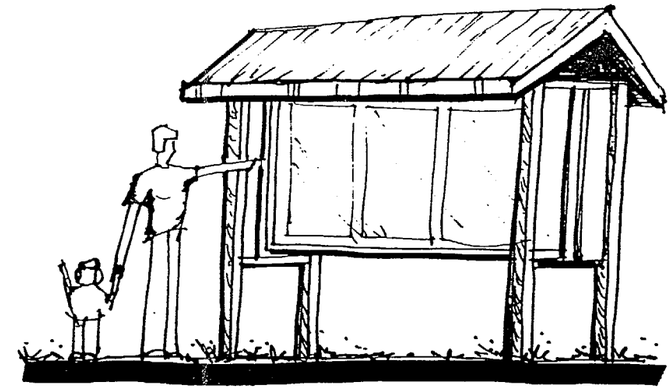
Much of Unit VIII is covered by relatively low value wetland habitat. Consequently, a primary goal for the management of the unit is to enhance the habitats present. A single habitat type, reed canarygrass marsh (with scattered patches of scrub/shrub and forested wetland intermixed), dominates the early succusssional stage habitat present on the unit. Since Unit VIII has been used for agricultural purposes in the recent past, the wetland habitat in this area has not yet reverted to well-developed wetlands as has occurred in other wetland units formerly used as agricultural lands but abandoned longer ago. A goal, therefore, in the enhancement of Unit VIII is to accelerate the process of wetland succession presently occurring on the



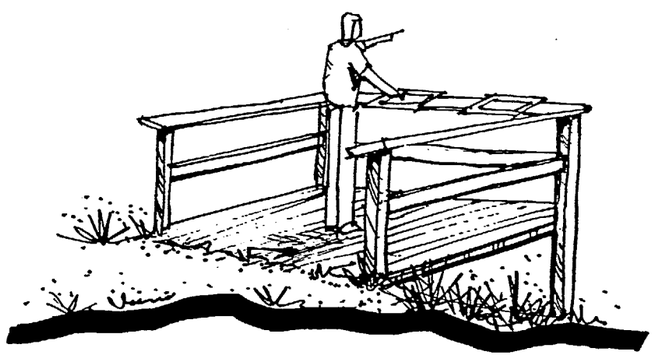
MARKER POST



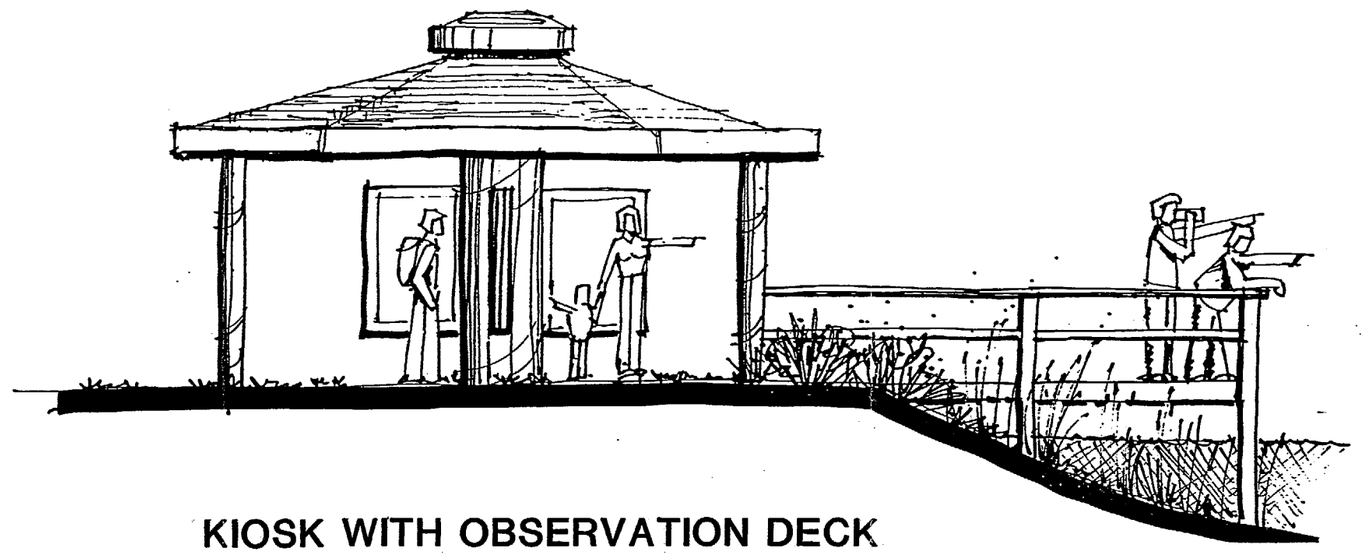
SIGNBOARD



COVERED SIGNBOARD



OBSERVATION DECK



KIOSK WITH OBSERVATION DECK
AT PARKING LOT OVERLOOKING CREATED WETLANDS

SHAPIRO & ASSOCIATES

INTERPRETIVE STRUCTURE OPTIONS

FIGURE 8

site. This can be achieved by diversifying habitat types present. Open water habitat could be created through 1) shallow excavation along the drainage ditches just landward of the dikes, and 2) the creation of a system of ponds as depicted in Figure 6. Plantings of cattail and bulrush along the margins of the ponds could create a more diverse plant community than presently exists. This habitat combination of open water and permanent cattail/bulrush marsh could encourage waterfowl such as gadwall and cinnamon teal to use the area in higher numbers than they may currently. Plantings of wetland shrub and tree species could also increase the structural and habitat diversity of the unit. Care must be taken in grading the ponds so as to create no deep backwaters where juvenile salmon may become stranded (from the main body of water) if water levels in the ponds drop seasonally. The trail shown crossing the pond should be monitored to determine if seasonal closure, especially during breeding season, should be done.

Removal of debris would also serve to enhance the habitat and aesthetics of Unit VIII. Old farm equipment and miscellaneous refuse are present on the unit. Using heavy equipment to remove only the larger debris, while removing the remainder of the debris by hand, would minimize impacts to the habitats and wildlife present. Because this unit is proposed as the central focus for public use of the wetland system as a whole, habitat enhancement could increase the unit's value as an educational/ recreational resource.

Estimation of Construction Costs

The facilities proposed for Unit VIII have been designed to be visually unobtrusive so they blend in with the natural surroundings. Roads and parking facilities are proposed to be gravel paved. Tire stops in the parking lot and all structures such as the interpretive signs, kiosk, and the boat launch/dock are proposed to be made of wood. The trails are proposed to be covered with wood mulch or gravel, and the plantings for wetland enhancement are proposed to be largely bareroot nursery stock. All of these materials are relatively low cost compared to higher cost materials used in more "urban" parks such as the Langus Riverfront Park in Everett.

The development of Unit VIII could be phased to spread the costs over time. A listing of estimated costs for certain materials and construction items is presented below. It is important to note that the costs shown are representative of current construction costs in which professional contractors are hired and all materials are purchased. Costs could be considerably lowered if volunteer labor and donated materials could be used, at least in part, during the development of Unit VIII.

A major expense item is the excavation of the created wetland ponds. The costs associated with excavation have been calculated for the excavation of approximately 7.5 acres of ponds averaging four feet in depth. Costs have been estimated at $3.00 per cubic yard of excavated soil totalling $160,000.00 for excavation. The Ebey Island Diking District has expressed an interest in using the excavated material in strengthening the flood-control dikes. A certain amount of the excavated soil would be placed on the landward side of the dikes. Hauling and removal costs of excavated material would be lessened by depositing soil on-site compared with the removal of all soil off-site.

UNIT VIII
ESTIMATED CONSTRUCTION COSTS

Item	Cost	Subtotal
Created/Enhanced Wetlands		
pond excavation	$160,000.00	
emergent plantings	34,000.00	
tree & shrub plantings	45,000.00	
		$239,000.00
Gravel Paving		
road, parking, & kiosk	37,000.00	
		$ 37,000.00
Trail System		
trails (gravel or wood chips)	16,000.00	
bridges & observation deck	4,400.00	
		$ 20,400.00
Interpretive Center		
kiosk	6,000.00	
signage	2,400.00	
observation deck	4,000.00	
		$ 12,400.00
Boat Launch		
floating dock	7,000.00	
elevated boardwalk	24,000.00	
observation deck	3,900.00	
		$ 34,900.00
Misc. Signage, Bollards, Gates		
Benches, Waste recepticles	3,500.00	
		$ 3,500.00
	TOTAL:	$347,200.00

The emergent marsh plantings proposed for the created wetland have been estimated to cost $34,000.00 using landscape contractor installed nursery stock. Such plantings would accelerate the development of a plant community in the ponds, however the the plantings may not be necessary. Natural introduction of cattails would occur over time, but may take considerably longer than if the emergents were planted. Rather than purchase bareroot emergent plant material, transplanted cattails and bulrush could be taken from other wetland units where habitat diversification may be desired and where the removal of emergents is key to such diversification.

Plantings of trees and shrubs have been proposed to enhance the habitats currently existing on Unit VIII. Three acres of such plantings have been estimated to cost $15,000.00 per acre, or $45,000.00 for all three

acres. Bareroot nursery stock is proposed for cost savings, however further reduction in costs could be achieved by using donations of nursery stock from conservation organizations which may wish to contribute to the enhancement of Unit VIII. The Pilchuck Audubon Society has already expressed an interest in donating plantings.

Another major cost of developing Unit VIII is the construction of the boardwalk, observation deck, ramp, and floating dock associated with the boat launch as it is currently depicted (see Figure 7). Costs of the facility (approximately $34,900.00) could be lowered considerably if Snohomish County gains ownership of an additional area of land adjacent to the small backwater slough south of the southwestern corner of Unit VIII (see Figure 6). The elaborate boardwalk and deck designed for currently owned County land could be eliminated by acquiring land closer to the backwater where a simplified, less costly, boat launch and ramp could be used.

6. References

6. REFERENCES

Burrell, Galen, 1978. Snohomish Estuary Wetlands Study, Volume III. Report prepared for the U.S. Army Corps of Engineers. 7 pp. plus appendices.

Dye, Paul, January 1989. Personal communication. Member of the Snohomish Citizens Wetlands Advisory Committee.

Reppert, R.T., W. Sigleo, E. Stakhiv, L. Messman, C. Meyers, 1979. Wetland Values: Concepts and Methods for Wetland Evaluation. U.S. Army Corps of Engineers, Institute of Water Resources. Research Report 79-R1, 109 pp.

Shapiro and Associates, Inc., 1985. Snohomish River Wetland Units Preservation Management Plan. Report prepared for Snohomish County Department of Planning and Community Development. 67 pp. plus appendices.

Shapiro and Associates, Inc., 1978. Snohomish Estuary Wetland Study, Volume II. Report prepared for U.S. Army Corps of Engineers. 335 pp. plus appendices.

Thompson, Patricia and L. Leschner, 1987. Snohomish River Estuary Wetlands Wildlife Habitat Inventory. Report prepared for Washington Department of Wildlife, 17 pp.

United States Army, Corps of Engineers, 1981. An Evaluation of Approaches to Preservation of the Delta Lobes, Braided Channel, Three Forks Park, North and Middle Forks Snoqualmie River as Contemplated in the Snohomish Mediated Agreement. Seattle District, Seattle, Washington, March.

Watson, Jim, December 1988. Personal communication. State Bald Eagle Coordinator, Washington State Department of Wildlife.

Appendix A: Resource Agency Correspondence

CURT SMITCH
Director

STATE OF WASHINGTON

DEPARTMENT OF WILDLIFE

600 North Capitol Way, GJ-11 • Olympia, Washington 98504-0091 • (206) 753-5796

RECEIVED
NOV 15 1988
SHAPIRO AND ASSOCIATES, INC.

November 10, 1988

Shapiro & Associates, Inc.
Andrew F. Gorski, M.S.
Wetlands Ecologist
The Smith Tower, Suite 1400
506 Second Avenue
Seattle, WA 98104

RE: **Shapiro (Snohomish River)**

Dear Mr. Gorski:

We have completed a review of our files for information on significant natural features in the study area. The result of this review is presented in the enclosed material, which summarizes the occurrence of special animals reported within or adjacent to the study area. The Washington Natural Heritage Program will mail, under separate cover, project area information concerning special plants and plant communities.

We hope this presentation will be useful to you. This response is provided for your information only and is not to be construed as an official Department of Wildlife environmental review of your project. For official Department review and comment, mail environmental impact documents to: Washington Department of Wildlife, Ted Muller, Regional Habitat Biologist, 16018 Mill Creek Boulevard, Mill Creek, WA 98012.

In order to ensure the protection of the special species occurring in the study area, we recommend that the specific locational information presented here not be published or distributed.

If your office should publish or distribute general information from the enclosed material, please provide the Nongame Wildlife Program with a draft of any document in which information from the Natural Heritage Data System is incorporated or referenced, and cite the System as follows:

Natural Heritage Data System
Washington Department of Natural Resources and
Department of Wildlife - Nongame Program
c/o Mail Stop EX-12
Olympia, Washington 98504

The information provided is not to be taken as a complete inventory of the project area and does not eliminate the need or responsibility to conduct more thorough research. If you have further questions or concerns, please feel free to contact us at (206) 586-1449.

Sincerely,

Richard H. Taylor
Nongame Data Systems Biologist

RHT:pr-b

cc: Lora Leschner
Ted Muller
Dana Base
Jim Watson

ELEMENT OCCURRENCE SUMMARY

Introduction

The Natural Heritage Data System was established by the State of Washington and the Washington Natural Heritage Program of The Nature Conservancy. It is currently maintained by the Heritage Program under contract to the Washington Department of Natural Resources and by the Nongame Wildlife Program of the Washington Department of Game.

The database is comprised of "element occurrences." An "element" is a natural feature of particular interest because it is exemplary, unique, or endangered on a statewide or national basis. An element can be a plant community, special plan, or special animal species. An "element occurrence" is a reported or confirmed locality of a native vegetation community, or of significant habitat for a plant or animal species of concern. Information on element occurrences in the state is collected from herbarium and museum specimens, scientific literature, knowledgeable individuals, and field investigations. This information is compiled in the Natural Heritage Data System for use in land-use planning and evaluating the status of Washington's natural features.

This enclosure summarizes the special animal occurrences reported within or adjacent to the study area and catalogued in the Natural Heritage Data System. The Washington Natural Heritage Program manages similar information concerning special plants and plant communities.

Format

The Element Occurrence Summary table lists those special animals that have been reported to occur in or adjacent to the area specified in your information request.

- The first column lists the U.S. Geological Service (USGS) topographic quadrangle.
- The second column lists the township, range, and section.
- The third column, entitled "conf." (confirmation), lists a code indicating the specifically of the locations recorded for each element occurrence.

Confirmation Codes

C = The location of the element occurrence is known to within a 1/4-mile radius. In addition, the locality has been confirmed.

U = The location of the element occurrence is known to within a 1/4-mile radius, but at this time has not been confirmed.

N = The location of the element occurrence is known to within a 1-mile radius. This information usually is derived from secondary sources.

G = The element occurrence is locatable only to a general area, usually denoted by a geographic name. This information was derived from secondary sources.

- The next column contains federal and state status information.

Status Codes for Special Animals

Code	Explanation
FE	Federal Endangered - A species in danger of extinction throughout all or a significant portion of its range.
FT	Federal Threatened - A species which is likely to become endangered within the foreseeable future.

The state status given in the second column under "Element Status" is based on status evaluations conducted by the Washington Department of Game, Nongame Program.

Code	Explanation
SE	State Endangered - A species which is seriously threatened with extirpation throughout all or a significant portion of its range within Washington.
PE	Proposed Endangered - A species proposed for listing as Endangered.
ST	State Threatened - A species that could become endangered within Washington in the foreseeable future without active management or removal of threats.
PT	Proposed threatened - A species proposed for listing as Threatened.
SS	State Sensitive - A species that could become threatened if current water, land, and environmental practices continue.
PS	Proposed Sensitive - A species proposed for listing as Sensitive.
SM	State Monitor - A species of special interest because it: 1) has significant popular appeal; 2) requires limited habitat during some portion of its life cycle; 3) is an indicator of environmental quality; 4) requires further field investigation to determine population status classification; or 6) was justifiably removed from Endangered, Threatened, or Sensitive classification.
PM	Proposed Monitor - A species proposed for listing as Monitor.
PD	Proposed Delete - A species proposed for deletion from the special animal species classification.

- In the fourth column the animal species is named.

- The fifth column, entitled "Crit." (Criteria), lists codes that indicate the specific criterion/criteria used to evaluate whether a habitat location is significant to the species.

Element Occurrence Criteria for Special Animals

IO	Individual occurrence. Any record of the species constitutes a special animal occurrence.
HC	Herptile Concentration. Five or more individuals present in the same location.
CR	Colonial roosts.
B	Evidence of breeding: nest, young or eggs, adult visiting probable nest site, nest building activity (i.e., carrying nest material), breeding display, agitated behavior and distraction display (i.e., feigning injury).
RI	Regular individual occurrences at the same location. Observations of less than 10 individuals that have been made during at least three different years, not necessarily consecutive.
RSC	Regular small concentrations, during migration, breeding or winter seasons, of 10-70 individuals observed during at least three different years, not necessarily consecutive.
RLC	Regular large concentrations, during migration, breeding or winter season of over 70 individuals, that have been reported during at least three different years, not necessarily consecutive.

Comments

The enclosed information represents the reported element occurrences currently catalogued in the Natural Heritage Data System. The Data System is constantly updated as more current and historic information on element occurrences in the state are reported. Consequently, some of the element occurrences reported to occur historically within the study area may no longer be present. Likewise, areas within the study boundary for which element occurrences have not yet been reported, nevertheless, may support special animal species.

Finally, if information is needed on specific plant community or special plant occurrences within the study area, please contact the Washington Natural Heritage Program, (206) 753-2449. For additional information on specific special animal occurrences, please contact the Washington Department of Game, Nongame Wildlife Program, (206) 586-1449.

ELEMENT OCCURRENCE SUMMARY - SPECIAL ANIMALS

FOR: Shapiro (Snohomish River)

Quad Name	T	R	S	Conf.	Status Fed.	Status State	Element Name	Crit.	No.	Nest #
Everett /4712282	29	5E	27				Snoqualmie HMA			
Marysville/4812212	29	5E	10		FT	ST	Haliaeetus leucocephalus (Bald eagle)	B	872	1
" "	29	5E	10		FT	ST	Haliaeetus leucocephalus (Bald eagle)	B	872	2
" "	30	5E	31			PM	Pandion haliaetus (Osprey)	B	459	

A few bald eagles are reported along the project area during the January midwinter bald eagle survey each year.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
2625 Parkmont Lane SW, Bldg B
Olympia, Washington 98502
206/753-9440 FTS 434-9440

RECEIVED
DEC 5 - 1988
SHAPIRO AND ASSOCIATES, INC.

November 29, 1988

Mr. Andrew F. Gorski
Wetlands Ecologist
Smith Tower, Suite 1400
506 Second Avenue
Seattle, Washington 98104

FWS Reference: 1-3-89-TA-34

Dear Mr. Gorski:

As requested by your letter, dated November 2, 1988 and received by us on November 14, I have attached for your information a list of endangered and threatened species (Attachment A) that may be present in the area of the proposed management plan for wetlands within the Snohomish River delta in Snohomish County, Washington. Attachment B outlines requirements that would become applicable should there be federal involvement (funding, permitting, planning, licensing) in the project.

If you have any questions regarding the Act, please contact Jim Michaels at the letterhead phone/address. Your interest in endangered species is appreciated.

Sincerely,

David C. Frederick
Field Supervisor

Attachments

c: WDW (Nongame)
WNHP

JWH:gb

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES THAT MAY OCCUR WITHIN THE AREA OF THE PROPOSED MANAGEMENT PLAN FOR WETLANDS WITHIN THE SNOHOMISH RIVER DELTA IN SNOHOMISH COUNTY, WASHINGTON
(T30N R5E S29/31/32/33; T29N R5E S3/4/5/6/10/11/14/15/16/21/22/23/27/28)

1-3-89-TA-34

LISTED

Bald eagle (*Haliaeetus leucocephalus*) - wintering bald eagles may occur in the vicinity of the wetlands from about October 31 through March 31.

A nesting territory is located at T29N R5E S10. Nesting activities occur from about January 1 through August 15.

Peregrine falcon (*Falco peregrinus*) may occur within the area as fall migrants or wintering birds.

PROPOSED

None

CANDIDATE

None

Attachment A

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) AND 7(c)
OF THE ENDANGERED SPECIES ACT

SECTION 7(A) - Consultation/Conference

Requires:

1. Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2. Consultation with FWS when a federal action may affect a listed endangered or threatened species to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the federal agency after it has determined if its action may affect (adversely or beneficially) a listed species; and

3. Conference with FWS when a federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or an adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Construction Projects *

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify any proposed and/or listed species which is/are likely to be affected by a construction project. The process is initiated by a federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, please verify the accuracy of the list with our Service. No irreversible commitment of resources is to be made during the BA process which would result in violation of the requirements under Section 7(a) of the Act. Planning, design, and adminstrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should: (1) conduct an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within the FWS, National Marine Fisheries Service, state conservation department, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures; and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. Upon completion the report should be forwarded to our Endangered Species Division, 2625 Parkmont Lane SW, Bldg. B, Olympia, WA 98502.

---

* "Construction project" means any major federal action which significantly affects the quality of the human environment (requiring an EIS), designed primarily to result in the building or erection of human-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes federal actions such as permits, grants, licenses, or other forms of federal authorization or approval which may result in construction.

ATTACHMENT B

WASHINGTON STATE DEPARTMENT OF
Natural Resources

BRIAN BOYLE
Commissioner of Public Lands

OLYMPIA, WA 98504

November 16, 1988

RECEIVED
NOV 17 1988
SHAPIRO AND ASSOCIATES, INC.

Andrew F. Gorski
Shapiro & Associates, Inc.
506 Second Avenue, Suite 1400
Seattle, WA 98104

SUBJECT: Management plan for the Snohomish River Delta

We've searched the Natural Heritage Data System for information on rare plants, high quality native wetlands and native plant communities in your study area. We have identified four types of high quality natural communities (wetlands) within Sections 29, 31, and 32 of Township 30 North, Range 05 East, as well as a sensitive plant, Fritillaria camschatcensis , in Section 29 of Township 30 North, Range 05 East.

The enclosed list summarizes the occurrences of these natural features in your study area. Also enclosed is a plant description of Fritillaria camschatcensis from An Illustrated Guide to the Endangered, Threatened, and Sensitive Plants of Washington.

In order to ensure the protection of the rare plants in the project areas, it's important that the specific locations on the enclosed list not be published or distributed.

The Natural Heritage Data System is a cooperative effort between the Department of Natural Resources' Washington Natural Heritage Program and the Department of Wildlife's Nongame Program. The Washington Natural Heritage Program is responsible for information on the state's endangered, threatened, and sensitive plants as well as high quality native plant communities and wetlands. The Nongame Program manages and interprets data on wildlife species of concern in the state. For information on animals of concern in the state, please contact the Nongame Program, Washington Department of Wildlife, Mail Stop: EX-12, Olympia, WA 98504.

The Natural Heritage Data System is not a complete inventory of Washington's natural features. Many areas of the state have never been thoroughly surveyed. There may be significant natural features in your study area that we don't yet know about. This response should not be regarded as a final statement on the

natural features of the areas being considered and doesn't eliminate the need or responsibility for detailed on-site surveys.

I hope you'll find this information useful.

Sincerely,

Sandra Norwood

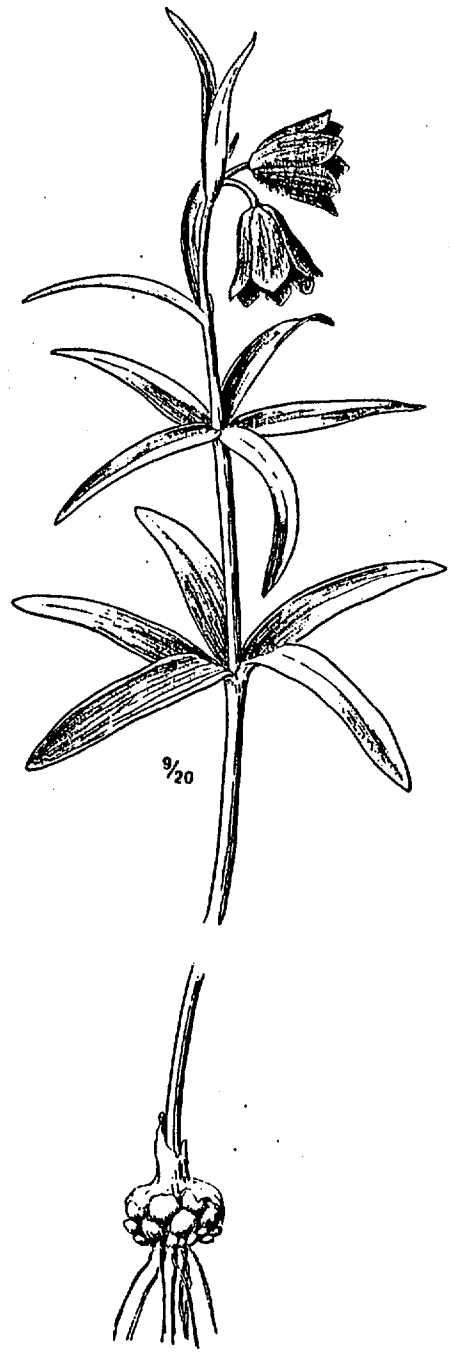
Sandra Norwood, Data Assistant
Washington Natural Heritage Program
Mail Stop EX-13
Olympia, WA 98504
(206) 753-2449

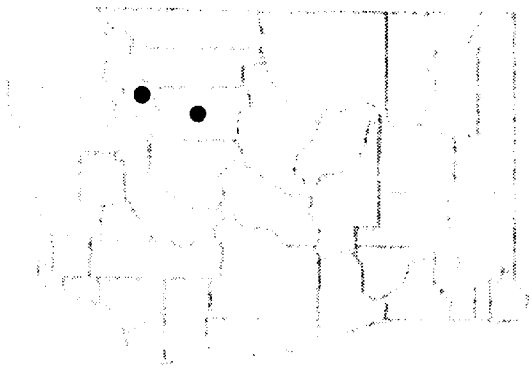
SN:fg
Enclosure

WASHINGTON NATURAL HERITAGE DATA SYSTEM
NATURAL FEATURES IN THE SNOHOMISH RIVER DELTA
CURRENT AS OF NOVEMBER 15, 1988

TOWNSHIP, RANGE & SECTION	NATURAL FEATURE	STATE STATUS
T30N R05E S29,31,32	Transition zone wetland	
T30N R05E S29,31,32	Surge plain wetland	
T30N R05E S29,31,32	Low intertidal, low salinity, silty marsh	
T30N R05E S29,31,32	High intertidal, low salinity marsh	
T30N R05E S29	Fritillaria camschatcensis (black lily)	Sensitive

NAME: *Fritillaria camschatcensis* (L.) Ker-Gawl. - Indian rice, black lily (FRCA 2)
FAMILY: Liliaceae - Lily family
STATUS: State: Sensitive
PROMINENT CHARACTERISTICS: Stems 2-5 dm. (8-20 in.) tall; leaves in 1-3 whorls of 5-9 each, with 1-several scattered above the uppermost whorl; flowers 2-7, spreading to pendent, bell-like, dark greenish-brown to brownish-purple, sometimes streaked or spotted with yellow. Similar to *F. lanceolata*, which has a ribbed capsule, *F. camschatensis* has a smooth capsule. Identifiable May to July.
HABITAT: Tidal meadows to marshy meadows in the foothills, up to 879 m. (2900 ft.).
RANGE: Peripheral in WA, Island and Snohomish cos.; Kodiak I. and coastal AK s. to Vancouver BC.
OCCURRENCE SUMMARY: Known from eight recent sightings.
THREATS: Diking and filling of tidal marshes and meadows, logging, trampling, plant collectors.
LAND OWNERSHIP/MANAGEMENT: FS, FWS, TIR, DNR, PVT





FROM: AN ILLUSTRATED GUIDE TO THE ENDANGERED, THREATENED, AND SENSITIVE VASCULAR PLANTS OF WASHINGTON. WASHINGTON NATURAL HERITAGE PROGRAM 1981.