SHARED STRATEGY FOR PUGET SOUND

EAST KITSAP WATERSHED CHAPTER

SALMON RECOVERY & CONSERVATION PLAN

v6

Kitsap County
City of Bainbridge Island
Suquamish Tribe
WA Department of Fish and Wildlife

2005 DRAFT

PREFACE

This document is DRAFT and was released for preliminary review by Shared Strategy for Puget Sound, the Puget Sound Chinook Technical Recovery Team, and NOAA Fisheries. Kitsap County, the City of Bainbridge Island, and the Suquamish Tribe, nor any other agency or organization has yet adopted this plan. Upon further revision, this plan is expected to be adopted by partnering agencies in the East Kitsap Watershed and used to guide salmon recovery and conservation.

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ACRONYMS AND ABBREVIATIONS

BIMC – Bainbridge Island Municipal Code
CAO – Critical Areas Ordinance
COBI – City of Bainbridge Island
GSRO – Governor's Salmon Recovery Office
LFA – Limiting Factors Analysis (see Haring, 2000)
NMFS – National Marine Fisheries Service (a NOAA sub-agency)
NOAA – National Oceanic and Atmospheric Administration
NOAA Fisheries – (the new name for NMFS)
PFC – Properly Functioning Conditions
PSAT – Puget Sound Action Team
SMMP – Shoreline Management Master Program
SRFB – Salmon Recovery Funding Board
TRT – NOAA Fisheries, Puget Sound Chinook, Technical Recovery Team
VSP – Viable Salmonid Population
WDFW – Washington State Department of Fish and Wildlife
WRIA – Water Resource Inventory Area

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1.0 - INTRODUCTION

Salmon conservation and recovery in the East Kitsap Watershed[1] is a matter of addressing both the habitat needs of specific species listed under the Endangered Species Act (i.e. Puget Sound Chinook), and maintaining and restoring the processes and habitat that sustain all species of salmon in the watershed and adjacent nearshore areas.

Similarly, local, state, Federal, and Tribal governments, businesses, community organizations, and individuals all have a role to play in the conservation and restoration of salmon in the watershed and the region as a whole. It is neither the responsibility nor within the authority of any single stakeholder to manage and restore our watershed and nearshore ecosystems so they support salmon into the future. Recovering salmon to healthy and harvestable population levels will continue to be a collaborative effort involving all parties using the tools of education, voluntary restoration, incentive and regulatory programs that exist today or that will be developed in the future.

[Insert map of East Kitsap Watershed within Puget Sound]

Conserving and restoring salmon habitat in the East Kitsap Watershed is primarily implemented through locally coordinated and implemented projects and programs. The Suquamish Tribe as well as state resource agencies such as WDFW, PSAT and the WA Sea Grant Program, provide critical support and technical assistance for much of these efforts. This report is intended to reflect the approaches used primarily by Kitsap County and the City of Bainbridge Island, in partnerships with other local jurisdictions and community organizations, to protect and restore salmon habitat in the East Kitsap Watershed.

1.1 - Vision

Citizens of incorporated and unincorporated areas of the East Kitsap Watershed, through extensive public involvement processes, have described how they see their communities today and into the future. Consistently, the visions expressed include a future in which natural systems and fish and wildlife habitat are protected, water quality is excellent and a diversified economic base supports good jobs and affordable housing choices for future generations. More specifically, our communities envision a future in which viable communities, with healthy economies, coexist with and maintain viable salmon populations sustained at harvestable levels.

Elements of the Kitsap County and City of Bainbridge Island comprehensive plans specifically recognize the importance of the natural environment through inclusion of the following elements:

"Protection and enhancement of the natural environment, including wetlands, streams, wildlife habitat, water quality and natural resource activities;" (Kitsap County Comprehensive Plan, 2002)

[1] For the purposes of this chapter, the East Kitsap Watershed includes those watershed and nearshore areas in the eastern portion of Kitsap County, including Bainbridge Island and Blake Island.

"Development should not be haphazardly imposed upon the landscape, but should be sensitive to its natural environs, recognizing the natural carrying capacity of Bainbridge as an Island, based on the principle that the Island's environmental resources are finite and must be maintained at a sustainable level." (City of Bainbridge Island Comprehensive Plan, 1994)

Additional goals and policies that support these respective community visions are included under various elements of the County and City of Bainbridge Island comprehensive plans and shoreline master programs. (See Appendices D & E)

Kitsap County and local municipalities, including the City of Bainbridge Island, have also adopted County-Wide Planning Policies (2003; See Appendix F) for salmon recovery that state:

"The County and the Cities shall preserve, protect, and where possible restore the functions of natural habitat to support ESA-listed species, through the adoption of comprehensive plan policies, critical areas ordinances, shoreline master programs and other development regulations that seek to protect, maintain or restore aquatic ecosystems[,] associated habitats and aquifer[s] through the use of management zones, development regulations, incentives for voluntary efforts of private landowners and developers, land use classifications or designations, habitat acquisition program[s] or habitat restoration projects.

The County and the Cities shall provide incentive-based non-regulatory protection efforts such as [the] acquisition of priority habitats through fee-simple and conservation easements from willing sellers.

The County and the Cities shall jointly establish and implement monitoring and evaluation program[s] to determine the effectiveness of restoration, enhancement, and recovery strategies for salmonids[2] including ESA-listed species. Each jurisdiction shall apply an adaptive management strategy to determine how well the objectives of listed species recovery and critical habitat preservation/restoration are being achieved."

In addition, the East WRIA 15 Lead Entity has adopted in its East Kitsap Peninsula Salmon Recovery Strategy (2004) a mission statement "to ensure local salmon habitat is preserved and restored to support salmon populations and human communities." The goal of the strategy is to "restore healthy, self-sustaining wild populations of the salmon species native to the streams and shorelines of [the] Kitsap Peninsula. Healthy [salmon] populations depend on the condition of local habitat, the level of harvest, hatchery practices and oceanic conditions."

1.2 - Timeframe

Consistent with the timeline recommended by the Shared Strategy for Puget Sound, this plan for the East Kitsap Watershed is generally intended to be implemented over a period of 5-10 years.

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[2] The terms "salmon" and "salmonid" are used interchangeably throughout this document and refer generally to all species belonging to the broader salmon family, including Chinook, coho, chum, sockeye, and pink salmon as well as steelhead and cutthroat trout.

Realistically, conservation and recovery of salmon species, including some species that have likely been in decline for a period greater than 100-years, is expected to take much longer than 5-10 years. Therefore, this plan will be iteratively reviewed and updated periodically based on the knowledge gained from its active implementation. Additionally, this plan includes many actions that are intended to be continued (and improved) in perpetuity in order to maintain viable salmonid populations at harvestable levels.

The content of this plan includes:

- a description of the East Kitsap Watershed, subwatersheds, and nearshore areas;
- a description of local salmon species and their population status;
- existing actions supporting recovery;
- an identification of gaps, opportunities, benefits and risks;
- a sub-area plan for the eastern portion of Kitsap County; and
- a sub-area plan for Bainbridge Island.

2.0 - WATERSHED SUMMARY

The East Kitsap County and Bainbridge Island provide a uniquely diverse geography for salmon. Between the backbones of the Kitsap Peninsula and Bainbridge Island and their shorelines, a narrow strip of land results in many short streams that drain to the west side of Central Puget Sound. The size of the East Kitsap Watershed, and the many small estuaries also provides an extensive and very diverse shoreline.

The streams are typical lowland type streams with generally moderate gradients. Considerable deciduous growth, interspersed with stands of conifers, farmland, and urban/suburban development is common on all streams. Many of the streams originate from lakes, ground water run-off, or swamp-like headwater wetlands (Williams et al. 1975). None of the streams are supported by snow runoff, as the maximum elevation in East Kitsap is less than 500 meters. Stream profile characteristics are, for the most part, pool-riffle in nature with water quality and aquatic insect production highly conducive to anadromous fish production (Williams et al. 1975).

The quantity of fresh water draining the East Kitsap Watershed and the number of salmonids utilizing the habitat are roughly the same as is found in a major river draining a similar sized territory. However, rather than flowing into a single large river, the water runs through many independent, short streams, directly into the Puget Sound. Salmon spawn and rear in approximately 86 of these stream systems. Though small, the streams are highly productive for salmon because of their low gradient and extensive associated wetlands. Our geography results in spatially diverse salmon populations, widely distributed in many small streams throughout the region. Spatial diversity is a key component of healthy salmonid populations and will be critical to regional salmonid recovery and conservation.

The East Kitsap Watershed is fortunate to enjoy a diverse 192 miles of marine shoreline. This nearshore habitat plays a critical role in the productivity of salmon stocks throughout Puget Sound. All salmon species, but particularly Chinook and chum, spend many months as juveniles feeding in the highly productive nearshore waters in preparation for their ocean migration. Although the importance of estuaries and other nearshore habitats to salmon have been largely underestimated in the past, we are now discovering that these nearshore environments are as important to salmon productivity as the freshwater streams where they are born.

The climate is characterized by mild, wet winters, and warm, dry summers. The average summer temperature range is 70-80° F during the day and 50-60° F at night. The average winter temperature is 40-50° F in the day and 30-40° F at night. Precipitation patterns are characterized by frequent rainfalls of low intensity. Precipitation varies from 39 inches at Bremerton to greater than 50 inches near Alexander Lake/Green Mountain.

2.1 - Geologic History

(modified from PSCRBT 1994)

The East Kitsap Watershed is geologically and topographically similar to other areas in the Puget Sound region, reflecting the influences of mountain building and glacial activity. During the

Eocene Epoch (approximately 38-55 million years ago), the East Kitsap Watershed was located at the western edge of the North American continent. Sediments were deposited in the coastal environment to the west of North America. Plate tectonic movement of the oceanic plate under the North America plate caused ocean and continental shelf rocks and sediment to be scraped off. These attached onto North America approximately 7-12 million years ago. Continued eastward movement uplifted these rocks and formed the hills and mountains of the Olympic Peninsula and the underlying Kitsap Peninsula. The underlying volcanic bedrock is overlaid with several thousand feet of marine sedimentary rocks. Green and Gold mountains, located west of Bremerton, are composed of these ocean floor rocks. The Pleistocene Epoch (or Ice Age), which began about 2 million years ago, formed most of the geologic features present in the watershed today. Cordilleran Ice Sheets, which originated in the coast and insular mountains of British Columbia, moved south to the southern end of the Puget Sound basin near Olympia. Up to 3,500 feet of glacial ice covered the Kitsap Peninsula. Geologic units from at least five major and several minor glacial advances have been identified in the Puget Sound basin, although only three are exposed (visible) in Kitsap County.

Each glacial advance is characterized by a similar set of geologic events. Advancing ice blocked rivers, which normally drained to the north and formed lakes in the southern portion of the Puget Sound basin. These lakes drained to the south. Widespread, fine-grained, lacustrine sediments were deposited by meltwater streams. Glacial till (a compact unsorted mix of clay, sand, and gravel, looking much like concrete) was then deposited directly under the glacier as it overrode the outwash sediments. Local recessional outwash sand and gravel deposits later formed from melt water as the front of the ice sheet receded to the north. Non-glacial intervals between the advances are characterized by fluvial (stream) sediments and peat.

The Fraser Glaciation, which occurred from 15,000 to 13,500 years ago, was the last glacial advance in the central Puget Sound basin (Deeter 1979). It eroded or covered much of the previous deposits. Deposits from the Fraser Glaciation in the area are characterized by silt and clay overlain by thick advance outwash sand, abundant till cover, and only local recessional outwash. Recessional meltwater outwash streams, much larger than present day streams, eroded and formed the larger valleys in the area. Valleys with “underfit” streams and estuaries or drowned river mouths were formed by the greater flow rates of outwash streams and a lower sea level during the Fraser Glaciation.

Following the final retreat of the Fraser Glaciation, erosional and depositional processes sculptured, and continue to shape, the landscape. Bluffs along the Puget Sound are being eroded and re-deposited as beaches and spits. Streams are eroding their banks and then depositing sediments in floodplains, wetlands, and bays.

2.2 - Marine Waters and Nearshore of East Kitsap County

The marine nearshore area of East Kitsap County and Bainbridge Island is irregular and composed of numerous bays, harbors, and lagoons, with varied topography and slope. The nearshore in the East Kitsap Watershed includes Colvos Passage, Sinclair Inlet, Dyes Inlet, Port Orchard Bay, Liberty Bay, Miller Bay, Appletree Cove, Port Madison, Bainbridge Island, Blake Island, Point No Point shoreline and the east side of Foulweather Bluff. Combined, there are approximately 192 miles of marine shoreline in the East Kitsap Watershed. The majority of East

Kitsap shoreline is relatively protected from severe weather conditions, although the east side of Bainbridge Island, Port Madison, and the east shoreline of Foulweather Bluff are exposed to high wind and wave energy.

The East Kitsap nearshore constitutes a significant portion of the nearshore habitat in central Puget Sound. The many estuaries and other shoreline habitats are used not only by the salmon produced in our own streams but also by juveniles from major rivers throughout Puget Sound as they migrate towards the open ocean. Use of this migration pathway by juveniles from various Puget Sound and Georgia Basin rivers is well documented (Fresh et al. 2003; Dorn & Best, 2005). The East Kitsap shoreline is probably even more important today than in historic times due to the highly urbanized shorelines along the east side of Puget Sound and the extensive loss of estuarine and nearshore habitats there. One result of the large number of streams that drain into the East Kitsap nearshore is an unusually diverse nearshore habitat with many small and medium sized estuaries, spaced relatively closely along the coast. This distributed network of estuaries provides a rich migration path for young salmon. These habitats are maintained by natural physical, chemical & biological processes which have generally been compromised by development of shorelines.

Examples of East Kitsap habitat types:

Salt Marshes: Salt marshes range from narrow fringes to fairly extensive areas. Salt marshes throughout Puget Sound have been significantly impacted. By some estimates over 70% of marshes have been lost in Puget Sound. Observational information suggests that significant and wide-ranging impacts have occurred to marshes within the East Kitsap Watershed. Losses have not been quantified, although they could by making comparisons between existing marsh areas and historic marsh areas documented fairly accurately in late 1800's US Coastal and Geodetic Surveys.

Salt Marshes:

- Point No Point Wetland
- Mouth of Eglon Creek
- Applecove Point
- Carpenter Creek Saltmarsh/Appletree Cove
- Doe-Keg-Wats Saltmarsh, Port Madison
- Nooschkum Point, Miller Bay
- Dogfish Bay Saltmarsh
- Virginia Point, Scandia Area
- Steele Creek Estuary, Burke Bay
- Mouth of Mosher Creek
- Illahee Creek Saltmarsh
- Barker Creek Estuary
- Chico Bay Saltmarsh
- Gorst Estuary
- Little Clam Bay Estuary

Salt Marshes:
- Olalla Creek Estuary
- Mouth of Clear Creek
- Clear Creek Lagoon
- Curley Creek Estuary
- Harper Estuary
- Beaver Creek Estuary
- Ross Creek Saltmarsh
- Blackjack Creek Estuary
- Point Monroe Pocket Estuary
- Battle Point Pocket Estuary
- Fletcher Bay Estuary
- Cooper Creek Estuary, Eagle Harbor
- Eagle Harbor (fringe marshes)
- Port Madison Bay (fringe marshes)
- Schel-Chelb Estuary, Rich Passage
- Blakely Harbor Log Pond
- Manzanita Creek Estuary, Little Manzanita Bay
- Manitou Beach Marsh, Murden Cove
- Murden Creek Estuary, Murden Cove

Feeder Bluffs: The Coastal Zone Atlas shows locations of feeder bluffs and erosion scars from past slope failures and the Bainbridge Island Nearshore Assessment identified additional actively eroding feeder bluffs (Small, 2002). Notable eroding bluffs include the shoreline from Foulweather Bluff to Port Madison Bay, Murden Cove to Point Monroe, Wing Point to Murden Cove; Fletcher Bay to Arrow Point, Manzanita Bay to Agate Point.

Tideflats: Extensive tidal flats are present in Kitsap County and Bainbridge Island in such areas as Carpenter Creek/Appletree Cove, Miller Bay, Liberty Bay, Dyes Inlet, Sinclair Inlet, Clam Bay, Pleasant Cove, Manzanita Bay, Murden Cove, Rolling Bay to Point Monroe, Fletcher Bay, Blakely Harbor, and Eagle Harbor.

Submerged Aquatic Vegetation: Eelgrass beds (*Zostera marina* and *Zostera japonica*) occur along approximately 48% of East Kitsap shorelines and kelp beds occur along approximately 21% of the shoreline (WDNR, 2001). While East Kitsap shorelines support aquatic vegetation the aerial extent and condition of eelgrass and kelp has not been accurately determined. Known losses include bull kelp forests in Rich Passage near Point White and eelgrass beds that once extended well into Eagle Harbor (Peter Namtvedt Best, personal communication).

Native Riparian Vegetation: There has been a significant loss of riparian function along the East Kitsap marine shoreline. According to the ShoreZone database (WDNR, 2001), only 23 percent of the East Kitsap shoreline has overhanging riparian vegetation. The ShoreZone estimates of overhanging vegetation on Bainbridge Island were consistent with the 27 percent documented during a recent on-the-ground inventory (Best, 2004). The Bainbridge Island

Nearshore Assessment also found that only 54 percent of the Island's marine riparian zone remains naturally vegetated and 23 percent is covered by impervious surfaces. Much of the shoreline of the Point No Point nearshore remains forested and nearshore areas remain largely unaltered by human activity. This area may likely represent some of the highest quality nearshore habitat remaining on the western side of the upper Puget Sound.

2.3 - East Kitsap County Subwatershed Descriptions

2.3.1 - Colvos Passage/Rich Passage Subwatershed

This area lies between the KGI (Key Peninsula, Gig Harbor, and Islands) subwatershed to the south and the Sinclair Inlet subwatershed to the west, including streams flowing to the west side of Colvos Passage and Rich Passage. From Point Glover in Rich Passage to just south of Olalla Creek in the Colvos Passage includes approximately 20 miles of saltwater shoreline. In spite of cumulative impacts of shoreline development along Colvos Passage, there is still a rich diversity of habitats, including intertidal marsh, mud flat, sand spits, and other nearshore features, as well as the estuaries of several streams (Curley, Olalla, and Beaver Creeks).

2.3.2 - Sinclair Inlet Subwatershed (from PSCRBT 1990)

The Sinclair Inlet watershed drains an area of 27,492 acres, including the creeks that flow into Sinclair Inlet (primarily along the southern shore) and the Beaver Creek watershed to the east. The watershed includes 57 miles of saltwater frontage, approximately 46 lakes with 9.7 miles of shoreline, and >62 miles of streams. The watershed is characterized by many small streams that drain relatively small areas. Gorst and Blackjack creeks are the main dischargers of freshwater into the Inlet (TetraTech 1988, as cited in PSCRBT 1990). Estimates of freshwater runoff into Sinclair Inlet have ranged from 335 cfs in January to 5 cfs in August. The contribution of groundwater flow to the inlet is unknown but thought to be substantial (Lincoln and Collias 1975, as cited in PSCRBT 1990).

Forest land covers 7,626 acres or about 28%of the watershed (20% is in public ownership, 68% in private woodlots, 12% in commercial forest land) (PSCRBT 1990). In 1990, >95% of the forest land was stands over 10 years of age. Rural/agricultural areas cover 10,627 acres, or about 37% of the watershed (35% covered with grass/shrubs, 65% covered with trees).

A management guideline for animal grazing is one animal unit (AU, defined as one 1000-pound cow and calf) per acre of pasture for a 7-month growing period. As rural lots become smaller, the number of AUs increases, which increases the potential for pollution. Pastures with high densities of livestock also tend to be in the worst condition. PSCRBT (1990) identified 76% of the farms and 75% of the pasture land acreage in the Sinclair Inlet watershed as being in poor or only fair condition, mostly the result of higher densities of grazing than the land can support. Another major problem associated with animal keeping activities is direct livestock access to streams. PSCRBT (1990) identified that 37% (54) of the farms as having streams of ditches on or adjacent to them, of which 80% still allowed livestock access to the streams. Animal access to streams results in direct discharge of wastes trampling of streambanks, and loss of riparian vegetation.

Bremerton and Port Orchard are the major urban areas with additional retail centers at Gorst, Manchester, and Annapolis. Kitsap County designates approximately 6,658 acres (24%) of this watershed as urban. The remainder of the watershed is characterized by large parcels of pasture, forest, single-family homes, small farms, and low-intensity commercial uses.

Most of the watershed consists of low, rolling hill topography. Slopes in the upper watershed are moderate, with some steep slopes (>50%) occurring in the City of Bremerton watershed.

Agricultural areas in the Blackjack creek drainage are gently rolling to nearly flat. Very steep bluffs dominate the shorelines of Port Orchard Narrows, and portions of Sinclair Inlet and Rich Passage. The highest point in the watershed is approximately 1,360 feet, about one mile west of Alexander Lake.

The USFWS has classified 5,012 acres of wetlands in the Sinclair Inlet watershed, with 17% being freshwater and 83% being marine. The PSCRBT identified an additional 57 acres of freshwater wetlands (ponded water and hydrophytic vegetation) using aerial photography, and an additional 1,560 acres of hydric soils using soils interpretation.

Sinclair Inlet and Rich Passage have a surface area of 4,668 acres. The main basin of Sinclair Inlet is deepest near the eastern end (130 feet) south of Point Herron, but the head of the bay is <10 feet deep. Tideflats present at the head of the inlet are exposed during low tides. The currents of Sinclair Inlet are relatively weak, at only 0.8 knots (Determan 1980, as cited in PSCRBT 1990). The estimated total flushing time is approximately 14 days for Sinclair Inlet (Lincoln and Collias 1975, as cited in PSCRBT 1990), assuming that none of the waters leaving the inlet on ebb tides returns on flood tides. In reality, some waters do return and waters from Sinclair and Dyes inlets mix in an area off Annapolis. The volume that mixes and returns on flood tides to Sinclair Inlet is unknown (TetraTech 1988, as cited in PSCRBT 1990).

2.3.3 - Dyes Inlet Watershed (from PSCRBT 1989)

The Dyes Inlet subwatershed drains an area of 30,289 acres, including the creeks that flow into Dyes Inlet and Port Washington Narrows. Approximately 40% of the watershed is within the urban area (12,231 acres) designated by Kitsap County. Bremerton and Silverdale are the major urban areas, with smaller retail centers at Chico, Tracyton, and Kitsap Lake. The Jackson Park Navel Reservation, Camp Wesley Harris, and parts of the Bangor Naval Reservation are located within the watershed. The remainder of the watershed is characterized by large parcels of land used for pasture, forest, wetlands, single-family homes, small farms, and low-intensity commercial uses.

Most of the watershed consists of low, rolling-hill topography. Slopes in the upper watershed are moderate, with the steepest slopes (>60%) occurring in the Lost Creek drainage. The highest point in the watershed is on Green Mountain (1,500 feet). Agricultural areas in the Clear Creek drainage are nearly flat. Steep, sloping sea cliffs and bluffs dominate the Port Washington Narrows shoreline.

The Dyes Inlet watershed is characterized by many small streams that drain relatively small areas. Clear, Barker, and Chico creeks are the main dischargers of freshwater into Dyes Inlet.

Freshwater runoff into Dyes Inlet varies considerably throughout the year. The contribution of groundwater flow to the inlet is unknown, but thought to be substantial (Lincoln and Collias 1975, as cited in PSCRBT 1990).

The Chico Watershed alternative futures analysis is a natural resource assessment approach for guiding community planning and natural resource protection. This project is Kitsap County's first attempt to develop a landuse plan based on a watershed boundary and natural watershed functions. This process provides a forum for community members to better understand landuse and water resource issues and to articulate their own vision for the future. These future visions are displayed in a series of land use maps and assumptions. Once these alternative futures have been created the maps are analyzed for their potential effects on the natural resources of the watershed. Results for effects on hydrology, channel conditions and wildlife habitat will be used to guide the development of a sub-area plan for the Chico watershed. The alternative futures approach is intended to help local governments simplify the task of integrating numerous land use planning and natural resource protection objectives into a coherent, scientifically supported, vision of the future. This approach integrates watershed and land use planning to address the impacts of growth and to align the goals of community planning with long-term sustainability. Alternative Futures Planning is a technique designed to analyze the relationships between human activities and changes that occur in the natural environment. The result of the process is a watershed management plan that is based on watershed function and natural resource protection and designed around a vision of the future that is articulated by the citizens of the watershed.

The Dyes Inlet watershed contains a diverse array of land uses. Land use in the watershed was estimated to be 25% forested, 29% rural/agricultural, 40% urban, and 6% other (lakes, wetlands, military, parks, etc.)(PSCRBT 1989). There has been extensive conversion of rural/agricultural/forest land to urban (residential and commercial) area since 1989, particularly in the Clear Creek and Barker Creek watersheds. The USFWS classified 5,785 acres of wetlands in the Dyes Inlet watershed, with 20% being freshwater and 80% being saltwater. Because of inventory methods, this does not constitute a complete list of existing wetlands. The PSCRBT identified and additional 78 acres of freshwater wetlands, and an additional 1,207 acres of hydric soils.

Over 75% of the soils in the Dyes Inlet watershed are included in the Alderwood/Kapowsin/ Shelton soil classification. These soils are nearly level to rolling, formed in material weathered from glacial till. The subsurface layers are gravelly sandy loams over a cemented hardpan at a depth of 20-40 inches. Permeability is moderate to moderately rapid above the hardpan and very low through the hardpan. This results in a perched water table. Runoff is slow and erosion hazard is slight. On-site sewage disposal systems often fail or do not work properly during periods of high rainfall because of these limitations, resulting in runoff that can carry animal waste, nutrients and other pollutants. Approximately 15% of the soils in the Dyes Inlet watershed are in the Indianola/Dystric Xerorthents soil classification. These occur on broad uplands and along side slopes or river valleys, formed in glacial outwash. These soils are somewhat excessively drained with rapid permeability. Runoff is slow and erosion is slight on lower slopes; however, on slopes >45% there is a potential for runoff and erosion. These soils are also poor for on-site sewage treatment, as they provide poor filter material, with greater potential to pollute groundwater. Approximately 8% of the soils in the Dyes Inlet watershed are in the

Kilchis/Schneider soil classification. These soils occur on the steep mountain slopes and crests found in the upper watershed, formed in material weathered from basalt. The surface layer is typically a very gravelly sandy loam, with a depth to bedrock of 20-40 inches. Runoff is rapid and erosion hazard is moderate to severe. These soils are also not suitable for on-site sewage disposal due to slope and depth to bedrock.

Dyes Inlet and the Port Washington Narrows have a surface area of 4,642 acres. The main basin of Dyes Inlet is deepest near the center (150 feet), but the adjacent bays are typically <35 feet deep (PSCRBT 1989). Tideflats present in the small bays and at the head of the inlet are exposed during low tides. The currents of Dyes inlet are relatively weak, but those of Port Washington Narrows are strong (4 knots)(NOAA 1988, as cited in PSCRBT 1989). The estimated total flushing time is approximately four days for Dyes Inlet (Lincoln and Colias 1975, as cited in PSCRBT 1989), assuming none of the waters leaving the Inlet on ebb tides returns on flood tides. In reality, some waters do return and waters from Sinclair and Dyes inlets mix in an area off Annapolis. The volume that mixes and returns on flood tides to Dyes Inlet is unknown (Tetra Tech 1988, as cited in PSCRBT 1989).

2.3.4 - Port Orchard Subwatershed

The Port Orchard subwatershed lies between the Sinclair Inlet and Dyes Inlet subwatersheds (to the south and west) and the Liberty Bay/Miller Bay subwatershed to the north. It includes those streams that flow from the west to Port Orchard from the Kitsap peninsula, and those that flow from the west side of Bainbridge Island on the east side of Port Orchard. The Bainbridge Island streams are included in the Bainbridge Island subwatershed discussion. No existing descriptions of this subwatershed area were located.

2.3.5 - Liberty Bay/Miller Bay Subwatershed (from PSCRBT 1994)

The Liberty Bay/Miller Bay watershed drains an area of 27,629 acres. Approximately 48% (13,224 acres) of the watershed was identified as residential land use in 1994, with parcels varying from <1 acre to 10 acres, with 52% of the platted residential area developed at that time. Poulsbo and the marine waterfront have the highest concentrations of residential use. Land use was estimated to be: 21% (5,654 acres) commercial forest land, 9% (2,587 acres) agricultural land (mostly small non-commercial farms), 1% (325 acres) commercial/industrial land, 2% (466 acres) military land, and 2% (640 acres) miscellaneous land use. An additional 17% (4,733 acres) was identified as open land that is likely being held for recreational purposes or as future real estate investments. This watershed experienced rapid development from 1980 to 1990, with an increase in housing units and population of 29%. This rapid rate of development has continued through the 1990s.

Over 75% of the soils in the Liberty Bay/Miller Bay watershed are included in the Poulsbo/Alderwood soil classification. Soils in this group occur on slopes ranging from flat to moderately steep. Creeks draining this soil group generally have little or no floodplain. This group is characterized by a moderately permeable, uncompacted till layer, 20-40 inches deep, overlying very compacted till material (hardpan). The soils are well drained above the hardpan, with low permeability through the pan. As a result, precipitation drains quickly to the hardpan then flows laterally to an outlet in a depression, hillside seep, creek, or road cut. Water often collects above the hardpan creating a seasonal high water table during the winter months. Approximately 17% of the soils in the Liberty Bay/Miller Bay watershed are in the Ragnar/Indianola soil classification. The soils in this group formed in glacial outwash. These soils have rapid permeability. Runoff is slow and erosion is slight on lower slopes; however, where the Ragnar soil is mapped on slopes >6%, the hazard of water erosion is severe. These soils are also poor for on-site sewage treatment, as they provide poor filter material, with greater potential to pollute groundwater. Approximately 10% of the soils in the Liberty Bay/Miller Bay watershed are in the Norma/McKenna soil classification, formed in a variety of materials. Surface water saturates and ponds on these soils during winter months. Runoff is slow and the hazard of water erosion is slight, except for likely streambank erosion on alluvial soils, where vegetation is removed by livestock or residents. The Kitsap soil group covers 5% of the watershed, in concentrations in the Scandia area, around Poulsbo, and in uplands in the Big Valley and Grovers Creek area. This silt loam soil formed in sediment from glacial lakes. Permeability is low with a seasonal high water table. This soil has a high potential for slippage on slopes >8%. Soils in many of the creek corridors in the Liberty Bay/Miller Bay watershed are prone to slumps, slides, or severe water erosion.

Liberty Bay is a relatively narrow shallow embayment (<60 feet deep). The bay is considered to be poorly flushed, with a tendency to concentrate pollutants PSCRBT 1994). Miller Bay is the second largest embayment in the watershed area, and is also shallow and poorly flushed. Many homes are located near the shore zone of the watershed, increasing possible septic effluent loading and other nonpoint pollutants to marine waters.

Portions of Liberty Bay have been classified as a conditionally approved shellfish harvest area since 1967. In 1994, 681 acres of shellfish beds within Liberty Bay were classified as restricted, with an additional 610 acres classified by the Dept. of Health (1991) as prohibited due to animal wastes, nearby marinas, and other nonpoint sources. These restrictions are due primarily to elevated fecal coliform contamination. Five potentially significant sources of pollutants were identified in Liberty Bay (PSCRBT 1994), including; the Dogfish Creek watershed, the unsewered west shoreline of Liberty Bay, stormwater runoff from the eastern Liberty Bay shoreline, raw sewage from boats moored in four area marinas, and an EPA Superfund site on the Keyport Naval Undersea Warfare Engineering Station

Longshore drift, caused by oblique wave action causing currents parallel to the beach, causes sediment to move along the shore to a bay or river mouth where the sediment is deposited to form a spit (PSCRBT 1994). Beach erosion results if the sediment normally transported by the drift is cut off. This scenario is likely in the Miller Bay spit-Indianola area if cliffs to the east, that naturally erode and provide the sediment, are protected by structures such as marine bulkheads. Building protective structures is only an expensive, short-term control measure, which usually results in the need to build additional protective structures. Restoring the natural sediment load is needed to stop beach erosion.

2.3.6 - Port Madison to Foulweather Bluff Area

This area extends from Miller Bay, at the northwest corner of Port Madison, north to Foulweather Bluff, including the Point No Point nearshore and Appletree Cove in Kingston, Washington and includes approximately 20 miles of saltwater shoreline. Much of the shoreline of the Point No Point nearshore remains forested and nearshore areas remain largely unaltered by human activity. This area represents some of the highest quality nearshore habitat remaining on the western side of the upper Puget Sound. Carpenter Creek drains into a natural estuary and into Appletree Cove. In spite of two undersized culverts within the estuary that restricts saltwater exchange and natural sediment transport to the outer estuary, the estuary remains in relatively good shape. There is an active watershed group in the Carpenter Creek drainage, and plans are underway to replace the culverts with bridges of sufficient length to restore near historical estuarine functions.

2.4 - Bainbridge Island Subwatersheds & Nearshore Areas

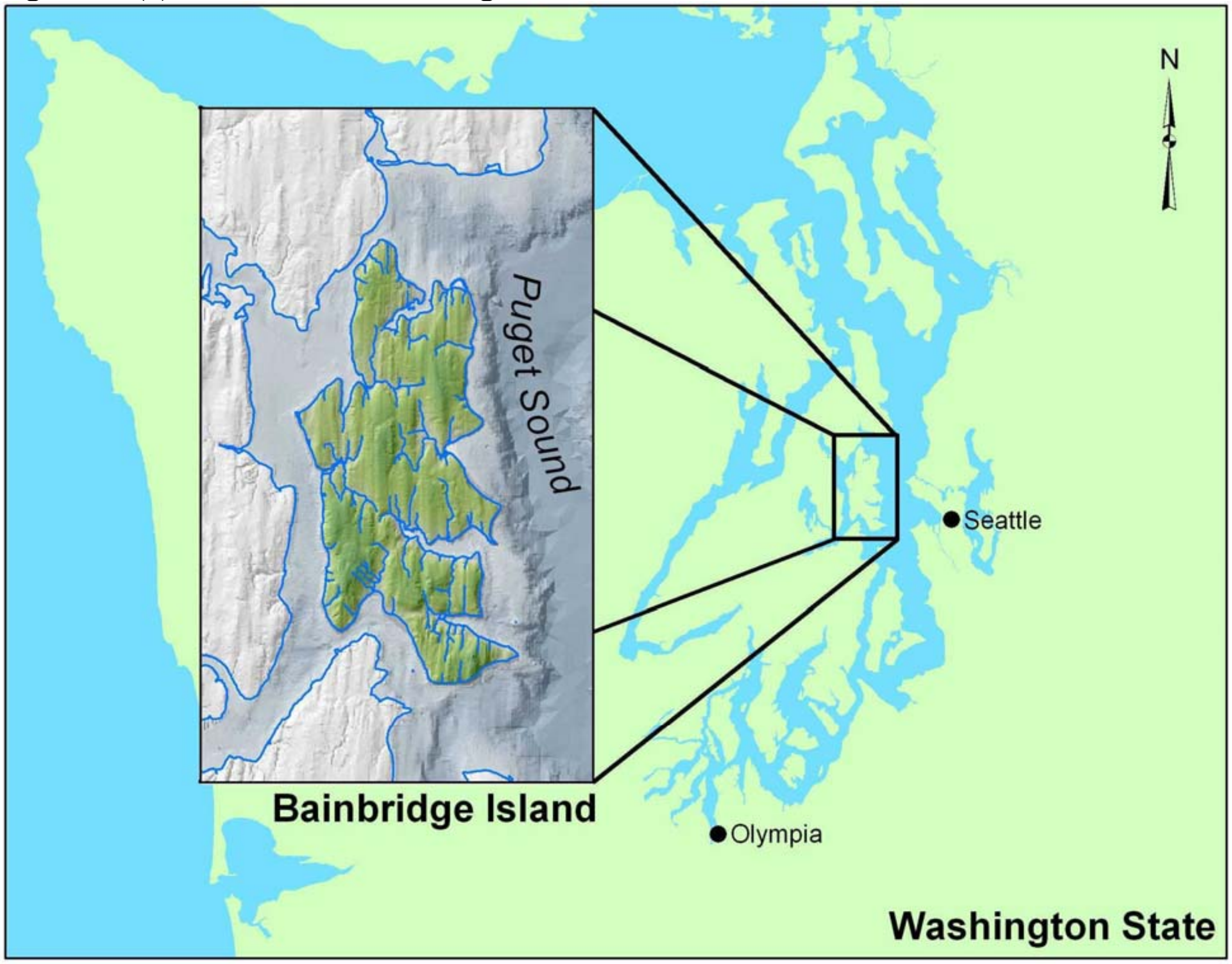
(*modified largely from PSCRBT 1995; Kato & Warren 2001; Williams et al 2003; and Williams et al 2004*)

Bainbridge Island is located east of the Kitsap Peninsula and west of the City of Seattle (see Figure 2.4(a)) in the Central Puget Sound. The Island is approximately 5 miles wide and 10 miles long, encompassing approximately 17,800 acres, or 28 square miles, and is one of the larger islands in Puget Sound.

Euro-American settlement of the Island began in the mid-1800's and was predominantly focused around large saw mills in Port Madison Bay and Blakely Harbor and ship building that first occurred in Blakely Harbor and later moved to Eagle Harbor. The Island's two saw mills had shut down by the early 1900's but ship repair and maintenance has remained a significant industrial presence in Eagle Harbor. Military installations and creosote wood treatment were significant industries for most of the 20th century. Agriculture (largely strawberries) became a significant Island industry in the early 1900's and continued through the mid 1900's. A large number of steam powered ferries known as the Mosquito Fleet connected the Island to the rest of Puget Sound until the early 1950's and significantly influenced development patterns along the shoreline. In 1950 SR-305, the Agate Pass Bridge, and the Washington State Ferry Terminal in Winslow were built and influenced a broadening of development and increased growth across the Island.

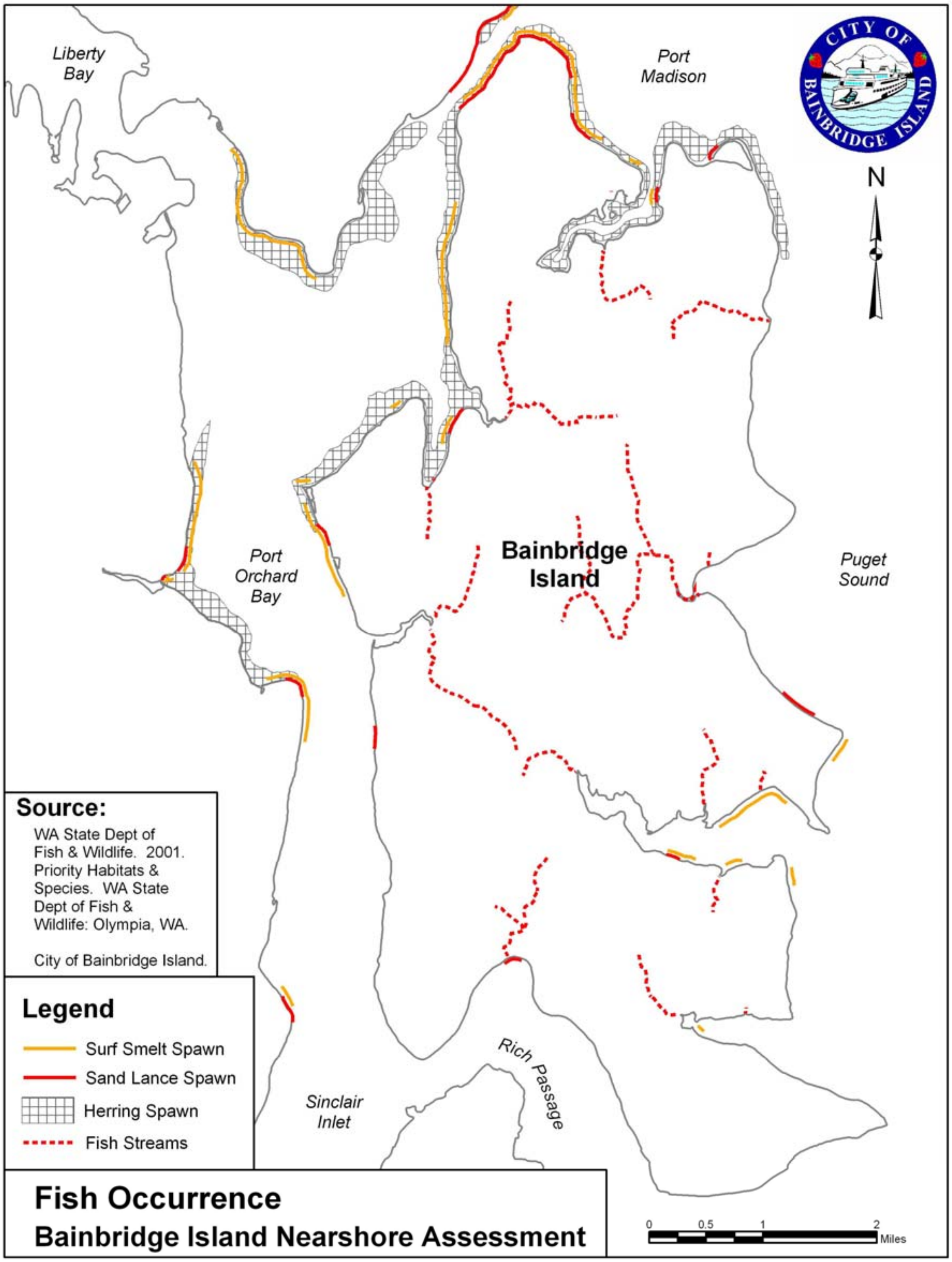
Since that time, the Island has experienced periods of rapid growth, particularly in recent decades, increasing from a population of 4,132 in 1950 to a population of 20,308 in 2000 (US Census). The population is projected to grow to nearly 28,660 by the year 2025 (Puget Sound Regional Council forecast), an increase of 41 percent from the 2000 census. This population growth is likely driven by the Island's semi-rural and small-town ambiance, public school system, and proximity to Seattle, the State's largest employment base. A significant portion of the Island's population commutes to work in Seattle via ferry.

Figure 2.4(a). Location of Bainbridge Island.



The Island was mostly part of unincorporated Kitsap County until 1991, when the unincorporated portions of the Island ware annexed by the City of Winslow and became the City of Bainbridge Island. The Island is predominantly residential, with the majority of development concentrated in and around Winslow (the Island's urban core), Neighborhood Service Centers, a few light manufacturing areas, and along the shoreline. Outside of the Winslow area, the interior of the Island is predominantly zoned for a residential density of one unit per 2.5 acres and the shoreline is predominantly zoned for a residential density of one or two units per acre. The Bainbridge Island Comprehensive Plan (COBI 2004) calls for 50% of population growth to be absorbed within Winslow.

Figure 2.4(b). Fish Occurrence on Bainbridge Island.
(*From Williams et al 2003*)



2.4.1 - Bainbridge Island Subwatersheds

Bainbridge Island's subwatersheds are largely the product of our regions glacial history. The rolling topography of Bainbridge Island contains several north to south oriented points and ridges that were largely shaped by glacial advances and retreats. Low-lying valleys occur between many of the ridges. The elevation ranges from sea level to approximately 400 feet. While most of the Island has typical lowland Puget Sound glacial geology, the geology of the southern portion of the Island is dominated by highly fractured sedimentary bedrock formations consisting of shale, sandstone, and conglomerates that are thought to be inclined between 45 and 90 degrees. This change in geology can be attributed to uplift of the southern portion of the island resulting from activity along the Seattle fault; an extension of the Seattle fault line crosses east-west through Blakely Harbor and the southern portion of the Island. Sedimentary bedrock formations are prevalent along the southern shoreline of the Island.

The Island is subdivided into 12 subwatersheds[3], each containing several small, perennial and intermittent streams (Figure 2.4.1(a)). According to Kato & Warren (2001), half the Island's streams appear to be perennial and the other half intermittent. Precipitation ranges from approximately 35 inches on the north end of the Island to about 45 inches on the south end. Approximately 75 percent of annual precipitation falls between October and March with only about five percent of annual precipitation during July and August. The average flow of most of the Island's streams is thought to be less than one cubic feet per second (cfs), but no long-term flow measurements are known to have been collected prior to the installation of a stream gauge on Springbrook/Fletcher/Island Center Creek in 2004. Some streams (e.g. Cooper Creek and Dripping Water Creek) appear to have a significant base flows maintained by springs and seeps. Freshwater wetlands, some extensive, occur throughout the Island and along the shoreline. The Islands subwatersheds are predominantly forested and generally zoned for residential land use.

Bainbridge Island's water supplies are primarily from groundwater withdrawals. Although surface and reservoir water rights exist, virtually no new surface water rights have been approved since the 1960's and the extent of actual surface water currently withdrawn is undocumented (Kato & Warren et al 2000). Presently, two streams, Springbrook/Fletcher/Island Center Creek (Stream #0340 & 0342) and Murden/Grisdale/Woodward/Meigs Creek (Stream #0322 & 0323), are closed to further surface water allocations (Kato & Warren et al 2000; WAC 173-515-040).

Coho, chum, cutthroat, and steelhead are known to use Bainbridge Island streams (Figure 2.4(b); Haring 2000; Appendix C) although the full distribution of these species, including upstream extent has not been adequately documented. Some efforts have been made to identify fish passage barriers (Haring 2000, Kato & Warren 2001; WDFW 2002b) throughout the subwatersheds. However, these do not appear to be comprehensive, do not use a repeatable/comparable evaluation method, and are not prioritized for corrective actions. Figure 2.4.1(b) summarizes the best information currently available regarding the location and rating of fish passage barriers. The lack of a comprehensive, well documented, and prioritized list of fish passage barriers is an important data gap that should be filled.

[3] The term "subwatershed" is used in this report as a means of maintaining a consistent nomenclature that readily conveys geographical hierarchy to the reader. Locally, subwatersheds on Bainbridge Island are commonly referred to as "watersheds" or as "basins" in some technical reports.

Comprehensive water quality and stream flow monitoring and on-the-ground assessments of salmonid habitat have not been conducted in the Island's subwatersheds, but a study of general subwatershed characteristics was conducted in 1995 by the Puget Sound Cooperative River Basin Team (PSCRBT 1995) and in the 2003 Kitsap Peninsula Salmonid Refugia study (May and Peterson 2003) included Bainbridge Island watersheds. Table 2.4.1(a) summarizes some of the 1995 PSCRBT subwatershed characterizations. The refugia study is discussed in section 2.5 of this chapter below. Table 2.4.1(b) summarizes the non-point source pollution concerns reported in the 1995 PSCRBT characterization. Haring (2000) conducted a limiting factors analysis of Bainbridge Island, which was largely based on qualitative inforation due to the lack of qualitative habitat assessments. Table 2.4.1(c) summarizes the habitat condition ratings from the Limiting Factors Analysis report (Haring 2000)

Figure 2.4.1(a). Bainbridge Island Subwatersheds.

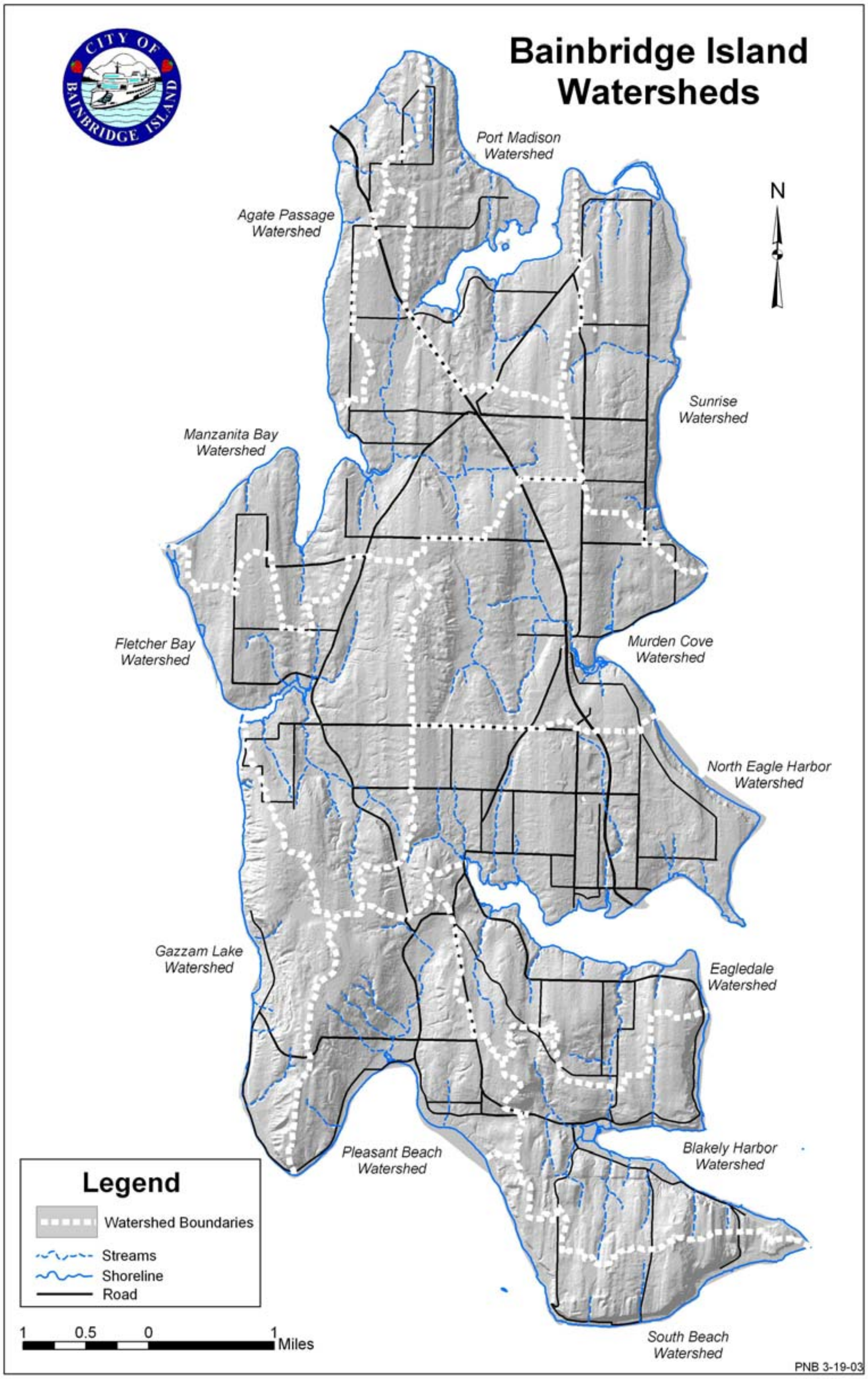


Table 2.4.1(a). Bainbridge Island Subwatershed Characteristics.

(*From PSCRBT 1995*)

Subwatershed	Total Acreage	Land Cover				Land Use							
		Wetlands	Forested	25-50% Impervious	> 50% Impervious	Residential	Open	Recreation	Transportation	Agriculture	Commercial/ Industrial	Designated Forestland	Public Facility
Agate Passage	573	6	458	1	-	497	-	-	49	12	3	-	12
Port Madison	1,522	86	1,274	17	8	988	194	153	84	61	22	16	4
Sunrise	1,347	79	980	19	26	1,063	18	24	69	86	1	58	28
Murden Cove	1,967	218	1,353	43	24	1,208	108	229	152	162	14	-	94
Eagle Harbor/ Eagledale	3,276	226	2,004	445	186	2,210	197	144	277	114	157	15	162
Blakely Harbor	1,422	86	1,191	52	-	275	1,012	46	59	21	-	-	9
South Beach	728	17	513	78	7	333	113	226	34	15	1	-	6
Pleasant Beach	1,513	109	1,174	102	7	1,009	157	-	87	70	47	134	9
Gazzam Lake	920	15	792	18	-	530	335	2	36	-	-	17	-
Fletcher Bay	2,129	157	1,603	-	22	1,429	131	165	87	223	20	70	4
Manzanita Bay	2,210	258	1,507	34	23	1,397	78	233	150	241	60	29	22
Total	17,607	1,257	12,849	809	303	10,939	2,343	1,222	1,084	1,005	325	339	350
% of Total	n/a	7%	73%	5%	2%	62%	13%	7%	6%	6%	2%	2%	2%

Note: The accuracy of these figures is unknown, methods and data sources are not well documented in the report.

Table 2.4.1(b). Bainbridge Island Nonpoint Pollution Concerns by Subwatershed.

(*From PSCRBT 1995, pg. 204*)

	Agate Passage	Port Madison	Sunrise	Murden Cove	North Eagle Harbor/ Eagledale	Blakely Harbor	South Beach	Pleasant Beach	Gazzam Lake	Fletcher Bay	Manzanita Bay
Potential Failing OSS											
- Poor Filtration	X		X			X		X			
- Bedrock						X	X				
- Slop/Soils with Slow Percolation		X			X	X	X		X		
- Threats to Bays Likely		X	X	X						X	X
Residential/Urban Runoff Transported to Bays			X		X					X	X
Marinas					X						

	Agate Passage	Port Madison	Sunrise	Murden Cove	North Eagle Harbor/ Eagledale	Blakely Harbor	South Beach	Pleasant Beach	Gazzam Lake	Fletcher Bay	Manzanita Bay
Superfund Site					X						
Discharge of Minimally or Untreated Effluent							X	X			
High Development Potential						X[1]					
Steep Slopes											
- Past/Potential Landslides			X		X	X		X	X		
- Current/Potential Surface Erosion			X	X	X	X	X	X	X		
Farms with Mod to High Pollution Potential										X	X
Shallow Aquifer											X
Major road Runoff				X							
Potential Timer Harvest on Designated Forestlands								X		X	
Landfill Under Investigation								X[2]			

[1] While Blakely Harbor still has relatively high development potential, a significant reduction in the total future development occurred with the 2001 acquisition of 255 acres for the IslandWood environmental learning center and 40 acres for the Blakely Harbor Park.

[2] The Vincent Road Landfill remediation was completed in 2003.

Figure 2.4.1(c). Habitat Condition Rating Based on Limiting Factors Analysis
[*From Haring 2000, pg 282-283]*

Stream	Fish Access	Floodplain Connectivity	Channel Conditions				Water Quality			Hydrology		Estuarine	Lack of Nutrients
			LWD	Pools	Substrate	Riparian Condition	Temp/DO	Fecal	Toxics	Peak Flow	Low Flow		
Coho Ck	P	G	G	G	G	G	*	*	*	*	*	P	*
Dripping Water Ck	G	*	*	*	*	*	*	*	*	*	*	*	*
Murden (Grisdale/ Woodward/ Meigs) Ck	*	G	*	*	P	P	*	*	*	P	CL	*	*
Ravine Ck	P	P	*	*	*	*	*	*	*	P	*	*	*

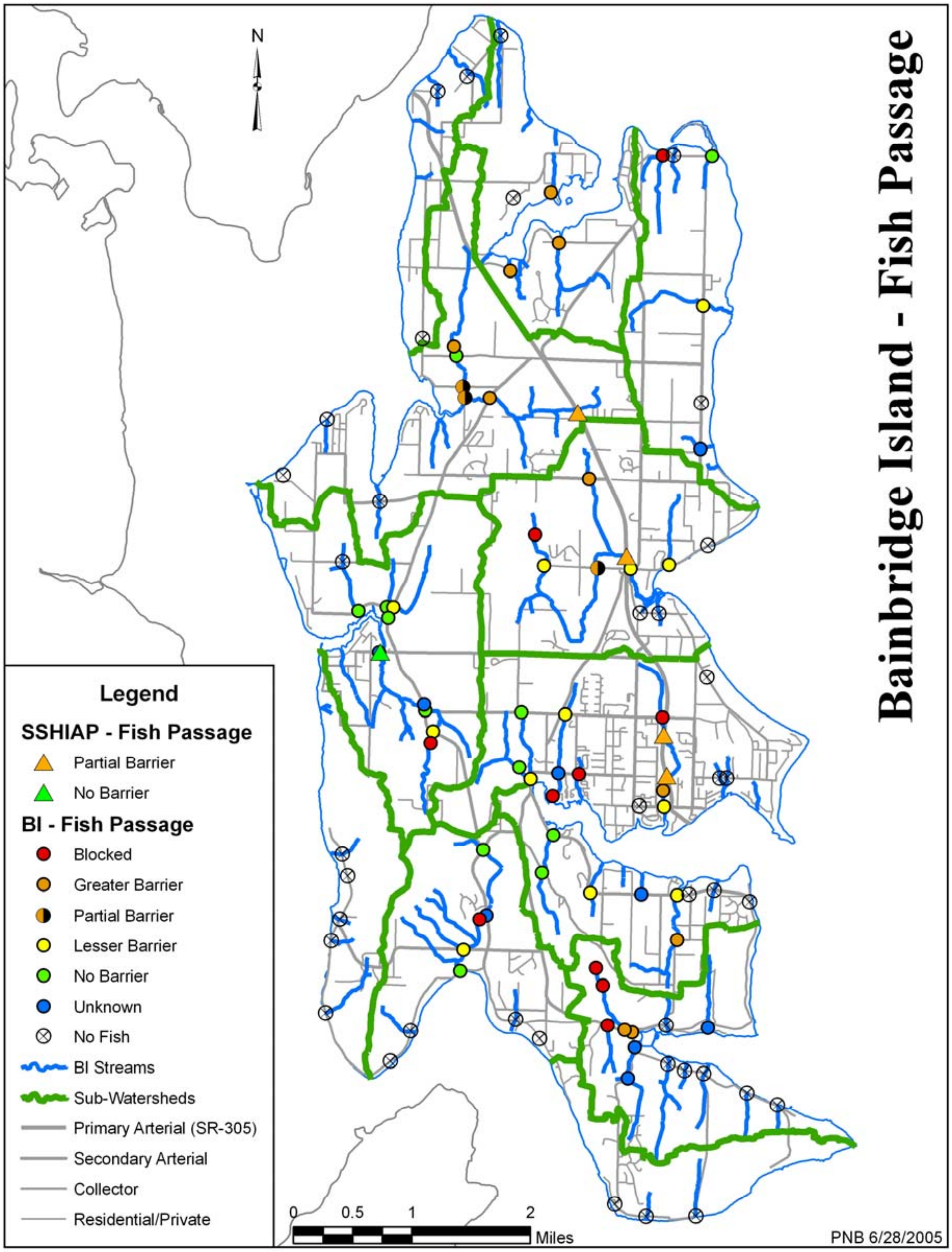
Weaver Ck	*	*	*	*	*	*	*	*	*	*	*	*	*
Hirakawa (Sportsmen's Club Pond) Ck	P	*	*	*	*	*	*	*	*	*	*	*	*
Cooper Ck	P	*	P	*	P	P-G	*	*	*	*	*	*	*
Blakely Falls Ck	G	*	*	*	*	*	*	*	*	*	*	*	*
Mac's Dam Ck	P	*	*	P-G	P-G	P-G	*	*	*	*	*	*	*
Unnamed 15.0332	*	*	*	*	*	*	*	*	*	*	*	*	*
Schel-Chelb Ck	*	*	*	*	*	*	*	*	*	*	*	G	*
Springbrook (Fletcher/ Island Center) Ck	F	P	*	*	P	P-G	*	*	*	*	CL	*	*
Manzanita Ck	P	P	*	*	*	P-G	*	*	*	*	*	*	*

Key: * = Data Gap
G = Average habitat condition considered to be good for the listed watershed
F = Average habitat condition considered to be fair for the listed watershed
P – Average habitat condition considered to be poor for the listed watershed
CL = Year-round closure to further surface water withdrawals

Note: Stream names updated for consistency with local usage and consistency in this report

Note: Due to the widespread lack of quantitative assessments, this table is largely based on the qualitative observations and experience of technical staff consulted by Haring (2000). Therefore, the timeliness, accuracy, and comparability of this data is unknown.

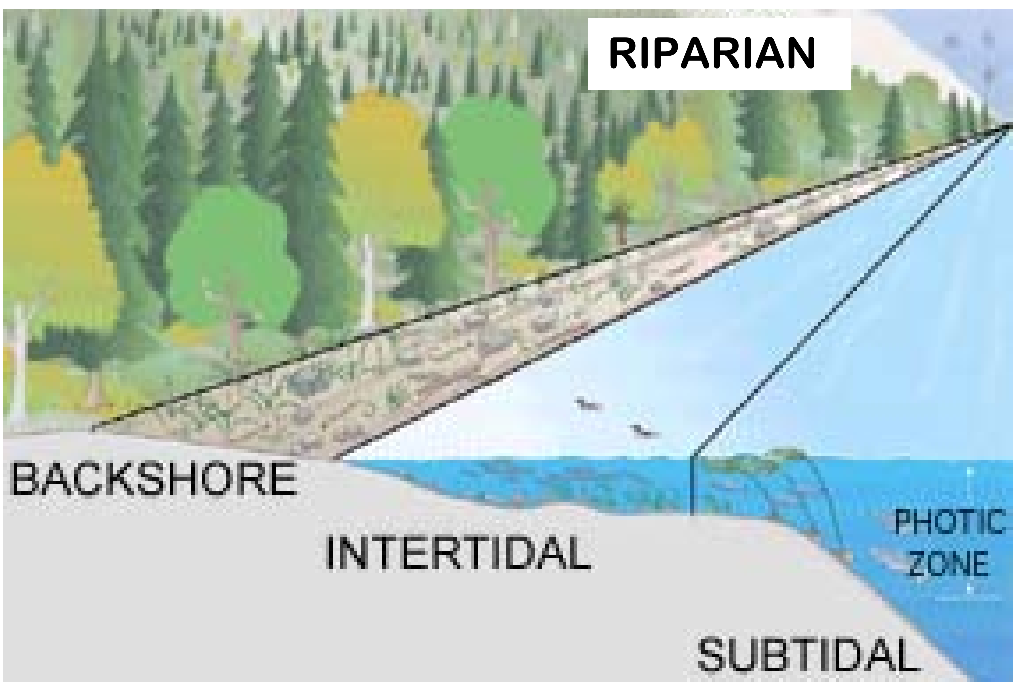
Figure 2.4.1(b). Bainbridge Island Fish Passage



2.4.2 - Bainbridge Island Nearshore

Bainbridge Island has approximately 53 miles of shoreline (Best, 2004). The shoreline is irregular, with numerous bays, inlets, and a significant diversity of other costal land forms (i.e. spits, bluffs, dunes, lagoons/pocket estuaries, cuspate forelands, tombolos, tide flats, stream and tidal deltas, islands, and rocky outcrops) (see Figure 2.4.2(a)). Major sand spits form Point Monroe and Battle Point. Extensive rocky shorelines, which are uncommon in Central Puget Sound, exist in portions of Blakely Harbor, Restoration Point, and along Rich Passage. The shoreline topography varies form relatively flat or gently sloping to high, nearly vertical bluffs. The nearshore geomorphology of Bainbridge Island is mapped in Figure 7.3.2(c).

The nearshore is the narrow strip of water and land where direct functional interactions occur between the aquatic and terrestrial environments. The nearshore extends subtidally to the depth of the photic zone (generally to a maximum depth of 30 meters MLLW). The nearshore includes all of the intertidal and backshore zones and extends upland to include the marine riparian zone. The landward extent of the marine riparian zone in Puget Sound has not been well defined by the scientific community, but the Bainbridge Island Nearshore Assessment utilized a reasonable distance of 200 feet landward of the ordinary high water mark because it is generally consistent with the scientific literature and it is the jurisdictional extend of shoreline management within the State of Washington. (Williams et al 2003 & 2004)



(*Image source: King County*)

Chinook, coho, chum, pink, cutthroat, and steelhead as well as forage fish (surf smelt, sandlance, and herring) are known to use the Bainbridge Island nearshore (Figure 2.4(b); Dorn & Best 2005; Williams et al 2003 & 2004). Forage fish spawning beaches have not been thoroughly documented (Williams et al 2003 and 2004) and should be comprehensively surveyed.

Williams et al (2003) summarized the best available science related to the Bainbridge Island nearshore and provides most of the technical basis for our scientific understandings and hypotheses about the nearshore ecosystem and ultimately provides the basis for evaluating the condition of the nearshore ecosystem. Williams et al (2003) identified nearshore habitats and discussed associated habitat structure, diagnostic species, functions, and stressors. These habitats include:

- Eelgrass Meadows
- Kelp Forests
- Flats
- Tidal Marshes
- Subestuaries (stream mouths and deltas)
- Sand Spits
- Beaches and Backshore
- Banks and bluffs
- Marine Riparian Zone.

Williams et al (2003) also identified and discussed nearshore physical processes and biological resources, and how they relate to habitat. Additionally, they summarize current scientific knowledge about the effects of nearshore modifications on physical processes, habitats, and biological resources, including salmon. Williams et al (2003), in its entirety, is located in Appendix H of this document. In order to avoid duplication, the reader is directed to that document for a thorough discussion of physical processes, habitat, and biological resources in the nearshore and the effects of human modification on them.

The City of Bainbridge Island conducted a very detailed inventory of nearshore modifications (including location and descriptive information) as well as selected nearshore biological and physical characteristics during the summer of 2001 (Best 2004; COBI 2001). Figures 2.4.2(g) and 2.4.2(h) show the distribution and density of most shoreline modifications inventoried along the shores of Bainbridge Island. Williams et al (2004) used that inventory information as well as other data representing biological resources and additional shoreline modifications (see Figures 2.4.2(b) through 2.4.2(f)) to conduct a comprehensive habitat characterization and ecological function assessment of the Bainbridge Island nearshore using a refined version of the conceptual model developed by Williams and Thom (2001), which is discussed further in section 7.3.3 below.

The assessment used two nested landscape scales as shown in Figure 7.3.3(b), including 9 Shoreline Management Areas (aggregations of drift-cells) and 201 shoreline reaches (Williams et al 2004; areas of generally homogenous geomorphology largely based on ShoreZone units, see WDNR 2001). Figure 2.4.2(i) shows the qualitative results of the assessment for ecological impacts by Management Area and reach. At the management area scale, most of the Island's nearshore is considered at risk (i.e. rated as moderate impact), which indicates that there is opportunity to improve the nearshore to an ecological condition considered to be properly functioning, however it also indicates that further impacts could result in an ecological condition considered to be not properly functioning. Two management areas (Murden Cove and Blakely Harbor) are somewhere between a properly functioning and at risk condition (i.e. rated as low/moderate impact). The assessment results indicate that no shoreline management area is considered to be properly functioning (i.e. no or low impact). Table 2.4.2 summarizes basic Management Area characteristics.

The Bainbridge Island Nearshore Characterization and Assessment report, in its entirety, is located in Appendix H of this document. In order to avoid duplication, the reader is directed to that document for a thorough discussion of the existing conditions of the Bainbridge Island nearshore.

Figure 2.4.2(a). Bainbridge Island Nearshore Geography.
(*From Williams et al. 2003*)

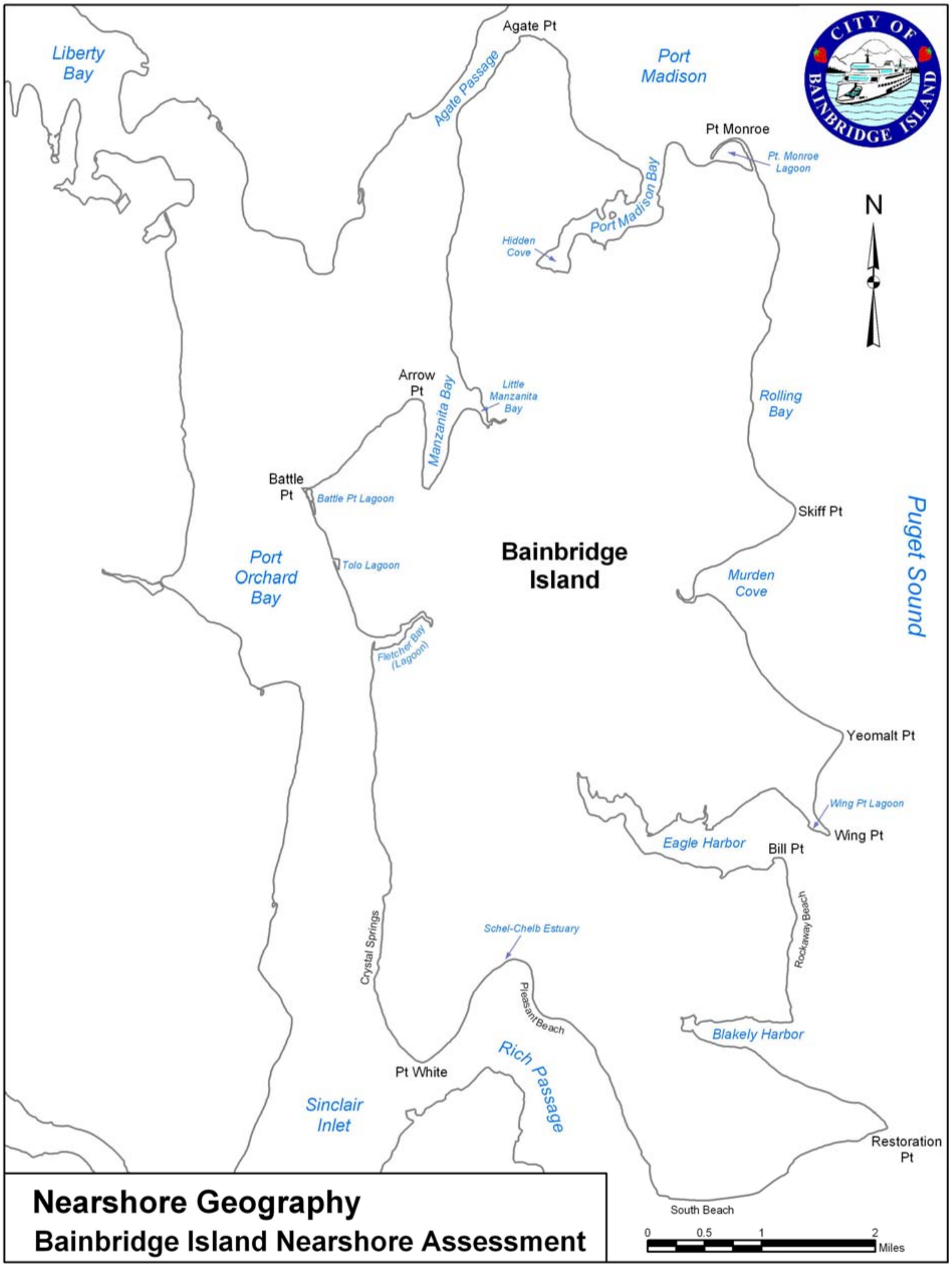


Figure 2.4.2(b). Bainbridge Island Sediment Sources and Wave Exposure
[*From: Williams et al 2004*]

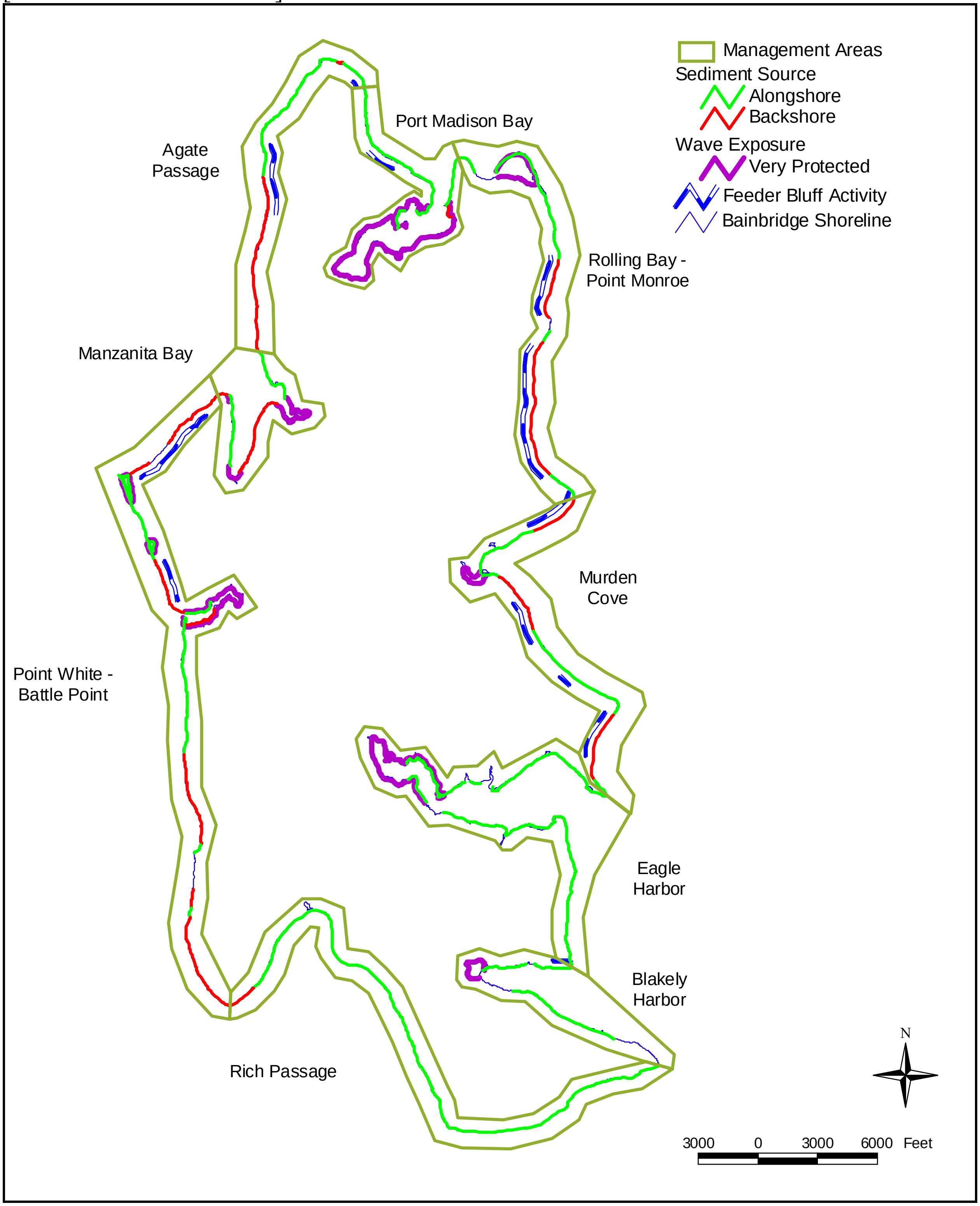


Figure 2.4.2(c). Bainbridge Island Overhanging Riparian and Saltmarsh Vegetation
[*From: Williams et al 2004*]

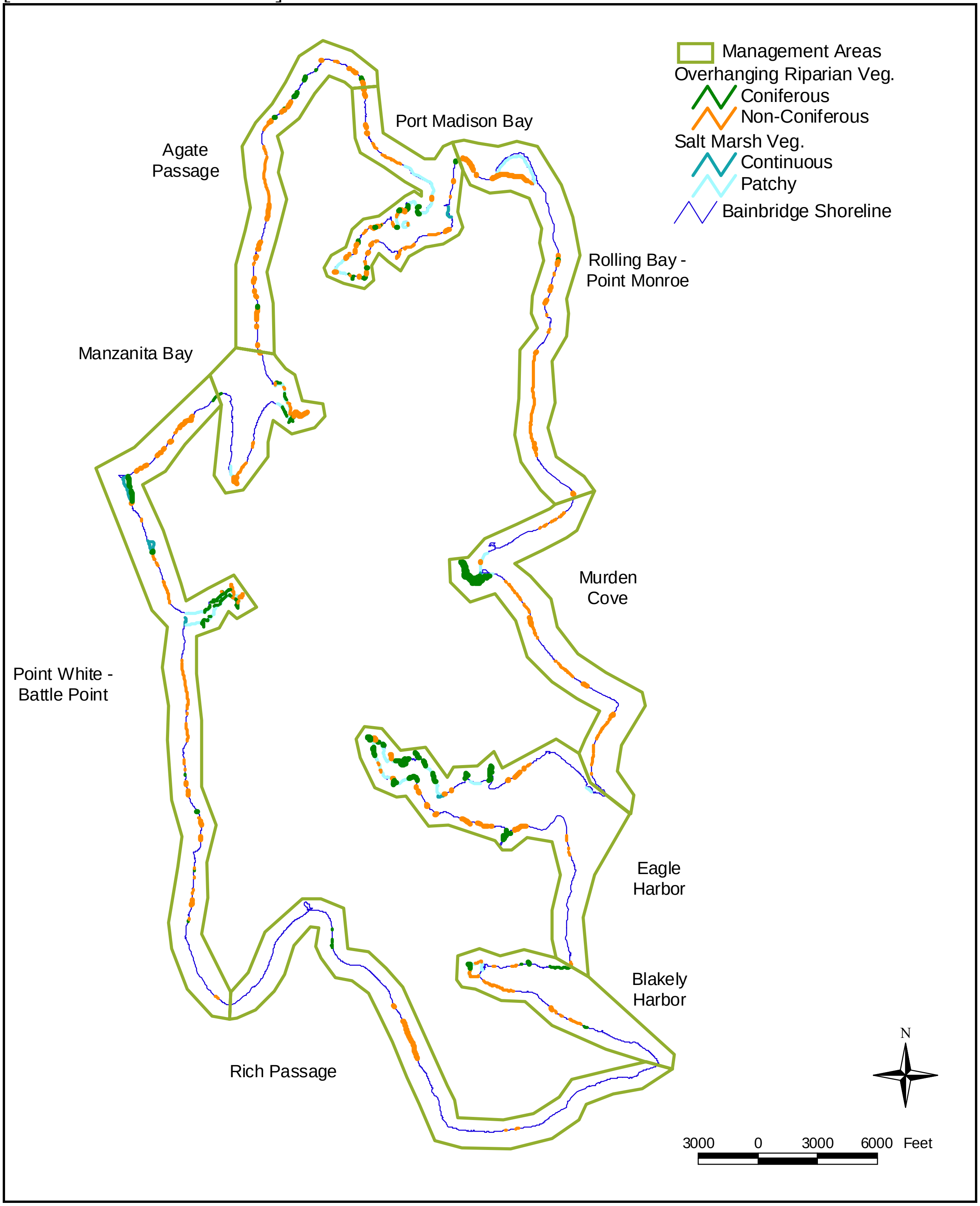


Figure 2.4.2(d). Bainbridge Isalnd Eelgrass, Kelp, and Seaweed Distribution
[*From: Williams et al 2004*]

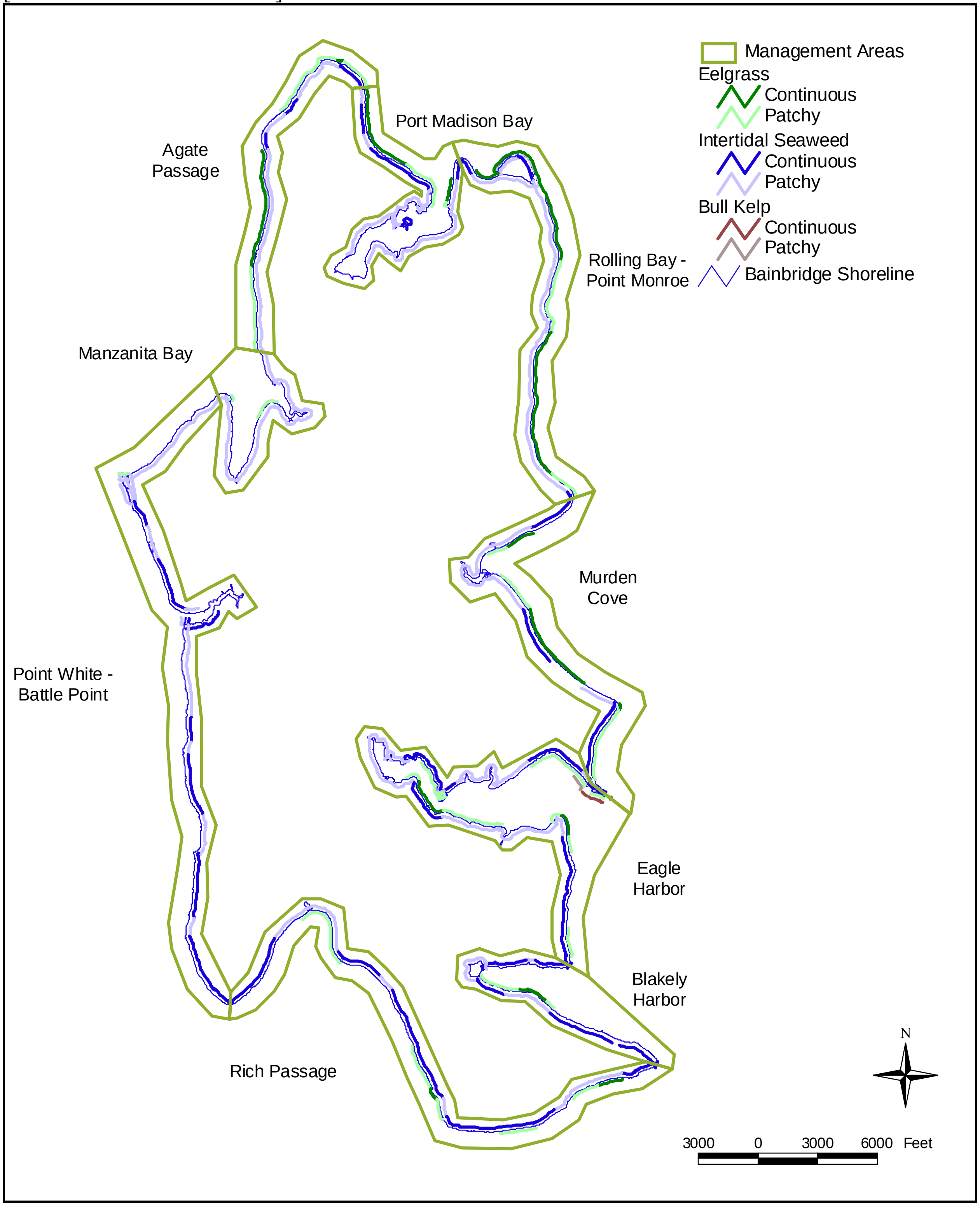


Figure 2.4.2(e). Bainbridge Island Riparian Zone Land Cover Classes
[*From: Williams et al 2004*]

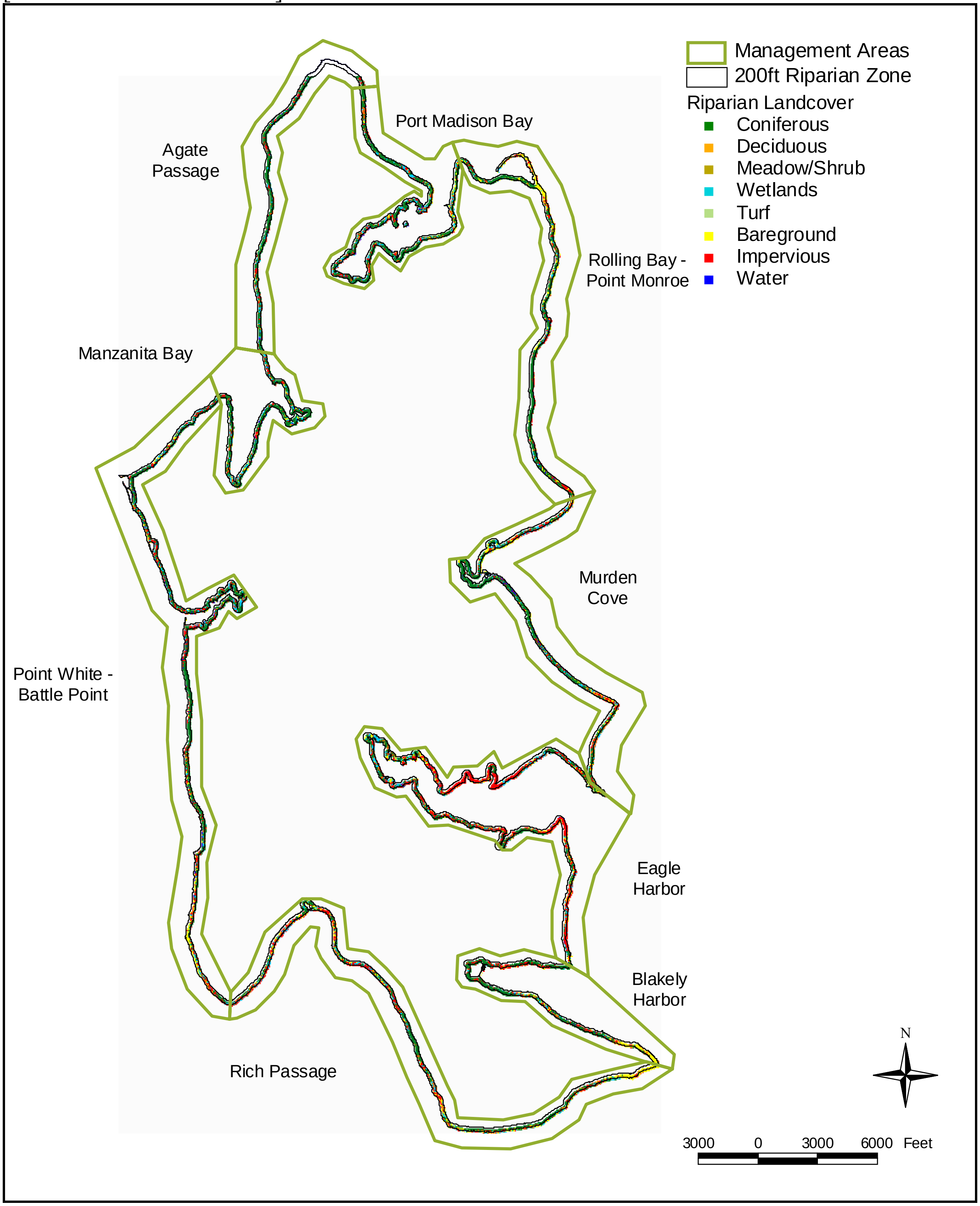


Figure 2.4.2(f). Bainbridge Island Shellfish Closures, Dredging, Tidal Constrictions, Urban Waterfront, Fish Farms, and Marina Locations
[*From: Williams et al 2004*]

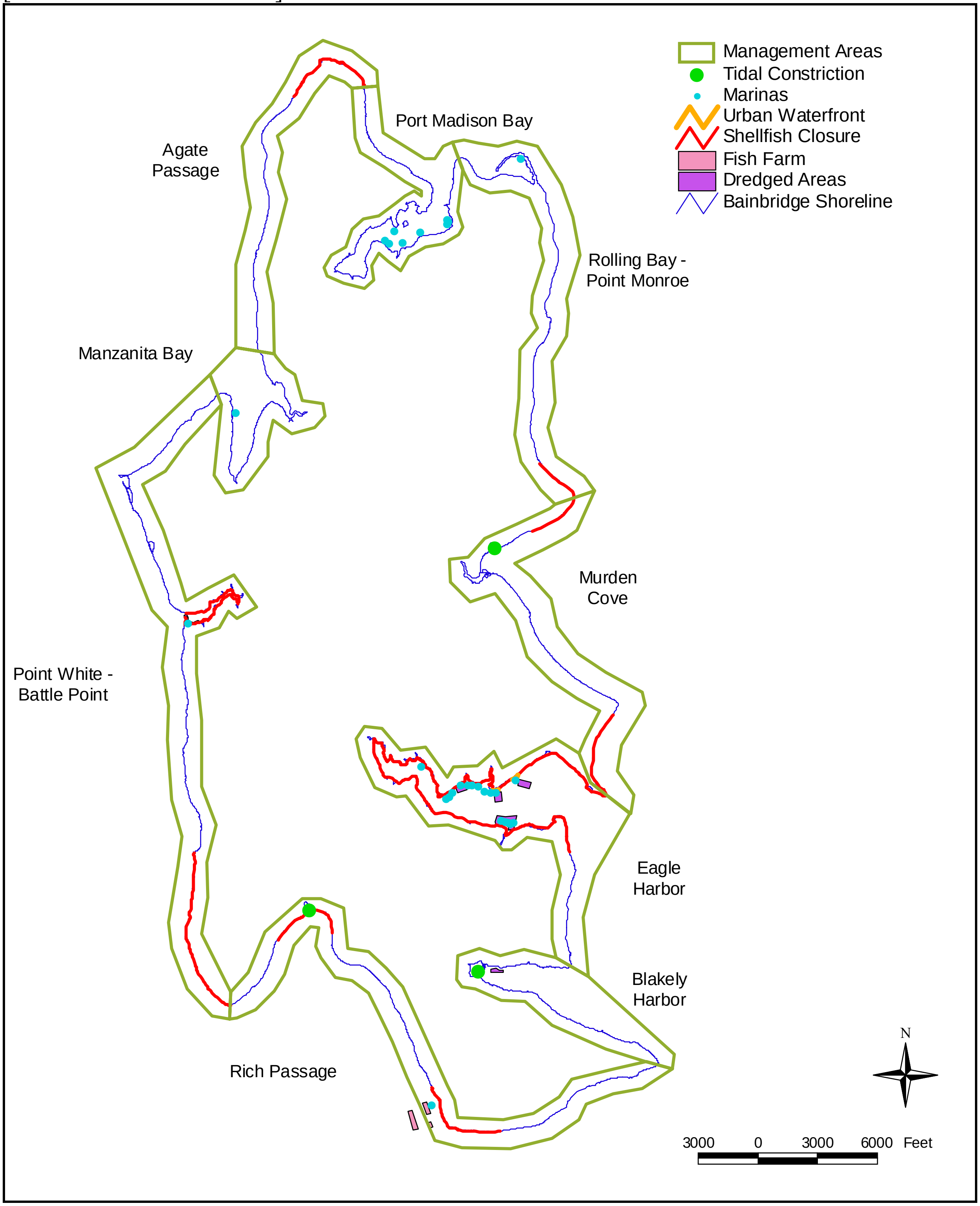


Figure 2.4.2(g). Bainbridge Island Shoreline Armoring and Armoring Encroachment. (*From Williams et al. 2004*)

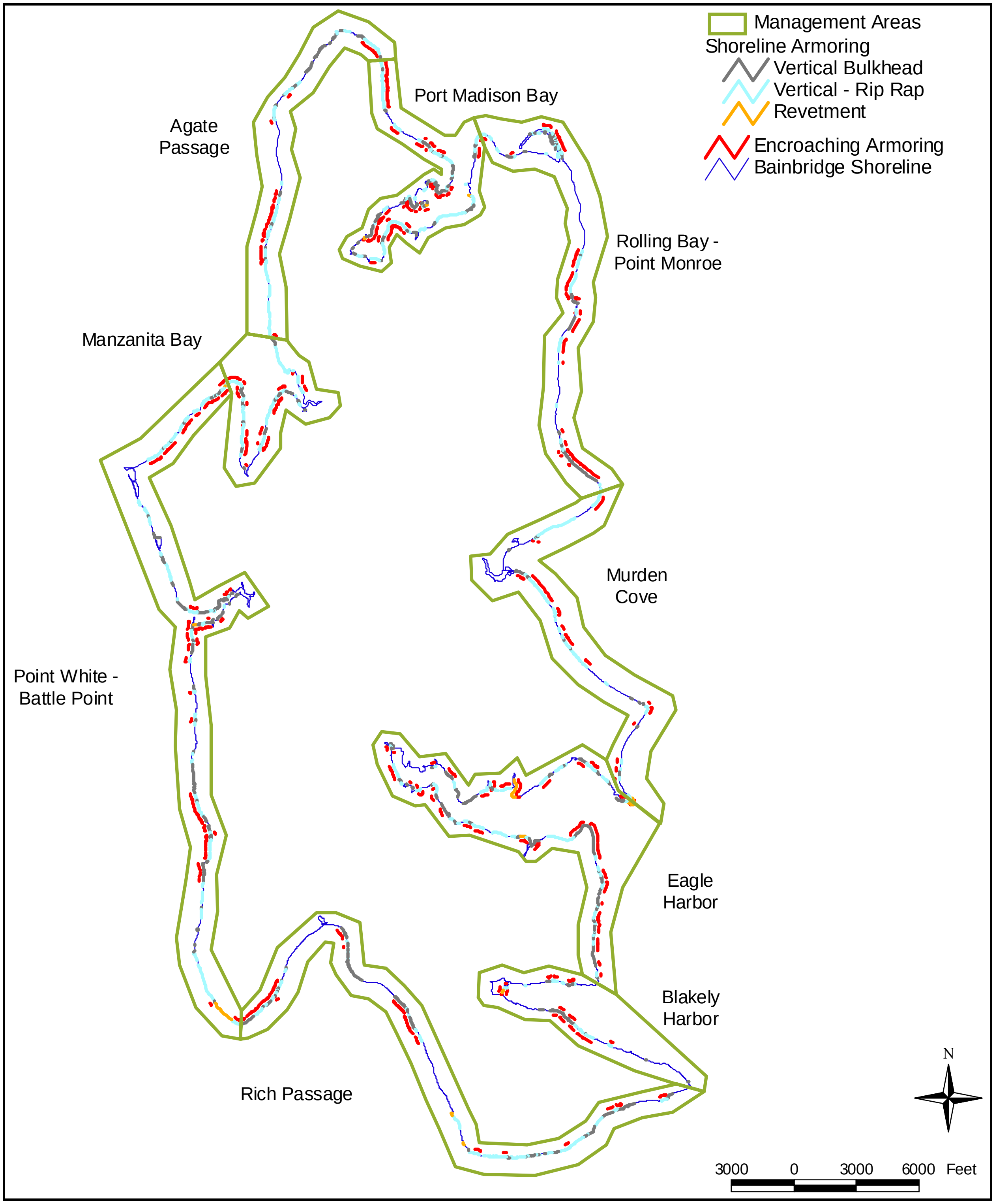


Figure 2.4.2(h). Bainbridge Island Point Modifications.
(*From Williams et al. 2004*)

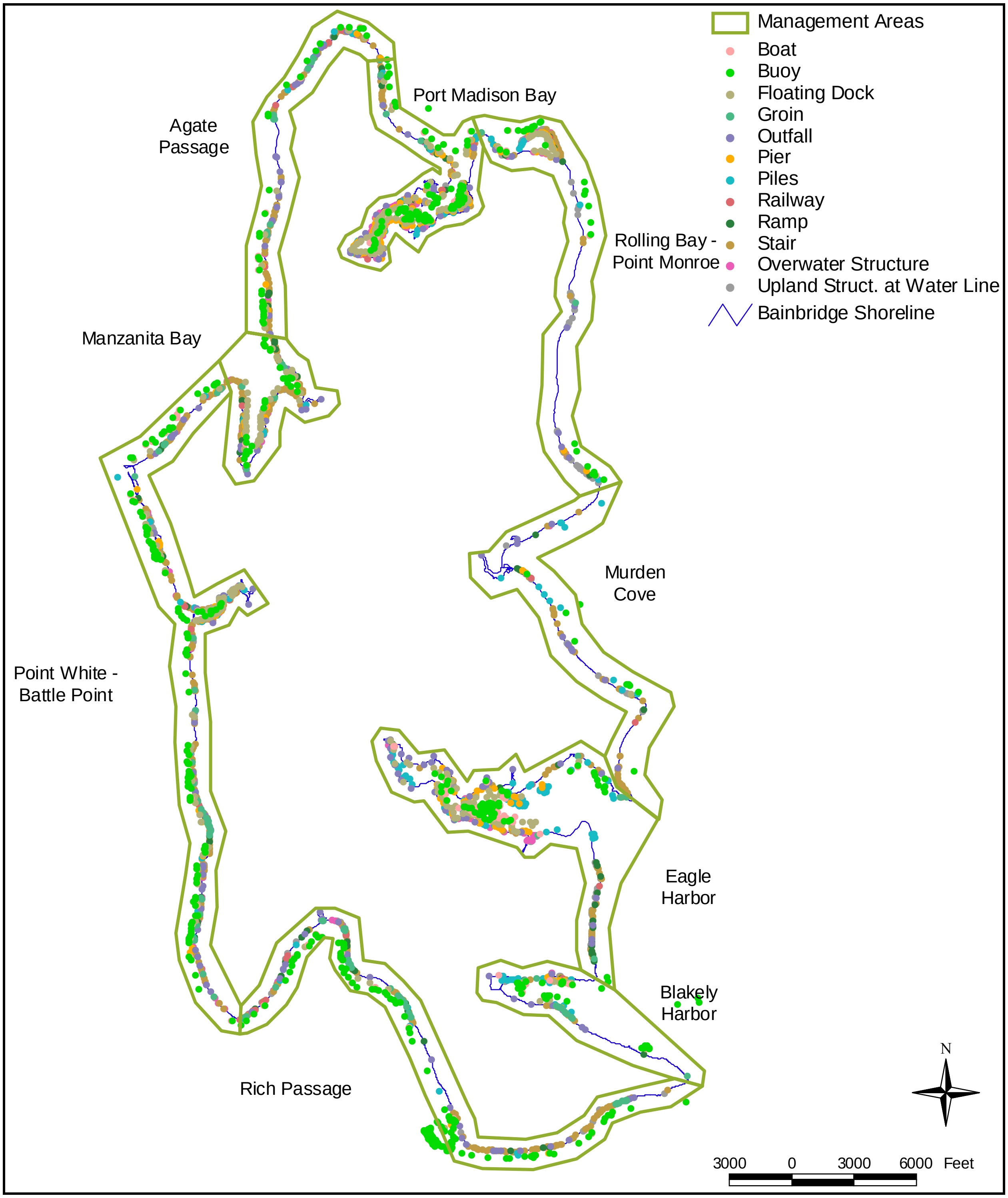


Figure 2.4.2(i). Bainbridge Island Qualitative Rating of Ecological Impact to Reach and Management Areas.
(*From Williams et al. 2004*)

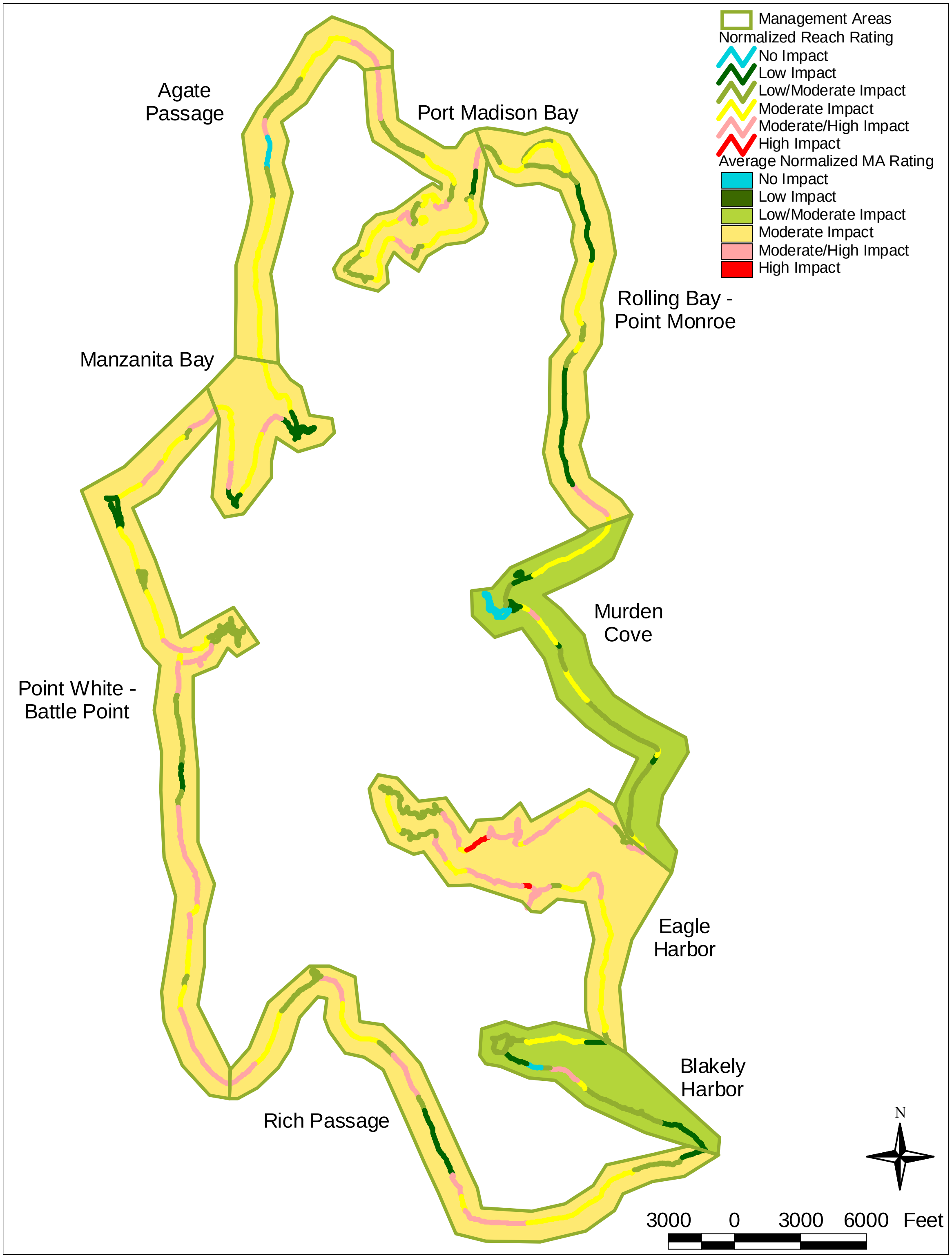


Table 2.4.2. Bainbridge Island Nearshore Characteristics by Management Area.

(*From Williams et al. 2004*)

	Agate Passage	Port Madison Bay	Rolling Bay - Point Monroe	Murden Cove	Eagle Harbor	Blakely Harbor	Rich Passage	Point White - Battle Point	Manzanita Bay	Island Total
Total Length (ft)	19,495	32,037	29,707	28,843	46,054	20,345	34,565	51,650	18,879	281,575
Armored (%)	57%	61%	38%	34%	53%	22%	52%	50%	57%	48%
Armor Encroaching (%)	21%	35%	27%	19%	30%	17%	21%	22%	29%	25%
Point Modification Density (#/1000ft)	12.1	13.9	9.8	3	11	6.5	11.6	11.9	11.5	10.4
Overhanging Riparian Veg (%)	36%	26%	29%	36%	23%	29%	8%	32%	35%	27%
Forest Cover in Riparian Zone (%)	72%	66%	57%	58%	36%	59%	42%	56%	70%	54%
Total Impervious Surface in Riparian Zone (%)	17%	14%	17%	18%	45%	19%	26%	22%	12%	23%
Geomorphology										
- High Bluff (%)	80%	32%	57%	52%	15%	0%	0%	29%	28%	30%
- Low Bank (%)	20%	16%	5%	4%	9%	31%	11%	14%	19%	13%
- Marsh/ Lagoon (%)	0%	33%	12%	16%	42%	15%	4%	29%	41%	23%
- Spit/Barrier/ Backshore (%)	0%	19%	27%	28%	34%	18%	79%	28%	13%	32%
- Rocky (%)	0%	0%	0%	0%	0%	36%	6%	0%	0%	2%
Ecological Impact										
- No	7%	0%	0%	14%	0%	4%	0%	0%	0%	2%
- Low	0%	4%	32%	17%	0%	24%	12%	12%	34%	13%
- Low/Mod	21%	30%	25%	35%	25%	47%	22%	27%	0%	26%
- Moderate	57%	45%	36%	31%	31%	18%	36%	24%	50%	35%
- Mod/High	14%	22%	7%	3%	41%	8%	30%	37%	15%	23%
- High	0%	0%	0%	0%	4%	0%	0%	0%	0%	1%

2.5 - Kitsap Salmonid Refugia

The Kitsap Salmonid Refugia Report (May & Peterson 2003) identified and characterizes areas that are critical for salmon. Areas that qualify as refugia typically have habitat features such as intact streamside forests, undeveloped floodplains, wetlands, and natural shorelines. Refugia are used intensively by salmon compared to non-refugia areas – they are biological "hot-spots." For more information on the identification and categorization process refer to the full report or Appendix B (Executive Summary).

The 29 streams and nearshore areas (in bold) that contain Category A, B & C refugia are shown in Table 2.5(a). In Category D there are 15 streams and 7 nearshore areas that are considered potential future refugia due to significantly degraded habitat conditions (see Table 2.5(b)). The nearshore designations should be considered interim results because at the present time, our knowledge of nearshore salmonid utilization is relatively basic and is rapidly expanding. In addition, the database on nearshore salmonid habitat conditions is also relatively sparse. Therefore the nearshore salmonid conditions should be considered as "interim" until more and better data is developed, such as the Bainbridge Island Nearshore Habitat Assessment.

Table 2.5(a). East Kitsap Refugia (nearshore in bold)

Highest Category	Stream/Nearshore Name	Subwatershed
A	Chico Creek	
A	**Point No Point Nearshore**	
B	Anderson Creek	
B	Barker Creek	
B	Blackjack Creek	
B	**Foul-Weather Bluff Nearshore**	
B	**Murden Cove Nearshore**	Bainbridge Island
B	**Rolling Bay Nearshore**	Bainbridge Island
B	Steele Creek	
C	Beaver Creek	
C	Blakely Harbor Creek (Mac's Dam Ck)	Bainbridge Island
C	**Burley Lagoon Nearshore**	
C	Carpenter Creek	
C	**Case Inlet Nearshore**	
C	Coulter Creek	
C	Curley Creek	
C	Fletcher Creek (Springbrook/Island Center Creek)	Bainbridge Island
C	Gazzam Creek	
C	Gorst Creek	
C	Grovers Creek	
C	Illahee Creek	
C	Indianola Creek	
C	Kitsap (North) Creek	

C	Minter Creek	
C	Olalla Creek	
C	Rocky Creek	
C	Salmonberry Creek	
C	Silver Creek	
C	Steele Creek	

Table 2.5(b). East Kitsap "Potential Refugia" (nearshore in bold)

Category	Stream/Nearshore Name	Subwatershed
D	**Agate Passage**	Bainbridge Island
D	Bjorgen Creek	
D	**Brownsville**	
D	Burley Creek	
D	Clear Creek	
D	**Colvos Passage**	
D	Cowling Creek	
D	Dogfish Creek	
D	**Dyes Inlet**	
D	**Eagle Harbor**	Bainbridge Island
D	Fern Creek	
D	**Fletcher Bay**	Bainbridge Island
D	Hudson Creek	
D	**Illahee Estuary**	
D	Lemolo Creek	
D	Manzanita Creek	Bainbridge Island
D	Murden Creek (Grisdale/Woodward/Meigs Ck)	Bainbridge Island
D	Sam Snyder Creek	
D	Schel-Chelb Creek	Bainbridge Island
D	Spring Creek	
D	Wright Creek	

3.0 - DISTRIBUTION AND CONDITION OF SALMON STOCKS

(Modified from: Haring 2000 and WDFW 2002)

The streams in East Kitsap WRIA 15 are generally small lowland streams. Many of the streams are short, but collectively the streams in East WRIA 15 provide over 215 miles of known salmonid use (including West Pierce County). Because of the low stream gradient and productive wetlands, the streams of East WRIA 15 rival the salmon productivity of many of the large river systems in Puget Sound. The diverse 270 mile marine shoreline of East Kitsap and Bainbridge Island also provides habitat for juvenile salmon.

The numerous streams in East Kitsap WRIA 15 primarily support chum and coho salmon, steelhead, and cutthroat trout. In addition, Williams et al. (1975) identified Chinook use in some of the larger streams. The only stream with consistent pink salmon returns in east Kitsap is Minter Creek (Williams et al. 1975). Sockeye are sporadically observed in several streams, but no established populations of sockeye have been observed in any WRIA 15 streams (Williams et al. 1975).

Nearshore waters of East Kitsap support Chinook, chum, pink, cutthroat, and some steelhead. East Kitsap and Bainbridge Island have about 270 miles of shoreline, including many inlets with quiet, shallow waters ideal for foraging and rearing habitat for juvenile salmon. Juvenile salmon are present along the shoreline in high numbers from March through July and in lower numbers throughout the year.

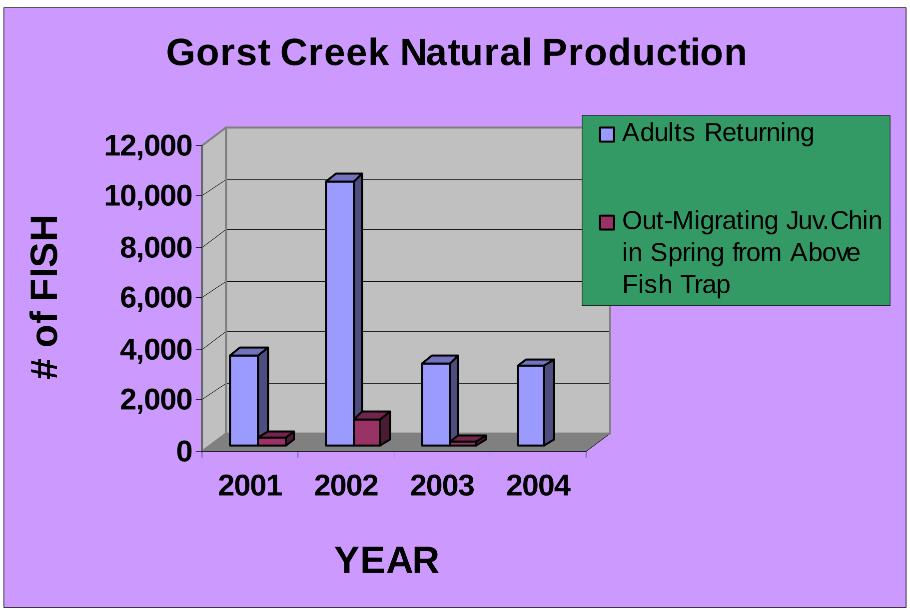
East WRIA 15 freshwater salmon, steelhead and cutthroat distribution (all species combined) is identified in Map 1, Appendix C (Haring, 2000) and general fish occurrence on Bainbridge Island is additionally identified in Figure 2.4(b). Adult and juvenile salmonid distribution is limited by natural and human-caused migration barriers, but may also be significantly influenced by decreased numbers of returning spawning adults (the extent of stream area utilized may decrease as adult or juvenile fish abundance declines), or by impaired habitat conditions that do not provide suitable spawning or rearing conditions. Most current distribution knowledge is based on contemporary stock assessment work (since 1965-1970), and likely represents a more confined distribution than occurred historically, when habitat and fish populations were healthier.

Anadromous salmonid distribution is limited in many East WRIA 15 streams by presence of natural (e.g. falls, cascades) and human-induced (e.g. culverts, dams, tide gates, reduced instream flow, etc.) fish passage barriers. Due to the low-gradient nature of East WRIA 15 streams, few natural barriers have been identified; most of the known barriers are human induced.

East WRIA 15 Fish passage barriers are on Map 7 of Appendix C (Haring, 2000) and additional fish passage barriers on Bainbridge Island are discussed in section 2.4.1.

3.1 - Chinook

East Kitsap streams lack the typical riverine Chinook habitat found in larger Puget Sound mainstem rivers. However, spawning adult Chinook are observed on a regular basis in numerous East Kitsap streams such as Coulter, Rocky, Minter, Burley, Gorst, Curley, Clear and Dogfish creeks. Chinook spawning in Gorst Creek has been increasing in recent years due to limited commercial value of salmon in terminal fishery. Most of these fish are believed to be returns from hatchery Chinook released from the Gorst rearing ponds; survival of progeny of naturally spawning fish appears to be low (Jay Zischke, Suquamish Tribe, personal communication). An escapement of 17,000 to the inlet (fishery plus stream escapement) in 2002 was the highest on record, with over 10,000 in Gorst Creek. Returns to the stream in the previous three years averaged around 2400 adult Chinook (Jay Zischke, Suquamish Tribe, personal communication). An out-migrant fish trap in Gorst Creek has been collecting juvenile Chinook data for the last 4 years. All indications point to poor natural Chinook production from this system as the following graph by Jon Oleyar, Suquamish Tribe, illustrates.

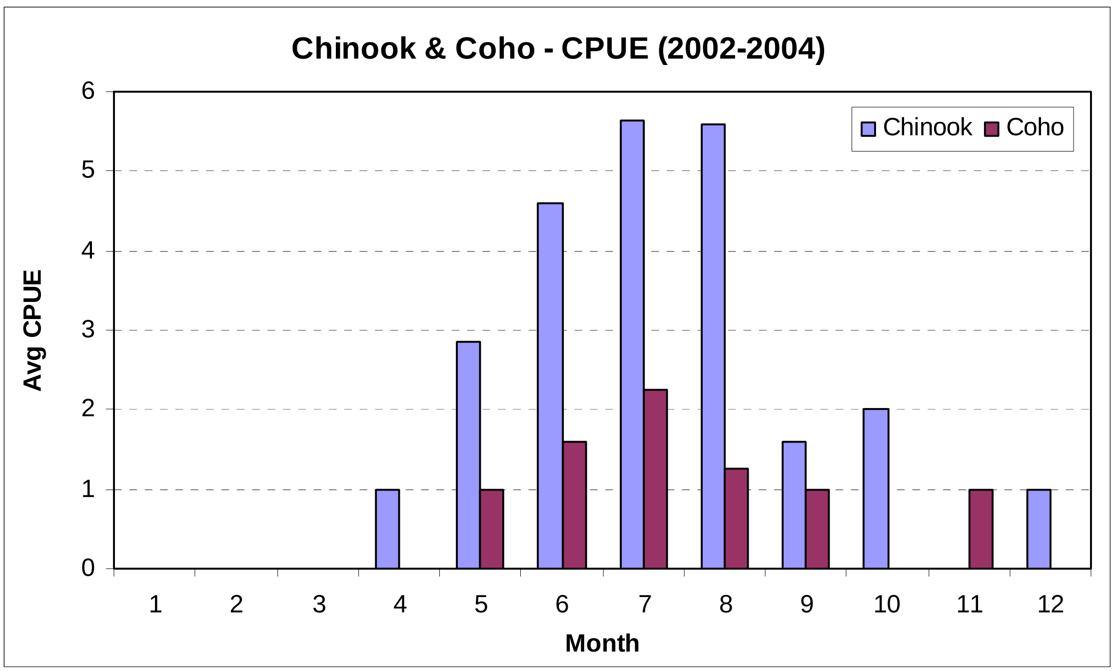


In addition to the larger drainages, recent observations indicate small numbers of adult Chinook straying into smaller streams such as McCormick, Crescent, Olalla, Blackjack, Clear, Barker, Steele, and Grovers creeks (WDFW & Suquamish Tribe, unpublished data). Chinook tend to utilize lower mainstem areas with large quantities of gravel and greater flows. Use of other smaller independent drainages in East Kitsap by Chinook is minimal, since these streams exhibit very low flows during the normal Chinook migration and spawning periods (Williams et al. 1975). Current returns of spawning adult Chinook are thought to be primarily the result of returns from Chinook enhancement programs (hatcheries, netpens, juvenile outplants). It is unknown whether, or to what extent, adult Chinook returns are the result of natural spawning. To identify naturally spawning Chinook, the CoManagers mass mark all E Kitsap Chinook, except a double index component of Grovers Creek Chinook production, and monitor the adult

Chinook returns to the hatcheries and local streams for presence, or absence, of marks as well as cwt's.

Upstream migration of adult fall Chinook in these lowland streams typically extends from early September through October, depending on stream flows and water temperature. Peak spawning occurs between mid-September and mid-October, and is usually completed in all small streams by the end of October (J. Oleyar, pers. comm.). Following incubation and subsequent fry emergence, the majority of Chinook fry rear in these lowland systems for 3-4 months and enter the estuaries around May or early-June, depending on the spring runoff flows.

Juvenile Chinook from small stream systems typically move into marine waters in late spring. Shallow nearshore waters provide protection from predators and support prey items. Recent beach seine studies by WDFW, Suquamish, and the City of Bainbridge Island indicate that Chinook salmon occupy the nearshore regions of East Kitsap nearly year-round with peak abundance from May through August as shown in the following tables from Dorn and Best, 2005 (Appendix ?):



In addition to Chinook from local streams, East Kitsap shorelines are host to juvenile Chinook from river systems throughout Puget Sound. Coded-wire tag recoveries of subyearling hatchery Chinook indicate that fish from Nisqually to the Fraiser River in Canada inhabit Sinclair Inlet during shoreline migration (Fresh et al. 2002). Coded wire tag recoveries from terminal commercial fisheries within this same area also show a mixed-origin of adult Chinook and coho. The shallow, protected waters of East Kitsap are likely important for wild salmon from other Puget Sound watersheds as well as hatchery fish. The following table summarizes the origins of cwt Chinook recovered in the COBI beach seining during 2002 – 2004:

Table 3: Chinook CWT Origin (2002-2004)

WRIA	Release Location	2002	2003	2004	**Total**
9	Big Soos (Green River)	5			**5**
10	Clarks Creek			1	**1**
15	Clear Creek			1	**1**
15	Gorst Creek	1	4	2	**7**
15	Grovers Creek		13	4	**17**
8	Issaquah Creek		2		**2**
15	Minter Creek			2	**2**
11	Nisqually River	1			**1**
10	Voight Creek			1	**1**
7	Wallace River			3	**3**
10	White River	1			**1**
	Total	**8**	**19**	**14**	**41**

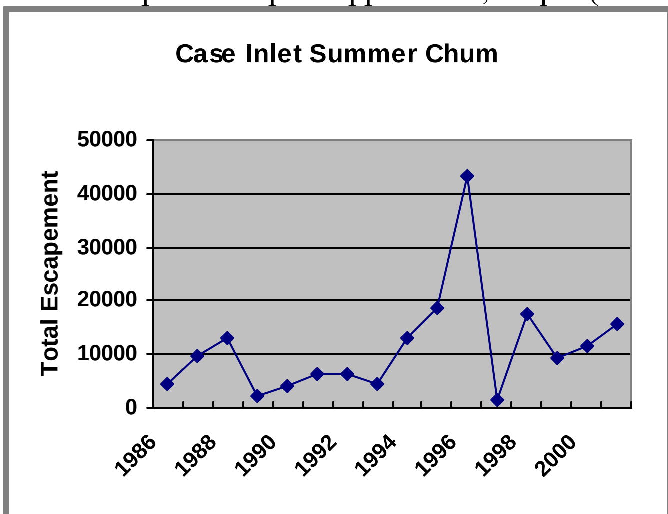
The Salmon and Steelhead Stock Inventory (SaSI 2002) identifies the South Sound Tributaries Summer/Fall Chinook stock as including Chinook production from East Kitsap streams and Case and Car Inlets in WRIA 15, as well as other south Puget Sound streams. It also identified that there are no genetic stock identification data for naturally spawning South Sound Chinook. The grouping of seemingly widely distributed Chinook was based on a history of extensive stock transfers from basin to basin and considerable hatchery outplants and associated straying of hatchery–origin Chinook in south Puget Sound. In SaSI 2002, the fall Chinook spawning aggregations observed in south Puget Sound independent tributaries are not rated. The Co-managers support this action with the following rationale: (1) The independent tributaries in south Puget Sound are not typical Chinook habitat because of relatively small stream size and low flows during the late summer/early fall spawning season. (2) The current low escapements (outside of streams that support on-station Chinook production programs) are likely the result of past hatchery plants or straying from either current South Sound hatchery production or viable South Sound natural populations. (3) Fall Chinook likely were not historically self-sustaining in these habitats and have little chance of perpetuating themselves through natural production. Distribution of Chinook in East WRIA 15 streams is shown on the chum species map in Appendix C, Map 2 (Washington Conservation Commission 2000).

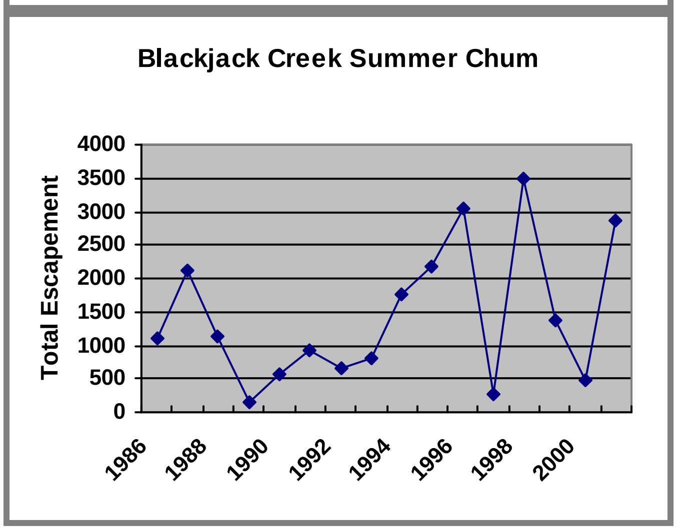
3.2 - Chum Salmon

Kitsap Peninsula streams produce large numbers of chum salmon. The low gradient streams of the area provide good spawning area. Chum rear in shallow nearshore waters prevalent on shorelines of East Kitsap and Bainbridge Island. Chum salmon abundance in the nearshore is very high during March through June with smaller numbers of fish present until early fall. Some of these fish enter marine waters at very small size (around 30 mm) with yolk-sac absorption not entirely complete.

3.2.1 - Summer Chum

SaSI identifies two distinct summer chum stocks as present in WRIA 15 streams: Case Inlet Summer Chum (this stock also includes summer chum spawning in several streams in WRIA 14) and South Sound-Blackjack Creek Summer Chum. Each of these stocks is identified as a separate stock because they are isolated from other Puget Sound stocks by geographic and temporal separation and are genetically distinct. Case Inlet summer chum spawn from September to late October; Blackjack Creek summer chum spawn during October. There are no directed fisheries on these stocks; however, these fish are impacted by mid-Puget Sound coho net fisheries. The status of both of these summer chum stocks is designated in SaSI as Healthy. The Coulter Creek hatchery was used to supplement wild summer chum spawning in Case Inlet streams, and is thought to have been a major contributor to large returns of wild summer chum into Coulter Creek. The supplementation project was discontinued in 1992 (Haring, 2000). Distribution of chum (summer and fall stocks combined) in East WRIA 15 streams is shown on the chum species map in Appendix C, Map 3 (Haring, 2000).





(SaSI 2002)

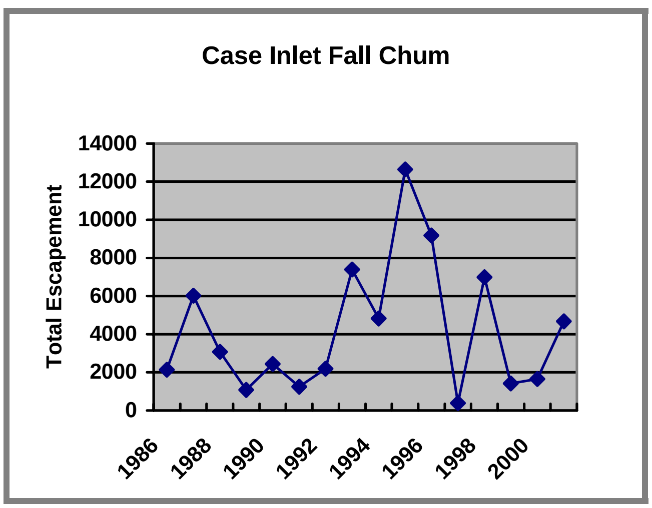
<u>Note:</u> In 2002 the Suquamish Tribe took genetic samples of chum salmon in Curley Creek and in March of 2003 the WDFW genetics lab confirmed that the Curley Creek Chum stock is a

genetically distinct run of summer timed chum, which spawn in October. – stock status is healthy (J. Oleyar, pers. comm.).

3.2.2 - Fall Chum

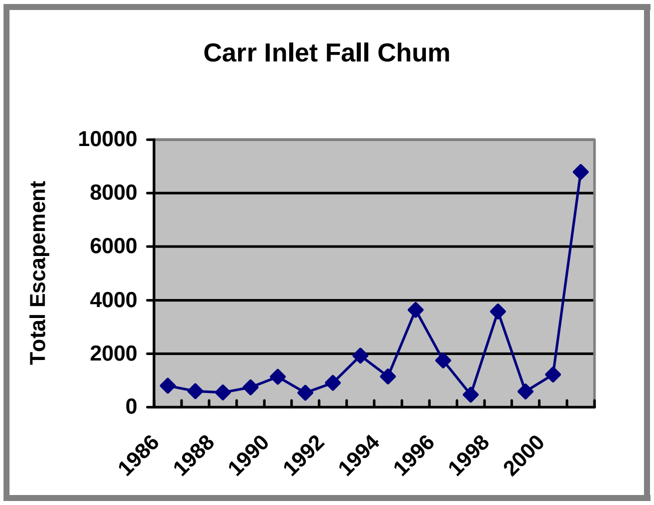
SaSI 2002 designates five distinct fall chum stocks for East WRIA 15 streams. These include the Case Inlet and Carr Inlet fall chum stocks in South Sound, and the Gig Harbor/Olalla Creek, the Dyes Inlet/Liberty Bay, and the Sinclair Inlet fall chum stocks in South Sound/East Kitsap.

Case Inlet fall chum were identified as a distinct stock based on isolation from other Puget Sound stocks by geographic separation and run timing, and because they have distinct genetic characteristics. Returns of spawning adult wild fall chum to Coulter, Sherwood (WRIA 14), and Rocky Creeks are specifically identified in SaSI, although fall chum are found in numerous other creeks in Case Inlet (Washington Conservation Commission 2000). Spawning occurs from early December to mid-January, reflecting a temporal separation from other Puget Sound stocks. Past hatchery releases have been made into most area streams (Washington Conservation Commission 2000). Juvenile chum plants to Sherwood Creek used local native brood stock, but non-local chum from Minter Creek were planted into Coulter Creek for at least two years. It is unknown to what extent the native stock may have been changed from its original form (SaSI). The stock status is identified in SaSI 2002 as being Healthy.



(SaSI 2002)

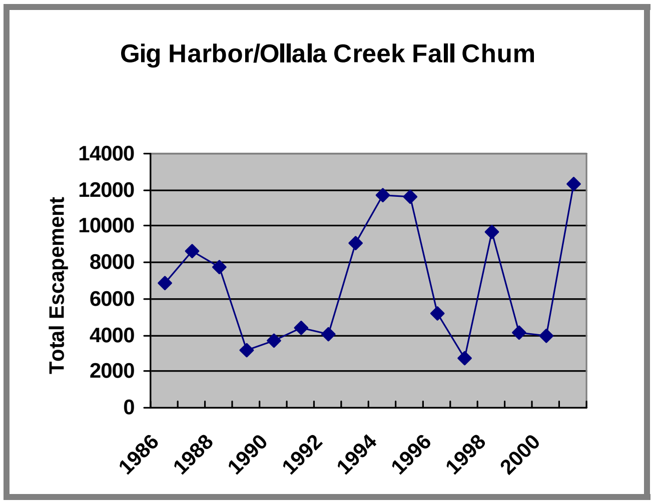
Carr Inlet fall chum are identified as a separate stock based on isolation from other Puget Sound stocks by geographic distribution (SaSI 2002). Spawn timing is from mid-November to early January. SaSI specifically identifies Carr Inlet fall chum presence in Burley and Lackey creeks, although fall chum are present in numerous other tributaries to Carr Inlet (Washington Conservation Commission 2000). In addition, several streams on the south side of the Gig Harbor Peninsula and on Anderson Island that support chum were identified during the preparation of the East Kitsap Limiting Factors Analysis (Washington Conservation Commission 2000), but that are not specifically included in any of the designated SaSI fall chum stocks. Escapements increased substantially beginning in 1995 and have remained at high levels, primarily because of a successful chum salmon enhancement program at the Minter Creek Hatchery. Heavy hatchery introductions and straying of Minter Creek hatchery origin chum has probably influenced the genetic makeup of wild spawning fish in most Carr Inlet streams. Prior to 1992, the Minter Creek Hatchery reared and released fall chum of Hood Canal origin. By 1992, this stock was replaced with the South Sound-origin Elson Creek Hatchery stock. SaSI indicates that the stable fall chum escapement to Lackey Creek may represent the lone remaining fall chum native to Carr Inlet. The aggregate Carr Inlet fall chum stock is considered mixed native/hatchery with stock status designated as Healthy (SaSI).



(SaSI 2002)

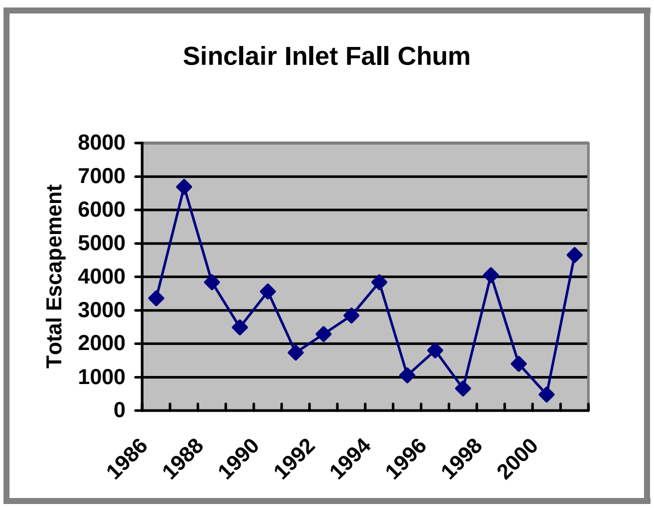
Gig Harbor/Olalla fall chum are identified as a stock based on isolation from other Puget Sound fall chum stocks by geographic and temporal distribution (SaSI 2002).

SaSI specifically identifies presence of this stock in North (Donkey), Crescent, Olalla, and Curley creeks although fall chum are present in several other small creeks in this geographic area (Washington Conservation Commission 2000). *(Curley Creek chum have subsequently been genetically distinguished as a summer stock. See the note following the summer chum discussion above related to early spawning times and genetic testing of Curley Creek chum.)* This stock spawns mainly from late-November through December, although Olalla fall chum may spawn as late as mid-January. Escapements increased substantially beginning in 1995 and have remained at high levels, primarily because of the contributions of a local hatchery program (SaSI 2002). North (Donkey) Creek production has been supported by the Minter Creek Hatchery. Prior to 1989, the hatchery released fall chum of Hood Canal origin. These fish were replaced by Elson Creek Hatchery fall chum (a South Sound stock) by 1992. Chum in Olalla, Curley and Crescent creeks may be native. Adult spawning chum in these streams may also include fall chum strays from the Minter Creek Hatchery. The stock is considered to be a mixed-origin stock, and the stock status is designated as Healthy (SaSI 2002).



(SaSI 2002)

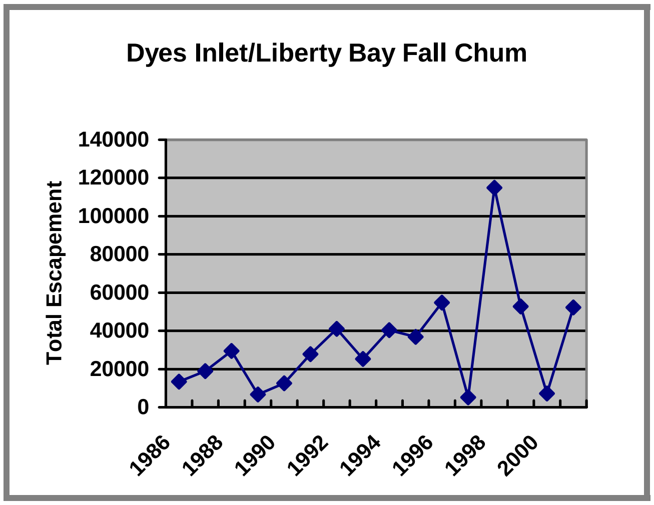
Sinclair Inlet fall chum are genetically similar to Chico Creek stock, but are identified as a stock based on isolation from other Puget Sound stocks by geographic distribution, and similarity in spawn timing of individual Sinclair Inlet streams. Spawning occurs from December through mid-January, creating a temporal separation from the earlier-spawning Dyes Inlet/Liberty Bay stock. SaSI identifies major spawning tributaries as including Gorst, Anderson, Ross, and Blackjack creeks, although fall chum are present in several other small creeks in this geographic area (Washington Conservation Commission 2000). The stock is considered to be of native origin, and the stock status is designated as Healthy (SaSI 2002).



(SaSI 2002)

Dyes Inlet/Liberty Bay fall chum were identified as a single stock because of similar spawn timing between the two inlets, and because of isolation from other Puget Sound stocks by geographic distribution and to some degree temporal separation (SaSI). SaSI identifies the major streams for this chum stock as Chico, Clear, Barker, Dogfish, Steele, Scandia, and Grovers creeks, although fall chum are present in numerous other creeks in this geographic area (Washington Conservation Commission 2000). The stock spawns in November (peak in mid-November), which is somewhat early for fall chum. The tributaries of both Dyes Inlet and Liberty Bay have historically had significant hatchery plants from the Suquamish Tribe's

Cowlings Creek Hatchery. The origin of the Cowlings Creek hatchery stock was Chico Creek fish, so this hatchery stock is considered a native stock within Dyes Inlet. Releases of the Cowling Creek hatchery stock into the tributaries of Liberty Bay have probably established a mixed stock with native remnant components. The stock status is designated as Healthy (SaSI). Although the 1997 and 2000 escapements of this salmon stock were low, 5,038 and 7,191 spawners respectively, (orcas took about 18,000 fish in Dyes Inlet in 1997), other recent escapements have been higher than the normal range for this stock. (SaSI 2002).



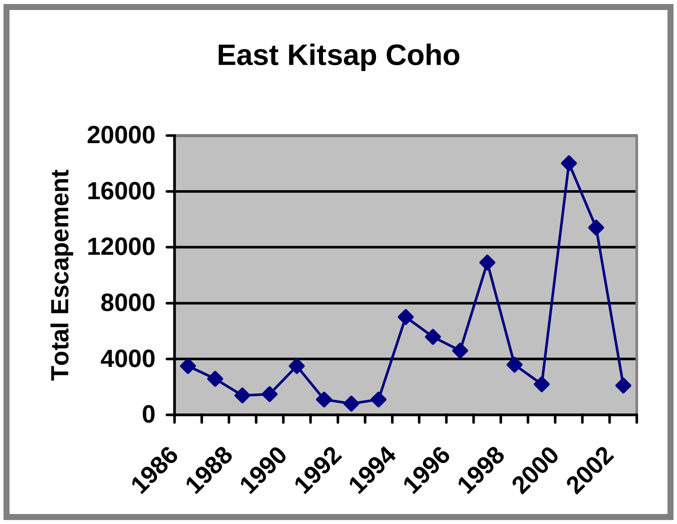
(SaSI 2002)

Distribution of chum (summer and fall stocks combined) in East WRIA 15 streams is shown on Map 3 in Appendix C (Washington Conservation Commission 2000).

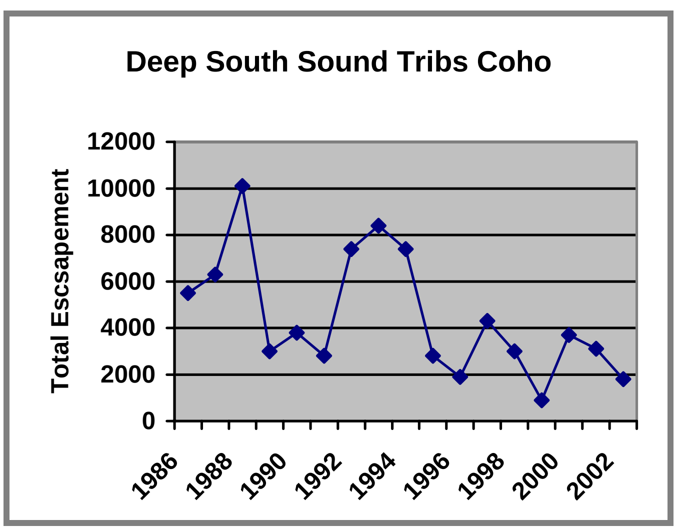
3.3 - Coho

All of the accessible independent lowland streams of the Kitsap Peninsula are utilized by coho salmon. Spawning occurs in every independent stream and tributary where suitable conditions exist, particularly in the upper headwaters. Since coho are well adapted to the typical lowland-type streams found in this basin, they inhabit the most remote and extreme rivulets, as well as the springs, swamps, and marshes forming the upper headwaters and high water overflow areas on many of these drainages. Coho juveniles rear throughout the accessible lengths of these streams and in the associated estuaries and marine habitats (Williams et al. 1975).

SaSI designates two stocks of coho in East WRIA 15; Deep South Sound Tributaries Coho, and East Kitsap Coho. Each of these stocks is defined on the basis of geographic spawning distribution (SaSI). Neither stock exhibits any documented unique biological characteristics, and spawn timing is typical of coho stocks with most spawning occurring from mid-Novemeber to late-December. Various non-native hatchery-origin coho have been released into South Sound streams. Additionally, adipose fin-clipped fish and coded-wire tags recovered from carcasses during spawning ground surveys in this region indicate a high level of adult straying into the natural spawning population from regional hatchery programs (SaSI 2002). The primary harvest management focus for East WRIA 15 coho (both stocks) is harvest of hatchery surpluses, with secondary protection provided for remaining natural-origin coho in the extreme terminal bays (Puget Sound Salmon Management Plan).



The Deep South Sound Tributaries coho stock includes all coho south of the Tacoma Narrows, excluding coho in the Chambers Creek (WRIA 12), Nisqually (WRIA 11), and Deschutes (portion of WRIA 13) basins. The stock includes coho in a portion of WRIA 13 (excluding the Deschutes), all of WRIA 14, and southern WRIA 15 drainages to southern Puget Sound. There have been substantial releases of hatchery-origin coho within this area, with significant off-station yearling plants from the early 1950s to the mid-1970s (SASSI). Off-station fingerling/fry plants occurred annually from the mid-1950s to 1996. There are also annual on-station yearling releases from the Minter Creek Hatchery and from various pen-rearing programs throughout the basin. The stock origin is considered to be mixed, and the stock status is designated as Healthy (SaSI).



(SaSI 2002)

Juvenile coho salmon are captured in nearshore waters primarily during spring and summer months in East Kitsap studies (Suquamish Tribe, WDFW, City of Bainbridge Island,

unpublished data). Ocean-type coho salmon are not considered to be as nearshore dependent as Chinook and chum salmon (Duffy 2003). Beach seine catch of coho in East Kitsap nearshore waters is low by comparison to chum and Chinook.
Distribution of coho in East WRIA 15 streams is shown on the coho species map, Appendix , Map 4 (Washington Conservation Commission 2000).

3.4 - Pink

The typical lowland type streams of the East Kitsap Watershed are not normally inhabited by pink salmon, as they seem to prefer drainages that are of glacial origin. Minter Creek is the only East WRIA 15 stream to record a meager return of pink salmon each odd year (Williams et al. 1975). Return of pink salmon to Minter Creek was not recognized in SaSI 2002. Pink salmon have also been observed irregularly in several of the larger East Kitsap streams on high abundance years (Suquamish, unpublished data 2004).

Pink salmon were observed in the nearshore in high numbers from March through May 2004 during beach seining efforts on Bainbridge Island shorelines (Bainbridge Island Beach Seining Project, unpublished data). The pink return to central Puget Sound in 2003 was very high and may account for the high numbers of juvenile pink salmon on Bainbridge shorelines this spring.

3.5 - Sockeye

No persistent sockeye salmon stocks are identified in SaSI as present in East Kitsap streams, although periodic presence of low numbers of sockeye has been noted in several streams. Observed sockeye are likely stray adults originating from other river systems (Haring 2000).

3.6 - Steelhead

No summer steelhead stocks are identified in East Kitsap. Two distinct stocks of winter steelhead are identified in SaSI: Case/Carr Inlet steelhead and East Kitsap steelhead. Wild winter steelhead in each stock are of native origin. Run timing of these stocks is generally from December through mid-March, and spawn timing is generally from early-February to mid-April. Each stock is comprised of a historically small number of steelhead, with insufficient information to classify its status as Healthy, Depressed, or Critical. As small stocks, they could be especially vulnerable to any negative impacts. The stocks are identified as distinct stocks due to the geographical isolation of the spawning populations; there is little or no information available to indicate whether these are genetically distinct stocks (SaSI 2002).

Distribution of Case/Carr Inlet winter steelhead is identified in SASSI as including Sherwood (WRIA 14), Coulter, Rocky, Dutcher, Artondale, Jones, Minter, Burley, Purdy, McCormick, and Lackey creeks. The status of the stock is identified in SaSI as Unknown.

Distribution of East Kitsap winter steelhead is identified in SaSI as including Olalla, Crescent, Curley, Gorst, Blackjack, Ross, Barker, Clear, Chico, Scandia, Dogfish, and Grovers creeks, although winter steelhead are present in several other creeks in this geographic area (Washington Conservation Commission 2000). The status of the stock is designated in SaSI as Unknown.

Distribution of winter steelhead in East WRIA 15 streams is shown on the steelhead species map on Map 5 of Appendix C (Washington Conservation Commission 2000).

3.7 - Cutthroat Trout

Cutthroat trout are present throughout East WRIA 15 streams, with distribution typically extending further upstream than anadromous salmon, and presence in additional streams where anadromous salmon presence is not known. At this time, distribution differences between resident and sea-run cutthroat are not known, except upstream of anadromous barriers, and they have been considered as a composite stock for the purposes of this report. No stock assessment data are available with which to estimate cutthroat population size.

Fewer recorded observations exist for cutthroat than for other salmon species. Cutthroat are thought to be ubiquitous throughout the low gradient watersheds of East WRIA 15. However, since so little is known regarding the extent of cutthroat presence, cutthroat presence is presumed at least to the uppermost extent of any other identified anadromous salmonid presence.

Cutthroat salmon of various sizes are regularly caught in beach seines and recreationally along East Kitsap shorelines. Little is known about cutthroat use in nearshore waters.

Distribution of cutthroat in East WRIA 15 streams is shown on Map 6 of Appendix C (Washington Conservation Commission 2000).

3.8 - Char (Bull Trout/DollyVarden)

No char presence is identified for East WRIA 15. Streams in this area are all low elevation streams, which are not likely to meet the low water temperature spawning requirements of char.

Bull trout also use nearshore waters. Forage fish commonly spawn along East Kitsap beaches and are important prey items for bull trout. Although bull trout have not been documented in local beach seine studies or local recreational or commercial fishing, these fish are quite mobile and may be missed in traditional catch methods. Bull trout use of East Kitsap nearshore waters is unknown.

Month	Chinook	Coho	Chum	Pink	Herring	Surf Smelt	Sand Lance
1							
2				7			
3			593	174			3
4	1		1,734	771	2	58	117
5	20	1	2,136	567	3	123	22
6	69	8	32	7	192	133	5,153
7	107	18	6		27	94	320
8	84	5	10		15	123	313
9	8	1	5		3	9	12
10	6				8	151	720
11		1	1		31	279	2
12	1				3	22	
Total	296	34	4,517	1,526	284	992	6,662

Table 2: Total Catch of Juvenile Salmonids and Forage Fish (2002-2004)

4.0 - EXISTING ACTIONS SUPPORTING RECOVERY & CONSERVATION

4.1 - Habitat

There are a number of programs and activities in the watershed directed at conserving and restoring salmon habitat. These actions include programs that identify, prioritize and implement habitat restoration and preservation projects; develop and conduct education programs, which assist the public in recognizing how our activities impact salmon and how these actions can be modified to be more salmon-friendly; and policies and programs designed to conserve existing, functioning habitat. This section provides a description of locally developed information sources that support these efforts and brief descriptions of the regulatory, non-regulatory and education and outreach programs being implemented that benefit salmon and their habitats.

4.1.1 - Local Information Sources

East Kitsap has long recognized the intrinsic value of its forested watersheds and the surrounding marine environment. Over the past twenty years, as population has grown and urban areas have expanded, local officials recognized the need for more comprehensive information to support decision making. This recognition has resulted in East Kitsap either partnering or commissioning the assessment of its natural resources and the watershed functions that support viable salmon populations. It is important to note, that several of these studies have been undertaken without a state or federal mandate, and that these studies form the basis for Kitsap's strategy to recover salmon. The following list includes assessments and reports that are intended to further the effort of salmon recovery in the Kitsap region of the Puget Sound.

<u>East Kitsap Peninsula Salmon Recovery Strategy (Kitsap County, 2004; see Appendix G)</u>

The mission of the East Kitsap Lead Entity is to ensure local salmon habitat is preserved and restored to support salmon populations and human communities. The goal of this strategy is to restore healthy, self-sustaining wild populations of the salmon species native to the streams and shorelines of the Kitsap Peninsula. Four objectives include:

- Increase population levels
- Maintain geographically diverse populations
- Promote the preservation and restoration of healthy, functioning ecosystems
- Increase public understanding and support for salmon recovery

This strategy addresses local habitat conditions and is therefore an integral part of the larger regional salmon recovery effort. ()

<u>Kitsap Salmonid Refugia Report (Chris May and Gretchen Peterson, 2003; see Appendix B)</u>

The goal of the refugia study was to identify and characterize potential salmonid conservation and restoration areas located within Kitsap County. After identifying these areas, a primary objective was to analyze and prioritize salmonid refugia to assist in conservation, enhancement, and restoration efforts. One major aim of the Refugia study was to support early salmon recovery actions necessary to preserve the remaining areas of high-quality salmonid spawning and rearing habitat in the region. Protecting the "last best places" is an essential part of the salmon recovery process.

Salmonid Habitat Limiting Factors WRIA 15 East (Haring, 2000)

The goal of this report was to identify habitat factors limiting production of salmon in the East Kitsap portion of WRIA 15, which includes "conditions that limit the ability of habitat to fully sustain populations of salmon". This report addresses habitat conditions that support anadromous salmon and steelhead, based on the stock status designations identified in the Salmon and Steelhead Stock Inventory (SaSI). This report provides information that is used in the development of salmonid habitat protection and restoration strategies.

Bainbridge Island Nearshore Assessment (Williams et al 2003 & 2004; see Appendix H)

The primary objective of this effort is to provide baseline data upon which to develop and implement nearshore management strategies (including restoration and conservation) and measure management success. A science-based conceptual model was used to characterize the status of shoreline ecological functions based upon systematic evaluations of shoreline modifications, controlling factors, habitat structure, and habitat processes. This information was synthesized to determine human impacts, locating critical areas for conservation or restoration, and identifying nearshore ecosystems most at risk to cumulative impacts.

Kitsap Peninsula Habitat Assessment (Washington Department of Fish and Wildlife, in prep.)

The purpose of this study is to improve natural resource protection through time while balancing the need to provide for growth by integrating science-based landscape conservation tools with county-based planning and implementation strategies. This project intends to meet the following objectives:

- Develop a spatially explicit, GIS-based landscape-level natural resource assessment for the Kitsap Peninsula.
- Develop landscape analysis tools that result in science-informed planning decisions.
- Integrate resource assessments and landscape analysis tools into Kitsap County's growth management and watershed planning processes.
- Develop landscape management guidance to inform county planning and land use decisions.

Addressing conservation planning at the landscape scale is more efficient and effective than site-by-site conservation or single-species management, which is why WDFW has engaged in ecoregional conservation assessments and county planning. This habitat assessment, specifically, will develop landscape tools and guidance that addresses the needs of fish and wildlife resources within the context of Kitsap's growing communities.

It is the County's intent to continue to provide its land use planners and natural resource managers with the best available information and analysis tools to continue to make informed decisions while planning for the future of its citizens, landscapes and fish and wildlife. As an example of this dedication, Kitsap County, through its Lead Entity, is organizing a nearshore assessment for the remaining unassessed 139 miles of marine nearshore. This assessment will address a major data gap and allow Kitsap to continue moving forward with its efforts to recovery salmon populations in Puget Sound.

4.1.2 - Policy & Regulatory Programs

Kitsap County and the municipalities in the East Kitsap Watershed have adopted a variety of policy directives and implementing ordinances that give special consideration to salmon and their habitats. The focus of these programs is primarily the protection of existing habitat from the impacts of development and other land use activities. Comprehensive Plans, Shoreline Master Programs, and the Critical Areas, Stormwater and Zoning Ordinances represent the major policy and implementing regulatory programs in East Kitsap. Summaries of specific Kitsap County and City of Bainbridge Island policies and regulatory programs are contained in Appendix I.

4.1.3 - Non-Regulatory Programs

Non-regulatory programs meet the duel needs of protecting existing habitat and restoring degraded areas. Programs such as open space land designation under the Current Use Tax Benefit Rating System provides property owners the opportunity for property tax relief by enrolling their property that contains important fish and wildlife resources. Similar incentive programs also exist for agricultural and forest lands. Other programs, like the City of Bainbridge Island Open Space Bond, allow local jurisdictions to work with local land trusts and park districts to purchase fee-title property or conservation easements for conservation purposes, including properties that contain important fish and wildlife resources.

The U.S. Department of Agriculture also supports a number of programs through the Natural Resource Conservation Service that are implemented locally through the Kitsap Conservation District. Many of these programs offer technical assistance, cost-sharing and use conservation easements to protect, enhance and restore watershed health. The Conservation District currently works both in unincorporated areas as well as some of the cities, such as Bainbridge Island, to implement these and habitat restoration programs

In addition to critical areas ordinances, habitat restoration in the East Kitsap Watershed provides one of the most significant contributions to the conservation and restoration of salmon populations in the watershed. Kitsap County's Public Works Department aggressively works to identify, prioritize and replace County-owned culverts blocking salmon from reaching spawning and rearing habitats. Similarly, the Kitsap Conservation District actively works to identify passage barriers on private property, and then works with landowners to design and identify funding to fix them. More detailed summaries of existing programs are provided in Appendix J.

The East Kitsap Watershed, including those portions of Pierce and Mason Counties not addressed in this report, is a Lead Entity salmon recovery area. Through the lead entity process, over $10 million dollars worth of projects have been funded through state and federal dollars awarded by the Salmon Recovery Funding Board and matching contributions by local project sponsors (See Appendix K). The East Kitsap Peninsula Salmon Recovery Strategy, cited above, identifies the salmon recovery priorities for the Lead Entity. The East Kitsap Lead Entity specifically addresses the VSP parameters of abundance and spatial diversity by including objectives to increase population levels and maintaining geographically diverse populations.

Additionally, the Lead Entity identifies nearshore habitat conservation and restoration projects as high priorities for action. With the exceptions of Bainbridge Island and the City of Port Orchard, much of the nearshore areas in the watershed have not been assessed to identify and quantify habitat types, evaluate levels of impaired habitat or ecosystem processes, or determine spatial and temporal use of the nearshore by salmonids. Kitsap County is currently developing an assessment program in collaboration with Battelle Marine Science Laboratory. This program proposes to utilize a similar and complimentary methodology as that used to conduct the City of Bainbridge Island's Nearshore Assessment. In the absence of this information however the East Kitsap Lead Entity has developed a preliminary prioritized list of nearshore projects for the watershed based on criteria that was adapted from Correa (2002). The preliminary list of projects and a description of the prioritization method are included in Appendix X.

4.1.4 - Watershed Planning

There are currently two watershed planning processes underway in the East Kitsap Watershed that address issues related to salmon recovery. The first and most expansive process is the development of a watershed plan for WRIA 15 under the Watershed Planning Act (RCW 90.82). The WRIA 15 plan is addressing the mandatory element of water quantity and the optional elements of water quality, instream flows and habitat. The WRIA 15 Planning Unit is currently developing recommendations with a final plan to be adopted in 2005. Similar to other sub-areas within the WRIA 15 Watershed Planning area, Bainbridge Island plans on adopting a sub-area plan, which will be based on our Level II Assessment (Kato & Warren et al 2000) and its recommendations (see Appendix O).

Kitsap County is also implementing a watershed planning process that integrates watershed assessment with subarea planning. Informally known as "planning by watershed" or "alternative futures" this program provides a science-based and community-based approach to developing community or subarea plans for areas in the county for subsequent adoption into the County's Comprehensive Plan. This process is designed to base future land use planning on a foundation of conserving watershed processes and functions by evaluating alternative development scenarios for their impact on parameters such as watershed hydrology, water quality, fish and wildlife habitat using a variety of models. The initial use of this process has been in the Chico Watershed, with adoption of a subarea plan scheduled for the fall of 2005. Additional funding has been secured to commence the process for the Barker Creek Watershed in the fall of 2004 with subarea plan adoption in 2006.

4.1.5 - Education & Outreach

Education and outreach are the cornerstones of successful salmon recovery and conservation. In direct response to the ESA salmon listings, education in all arenas became an urgent and necessary element to address salmon recovery and conservation. Suddenly landowners, policymakers and educators all needed to comprehend how salmon used their habitat, that same habitat in which humans co-exist. Education is the critical link to meeting the demands of salmon recovery in all realms of regulation, restoration, conservation, and research efforts. At its core, outreach related to salmon is most effective when it places topics into the context of stewardship. Understanding of systems and their processes is fundamental to comprehending how human action can augment salmon recovery.

Outreach and education programs in East Kitsap are steeped in strong collaborative, partnership-based efforts emanating from both government and non-governmental organizations. Partnerships mobilized to address initial salmon listings are still in existence today; continually educating on salmon and strategies for recovery. As the science of salmon habitat usage and life history evolves, education co-evolves and disseminates new information to decision-making bodies and the public. This trend is expected to continue as new assessments and studies emerge and evaluation of past restoration and outreach efforts can be incorporated into directing future efforts.

East Kitsap has strong programs targeting public awareness coupled with action-oriented work plans. Programs range the spectrum from:

- Teachers addressing the salmon life cycle in elementary school
- Volunteers planting native riparian vegetation
- Adults annually visiting spawning habitat and learning from local biologists
- Educators making the connection between household activities and salmon habitat
- Working collaboratively to address stormwater runoff in innovative ways
- Integrating community outreach into restoration projects

For highlights of prominent outreach and education efforts directed at salmon recovery in the East Kitsap Watershed see Appendix L. The list is not intended to be exhaustive but representative of the excellent programming underway. New efforts begin regularly and others have evolved into other programs. Education takes numerous forms: elementary students studying salmon for an entire unit; community groups working in unison with agencies to restore degraded stream or nearshore habitat; a parent and child stopping the car at a pull out to watch salmon spawning.

4.2 - Hatcheries

The co-managers (WDFW and Treaty Tribes) operate several hatchery programs in the East Kitsap region. These include both Chinook production facilities as well as enhancement programs for other species including coho, and chum salmon. The co-managers Chinook programs are described below followed by the Suquamish Tribe's coho and chum program descriptions.

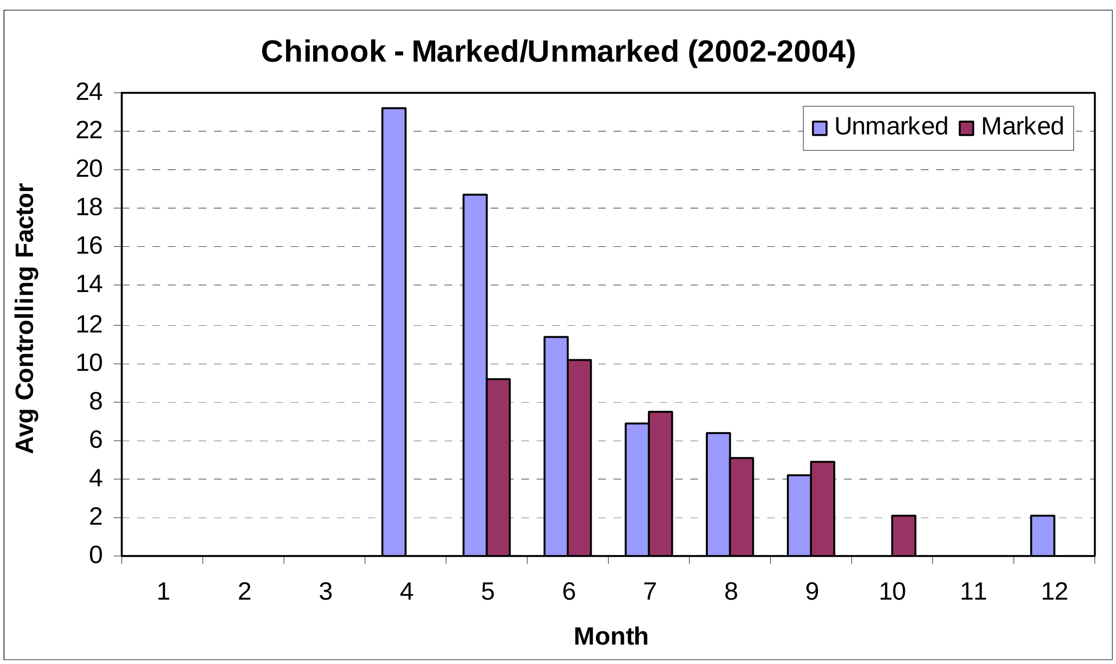
4.2.1 - General Description of Chinook Hatchery Production - East Kitsap Region

There are currently 7 enhancement facilities operating in the East Kitsap area. The Suquamish Indian Tribe operates four facilities and three are operated by WDFW. Table 1 lists the facilities that support chinook production; the number of fish released and the watershed fish are released into. The Tribe's Chinook program is detailed in Appendix R in a paper by Dorn, et al, 1997.

Table 1. Chinook production in East Kitsap Region (information from the 2003-04 Future Brood Document)

Production Facility	**Fall Chinook Released Sub-yearling**	**Yearling**	**Spring Chinook Released Sub-yearling**	**Yearling**	**Watershed**
Grovers Creek	500,000				Grovers
Gorst Creek	2,100,000	150,000			Gorst
Webster's Pond	200,000				Dogfish
Clear Creek	50,000				Clear Crk
Coulter Creek	Transfer to Tumwater Falls Hatchery. 2,800,000				
Minter Creek	1,800,000				Minter
Hupp Springs			250,000	85,000	Minter
Total Production	4,650,000	150,000	250,000	85,000	

The recent E Kitsap beach seining research undertaken by the COBI and Tribe attempts to document the interaction of natural (unmarked) with hatchery (marked) chinook salmon by using the observed condition factor (length/weight). The following data taken from Dorn and Best, 2005, illustrates a significant difference between the natural and hatchery Chinook early in the year, but their convergence to similar condition factors by mid-summer:



The Comprehensive Management Plan for Puget Sound Chinook, current version dated March 1, 2004, provides a framework for co-managers to set chinook production and harvest goals for management years 2004 - 2009. This document will be updated as discussed in the Harvest section into a Comprehensive Chinook Management Plan to guide recovery of Chinook in Puget Sound. The primary purpose of enhancement programs in the East Kitsap Region is to augment harvest opportunities. The goal of harvest programs is to provide for recreational, commercial and tribal fishing opportunity. The operation at Hupp Springs is a conservation program that seeks to support the recovery of the White River spring chinook salmon (Hatchery Reform recommendations, Feb. 2002).

4.2.2 - General Description of Coho and Chum Hatchery Production – East Kitsap Region

Coho

Agate Pass Coho Salmon Net Pens: The purpose of this coho salmon rearing program, which is operated by the Suquamish Tribe in cooperation with WDFW, is to provide harvest for Suquamish tribal members, non-Treaty sport fishers and commercial fisheries. The production objective of this program is to release 600,000 yearling coho salmon from the Agate Pass net pens. The program was temporarily reduced in 2003 and 2004 to 100,000 fish, which were raised at Manchester with the support of the U.S. Navy. Agate Pass Seapens operation was suspended by the Tribe in 2005 due to program budget constraints and is currently dormant. All Agate Pass Seapen coho brood stock collection, spawning, incubation, and early rearing was done at WDFW's Minter Creek Hatchery. Fingerling coho salmon are transferred from WDFW to net pens at Agate Pass in February or March when fish are physiologically ready to adapt to the salt water. Fish were fed daily until they are approximately 10 fish/pound in size. They are released in early June. This coho program is described in detail in Appendix S in a paper presented by Dorn, et al, 1996. The Tribe reserves the option to reactivate this program in the future.

The effects of this program on Chinook salmon are most likely minor. Impacts from the program, if they occur, would occur only in the nearshore environment in common with those from many other stocks where potential impacts have been hard to quantify. The program does not impact Chinook salmon by brood stock collection because it does not collect its own brood stock (see WDFW Minter Creek Coho Salmon program for details of brood stock collection). Potential disease impacts of the program are controlled through regular monitoring by professional pathologists from the Northwest Indian Fisheries Commission and treatment if necessary. Delayed release of coho salmon in June is intended to minimize potential impacts on migrating salmon that may be in the area. With the coho program releases ceasing in 2005, the Tribe will be able to document any changes in local Chinook hatchery returns compared to the historic returns of local Chinook while Agate Pass production was at full capacity.

Chum Salmon

Cowling Creek Fall Chum Salmon: The purpose of this program, operated by the Suquamish Tribe, is to support tribal treaty fisheries by restoring chum salmon to local East Kitsap Peninsula streams. The production objectives were to release 1,200,000 fed fry into South and North Cowling creeks and 600,000 unfed fry from satellite incubation boxes into independent East Kitsap tributaries of Dogfish, Clear, Barker, and Steele creeks, but has recently been reduced to approximately due to budget constraints and high natural adult chum returns. The program was started in 1977 with broodstock from Hood Canal (Quilcene River). Returning adults were not spawned, however, and subsequent brood fish were collected from Chico Creek, a local stream, beginning in 1978. Approximately 4,000 brood fish are currently collected annually from adults returning to Cowling Creek. Fish are spawned at the Cowling Creek facility. Eggs for release from satellite incubation boxes in Dogfish, Clear, Barker, and Steele creeks are transferred as water-hardened eggs to the incubation boxes. Most of the eggs are incubated under natural conditions in Netarts rearing troughs in South Cowling Creek. After hatching, fry are allowed to volitionally migrate into circular ponds for initial feeding. Once fry are actively feeding, they are allowed to migrate downstream to an earthen rearing pond on South Cowling Creek where they can grow under natural conditions. Fish are released from Cowling Creek into the estuary on high tides in late April or May. The Tribe has shifted some Cowling Creek chum production to Grovers Creek Hatchery due to budget constraints. The Tribe reserves the option to increase the Cowling Creek chum program in the future. The historic chum program is described in detail in Appendix T in a paper by Dorn, 1997.

The effects of the chum program on Chinook salmon are minimal. Brood stock collection has no negative impact on Chinook salmon. No Chinook salmon occur in Cowling Creek, which is small and has inadequate flows for Chinook. Self-sustaining populations of Chinook salmon do not occur in this area of the Puget Sound and no adult Chinook salmon have ever been captured at Cowling Creek Hatchery in its 29 years of operation. Potential disease effects of the program are controlled through regular monitoring by professional pathologists from the Northwest Indian Fisheries Commission and treatment if necessary. Potential competition between chum salmon and Chinook salmon from mid-Puget Sound stocks in the nearshore is minimized by releasing the chum salmon into the estuary where they can disperse quickly over a large area. Because of life history and developmental differences, predation by juvenile chum on Chinook salmon would be extremely unlikely.

4.2.3 - Operational Guidance for Hatcheries in the East Kitsap region of Puget Sound

Several documents provide operational guidance, direction, or program descriptions for hatcheries in the East Kitsap region. These include the Future Brood Document, the Co-Managers Salmonid Disease Control Policy, the Hatchery Genetic Management Plans (HGMPs) for each salmon species, and the Resource Management Plans.

<u>Resource Management Plans</u>

The co-managers have submitted to NOAA's National Marine Fisheries Service (NMFS) two Resource Management Plans (RMPs) for Puget Sound. One Resource Management Plan discusses hatchery programs that produce chinook salmon. The other Resource Management Plan describes steelhead, coho, pink, chum, and sockeye hatchery programs. Comments and suggestions are invited from all interested parties to ensure that the EIS considers the full range of related issues and alternatives to the proposed action. The RMPs and HGMPs and other information are available online at http://www.nwr.noaa.gov/lsrd/Propagation/.

The Resource Management Plans are the proposed frameworks through which the co-managers would jointly manage Puget Sound region salmon and steelhead hatchery programs while meeting conservation requirements specified under the Endangered Species Act (ESA). The Plans describe 113 hatchery programs and evaluates their effects on Puget Sound chinook and summer chum populations protected as threatened species under the ESA. In addition, the Plans describe the scientific foundation and general principles for continued innovation in response to new information. Appended to the Plans are individual HGMPs for each of the 113 hatchery programs. The HGMPs describe each hatchery program in more detail, including specific measures for research, monitoring, and evaluation activities that would guide future program adjustments.

NMFS' ESA determination on the co-managers' Resource Management Plans is the federal action requiring National Environmental Policy Act (NEPA) compliance. Consistent with NEPA, a single EIS will be prepared for the two Plans. NMFS' NEPA determination for the Plans will be in effect for 15 years. The EIS will consider potential impacts on listed and non-listed animal and plant species and their habitats, water quality and quantity, socioeconomics, and environmental justice. The EIS will also include information regarding potential impacts on other components of the human environment, including air quality, human health, transportation, and cultural resources.

NMFS will rigorously explore and objectively evaluate a full range of reasonable alternatives in the EIS, including the Proposed Action (implementation of the co-managers' Resource Management Plans) and a No Action alternative. Additional alternatives could include the following: (1) a decrease in artificial production in selected programs that have a primary goal of augmenting fisheries, and (2) an increase in artificial production in selected programs that have a primary goal of augmenting fisheries.

Future Brood Document

The Future Brood Document (FBD) is a pre-season planning document for fish hatchery production in Washington State for the upcoming brood stock collection season. The FBD is coordinated between WDFW, the Northwest Indian Fisheries Commission (NWIFC), and Federal fish hatcheries. Hatchery production by volunteers, schools, and Regional Fisheries Enhancement Groups are represented by WDFW. Every Puget Sound hatchery program is listed in the document by facility location, species, race, brood year, stock and WRIA number. Each program lists the egg take goal, transfers that occur throughout the year and the planting goal. Dates, fish size and pounds produced are listed for each transfer and plant. This document is reviewed annually and the co-managers agree to production numbers. Changes to the FBD require submission of an FBD change form and approval by the co-managers.

Co-Managers Salmonid Disease Control Policy

This policy was developed between the Co-Managers in order to provide guidance and policy control of how hatcheries will operate to minimize the risk of importation, dissemination, and amplification of pathogens known to adversely affect salmonids. The policy divides the state into eight egg health management zones and 14 fish health management zones. The Policy provides direction for the care of broodstock, egg collection, egg and fish transfers within and between health zones.

Hatchery Genetic Management Plans

Listing of Puget Sound Fall Chinook as threatened under the Endanger Species Act required all hatcheries in Puget Sound to develop a Hatchery Genetic Management Plans (HGMPs). All chinook programs in South Sound have an HGMP. The HGMP’s describe, in a format prescribed by NOAA Fisheries, the operation of each artificial production program for salmon and steelhead in the Puget Sound region and the potential effects of each program on listed species. The HGMP's have been provided to NOAA Fisheries for consideration as significant measures under Section 4 (d) of the Endangered Species Act.

The following chinook HGMP's are listed for the East Kitsap facilities:

Grovers Creek Hatchery and Satellite Rearing Ponds
White River Spring Chinook (Minter Creek and Hupp Springs)
Minter Creek/Coulter Creek Fall Chinook Fingerling Programs

The Suquamish Tribe also has a Cowling Creek Chum Salmon HGMP and an Agate Pass Seapens Coho Salmon HGMP.

<u>HSRG Recommendations</u>

Currently, hatchery programs in Washington State are undergoing an extensive operational review by the Hatchery Scientific Review Group (HSRG). The task of the HSRG is to assemble, organize and apply the best available scientific information available to provide guidance and recommendations to the policy makers and technical staff who are responsible for implementing hatchery reforms.

A review of the East Kitsap region hatchery programs was completed by the HSRG in 2003. The HSRG recommended both Area-wide and Regional improvements.

Area-wide

- Take a regional approach to managing hatchery programs
- Operate hatcheries within the context of their eco-system
- Measure success in terms of contribution to harvest and conservation goals
- Emphasize quality, not quantity in fish releases
- Incorporate flexibility into hatchery design and operation
- Evaluate hatchery programs regularly to ensure accountability for success
- Develop a system of wild steelhead management zones
- Use in-basin rearing and locally adapted broodstock
- Take eggs over the natural period of adult return
- Develop spawning protocols to maximize effective population size
- Take into account both freshwater and marine carrying capacity in sizing hatchery program

Regional Recommendations

The HSRG made over 1,000 Regional recommendations. Of those many were specific for South Sound programs. These recommendations included program reductions or facility closures, broodstock collection adjustments and facility improvements. Currently a number of these recommendations have been carried out and several are ongoing.

These include:

- Grovers Creek develop on-site incubation capability to eliminate the need for egg transfers to and from Minter Creek.
- Discontinue backfilling Grovers program with Minter Creek eggs
- Review program needs and size to fit
- Elimination of Agate Pass coho program at Coulter Creek
- Elimination of Coulter Creek chinook releases
- Elimination of pink production at Minter Creek
- Reduction of coho production at Minter creek
- Discontinue the transfer of chum eggs from Minter Creek for the Donkey Creek program
- Adjusting Chinook broodstock returning timing at Minter Creek
- Evaluation and monitoring of each hatchery stocks through coded-wire tagging and mass-marking
- Provides for improved predator control measures to ensure accurate pond inventory at release
- Purchase of fish counters for evaluation and monitoring of juveniles released from hatcheries
- Purchase of equipment to improve operational effectiveness such as fish pumps

The HSRG review is providing a framework to improve operational efficiency and facility improvements to minimize the impacts our hatchery programs may have on listed stocks in the Puget Sound region.

4.2.4 - Summary

Hatcheries in the East Kitsap Region of Puget Sound have a dual role in salmon management: first, selected facilities work to conserve and enhance threatened or depressed stocks (White River Spring Chinook) and, secondly, to provide harvest opportunities for recreational, commercial and tribal fishers. Hatcheries also play a key role in the educational and regional enhancement projects located throughout the East Kitsap area.

4.3 - Harvest

4.3.1 - Chinook

The Co-managers (WDF&W and Treaty Tribes) in conjunction with NOAA have developed a Harvest Management Plan for Puget Sound Chinook (PS Indian Tribes & WDFW March, 2004. The document is envisioned as one element (harvest management component) of a Comprehensive Management Plan for Puget Sound Chinook to guide the recovery of Chinook. The Plan is anticipated to adequately address limit 6 of the 4(d) Rule (50 CFR 223:42476) under the ESA for the term covering management of fisheries from 2004-2009.

The Plan guides the implementation of fisheries in Washington, under the co-managers' jurisdiction, but it considers the total harvest impacts of all fisheries, including those in Alaska and British Columbia, to assure that conservation objectives for Puget Sound management units are achieved. Accounting of total fishery-related mortality includes incidental harvest in fisheries directed at other salmon species, and non-landed Chinook mortality.

The fundamental intent of the Plan is to enable harvest of strong, productive stocks of chinook, and other salmon species, and to minimize harvest of weak or critically depressed chinook stocks. However, the Puget Sound ESU currently includes many weak populations. Providing adequate conservation of weak stocks will necessitate foregoing some harvestable surplus of stronger stocks

The Plan's objectives can be stated succinctly as intent to:

> *Ensure that fishery-related mortality will not impede rebuilding of natural Puget Sound chinook salmon populations, to levels that will sustain fisheries, enable ecological functions, and are consistent with treaty-reserved fishing rights.*

This Plan will constrain harvest to the extent necessary to enable rebuilding of natural Chinook populations in the Puget Sound evolutionarily significant unit (ESU), provided that habitat capacity and productivity are protected and restored. It includes explicit measures to conserve and rebuild abundance, and preserve diversity among all the populations that make up the ESU.

While the plan identifies 15 separate Chinook management units, none of those represent drainages within the East Kitsap Watershed Chapter. However, the constraints imposed by weak management units restrict harvest from the ocean, straits of Juan de Fuca and Puget Sound resulting in reductions in preterminal interceptions of Kitsap bound salmon stocks. The lack of significant independent Chinook populations in East Kitsap provides flexibility for terminal directed harvest to take advantage of abundant hatchery fish. Programs such as the Gorst Chinook rearing facility provide isolated harvest opportunities for both Tribal and recreational fishers. Stock composition derived from 15 years of fishery sampling indicates 98% of Sinclair Inlet directed Chinook harvest are fish from local enhancement efforts.

4.3.2 - Coho, Sockeye, Chum, and Pink

Other salmon directed fisheries are guided by the Pacific Salmon Treaty (U.S. Canada 1999), the Magnuson Stevens Fisheries Conservation and Management Act (1976) and the Puget Sound Salmon Management Plan (1985). These regulatory forums limit fishery impacts based on conservation and sharing principles implemented annually within fishing plans adopted by the U.S. Department of Commerce and Canadian government. In most cases, weak stock management drives limitations on regional interceptions. System by system escapement objectives are defined for the majority of stocks directing fishery management decisions based on annual abundances.

Chum and coho stocks returning to East Kitsap are vulnerable to outside interception in mixed stock areas. However recent escapement trends in these basins indicate total spawner abundance at or above escapement goals with the exception of the deep south sound tributary coho which reflect an aggregate of stocks south of this chapters geography.

5.0 - GAPS

The combination of programs described above being implemented by various entities in the East Kitsap Watershed represent a comprehensive effort to conserve and restore salmon habitat from a multi-species perspective. These efforts undoubtedly represent a significant contribution to the recovery of Puget Sound Chinook, yet quantifying that contribution is difficult for a number of reasons. These reasons can be categorized as gaps in information, processes, and resources. This section will identify gaps and discuss the mechanism by which they are being or could be addressed.

5.1 - Information Gaps

No independent populations of Chinook have been identified in the streams of the East Kitsap watershed. While there is a documented presence of naturally spawning Chinook in some East Kitsap streams, it is unclear whether these fish originated from local enhancement programs, as is widely assumed, or whether they represent “sink” populations derived from independent populations of wild Chinook using local streams during times of higher abundance. Understanding the origins of these fish is critical to understanding East Kitsap’s role in the recovery of Puget Sound Chinook throughout the ESU. As marked brood years begin returning to the area it should be possible to determine the levels of escapement that represent fish from independent populations using East Kitsap streams (Jay Ziske, Suquamish Tribe, pers. comm.).

The assumption of spawner origin from local enhancement has created an isolated hatchery management area for co-managers driven by hatchery escapement goals for Chinook in the watershed (Jay Ziske, Suquamish Tribe, pers. comm.).

Without locally identified independent populations of Chinook, yet a variety of populations from other watersheds using East Kitsap nearshore areas, it is difficult at this time to assess the effectiveness of existing or future recovery actions on populations.

There is a growing body of evidence suggesting that Puget Sound Chinook from various independent populations are using the nearshore areas and estuaries for rearing and migration. Local beach seining data suggests that the greatest number of fish in the East Kitsap nearshore from independent populations originate from Central and South Sound (Dorn & Best 2005, Fresh et al DRAFT). Unfortunately, the lack of a comprehensive habitat assessment of East Kitsap’s nearshore/estuarine areas makes it difficult to determine with certainty where and how Chinook are using these systems.

Similarly, there is no comprehensive monitoring program for the watershed that enables managers to track progress on salmon recovery resulting from actions currently being taken or planned for the future. Bainbridge Island does not currently have a comprehensive water quality and stream flow monitoring program, although a permanent stream gauge was installed in 2004 and there are limited historic water quality and stream flow data.

Although it is unlikely that the issues of population and planning targets will be resolved by parties within the East Kitsap Watershed, the latter issues of nearshore habitat assessments and comprehensive monitoring can be addressed by local stakeholders. As noted above, Kitsap County is currently developing a nearshore assessment project that when completed and combined with the existing Bainbridge Island Nearshore Habitat Assessment should provide the capacity to identify and take specific actions needed to protect (most certain), restore, rehabilitate or create (least certain) habitat conditions favorable to salmon recovery. Likewise, as our existing efforts expand over time it will become even more critical to develop and implement a comprehensive monitoring program to assess the outcomes of our actions and adaptively manage our programs based on the results.

5.2 - Process Gaps

Also contributing to the difficulty in the recovery of Puget Sound Chinook is the lack of an on-going stakeholder process to participate in salmon recovery at the various levels needed to address recovery. While Kitsap County and the City of Bainbridge Island have a strong and successful tradition of public involvement, recovery has never been addressed on all fronts with a core group of stakeholders being exposed to everything from the voluntary restoration efforts to regulatory programs or development issues. Many of the stakeholder groups simply lack resources or interest to actively participate in comprehensive, salmon related, watershed forums. This is in part due to the fragmentation of natural resources management programs in the East Kitsap Watershed caused by the variable geographic configurations of the watershed. For example, WRIA 15 watershed planning boundaries encompass the entire Kitsap Peninsula, yet for Lead Entity purposes (and Shared Strategy) the peninsula is split between Puget Sound and Hood Canal drainages. Similarly, it is more difficult to catalyze stakeholder involvement around approximately 200 miles of shoreline, much of which is broken into numerous inlets and bays, than it is around a single waterbody such as a major river system.

Fortunately, growing integration of natural resource programs at the County and City-levels are creating a more efficient network of programs that draw on shared information and expertise. Programs like integrated watershed and community planning are serving to address a multitude of community issues, including salmon recovery, into a single process. As this program grows, it should consolidate larger areas of the East Kitsap Watershed into complimentary and consistent processes, facilitating greater recovery planning.

The Kitsap Nearshore Coordination Group works to foster collaboration between nearshore researchers, habitat managers and educators. Participants from the tribes, state and local agencies and community groups meet to share current work and support each others projects to better understand the Kitsap nearshore. This collaboration has resulted in sharing of resources, ideas and partnership opportunities and has helped strengthen the work of individual entities. Growing coordination with regional nearshore efforts is necessary to ensure efforts are aligned with Puget Sound wide recovery actions. In the future this effort could be the technical support arm of a citizen-based Marine Resources Committee modeled after the Northwest Straits Commission program.

5.3 - Resource Gaps

One of the major obstacles to adequately assessing the contribution of existing and proposed actions to the recovery of Puget Sound Chinook and the conservation of other species is a general lack of resources. This issue has an effect on the other categories of gaps discussed above, but also impacts the certainty of potential future actions. Lack of resources is the primary reason why cities in the East Kitsap Watershed, other than Bainbridge Island, have not been actively engaged in salmon recovery plan either in their respective jurisdictions or regionally. There is a general lack of funding for local government to support natural resource programs. This is particularly true of non-mandated efforts such as Shared Strategy and the Lead Entity program.

6.0 - EAST KITSAP COUNTY SUB-AREA PLAN

6.1 - East Kitsap County Conceptual Model for Salmon Habitat Restoration

Development of a simple conceptual model is useful to illustrate the interaction of existing information sources and programs with ecological factors that drive salmon habitat conservation and restoration in East Kitsap County (Fig. 6.1). While our knowledge of habitat forming processes in the watershed and how salmon use various habitats is increasing, there is insufficient information to develop a more sophisticated, multi-species model that evaluates the interactions of salmon with various habitats over space and time. Despite the lack of empirical information to develop a more comprehensive model, there is emerging agreement that certain population characteristics can be used to define viable salmon populations (VSP). VSP parameters and their respective importance in supporting viability are described in McElhaney, et al. (2000).

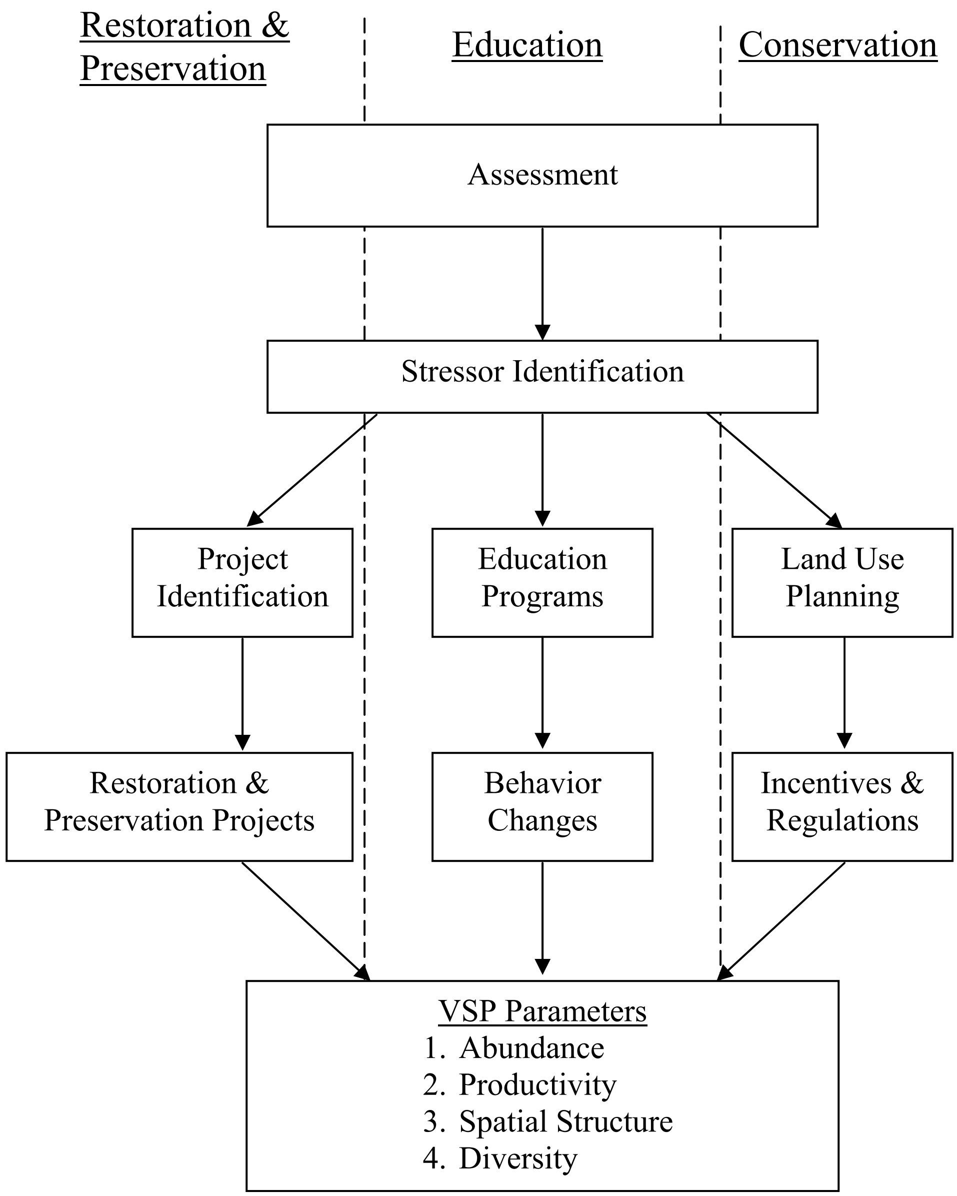
Briefly, the four VSP parameters are:

- Abundance – larger populations are at less risk than smaller ones of going extinct.
- Population growth rate – populations that are regularly replacing themselves are at less risk of extinction.
- Spatial structure – may affect populations' ability to adapt to environmental changes (metapopulations with associated subpopulations)
- Diversity – among and within populations, it allows species to use a wider variety of environments, protects (survival) against short-term disturbance and long-term changes in the environment.

Figure 6.1 illustrates the various levels and processes used, in-part, to direct habitat management decisions in East Kitsap County. As will be described in more detail below, programs or activities currently supporting salmon recovery in the watershed can be categorized as restoration, education and conservation. These three categories characterize a three-track approach to habitat management in East Kitsap County. This conceptual model assumes that the activities and programs associated with the three tracks and described below are sufficient to maintain and restore habitat for viable salmon populations.

Common to all three tracks is the assessment of habitat types and quality, as well as stock assessments for the various species of salmonids found in the watershed. These assessments are undertaken as resources allow and vary in their scopes including assessments of watershed and nearshore processes (Chico Watershed Planning Project, 2003), instream and nearshore habitat quality (May & Peterson, 2003; Bainbridge Island Nearshore Habitat Assessment, 2004; WRIA 15 East Kitsap Limiting Factors Analysis, 2000) and stock assessments (Salmon and Steelhead Inventory, 2002).

Figure 6.1. Conceptual Model for Salmon Habitat Recovery in East Kitsap County



Also common to all three tracks and resulting in part from assessments is the identification of stressors. Stressors are factors typically resulting from human actions that may directly or indirectly affect or limit VSP parameters. Stressors are also identified through a growing body of scientific information from other areas. For example, there is a growing body of scientific evidence linking the presence of pesticides in aquatic ecosystems with deleterious neurological effects on salmon (Scholz, N.L. et al., 2000), yet this type of work has not been conducted in the watershed to determine the extent of its impact on local or transient stocks of salmon.

The identification of stressors or factors limiting VSP parameters drives programs and projects in the three respective tracks. For example, physical stressors, such as riparian area degradation, are addressed through the identification, prioritization, design and implementation of voluntary restoration projects. Practices such as home and garden use of pesticides are improved through education programs and resulting behavior changes. While natural resource and land use planning help identify opportunities for communities to accommodate growth while maintaining watershed and nearshore processes and protecting habitat by identifying areas appropriate for more intensive land use and creating development standards and incentive programs to safeguard existing habitats.

By addressing stressors through the application of restoration/preservation, education and conservation actions, VSP parameters are supported for local species of salmon as well as the life stages of salmon originating from other watersheds that use our estuarine and nearshore areas during migration out to sea and back again.

6.2 - Nearshore Hypotheses

The Regional Nearshore Salmon Recovery Plan, currently under development by the Puget Sound Action Team (PSAT), focuses on two of the VSP parameters, diversity and spatial structure. The PSAT has recognized that further evaluation of how habitats and stressors affect these parameters will require additional “landscape analysis” of populations and/or marine sub-regions of Puget Sound. Given that PSAT has not yet undertaken these landscape analyses, they have proposed two hypotheses for salmon in the nearshore that focus on functions provided to individual salmon (primarily outmigrant juveniles) rather than the viability of populations. These working hypotheses relate to individuals and are NOT extended to populations, life history types expressed (or potentially expressed) in these populations, or the specific Puget Sound nearshore and marine landscapes over which these populations range. While PSAT recognizes that these hypotheses and analyses are incomplete, the hope is that they will help to define and generate concurrence about the building blocks that will be used in landscape analyses to evaluate effects of stressors and potential habitat protection and restoration efforts on chinook populations.

In an effort to be consistent with the developing Regional Nearshore Salmon Recovery Plan, we have made an attempt to apply these two hypotheses, namely the Habitat-Based and Stressor-Based Hypotheses, to the East Kitsap nearshore.

6.2.1 - Habitat-Based Hypotheses

East Kitsap nearshore habitats provide four functions for individual juvenile salmon:

- feeding and growth (rearing),
- refuge from predation and extreme events,
- physiological transition, and
- migratory corridors.

Viable salmon populations require that East Kitsap nearshore and marine landscapes provide these functions for a diversity of life history types.

East Kitsap nearshore habitat can be categorized into four broad landscape classes with primary focus on juvenile salmonids. These include:

1. Open Exposed Shorelines
2. Protected Shorelines
3. Pocket Estuaries
4. River Mouth Estuaries and Deltas

Each of these broad classes includes a number of embedded smaller scale habitat types such as mudflats, eelgrass, blind channels, etc. Specific salmon habitats can occur in more than one of the four landscape classes. For example, eelgrass may be found in pocket estuaries, along protected shorelines. Blind channel networks can be found in pocket estuaries.

If specific habitat features are lost (either naturally or by human causes), the landscapes may provide lesser functions for salmon, which may result in the elimination of a particular life history type within a population (Fresh, pers. comm.). This also means that the consequences of habitat losses to salmon populations are not limited to the on-site effects, but can extend to distant areas. For example, the loss of river estuary and proximal nearshore habitats can eliminate the pocket estuary fry from a population even though high quality pocket estuaries may be abundant in the marine sub-basin (B. Graeber, NOAA-TRT, personal communication).

6.2.2 - Stressor-Based Hypotheses

The stressor-based hypothesis in the developing Regional Nearshore Salmon Recovery Plan does not address how stressors affect the viability of specific populations of Puget Sound chinook. Rather, depending on the severity and geographic and seasonal distribution of the loss of habitat functions, the viability of populations might be at risk due to concerns about:

- abundance (e.g., if reduced food production would limit the number of fish that could be supported in the area over which a population is distributed);
- productivity (e.g., if reduced refuge increased the rate of mortality of outmigrant juveniles due to predation);
- spatial structure (e.g., if reduced distribution of habitat features that provide food for outmigrant juveniles would limit the geographic area over which a population was successfully foraging); and
- life history diversity (e.g., if reduced refuge appropriate for fry and fingerling migrants increased the mortality of these life history types).

Future efforts at landscape analysis by PSAT (and others) will help us to develop hypotheses about how specific life history types of individual populations are affected by stressors in various marine sub-regions of Puget Sound, including the East Kitsap nearshore. No matter which habitat type or landscape a juvenile salmon encounters in the East Kitsap nearshore, it is likely that human-induced stressors may have impaired some of the habitats' attributes. Stressors are compounded in estuarine and nearshore (presumably) areas because the fish are already stressed due to physiological changes (from fresh to salt water environment) (from Aitken 1998). Using an adapted version of the proposed classification scheme from the developing Regional Nearshore Salmon Recovery Plan, examples of key stressors that limit habitat function along the East Kitsap nearshore include:

Shoreline Development

- **Shoreline Armoring/Bulkheading:** Marine shorelines in East Kitsap are extensively armored/bulkheaded. The East Kitsap shoreline is estimated to be approximately 80% developed and Bainbridge Island shorelines are approximately 48% armored. Activities associated with shoreline development include filling of intertidal mudflat, salt marsh, and lagoon habitat, shoreline armoring, removal of riparian vegetation. These activities have altered natural shoreline processes, including recruitment of sediment and woody debris from eroding bluffs and sediment transport and deposition along the shoreline.

- **Landfill:** Fill of upper intertidal often results in direct elimination of saltmarsh habitat and reduces tidal influence. Based on Washington Department of Ecology Oblique Photographs (2000-2001), fill has altered nearshore processes along East Kitsap Shorelines. However, the extent of alterations has not been determined.

- **Dredging and Conversion of Nearshore Habitat to Deepwater Habitat:** Marinas with boat moorage facilities are present throughout East Kitsap; there are 17 marinas in the Kitsap County. Most marinas involve at least some dredging of intertidal and shallow subtidal habitat to provide sufficient depth for navigation and boat moorage. In addition, many marinas have breakwater structures that extend from the upper intertidal well out into the subtidal area. Overwater shading of moored boats, boathouses, and docks and piers can also affect the benthic productivity, and may also affect nearshore migration behavior of juvenile salmonids. Marinas are also known to have increased incidence of water quality problems, including fuel spills, increased nutrients and toxics.

- **Alteration of Intertidal/Shallow Subtidal Vegetated Habitat:** Intertidal and aquatic vegetated habitat is impacted by a variety of activities in East Kitsap. Fill of upper intertidal areas often results in direct elimination of saltmarsh habitat and alteration of natural sediment transport processes from estuaries (e.g., Carpenter Creek, Clear Creek) has resulted in sedimentation in the estuary, with associated loss of saltmarsh habitat. Loss of eelgrass (*Zostera marina*) habitat in the intertidal/shallow subtidal area is a concern. These habitats are directly impacted by fill or dredging, overwater structures and loss of natural shoreline sediment process. Remaining eelgrass meadows also appear to be at risk of eutrophication and elimination due to the increasing presence of ulvoid mats (*Ulva spp*.). Storm water outfalls may also alter eelgrass and aquatic macroalgae beds. The mechanisms for these alterations are not well understood, but are likely related to both water quality impacts as well as reduced salinity near the storm water outfalls.

- **Loss/Lack of Shoreline Riparian Vegetation:** There has been significant loss of riparian functions along the East Kitsap shoreline, associated with development. Marine shoreline riparian vegetation provides similar functions to those in the freshwater environment: bank stability, shade, detrital/nutrient input, and contribution of large woody debris (LWD).

Spills and Discharges to Marine Waters

- **Discharges Impacting Water Quality:** There are a number of marine water quality problems in East Kitsap County, with many streams being listed on the Clean Water Act

303(d) list. (Discharges are from both point and nonpoint pollution sources including stormwater.)

- **Oil and Toxic Spills:** The marine shorelines and resources of East Kitsap are at risk of significant adverse impacts from oil spills and other toxic spills in the marine environment. There are numerous marinas and docking facilities. In addition, transport, storage, and transfer of large volumes of fuel occur at the PSNS and the Navy Fuel Depot at Manchester. All of these pose a significant risk of chronic (small volume) or catastrophic toxic spills.

Legacy Contamination in East Kitsap Sediments

- **Marine Sediment/Water Quality:** There are several sediment quality (and water quality) problems associated with current and previous Navy facilities. Sediment contamination has been indicated at the PSNS, Keyport, Manchester, and Jackson Park. In addition, Dyes Inlet/Port Washington Narrow, Port Orchard/Agate Passage/Rich Passage, and Sinclair Inlet have been on the 303(d) list for exceeding a broad variety of water quality parameters. There are also several water quality and sediment quality problems associated with industrial activity, including the Wyckoff/Eagle Harbor Superfund Site.

Shellfish and Finfish Aquaculture

- **Netpen Facilities:** There are salmonid netpen facilities at several locations, including Manchester and at the southern end of Bainbridge Island. Netpen installations are known to affect sediment quality due to shading, and due to accumulation of excess food and fish feces that accumulate on the bottom in the vicinity of the netpen.

Hatchery Fish Interactions

- Refer to hatchery section (P. Dorn, pers. Comm.).

Non-Native Invasive Species

- Several invasive species may pose a threat to salmon at various life stages either through direct alteration of habitat or indirect ecosystem implications such as displacement of native species. The presence of spartina infestations in several local estuaries has physically changed the habitat structures in portions of these areas.

Urbanization of Smaller Independent Freshwater Drainages

PSAT has noted that Graeber (NOAA-TRT, personal communication) has observed urbanization (structures, impervious surfaces, land use, over-water structures, etc) in many of the small drainages throughout Puget Sound. With urbanization, Fresh (personal communication) reported an increase in the magnitude and frequency of floods, as well as an altered hydrologic cycle (e.g., new peak runoff events). As a result of these alterations, additional sediments are transported to estuaries more frequently which may lead to filled-in marsh channels and buried vegetation (Fresh personal communication) that can affect juvenile salmon. For example, chum salmon often utilize and spawn in many of the smaller independent freshwater drainages of Puget Sound (some streams are even intermittent); “many of these small systems that have been heavily impacted by effects of urbanization” (Fresh personal communication).

The cumulative effect of the urbanization of smaller independent freshwater drainages (not connected to larger estuaries) like those in East Kitsap, may alter hydrology and sediment processes. Urbanization affects water quantity and water quality, and sediment composition, and which affect the nearshore habitats upon which salmon depend (e.g., reduced opportunities to utilize habitats). Thus, the effects on juvenile salmon include altered feeding and growth (e.g., reduced food sources available to salmon), affected refuge locations from predators and extreme events, and affected physiological transition areas. The resulting effects on the functions of juvenile salmon affect one or more life history trajectories of one or more of the listed salmon populations.

The role of stormwater and water quality on salmon habitat is an evolving body of literature. Stormwater links to acute fish kills in other parts of the Puget Sound region are identified, yet which constituent(s) of the stormwater that proved lethal is as yet undetermined. Increased urbanization is associated with degraded water quality and increased contaminants, such as heavy metals and pesticides, are deemed hazardous to salmon, yet our scientific knowledge is limited due to the complexity and expense of thorough toxicological studies. As this research base increases, we will have an increased understanding of urbanization impacts on salmon. The USGS studies of the Puget Sound Basin over the last decade have found potential impacts to salmon linked to urbanization via water quality and decreased invertebrate productivity (Ebbert, J.C., et al. 2000).

6.3 - Future Actions

Future actions to be undertaken in the East Kitsap Watershed by Kitsap County primarily consist of the continuation of existing programs described above. These programs are a combination of mandated updates to the County’s Comprehensive and Shoreline Master Plan goals and policies as well implementing ordinances, such as the Critical Areas Ordinance, and non-mandated programs such as watershed planning and coordination of the East Kitsap Lead Entity.

Specifically, Kitsap County will update both its Comprehensive Plan and Shoreline Master Program in 2011 to include policies based upon best available science (BAS) giving special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries as required under the Growth Management Act (RCW 36.70A. 172). Also in 2011, Kitsap County will revise its Critical Areas Ordinance, again based upon BAS and providing special consideration for salmon.

The implementation of non-mandated recovery related programs are dependent on available local, state and federal funding to support these actions. These actions will include the continued implementation of prioritized nearshore and watershed restoration and protection projects identified in the East Kitsap Peninsula Salmon Recovery Strategy and Lead Entity process.

As the WRIA 15 Watershed Plan is developed and adopted in the coming years, recommendations from the plan and technical assessments will be used to inform local natural resource management and land use planning processes to better manage water resources to support the needs of people and salmon.

With the continuation of integrated watershed and land use planning, Kitsap County will develop land use plans that accommodate population growth and the resulting development in ways that minimize the impact to natural watershed process and fish and wildlife habitats.

6.4 - Estimated Costs -TBD

- Administration
- Programs
- Projects

7.0 - BAINBRIDGE ISLAND SUB-AREA PLAN

Salmon are important to the residents of Bainbridge Island as an ecological, cultural, recreational and commercial resource and they are one of the most iconic symbols of the region we call home. Healthy salmon populations are an indicator of overall environment health – and are therefore a measure of the success or failure of our long-term environmental stewardship.

The approach taken by Bainbridge Island for salmon recovery and conservation is guided by City Council Resolution 2000-31 (see inset), which directs the City administration to pursue salmon recovery and conservation primarily through the fulfillment of existing State mandates and the implementation of the City's Comprehensive Plan.

RESOLUTION No. 2000-31

A RESOLUTION of the City Council of the City of Bainbridge Island, Washington, stating the Council's intent to conserve and recover the Puget Sound Chinook salmon and to protect habitat for the Puget Sound Chinook salmon.

WHEREAS, the federal government has listed Puget Sound Chinook salmon as threatened by extinction under the Endangered Species Act; and

WHEREAS, the shoreline environment of Bainbridge Island contains critical habitat utilized by Puget Sound Chinook salmon and other important fish and wildlife species; and

WHEREAS, the protection of habitat critical for the survival of salmon and other fish and wildlife species is a priority of the City of Bainbridge Island, as stated in the City's Comprehensive Plan and Shoreline Master Program; and

WHEREAS, the City's Comprehensive Plan is currently undergoing review as mandated by the State of Washington, the City's Shoreline Master Program and Stormwater Management Plan will also undergo extensive review as mandated by the State upon the State's adoption of final rules for its stormwater and shorelines programs; and

WHEREAS, in the interest of maximizing the city's limited staff and financial resources to comply with various federal and state mandates which protect and conserve our natural environment;

THE CITY COUNCIL OF THE CITY OF BAINBRIDGE ISLAND HEREBY RESOLVES:

The City of Bainbridge Island shall provide for the conservation and recovery of the Puget Sound Chinook salmon through the scheduled review and revision of the Comprehensive Plan, the Shoreline Master Program and the Stormwater Management Plan, and through a comprehensive review of its Roads Maintenance and Operations Program and other activities which may impact salmon and salmon habitat. During these reviews, activities believed to impact salmon and nearshore habitat will be addressed first and will receive priority for revision and implementation. The City will monitor the efforts of Kitsap County, the State of Washington and the National Marine Fisheries Service and will give due consideration to any clear and rational regulations or requirements proposed by these agencies.

Kitsap Countywide Planning Policies (see Appendix F) and the City's Comprehensive Plan (see Appendix E), specifically policy FW 1.6 (see inset), further guides the approach taken by Bainbridge Island for salmon recovery and conservation and guides the City's involvement in the development of a regional salmon recovery and conservation plan.

Comprehensive Plan Policy FW 1.6

The City shall undertake appropriate, adequate, and timely actions to protect and recover state priority species, species listed under the federal Endangered Species Act, local species of concern, and their habitats located within the City to 1) avoid local extirpation of such species from the lands or fresh waters or nearshore of the City and 2) contribute to the protection and recovery of such species throughout the greater region in cooperation with federal, state, and other local agencies.

Discussion: Local extirpation means the elimination of self-sustaining residential populations from the entire Island and its waters, or adequate habitat to sustain use of the Island's lands and waters by transitory or migratory populations.

This plan is the implementation of the policy direction and guidance discussed above by the City administration and is the primary tool for:

- ***Coordinating and integrating the various activities required to be implemented,***
- ***Providing a sound technical basis for their implementation,***
- ***Monitoring their effectiveness, and***
- ***Identifying outstanding issues that need to be further addressed.***

7.1 - Scope of the Bainbridge Island Sub-Area Plan

Extirpation and extinction of salmon populations have occurred within Puget Sound and a significant number of salmon populations (aka: stocks) are considered depressed or critical (WDFW 2002). Extirpation of salmon from a limited number of Bainbridge Island streams has potentially already occurred based on known habitat impacts and fish passage barriers, but has not been documented. Important habitat capacity for salmon within the Island's nearshore areas has been lost, primarily due to historic filling, armoring, and water quality impacts. However, high quality freshwater and nearshore habitats remain and there is great and wide-spread potential for habitat improvements.

The Bainbridge Island Sub-Area Plan applies to multiple salmonid species in the subwatershed and nearshore areas within the jurisdictional boundaries of the City of Bainbridge Island. The salmon species and applicable life-stages addressed by this plan are summarized in Table 7.1. This plan is primarily focused on juvenile rearing and migratory life-stages as well as the adult spawning life-stage since these are the periods of the salmon life cycle that are affected by local habitat conditions. Bull Trout are not specifically addressed by this plan because they do not occur within the Island's small streams and are not known to occur along the shorelines of Bainbridge Island (see Section 3.10). Since this plan uses an ecosystem-based approach, actions benefiting the targeted species are expected to benefit Bull Trout that may utilize the Bainbridge Island Nearshore. The Islands subwatersheds are not utilized by Chinook and sockeye salmon and historically did not contain suitable habitat for these species. Sockeye salmon may utilize the Island's nearshore but have not been documented to do so during almost four years of beach seining, although all seining has occurred during the day and juvenile sockeye are thought to migrate at night. Pink salmon have not been documented in Island streams (Haring 2000; WDFW 2002) but could potentially utilize some Island streams. Freshwater resident streelhead trout, known as rainbow trout, have not been documented in Island streams, which are not likely to provide suitable habitat.

Table 7.1. Species and Life-Stage Addressed by the Bainbridge Island Sub-Area Plan

Species	Life-Stage		ESA Status
	Subwatersheds	Nearshore	
Chinook	None	Juvenile rearing & migration	Threatened
Coho	Egg incubation; Juvenile rearing & migration; Adult spawning	Juvenile rearing & migration	Candidate
Chum	Egg incubation; Juvenile rearing & migration; Adult spawning	Juvenile rearing & migration	
Pink	Not Documented, but possible: Juvenile rearing & migration; Adult spawning	Juvenile rearing & migration	
Sockeye	None	Not Documented, but possible: Juvenile rearing & migration	
Cutthroat	Egg incubation; Juvenile rearing & migration; Adult spawning & residence	Juvenile rearing & migration; Adult residence	
Steelhead	Juvenile rearing & migration; Adult spawning	Juvenile rearing & migration	

This sub-area plan is the beginning of an iterative and adaptive resource management process, one in which the City has been engaged for years in many respects but not previously in such an integrated and focused way. Therefore, some actions and programs identified in this plan are already being implemented and should be continued and/or modified while other proposed actions should be implemented over various time scales ranging from the very near term (1-5 years), mid-term (5-15 years), and some long-term actions likely to continue at various frequencies in perpetuity. The focus of this plan (iteration #1) is on the near to mid-term with particular emphasis on integrating/modifying existing efforts, filling important gaps, improving the technical basis for long-term planning, and implementing priority projects.

7.2 - Goals, Objectives, & Principles

> "Ecosystem Management is management driven by explicit [objectives], executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function.
>
> Ecosystem Management must include the following:
>
> 1. Long-term sustainability as [a] fundamental value,
> 2. Clear, operational [objectives],
> 3. Sound ecological models and understanding,
> 4. Understanding complexity and interconnectedness,
> 5. Recognition of the dynamic character of ecosystems,
> 6. Attention to context and scale,
> 7. Acknowledgment of humans as ecosystem components, and
> 8. Commitment to adaptability and accountability."
>
> *Christienson et al. 1996 (see Appendix M)*

Overall Goal

The goals and objectives of this plan provide the framework for the implementation of salmon recovery and conservation on Bainbridge Island consistent with the vision and timeframe articulated in Section 1.1; specific policy guidance provided by the City Council and the Bainbridge Island Comprehensive Plan (see Sections 7.0 and Appendix E); and technical guidance provided by the Puget Sound Technical Recovery Team, Shared Strategy for Puget Sound, Washington State Department of Fish and Wildlife, and the Suquamish Tribe.

Goal: Restore and conserve self-sustaining and harvestable wild salmon populations on the Island and contribute to regional salmon recovery and conservation in a manner that is ecologically sound and socially equitable; does not jeopardize other species; and enhances our community, our quality-of-life, and our economy.

When combined and if successfully achieved, the following objectives and principles will result in the accomplishment of the overall goal. Objectives are split into three categories for organizational purposes and numbered for reference, but are not listed in any particular order.

7.2.1 - Ecosystem Objectives

> **"Sound ecological models and understanding.** Ecosystem management is based on sound ecological principles and emphasizes the role of processes and interconnections. Ecosystem management should be rooted in the best current models of ecosystem function. … Ecosystem Management depends on research performed at all levels…, from investigations of the morphology, physiology and behavior of individual organisms, through studies of the structure and dynamics of populations and communities, to analysis of patterns and processes at the level of ecosystems and landscapes.
>
> **Complexity and connectedness.** … Biological diversity and structural complexity of ecosystems are critical to such ecosystem processes as primary production and nutrient cycling. Complexity and diversity also impart resistance to and resilience from disturbance, and provide the genetic resources necessary to adapt to long-term change. …
>
> With complexity comes uncertainty. Some of our uncertainty regarding or lack of precision in predicting ecosystem behavior derives from the fact that we do indeed have more to learn. However, we must recognize that there will always be limits to the precision of our predictions set by the complex nature of ecosystem interactions and strive to understand the nature of those limits. Ecosystem management cannot eliminate surprises or uncertainty; rather, it acknowledges that, given sufficient time and space, unlikely events are certain to happen.
>
> **Recognition of the dynamic character of ecosystems.** Sustainability does not imply maintenance of the status quo. Indeed, change and evolution are inherent characteristics of ecosystems, and attempts to "freeze" ecosystems in a particular state or configuration are generally futile in the short term and certainly doomed to failure in the long term. Crises associated with the management of our forests, fisheries, and wildlife have driven home the points that individual resources cannot be managed outside of the context of the full array of ecosystem components and processes and that the spatial and temporal domains of critical ecological processes are rarely congruent with the spatial boundaries and temporal schedules of management.
>
> **Context and scale.** Ecosystem processes operate over a wide range of spatial and temporal scales, and their behavior at any given location is very much affected by the status and behavior of the systems or landscape that surrounds them (*citation ommitted*). There is no single appropriate scale or timeframe for management."
>
> *Christienson et al. 1996 (see Appendix M)*

(*The following objectives are largely adapted from: Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Steering Committee, 2004 and Spence et al 1996*)

E-1: Maintain and restore watershed and nearshore processes that create and sustain habitats and ecological functions necessary to sustain healthy salmon populations.

E-2: Maintain and restore habitat necessary to sustain healthy salmon populations during all life-stages and life-histories as well as functional corridors linking these habitats.

E-3: Maintain and restore a well-dispersed network of high-quality refugia habitats necessary to sustain core salmon populations and serve as centers for population expansion.[4]

E-4: Maintain and restore connectivity between high-quality refugia habitats to allow for recolonization and salmon population expansion.

E-5: Maintain genetic diversity and integrity within and among salmon populations and species.

7.2.2 - Community Objectives (People and Economy)

"Ecosystem Management acknowledges the role of humans, not only as the cause of the most significant challenges to sustainability, but as integral ecosystem components who must be engaged to achieve sustainable management goals (*citations omitted*). Human effects on ecosystems are ubiquitous. Although we should strive to reduce deleterious impacts, current trends in population growth and demand for natural resources will undoubtedly require more intensive and wiser management, particularly to support human needs in a sustainable way. Thus, identifying and engaging stakeholders in the development of management plans is a key ecosystem management strategy. Humans who are part of the ecosystems will, of necessity, define the future of those ecosystems."

"[A]ny corporate manager knows that, when inventories are depleted and the physical plant is allowed to deteriorate, it is possible to make money in the short term while watching your net worth waste away. Such is the road to bankruptcy. Businesses routinely make decisions with short-term costs, but obvious benefits to their long-term sustainability.

This metaphor captures the sense of intergenerational equity and the stewardship responsibilities that are central to an ecosystem management philosophy. Ecosystem management is the ecological analog to the economic stewardship of a trust or endowment dedicated to benefit all generations.

Ecosystem management is not a rejection of the anthropocentric for a totally biocentric world view. Rather, it is management that acknowledges the importance of humans needs while at the same time confronting the reality that the capacity of our world to meet those needs in perpetuity has limits and depends on the functioning of ecosystems."

Christienson et al. 1996 (see Appendix M)

[Add discussion summarizing applicable info from Community Values Survey and about social and economic costs and benefits associated with salmon recovery – see "Saving Salmon, Sustaining Prosperity"]

Responses to 2000 Community Values Survey:

- **Over 2/3 of respondents characterized the Island as suburbanizing**

[4] May & Peterson (2003) evaluates watershed and nearshore refugia throughout the East Kitsap Watershed. Since the Bainbridge Island Nearshore Assessment (Williams et al 2004) provides a more detailed nearshore ecological evaluation, it will be used to evaluate nearshore refugia within the Bainbridge Island Sub-Area.

- **Respondents split nearly 50/50 over negative or positive feelings about growth**
- **Characteristics that most contribute to Island's Character:**
  - **Most (30%) said Forested Land**
  - **4th (9%) said Open Space**
  - **Last (3%) said Wildlife**
- **Characteristics most valued**
  - **Most (42%) said Sense of Community**
  - **Second (28%) said Open Natural Space**
- **Characteristics least valued**
  - **Least (2%) said Open Natural Space**
  - **Second least (3%) said Sense of Community**
-

C-1: Maintain and build community appreciation and support for salmon recovery and conservation.

C-2: Use salmon recovery and conservation activities as opportunities to improve our community and sense-of-place. Integrate signage, public access, and community participation whenever possible and at appropriate scales on public lands and willing private lands.

C-3: Utilize a broad and appropriate range of management tools (e.g. policy, planning, regulation, incentives, assistance, easements, and acquisition) to fairly and equitably share the burdens and benefits of salmon recovery and conservation in a manner that respects private property rights.

C-4: Integrate watershed and nearshore conservation and restoration into land use plans and developments in a way that enhances overall community character, livability, and does not degrade property values.

C-5: Communicate with the community about salmon recovery and conservation activities in a timely manner and provide easy access to information, reports, and data.

C-6: Make wise and strategic public and private investments that result in overall fiscal benefits (e.g. increased value, decreased costs) and social benefits (e.g. aesthetics, quality-of-life, recreation, clean water, etc) to the community and result in overall benefits to salmon.

C-7: Avoid future salmon recovery costs and minimize mitigation costs by avoiding and minimizing adverse impacts to ecosystem processes and salmon habitats in the first place.

C-8: Work with WDFW and the Suquamish Tribe to integrate habitat, harvest, and hatchery management activities in a manner that is equitable, respects treaty rights, and minimizes risks to salmon populations in the Bainbridge Island Sub-Area.

7.2.3 - Adaptive Management Objectives

> "As in all areas of science, current models and paradigms of ecosystem function are provisional and subject to change. Ecosystem managers must acknowledge that our knowledge base is incomplete and subject to change. Management goals and strategies must be viewed as hypotheses to be tested by research and monitoring programs that compare specific expectations against objective measures of results (*citations omitted*).
>
> Adaptability and accountability are central elements of ecosystem management. Managers must be able to adapt to the unique features or needs of a particular area and to inevitable temporal changes as well. Management must also be able to adapt to new information and understanding. To be adaptable and accountable, management objectives and expectations must be explicitly stated in operational terms, informed by the best models of ecosystem functioning, and tested by carefully designed monitoring programs that provide accessible and timely feedback to managers. Public understanding and acceptance of the experimental nature of all natural resource management are critical to the implementation of ecosystem management protocols."
>
> *Christienson et al. 1996 (see Appendix M)*

(The following objectives are partially adapted from: Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Steering Committee, 2004)

AM-1: Approach the development and implementation of management plans and actions in a scientifically rigorous manner, including the articulation of appropriate hypotheses.

AM-2: Employ scientifically rigorous monitoring, including implementation, effectiveness, and validation monitoring, at appropriate scales to measure how well management actions achieve goals and objectives. As necessary, employ corrective actions to achieve goals and objectives.

AM-3: Conduct research and investigations necessary to improve the understanding of ecosystem conditions as well as the watershed and nearshore processes that are critical to the formation of salmon habitat.

AM-4: Review and update management plans at defined intervals (or more frequently as necessary) based on the results of monitoring, research, and literature review.

AM-5: Take action in the face of scientific uncertainty provided that the action is rigorously planned, designed, and monitored; that the costs and risks are worth the benefits of learning from possible mistakes and failures; and that corrective actions will be employed, if necessary, to achieve goals and objectives.

7.2.4 - Guiding Principles

(The following principles are partially adapted from: Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Steering Committee, 2004)

The principles listed below are intended to further guide how objectives will be met, particularly when there are many potential management actions and not enough time or resources to implement them all. They are numbered for reference, but listed in no particular order.

P-1: Priority should be given to actions that mitigate risks to resources that benefit salmon.

- Risk is a cumulative function of both the potential *magnitude* that an impact will have and the potential *frequency* that the impact will occur. For example, a large oil spill from a ship or truck poses a risk of great magnitude, but at a low frequency while heavy metals and other hazardous materials emitted from vehicles onto roads ways and into stormwater may have a low magnitude, but occur at a very high frequency.

P-2: Priority should be given to actions that will result in a high level of benefit related to its associated cost. The following factors should be considered when evaluating cost:

- Fiscal Value – Is the cost of the action discounted (below market rate), market rate, or at a premium (above market rate)?
- Opportunity cost – Will the cost of the proposed action be less/greater than if it were implemented at an alternative site or time? If the activity can occur only in one or possibly a few locations or if the proposed location is highly essential to achieve an important objective or reduce significant risk, then the cost of forgoing the opportunity would be very high.
- Community Value – Does the project incur unacceptable or inequitable community costs or does it enhance the character and quality-of-life in the community?

P-3: Whenever possible, priorities should be based on the results of a comprehensive assessment of a system (i.e. subwatershed or shoreline management area), a modeling of system-wide benefits to salmon, estimated costs, and capacity to implement the range of necessary actions.

P-4: Priority should be given to species that are listed or are candidates for listing under the Federal Endangered Species Act or by the Washington State Department of Fish and Wildlife. Priority should also be given to species who are at risk of extirpation from Bainbridge Island.

P-5: Priority should be given to the conservation of remaining high quality habitat because it is generally the most cost-effective approach; it provides the greatest certainty that habitats and ecological processes will be sustained; and minimizes impacts to existing community and private infrastructure.

P-6: Restoration projects should seek to return ecological processes and habitat functions to conditions that allow for natural long term variation whenever possible.

- Records of historic conditions provide the best template for the scale and scope of restoration projects. In the absence of a historic record or in systems where historic conditions are not achievable, best professional judgment and the use of various technical tools (i.e. models, etc) will be necessary to determine the best approach.
- This does not imply that all historic functions will be or must be restored. However, restoration of adequate function and capacity for natural variation will minimize risks to salmon populations, reduce long-term maintenance cost, reduce

potential risks to the community (i.e. flooding, landslides, etc), and reduce potential future restoration or enhancement cost.

P-7: Develop and implement a process and the capacity to shift priorities and resources, or pull on reserved contingency resources, when unplanned or unanticipated opportunities and risks arise.

P-8: Capitalize on the opportunities provided from continued population growth to maintain and restore habitat.

- Seek legally appropriate and socially responsible opportunities to incorporate habitat conservation and restoration when property is developed or redeveloped.
- Evaluate potential revenue opportunities that could be derived from the economic expansion associated with continued population growth.
- Focus education and outreach efforts, in part, on new residents and the industries associated with growth and development (real estate, developers, contractors, etc).

P-9: As a tool to improve equity in the benefits and burdens created by management actions, the greater public should make investments in community infrastructure (e.g. docks, beach access, etc) where management actions (i.e. regulations, legal agreements) have restricted or limited the development of private infrastructure in areas where such private development may likely and reasonably occur (i.e. dock or beach access is not likely or reasonable in muddy back bays, but is likely and reasonable in areas with access to navigable waters or sandy/gravel beaches).

P-10: Avoid adverse impacts from salmon recovery and conservation activities to existing habitat that could lead to the local extirpation of other species from the Island.

- Note that salmon recovery and conservation on Bainbridge Island is focused on restoring ecosystems and therefore should pose very limited, if no, risk to other species. However, risks to other species could occur in extreme cases where, for example, watersheds or nearshore areas are so modified that habitat enhancement or creation would be the principle method of increasing the viability of salmonid populations and where such projects would adversely impact the habitat of a native species that is itself on the brink of extirpation. Based on our current knowledge about the existing ecological conditions in the Bainbridge Island Sub-Area, this type of scenario is not expected to arise.

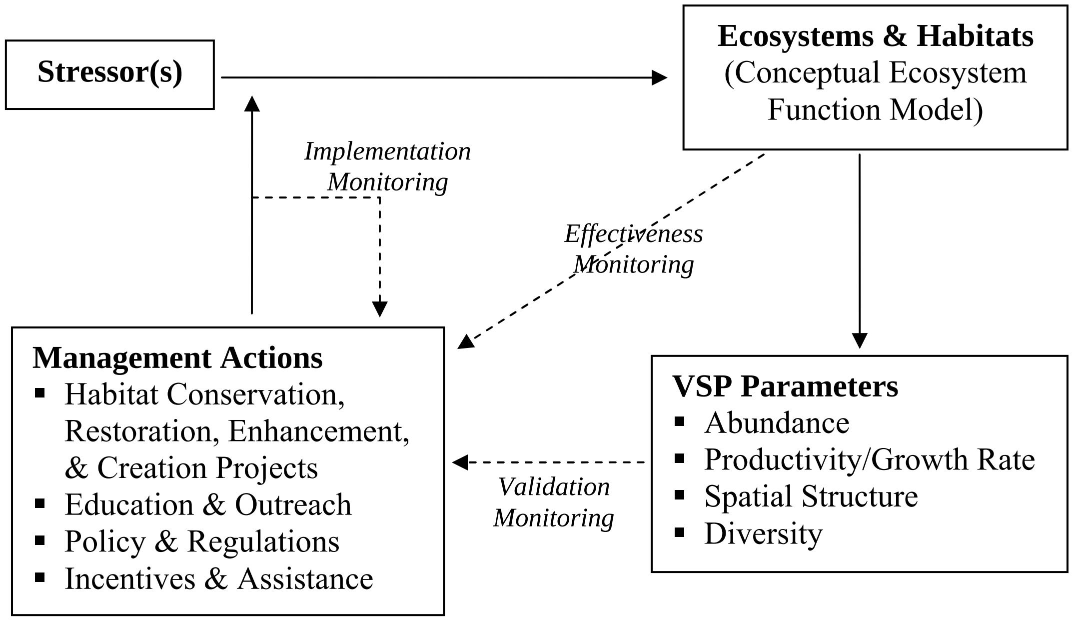
7.3 - Conceptual Models for Salmonid Habitat Restoration and Conservation

> "Knowing exactly what to expect from complex systems is a nontrivial challenge, and models are essential to meeting this challenge. Models may take the form of simple compartment diagrams that provide a means of organizing information or expressing connections and relationships, or they may be developed as complex computer simulations that allow us to depict processes operating through time and across landscapes.
>
> It is not possible to design monitoring programs to measure the dynamics of every species and ecosystem process. Models can be useful in identifying particularly sensitive ecosystem components or in setting brackets around expectations for the behavior of particular processes. They can be especially useful in identifying indices and indicators that provide a measure of the behavior of a broad suite of ecosystem properties. Finally, models often provide useful tools for exploring alternative courses of action."
>
> *Christienson et al. 1996 (see Appendix M)*

Conceptual models are used to build scientifically defensible frameworks for resource management, especially when existing empirical knowledge alone is not adequate. The conceptual models presented below capture the overall management approach to salmon recovery and conservation on Bainbridge Island. Fundamentally, this approach is ecosystem-based because the long-term recovery and conservation of salmon is dependent upon the availability and maintenance of the ecosystem processes that create and maintain habitats as well as the ecological functions provided by the habitats those species occupy. Particularly since salmon utilize a broad range of habitats throughout their various life-stages and life-histories, including many habitats that reach extensively throughout developed and developing watersheds and nearshore areas.

A conceptual management model for both subwatersheds and nearshore areas is presented in Figure 7.3 and is organized in the following general way. The model hypothesizes that stressors (e.g. urbanization, habitat modification, pollution, harvest, hatcheries, storms, floods, landslides, climate variability, etc.) exert direct, indirect, and cumulative effects to varying degrees on ecosystems and therefore the viability of salmon populations that exist in those ecosystems. These models also hypothesize that various management actions can be used to avoid, minimize, or mitigate the effects exerted by stressors on ecosystems, habitat, and viable salmonid populations.

Figure 7.3. Conceptual Management Model for Ecosystem-Based Salmon Recovery and Conservation in the Bainbridge Island Sub-Area



The management model includes conceptual ecosystem function models used to relate these stressors to effects on ecosystems and habitats. The application of these ecosystem function models to the assessment of existing conditions or hypothesized future conditions can then be used to evaluate the potential effects (impacts and benefits) that stressors and management actions have on ecosystems, habitats, and the viability of salmon populations. The results of these assessments, in conjunction with appropriate monitoring, can be used to refine existing management actions or develop and implement new management activities (i.e. adaptive management).

7.3.1 - Definition & Characteristics of a Viable Salmonid Population (VSP)

> "A VSP is an independent population that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time period"
>
> (Ruckelshaus et al 2003, citing McElhany et al. 2000).

The four key characteristics of a viable salmonid population are:
(*Modified from Ruckelshaus et al 2003, citing McElhany et al 2000*)

1. Abundance – *the number of individuals in the population at a given life stage or time*

Abundance is recognized as an important parameter because, all else being equal, small populations are at greater risk of extinction than large populations, primarily because several processes that affect population dynamics operate differently in small populations than they do in large populations. These processes are deterministic density effects, environmental variation, genetic processes, demographic stochasticity, ecological feedback, and catastrophes.

2. Productivity/Population Growth Rate – *the actual or expected ratio of abundance in the next generation to current abundance*

Productivity/population growth rate (i.e., productivity over the entire life cycle) and factors that affect population growth rate provide information on how well a population is "performing" in the habitats it occupies during the life cycle. Estimates of population growth rate that indicate a population is consistently failing to replace itself are an indicator of increased extinction risk. Although our overall focus is on population growth rate over the entire life cycle, estimates of stage-specific productivity – particularly productivity during freshwater life-history stages – are also important to comprehensive evaluation of population viability.

Other measures of population productivity, such as intrinsic productivity and the intensity of density-dependence may provide important information for assessing a population's viability. The guidelines for population growth rate are closely linked with those for abundance.

3. Spatial structure – *the number of individuals and their distribution at any life-stage among available or potentially available habitats*

Spatial structure must be taken into account for two reasons: 1) Because there is a time lag between changes in spatial structure and species-level effects, overall extinction risk at the 100-year time scale may be affected in ways not readily apparent from short-term observations of abundance and productivity, and 2) population structure affects evolutionary processes and may therefore alter a population's ability to respond to environmental change. Spatially structured populations in which "subpopulations" occupy "patches" connected by some low to moderate stray rates are often generically referred to as "metapopulations". A metapopulation's spatial structure depends fundamentally on habitat quality, spatial configuration, and dynamics as well as the dispersal characteristics of a population.

4. Diversity – *the variety of life histories, sizes, and other characteristics expressed by individuals within a population*

Diversity exists within and among populations, and this variation has important effects on population viability. In a spatially and temporally varying environment, there are three general reasons why diversity is important for species and population viability. First, diversity allows a species to use a wider array of environments than they could without it. Second, diversity protects a species against short-term spatial and temporal changes in the environment. Third, genetic diversity provides the raw material for surviving long-term environmental change.

7.3.2 - Applying the Management Model in Subwatersheds

Conceptual Ecosystem Function Model

For the recovery and conservation of salmonids in the subwatersheds of Bainbridge Island, the management model (see Section 7.3) integrates Properly Functioning Conditions (PFC - see Appendix N) as the ecological function model used to evaluate the effects of stressors and management activities to viable salmonid populations[5]. Consistent with the guidance provided by NMFS (1996), the specific criteria and thresholds for stressors and their effects that are contained in Appendix N should be reviewed and modified, if appropriate, before used to assess the condition of Bainbridge Island subwatersheds. This model, combined with other guidance (NMFS 1999) can be used to generally evaluate the effects of stressors and management activities on salmon populations.

Effects of Stressors and Management Actions on Viable Salmon Population (VSP) Parameters

The subwatersheds of Bainbridge Island have not been assessed using the subwatershed ecosystem function model and local population status has not been evaluated. Therefore, it is not currently possible to discuss the effects of stressors or management actions on the viability of local salmon populations based in a comprehensive manner. This is a fundamental data gap that needs to be filled soon.

The existence of such significant data gaps, however, should not prevent the pursuit of meaningful management actions. In the absence of a comprehensive subwatershed assessment based on the ecosystem function model, the effects of stressors and management actions on VSP parameters should be hypothesized based on:

- Any known information about salmon population status and the potential carrying capacity of the subwatershed,
- Any known information about the existing conditions of ecosystem processes and habitat,
- Best available science, and
- Best professional judgment.

7.3.3 - Applying the Management Model in the Nearshore

[Modified from: Williams et al 2004]

Conceptual Ecosystem Function Model for the Nearshore

The conceptual nearshore ecosystem function model for the recovery and conservation of salmonids in the nearshore areas of Bainbridge Island is defined and thoroughly discussed in the Bainbridge Island Nearshore Assessment (Williams et al 2004), which has been provided, in its

[5] A compatible or possibly alternative model might be the Ecosystem Diagnosis and Treatment (EDT) model, which has been used in many watersheds to analyze the effects of stressors as well as identify and analyze the benefits of management actions. Prior to implementation of any subwatershed ecological function assessment and analysis, the PFC and EDT models should be more fully evaluated.

entirety, in Appendix H to this document and the reader is directed to that document for a thorough discussion of the model. This section summarizes the key aspects of the model.

The nearshore conceptual model assumes that stressors exert effects to varying degrees on a nearshore ecosystem's controlling factors (Figure 7.3.3(a); Table 7.3.3). Controlling factors (e.g. light level, wave energy) are physical processes or environmental conditions that control local habitat structure and composition (e.g. vegetation, substrate), including where habitat occurs and how much is present. In turn, habitat structure is linked to support processes, such as primary production or landscape connectivity, which influence ecological functions. Thus, impacts that affect controlling factors within an ecosystem are reflected in changes to habitat structure, and ultimately are manifested as changes to functions supported by the habitat and the species that rely on that habitat. The effect at the functional level depends upon the level of disturbance and the relative sensitivity of the habitat to the disturbance. Controlling factors are defined and discussed below. The nearshore model is applied using nearshore landscapes and geomorphic classification, which are also discussed in more detail below.

Figure 7.3.3(a). Conceptual Ecological Function Model for the Nearshore
(*from Williams et al. 2004*)

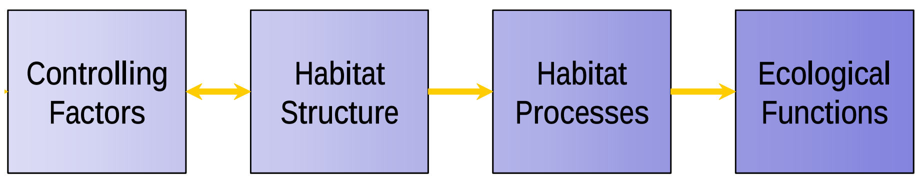


Table 7.3.3(a). List of Major Controlling Factors, Habitat Structure, Habitat Processes, and Ecological Function Metrics.

Controlling Factors	Habitat Structure	Habitat Processes	Ecological Functions
▪ Wave Energy ▪ Light (Increase) ▪ Light (Shading) ▪ Sediment Supply ▪ Substrate ▪ Depth/Slope ▪ Pollution/Nutrient ▪ Hydrology ▪ Physical Disturbance	▪ Density ▪ Biomass ▪ Length/Size ▪ Diversity ▪ Landscape Position ▪ Patch Shape ▪ Patch Size	▪ Production ▪ Sediment Flux ▪ Nutrient Flux ▪ Carbon Flux ▪ Landscape Connectivity or Fragmentation	▪ Prey Production ▪ Reproduction ▪ Refuge ▪ Carbon Sequestration ▪ Biodiversity maintenance ▪ Disturbance Regulation ▪ Migration Corridors

Controlling Factors and their Stressors

Below, each of the nine controlling factors is defined and discussed in context of typical stressors. See Williams et al (2004) for a more in-depth discussion of these controlling factors as well as the criteria used to evaluate them.

1. Wave Energy
Wave energy primarily describes the reflective energy of waves, which can be modified by the composition, encroachment, and vertical design of shoreline armoring structures. Reaches with a high percentage of shoreline composed of armoring are assumed to have relatively higher wave reflective energy than those with less armoring. Wave reflection forces generally increase as armoring methods intensify, with higher impacts to beach processes in areas with solid vertical or re-curved seawalls, and lower impacts in areas using graded or porous structures (e.g., revetments and rip-rap) or dynamic "soft" solutions. Hardened armoring approaches, such as bulkheads and revetments, represent the types of shoreline modifications most likely to affect wave-energy regimes. Encroachment of the structure into the intertidal zone also may increase the reflective energy of waves. Wave exposure and geomorphic context provide appropriate guidance on reaches more likely to be affected by these shoreline modifications.

2. Light Regime (Loss of Natural Shade)
Light regime (loss of natural shade) primarily describes a loss of shading that affects natural temperature and desiccation rates, especially when anthropogenic alteration removes overhanging marine riparian vegetation. Reaches with intact, relatively undisturbed riparian zones are assumed to have a relatively high percentage of overhanging vegetation. Geomorphic context provides guidance on where overhanging riparian vegetation would historically be an important shoreline feature (i.e., low bank, high bluff, and marsh/lagoon).

3. Light Regime (Artificial Shade)
Light regime (artificial shade) describes the diminishment of light, or shading, which is caused by anthropogenic modifications, such as piers, docks, and other floating or overwater structures. The availability of light for aquatic vegetation may be reduced by shoreline structures that are built in the intertidal and shallow subtidal zones and by floating structures that are found closer to the bottom. Structures such as piers or boardwalks built over the backshore zone can also affect light regimes important to dune and marsh vegetation. The orientation and composition of a structure affects the level of impact upon light regimes.

4. Sediment Supply
Sediment supply, defined as the abundance of sediment within a reach, is substantially affected by shoreline armoring and other stabilization structures. This influence is especially true in situations in which backshore sediment sources, such as feeder bluffs, have been documented, although upland use may also affect this factor. Groins, as well as some ramps and other structures built waterward of the OHWM, affect alongshore transport of sediment in a drift cell. Wave exposure and geomorphic context provides guidance on the type of reaches for which backshore or alongshore sediment supply is not especially relevant.

5. Substrate Type
Substrate type represents the direct modification or replacement of natural substrates from the addition of novel structural materials associated with shoreline modifications. An example would include situations in which mixed soft sediment (e.g., gravel and sands) is replaced by solid concrete or large rip-rap materials, or the addition of pilings or other hard structures that provide substrate for attaching macroalgae and invertebrates. Geomorphic context provides

guidance on the type of reaches in which existing substrates are already "hardened" (i.e., rocky shorelines).

6. Depth or Slope
Depth or slope reflects the change of natural beach slope, bottom depth, or intertidal zone area, and has associated impacts on the native vegetation and biota using these habitats. Structures exhibiting intertidal encroachment may have an affect on natural beach slope or depth more significantly than would other shoreline modifications. Bottom depth and slope is also significantly changed by dredging.

7. Pollution
Pollution, which includes toxic contaminants, fecal coliform bacteria, excessive nutrients, and altered salinity and temperature regimes, is often associated with proximity to outfalls and stream sources or in association with marinas and fish farms. Information on historic use (e.g., creosote wood treatment in Eagle Harbor) also provides useful guidance on site and landscape effects. Human use may contribute pollutants along heavily armored shorelines adjacent to upland areas with extensive development (e.g., industrial, commercial, residential, agricultural), impervious surfaces, and areas of reduced riparian habitat. Marine riparian vegetation provides a buffer analogous to freshwater systems that serves to filter nutrients, bacteria, and other pollutants from surface waters. In the absence of existing data for marine systems, it is assumed that the positive relationship between watershed imperviousness and pollution that exists for stream systems in the region largely applies to marine nearshore systems as well.

8. Hydrology
Hydrology refers to whether tidal inundation regimes or patterns of groundwater and surface water flow are impacted. Tidal encroachment by armoring structures displaces intertidal and subtidal vegetation, whereas the placement of outfalls may result in local patterns of sediment scouring. Alteration of groundwater and surface flows by development in the marine riparian zone may influence vegetation distribution and slope stability. Marine riparian vegetation provides a buffer analogous to freshwater systems that serves to moderate the effects of stormwater runoff, soil erosion, and water-level fluctuations. In the absence of existing data for marine systems, it is assumed that the positive relationship between watershed imperviousness and hydrology that exists for stream systems in the region largely applies to marine nearshore systems as well. Geomorphic context provides guidance on the types of reaches in which hydrologic alterations may not be especially relevant (i.e., rocky shorelines), or where tidal constrictions may have disproportionate effects by affecting flushing and inundation rates (i.e., marsh/lagoons).

9. Physical Disturbances
The definition of physical disturbances is limited to recurring physical disturbances associated with human activities in marine and riparian shoreline habitats, but does not include temporary construction impacts associated with various nearshore modifications. Recurring physical disturbances are primarily associated with the grounding of floating docks, mooring buoys (and chains), vessels that are inappropriately located relative to tidal elevation, and various activities associated with boat launch ramps (e.g., prop wash). These regular disturbances physically

distress local benthos and vegetation. A variety of human-derived physical disturbances are particularly relevant along urban waterfronts.

Nearshore Landscapes

On Bainbridge Island, the nearshore landscape is shaped by processes that affect sediment transport, water circulation and aquatic species movement patterns. It is apparent that these shoreline processes must continue to function appropriately across the entire landscape to manage nearshore habitats and ecological functions in a long-term, self-sustaining condition (Williams and Thom 2001 – cited in Williams et al 2004; Best 2003). With this in mind, the nearshore model is applied to nearshore processes at two landscape scales. The larger Shoreline Management Area (MA) is scaled to encompass aggregations of drift cells, analogous to upland watersheds, which define sediment transport processes that form the basis for establishing and maintaining habitat structure and function (Figure 7.3.3(b)). A Shoreline Management Area is comprised of multiple shoreline reaches (based largely on ShoreZone units, see WDNR 2001 – cited in Williams et al 2004), which are scaled to current or historic geomorphic conditions (Figure 7.3.3(b)). Geomorphology often defines or is commonly associated with distinct habitats.

Nearshore Geomorphology

The nearshore contains a diversity of geomorphic settings (e.g. high bluff, lagoon), each associated with various physical characteristics and habitats, which do not provide the same functions or respond to stressors in the same manner. Therefore, the nearshore ecosystem function model (Figure 7.3.3(a)) is refined by a shoreline's geomorphic setting to provide better predictive relationships between nearshore controlling factors and ecological function (Table 7.3.3(b)) and to provide context for comparing existing conditions with natural conditions and setting restoration goals. Each reach of Bainbridge Island shoreline was classified into one of five major geomorphic categories, following the shore types outlined by Terich (1987).

- Low Bank
- High Bluff
- Spit/Barrier/Backshore
- Marsh/Lagoon
- Rocky Shore

The distribution of geomorphic classes over Bainbridge Island is shown in Figure 7.3.3(c). Table 7.3.3(b) summarizes the influence of geomorphic context on each controlling factor.

Figure 7.3.3(b). Nearshore Landscapes: Shoreline Management Areas & Shoreline Reaches.
(*From: Best 2003*)

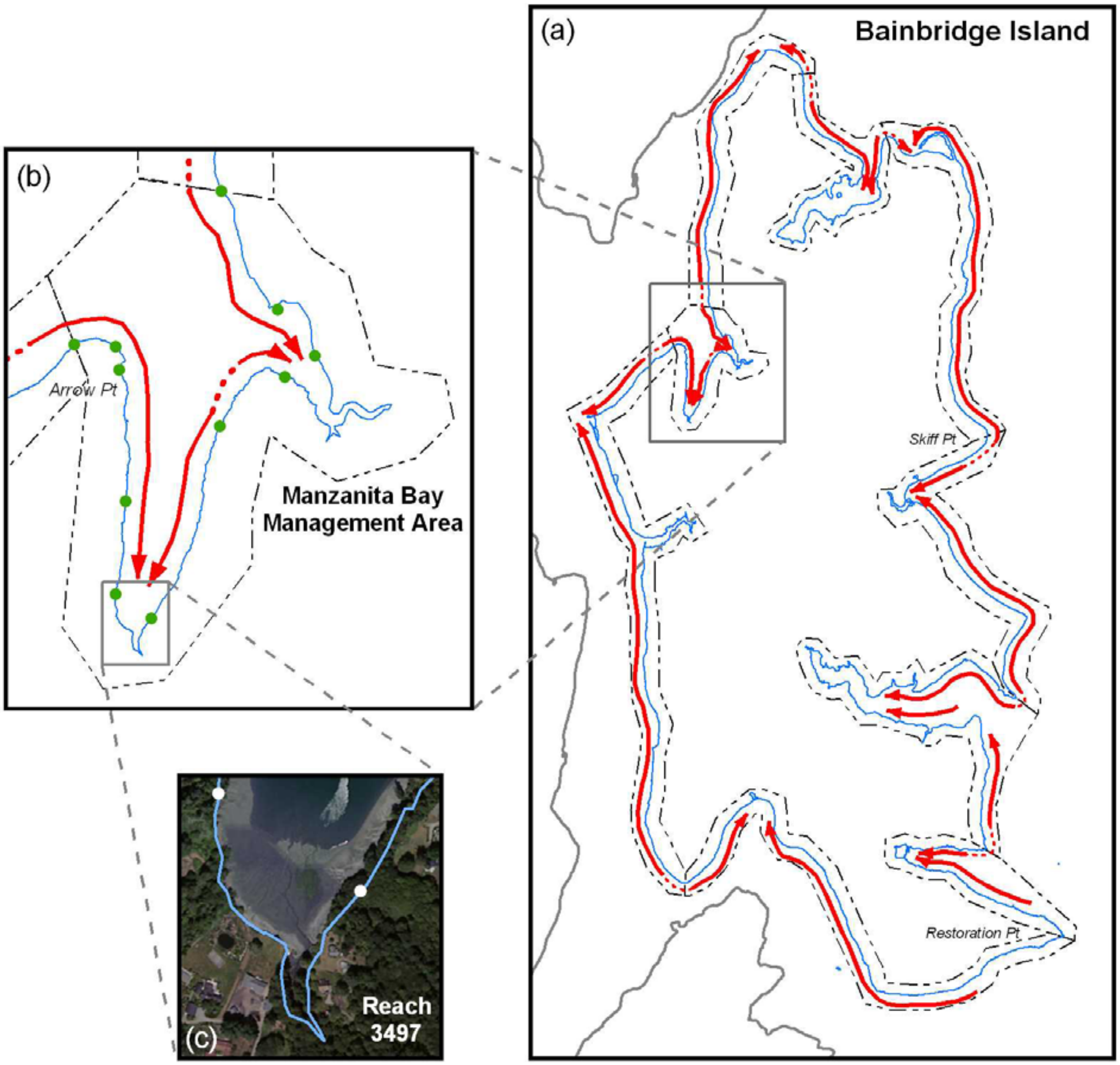
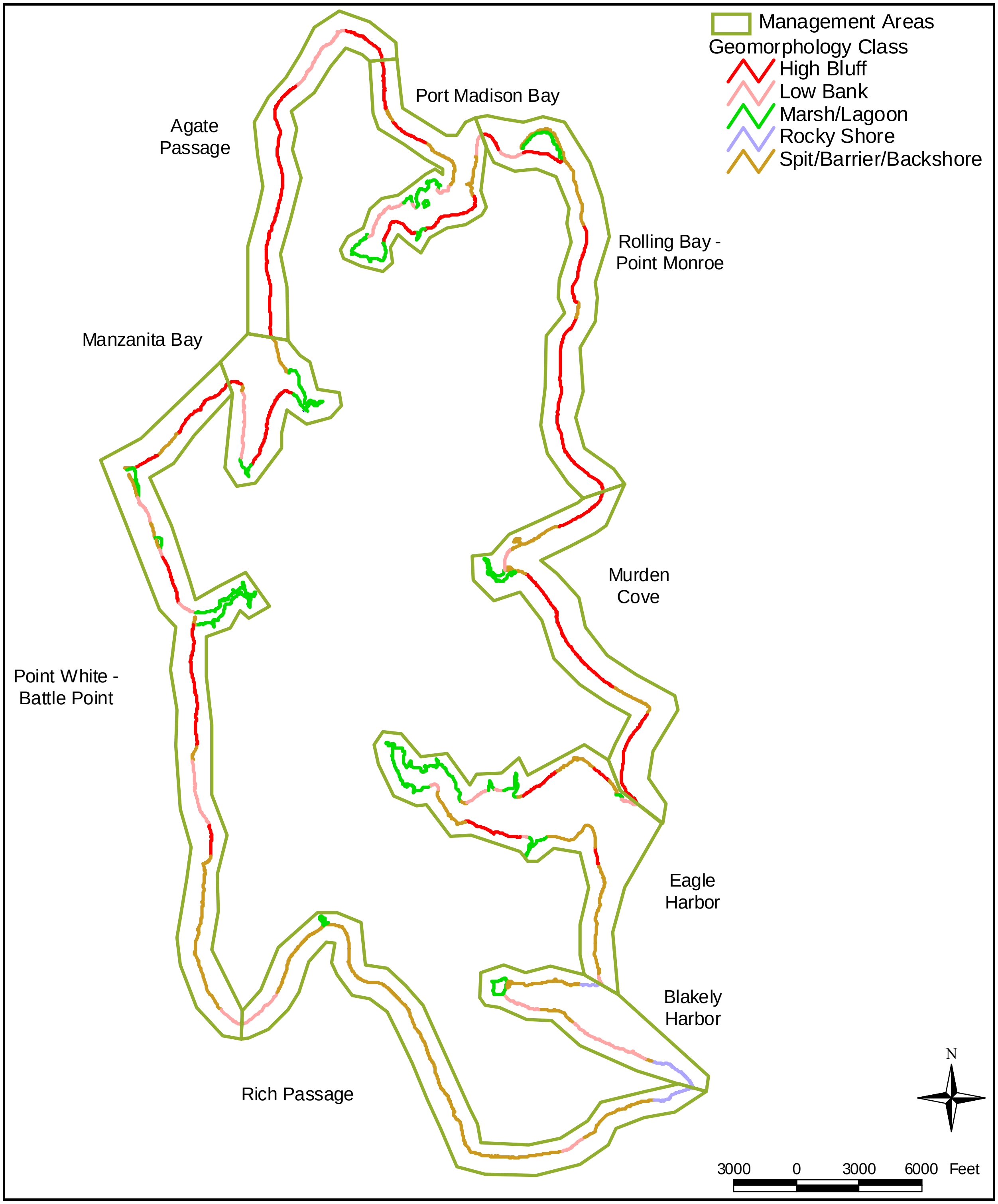


Figure 7.3.3(c). Distribution of Bainbridge Island Nearshore Geomorphic Classes.
(*From: William et al. 2004*)



Effects of Stressors and Management Actions on Viable Salmon Population (VSP) Parameters

[This section may be improved based on further discussions with biologists.]

Very limited guidance has been provided by NOAA Fisheries and the Puget Sound Technical Recovery Team relevant to how VSP parameters are affected by stressors in the nearshore. Until more comprehensive guidance is developed, the following types of effects from stressors on the VSP parameters have been hypothesized and integrated into the nearshore ecological function model relative to controlling factors and geomorphic settings (Table 7.3.2(b)) based on our current level of knowledge regarding juvenile salmonid use of the nearshore (Williams et al 2003 & 2004; Fresh, in prep).

- Altered osmoregulation – interference with osmoregulation can:
  - Reduce diversity and diminish abundance of life-histories that are more estuarine dependent,
  - Diminish productivity/population growth rate, and
  - Diminish overall abundance of the population
- Altered migration – interference with migration can:
  - Reduce diversity and diminish abundance of life-histories that are more dependent on the particular type of resource that has been altered,
  - Diminish productivity/population growth rate, and
  - Diminish overall abundance of the population
- Reduced prey – reduction in prey can:
  - Reduce diversity and diminish abundance of life-histories that are more dependent on the particular type of resource that has been altered,
  - Diminish productivity/population growth rate, and
  - Diminish overall abundance of the population
- Reduced refugia – reduction of refugia habitat can:
  - Reduce diversity and diminish abundance of life-histories that are more dependent on the particular type of resource that has been altered,
  - Diminish productivity/population growth rate, and
  - Diminish overall abundance of the population
- Increased predation – increases in predation can:
  - Reduce diversity and diminish abundance of life-histories that are disproportionately preyed upon,
  - Diminish productivity/population growth rate, and
  - Diminish overall abundance of the population

Due to existing knowledge gaps, the degree of these effects on the viability of salmonid populations cannot be calculated, but should be qualitatively considered relative to geographical scales and cumulative stressors. It is well recognized throughout the Puget Sound region that significant work remains to more fully understand the affects of nearshore stressors on VSP parameters. Additional work is necessary to understand the relative level of effects on different populations that originate from watersheds throughout Puget Sound. The responsibility for this level of work rest upon agencies and organizations with a regional focus such as WDFW and NOAA Fisheries, however efforts within watersheds can contribute valuable effort and information.

Table 7.3.3(b). Stressor Effects by Geomorphic Class and Controlling Factor (Shaded).

(*Adapted from: Williams et al. 2004*)

[This section will be completed based on further discussions with biologists.]

<table>
<tr><th>Geomorphic Class</th><th>Habitat Structure</th><th>Habitat Processes</th><th>Ecological Function</th><th>VSP Abundance</th><th>VSP Productivity/ Growth Rate</th><th>VSP Spatial Structure</th><th>VSP Diversity</th></tr>
<tr><td colspan="8">Wave Energy</td></tr>
<tr><td>Rocky</td><td>Generally not an issue, but may affect structure of attached macroalgae community.</td><td>Only as it affects macroalgal productivity.</td><td rowspan="2">May affect biodiversity maintenance.</td><td>Not likely to be an issue, but may

Reduce prey

Reduce refugia (aquatic vegetation)</td><td>Not likely to be an issue, but may

Reduce prey

Reduce refugia (aquatic vegetation)</td><td>Not likely to be an issue, but may

Alter Migration

Reduce prey

Reduce refugia (aquatic vegetation)</td><td>Not likely to be an issue, but may

Reduce prey

Reduce refugia (aquatic vegetation)</td></tr>
<tr><td>Marsh/ Lagoon</td><td>Generally not an issue in these wave protected habitats, though habitat structure of marsh plant community could be affected by increased wave energy.</td><td>Loss of primary production and altered sediment flux.</td><td>Altered osmoregulation in proximity to natal stream

Reduced prey

Reduced refugia (LWD, aquatic vegetation)</td><td>Altered osmoregulation in proximity to natal stream

Reduced prey

Reduced refugia (LWD, aquatic vegetation)</td><td>Altered osmoregulation in proximity to natal stream

Altered Migration

Reduced prey

Reduced refugia (LWD, aquatic vegetation)</td><td>Altered osmoregulation in proximity to natal stream

Reduced prey

Reduced refugia (LWD, aquatic vegetation)</td></tr>
<tr><td>Spit/Barrier/ Backshore</td><td>At critical tidal elevations or areas</td><td>Loss of primary production.</td><td>Loss of associated habitat functions,</td><td>Altered Migration</td><td>Altered Migration</td><td>Altered Migration</td><td>Altered Migration</td></tr>
</table>

Geomorphic Class	Habitat Structure	Habitat Processes	Ecological Function	VSP Abundance	VSP Productivity/ Growth Rate	VSP Spatial Structure	VSP Diversity
Low Bank High Bluff	exposed to waves, turbulence may displace rooted aquatic vegetation (e.g., eelgrass), suspend and coarsen fine sediment, reduce LWD retention	Increased sediment and carbon flux. Landscape fragmentation.	including salmon prey production and refuge. Loss of eelgrass affects herring spawn; altered sediment composition may affect forage-fish spawning substrate.	Reduced prey Reduced refugia (LWD, aquatic vegetation)	Reduced prey Reduced refugia (LWD, aquatic vegetation)	Reduced prey Reduced refugia (LWD, aquatic vegetation)	Reduced prey Reduced refugia (LWD, aquatic vegetation)
Loss of Natural Shade							
Rocky	Light increase generally not an issue (little riparian vegetation)	N/A	N/A	N/A	N/A	N/A	N/A
Marsh/ Lagoon	Loss of riparian vegetation affects habitat complexity. Increased light levels reaching marsh/mudflats increases desiccation and temperature regimes.	Loss of primary productivity from riparian litterfall. Carbon flux alteration and landscape fragmentation.	Loss of biodiversity, prey production (terrestrial insects), and refuge. Increased water temperatures in lagoons may affect herring embryo development.	Altered osmoregulation Reduced prey Reduced refugia (LWD, aquatic vegetation)	Altered osmoregulation Reduced prey Reduced refugia (LWD, aquatic vegetation)	Altered osmoregulation in proximity to natal stream Altered migration (Increased temperatures may affect estuarine dependent life-histories/life-stages) Reduced refugia (LWD, aquatic vegetation)	Altered osmoregulation in proximity to natal stream Altered migration (Increased temperatures may affect estuarine dependent life-histories/life-stages) Reduced refugia (LWD, aquatic vegetation)
Spit/Barrier/ Backshore	Same as Rocky (low growing dune vegetation).	N/A	N/A	N/A	N/A	N/A	N/A

Geomorphic Class	Habitat Structure	Habitat Processes	Ecological Function	VSP Abundance	VSP Productivity/ Growth Rate	VSP Spatial Structure	VSP Diversity
Low Bank High Bluff	Same as Marsh/Lagoon.	Same as Marsh/Lagoon.	Same as Marsh/Lagoon. Increased temperatures and desiccation affects beach spawning forage-fish embryos.	Altered osmoregulation in proximity to Marsh/Lagoon Reduced prey Reduced refugia (LWD)	Altered osmoregulation in proximity to Marsh/Lagoon Reduced prey Reduced refugia (LWD)	Altered osmoregulation in proximity to natal stream Altered Migration (Increased temperatures may reduce use of habitat) Reduced refugia (LWD)	Altered osmoregulation in proximity to natal stream Altered Migration (Increased temperatures may reduce use of habitat) Reduced refugia (LWD)
Artificial Shade							
Rocky	Total light loss would impact attached macroalgae communities, including patch size, density, and shape.	Loss of primary productivity from macroalgae. Landscape fragmentation.	Loss of associated biodiversity, prey production, and refuge. Darkness may inhibit salmon migration.	Reduced prey Reduced refugia (aquatic veg) Increased predation	Reduced prey Reduced refugia (aquatic veg) Increased predation	Altered migration Avoidance of certain areas	Could affect smaller/earlier migrant life-histories more than larger/later migrant life-histories
Marsh/ Lagoon	Total light loss would impact vascular marsh plant, macroalgae, and eelgrass communities, including patch size, density, and shape.	Loss of primary production. Carbon flux alteration. Landscape fragmentation		Reduced prey Reduced refugia (LWD, aquatic vegetation) Increased predation	Reduced prey Reduced refugia (LWD, aquatic vegetation) Increased predation	Altered migration Avoidance of certain areas	Could affect smaller/earlier migrant life-histories more than larger/later migrant life-histories
Spit/Barrier/ Backshore	Total light loss would			Same as Rocky	Same as Rocky	Same as Rocky	Same as Rocky

Geomorphic Class	Habitat Structure	Habitat Processes	Ecological Function	VSP Abundance	VSP Productivity/ Growth Rate	VSP Spatial Structure	VSP Diversity
Low Bank	impact eelgrass and marine vegetation, including patch size, density, and shape.			Same as Marsh/Lagoon	Same as Marsh/Lagoon	Same as Marsh/Lagoon	Same as Marsh/Lagoon
High Bluff							
Sediment Supply							
Rocky	Generally not an issue, though blockage of alongshore transport may change some substrate characteristics.	Only as it affects sediment flux, if present.	May affect biodiversity.				
Marsh/ Lagoon	Excessive supply from fluvial sources likely to be issue. May affect beach slope and smother eelgrass beds and marsh vegetation.	Altered sediment flux. Loss of eelgrass and riparian primary production, carbon flux, and landscape connectivity.	Loss of eelgrass associated salmon refuge and prey production. Excessive sediments may smother benthos, reducing biodiversity.	Reduced prey Reduced refugia (aquatic veg)			
Spit/Barrier/ Backshore	Impoundment of backshore sediments may cause beach erosion, coarsening of sediments, and loss of rooted vegetation.		Loss of eelgrass associated salmon refuge and prey production. Substrate coarsening affects				

Geomorphic Class	Habitat Structure	Habitat Processes	Ecological Function	VSP Abundance	VSP Productivity/ Growth Rate	VSP Spatial Structure	VSP Diversity
Low Bank	Impoundment of backshore sediments may cause foreshore and alongshore beach erosion (due to loss of sediment source), bank steepening, and sediment coarsening. Loss or change of rooted vegetation.		biodiversity.				
High Bluff	Major issue. Same as Low Bank, but may be more significant along high bluffs, which are often important feeder bluffs.						
Substrate Type							
Rocky	Generally not an issue; modifications are often rock cobble or concrete.	N/A.	N/A	N/A	N/A	N/A	N/A
Marsh/ Lagoon	Change from soft sediments to novel hard substrates (e.g. rock, concrete, steel, wood) associated with structures. Attached macroalgae and biota (e.g., mussels and barnacles) subsume soft sediment-associated vegetation and animals.	Reduction in sediment flux and alteration of landscape connectivity. Also affects source of primary production and carbon flux.	Alters local biodiversity (especially vegetation and invertebrate communities) in favor of those attaching to hard stuctures. Also, potential loss of beach spawning habitat for forage fish.				
Spit/Barrier/ Backshore							
Low Bank							
High Bluff							

Geomorphic Class	Habitat Structure	Habitat Processes	Ecological Function	VSP Abundance	VSP Productivity/ Growth Rate	VSP Spatial Structure	VSP Diversity
Depth - Slope							
Rocky	May alter distribution of attached macroalgae and biotic (e.g., mussels, barnacles) communities depending upon encroachment. May also simplify habitat complexity.	May reduce landscape connectivity.	May alter biodiversity maintenance and salmon migratory corridors.				
Marsh/ Lagoon	Change in distribution of eelgrass, saltmarsh vegetation, and mudflat channels. Impacts to associated landscape metrics.	Same as above, as well as modification of sediment flux and reduction of primary production.	Same as above, as well as alteration of salmon prey production.				
Spit/Barrier/ Backshore	Encroachment and slope increase narrows distribution of eelgrass and other vegetation, simplifying or reducing habitat structure.						
Low Bank							
High Bluff							

Geomorphic Class	Habitat Structure	Habitat Processes	Ecological Function	VSP Abundance	VSP Productivity/ Growth Rate	VSP Spatial Structure	VSP Diversity
Pollutants/ Nutrients							
Rocky	Nutrients may initiate nuisance algal blooms and epiphyte growth. Herbicides, contaminants, or water quality impacts may affect kelp vegetation, cause disease outbreaks, and affect growth.	May fragment landscape, affect sediment nutrient, and carbon flux, and reduce habitat connectivity and primary productivity..	Direct toxicity to organisms, especially relevant to herring spawn, juvenile salmon, and their prey. Loss of vegetation causes reduction in salmon prey production and refuge. Affects biodiversity maintenance both in subtidal and riparian settings.				
Marsh/ Lagoon	Especially relevant in these settings with low flushing rates. Same impacts as noted above, especially as related to eelgrass, marsh, and marine riparian vegetation.						
Spit/Barrier/ Backshore	Same impacts as noted above, especially as related to eelgrass and dune vegetation.						
Low Bank	Same impacts as noted above, especially as related to eelgrass and riparian vegetation.						
High Bluff							

Geomorphic Class	Habitat Structure	Habitat Processes	Ecological Function	VSP Abundance	VSP Productivity/ Growth Rate	VSP Spatial Structure	VSP Diversity
Hydrology							
Rocky	Generally not an issue.	N/A	N/A	N/A	N/A	N/A	N/A
Marsh/ Lagoon	Constrictions may impact tidal influence and flushing rates, affecting the distribution and diversity of riparian, eelgrass, and marsh vegetation.	Affects primary production, carbon, nutrient, and sediment flux, landscape connectivity	Affects associated plant and animal biodiversity and disturbance regulation. Vegetation change alters migration corridors for birds, mammals, and fishes.				
Spit/Barrier/ Backshore	Encroachment into intertidal zone may alter tidal hydrology and displace dune vegetation		Same as Marsh/Lagoon. As well, altered hydrology may affect spawning success of forage fish (both via modifications to groundwater seeps and surface flow scour).				
Low Bank	Alteration of groundwater and surface flows may impact riparian vegetation distribution and slope stability, whereas tidal encroachment by structures and location of outfalls may displace or scour intertidal saltmarsh vegetation and eelgrass.						

Geomorphic Class	Habitat Structure	Habitat Processes	Ecological Function	VSP Abundance	VSP Productivity/ Growth Rate	VSP Spatial Structure	VSP Diversity
High Bluff	Same as Low Bank, though likely greater impacts to slope stability.						
Physical Disturbance							
Rocky	Benthic disturbances alter patch size, shape, and density of attached macroalgae and invertebrates (e.g. barnacles, mussels).	May fragment landscape and affect primary production associated with eelgrass or marsh communities. Altered carbon, nutrient, and sediment flux.	Biodiversity maintenance and natural disturbance regime.				
Marsh/ Lagoon	Unnatural or frequent disturbance of benthic habitats affects the distribution, size, shape, and density of eelgrass beds, macroalgae, and benthic communities.		Bottom disturbances affect benthic community biodiversity, salmon prey production and refuge, as well as disturbance regulation. May also affect spawn of forage fish. Human noise, activity, and sound may impact nesting and migration corridors of mammals and birds.				
Spit/Barrier/ Backshore							
Low Bank	Same as above. Also, vegetation removal affects structure and complexity of riparian cover.	Same as above. Also, reduced contribution of riparian primary production.					
High Bluff							

7.3.4 - Effects of Management Actions on Stressors and VSP Parameters

The purpose of implementing management actions is to avoid, minimize, and mitigate the effects of new stressors and to eliminate or reduce the effects of existing stressors on ecosystems, habitats, and the viability of salmon populations in subwatersheds and nearshore areas. The effects of management actions on stressors and VSP parameters can be determined by using the conceptual ecosystem function models to predict alternative ecological conditions based on a proposed set of management actions. Several simple examples are provided below. These models are particularly valuable for evaluating cumulative effects and should be used to evaluate the cumulative effects of various proposed management actions across a large landscape (i.e. subwatershed or shoreline management area).

Subwatershed Example: Existing Stressor

Management Action	Replace a culvert that blocks fish passage to properly functioning upstream habitats with a culvert that allows unimpeded fish passage (Note: this type of action is often in the public right-of-way, but would be dependent on a willing property owner if on private property)
Effect on Stressors	Eliminates the blockage to spawning and rearing habitat
Effect on VSP Parameters	Opening access to properly functioning spawning and rearing habitat is expected to increase abundance and spatial structure. If the opened area includes habitat that was not available in the previously accessible portions of the subwatershed, than potentially diversity could increase. Increased survival and expanded spawning should help improve population growth rates.

Subwatershed Example: New Stressor

Management Action	Require the conservation of a forested native vegetation riparian zone between a stream and adjacent development.
Effect on Stressors	Retaining the buffer will help maintain properly functioning conditions by limiting impacts on water temperatures, water quality and flows as well as maintain LWD and prey recruitment.
Effect on VSP Parameters	Maintaining properly functioning riparian zones is expected to help sustain abundance and spatial structure provided that other PFC criteria are also maintained. Maintaining healthy freshwater survival rates should help sustain population growth rates.

Nearshore Example: Existing Stressor

Management Action	Remove an encroaching bulkhead in front of a feeder bluff within the up-drift portion of a drift cell with reduced eelgrass abundance (Note: action dependent on a willing property owner if on private property)
Effect on Stressors	Reduces the loss (burial) of upper intertidal habitat, reduces the loss of sediment supply into the system, reduces the loss of finer sediments, conversion to deeper water and reduction of beach slope due to scouring, reduces intensified wave energy
Effect on VSP	Restoring natural sediment dynamics is expected to benefit VSP parameters in

Parameters	many, but often indirect ways. Restoration of finer sediments and beach slope is expected to increase eelgrass distribution and patch size, which in turn increases prey production and refugia habitat. Restoring finer sediment, beach slope, and access to upper intertidal habitat is expected to increase prey (e.g. forage fish) production and increase shallow migratory habitat. Therefore the management action is expected to support increased salmon abundance and spatial structure. Increased survival should help improve population growth rates.

Nearshore Example: New Stressor

Management Action	Build public and community docks in a location and manner that minimizes shading and substrate impacts. Public and community docks would be in lieu of private docks.
Effect on Stressors	Significantly reduces cumulative stress on aquatic vegetation from artificial shade and benthic organisms from sediment displacement and ongoing physical disturbances (i.e. prop wash/scour).
Effect on VSP Parameters	Helps maintain the abundance of prey, refugia and migratory habitats, and may reduce the amount of predation on salmon. Therefore, the management action would help sustain abundance, spatial structure and diversity. Maintaining healthy nearshore survival rates should help sustain population growth rates.

7.4 - Recommended Management Actions

[This section incomplete]

No single management action will address existing and future stressors on the Island's subwatersheds and nearshore ecosystems. A combination of management actions will be necessary to successfully achieve the goals and objectives of this sub-area plan. Potential management actions are listed in no particular order in Table 7.4 and must be selected and implemented consistent with the goal, objectives, and principles of this plan.

Table 7.4. Management Action Toolbox

- Policy
  - Comprehensive Plan (land use, environment, transportation, water resources, etc)
  - Shoreline Management Master Program
  - Six-year Capital Improvement Plan
  - Harbor Management Plans
  - Transportation & Utility Plans
  - Watershed Management Plans (groundwater & surface water)
  - Park and Open Space Management Plans
- Regulations
  - Zoning (density, land use, land cover, etc)
  - Critical Areas Ordinance (buffers, reasonable use exceptions, etc)

- Shoreline Management Master Program (buffers, land use, land cover, etc)
  - Surface and Stormwater Management Ordinance (water quality and flow measures)
  - Vegetation Management Ordinance (clearing)
  - Building Code (grading)
  - State Environmental Policy Act
  - Transportation Design Guidelines
  - Enforcement
- Operations
  - Surface and stormwater management
  - Road and utility maintenance
  - Park and public land management
  - Private land management
- Acquisition (primarily for habitat conservation, but also for habitat restoration, enhancement, and creation)
  - Less than fee-title acquisition (e.g. conservation easements, TDR) from a willing seller/donor
  - Fee-title acquisition from a willing seller
  - Land exchange with a willing land owner
  - Immanent domain from an unwilling seller (note that this action is highly dependent upon legal constraints and community acceptability)
- Incentives
  - Tax reductions
    - Conservation tax classification
      - Open Space (i.e. Public Benefit Rating System)
      - Forest Land
      - Timber Land
      - Agricultural Land
    - Assessment adjustments (e.g. conservation easements, regulatory restrictions, TDR, etc)
    - Tax credits (e.g. land/TDR donations, conservation easements)
  - Conservation payments (e.g. CREP, etc)
  - Financial assistance
    - Grants
    - Partnerships (cost share, technical assistance, etc)
- Education & Outreach
  - Property owners
  - School children
  - Real estate and development professionals
- Habitat Restoration
- Habitat Enhancement
- Habitat Creation

[Summary of Recommended Management Actions located in Appendix Q will be inserted here with discussion that puts those actions in context]

[Add discussion about certainty of implementation and certainty of benefit to salmon]

7.5 - Revenue Sources

Revenue sources that, in part, funds activities that affect salmon recovery and conservation:

Category	Description	General Value
SSWM Utility Fees	Fees are currently collected at a rate of $78 per unit equivalent (single-family residential/duplex/condo unit or 3,000 sq. ft. of commercial/mixed-use impervious surface) before applicable reductions. Rates are automatically adjusted for inflation annually unless the City Council resolves on an annual basis that the adjustment not occur. (BIMC 13.24) This revenue can be used to fund capital, maintenance, and operations of surface and storm water facilities, including facilities that can affect fish passage, water quality (surface, ground, and nearshore waters), stream flows, and salmonid habitat (stream & nearshore). ➲ SSWM Utility Fees collected between 1996 and 2004 have covered only 49.7% (54.4% projected for 2005-2010) of SSWM expenditures. Transfers from the City's general fund, real-estate excise taxes, low-interest loans, and grants have supplemented SSWM Utility revenues in all years (1996-2005) except for 1997.* ➲ $118,000 of this revenue was used to fund capital projects.*	$900,000* .
Open Space Bond	General obligation bond supported by 70% of voters. Used to acquire opens space for conservation, recreation, and agricultural purposes. Approximately $1 million of the bond remains unspent, but is anticipated to be spent in 2005. ➲ Since 2002, City has spent ~$3.5 million of Open Space Bond money on acquisition of shoreline habitat ▪ With match from grants and private donations, total cost for acquisitions is ~$9.2 million (approximately a 62% match) ▪ Adds up to ~1-mile of shoreline, and ~100-acres of land	$8,000,000

	▪ Habitats include marshes, tideflats, rocky reefs, feeder bluffs, forage fish spawning beaches, riparian forest ➲ The community should consider another bond in the coming years that again combines a range of priorities, including salmon habitat conservation with priorities guided by nearshore and subwatershed assessments.	
Real-Estate Excise Tax	This tax is assessed at a rate of ½ of 1 percent (0.5%) on the sale of real-estate and is restricted to funding capital projects. ➲ $575,000 of this revenue was used to fund SSWM capital projects.*	$1,677,000*
General Fund	General funds are derived from property taxes, sales tax, B&O tax, utilities tax, and other sources. General funds are used for a wide-range of City operations and projects. These funds are unrestricted and can be transferred to other funds for salmon recovery and conservation projects. ➲ $450,000 of general funds were used for SSWM operations.*	$13,702,400*
State Public Works and Transportation Fund	This revenue is low-interest loans competitively awarded to the City by the State Department of Ecology. ➲ $827,675 of this revenue is for the construction of a new decant facility in 2005*, which will replace the existing facility near a salmon stream which is under a Kitsap Health District clean up order. Proper decant is essential to reduction of pollutant load entering streams and nearshore. ➲ $1,937,650 of this revenue is part of $5,600,000 in total PWTF loans for expansion of the South Island Sewer*, which will be repaid largely by LIDs. This project will correct areas of failing septic systems and result in some net improvements to water quality, but may also reduce local ground water recharge and interflow that could have an effect on streams.	$6,534,525*
Grants	Grants are received from governmental and potentially private foundation sources. ➲ $198,650 from the State Centennial Clean Water Fund* that will be used to help design and test a Comprehensive (Island-wide) Surface and Nearshore Water Quality Monitoring Program. ➲ $45,750 from the State Office of Community, Trade, Economic Development* helped update the City's	$834,400*

	Comprehensive Plan and Critical Areas Ordinance. ➲ $250,000 from Salmon Recovery Funding Board to help acquire the Close Property (total purchase price $2.5 million).	

* Source: 2005 City of Bainbridge Island Budget.

Other potential revenue sources:

Category	Description	Value
Grants	NOAA Restoration Program – various grants	varies
Grants	USFW – various grants	varies
Grants	WDFW – various grants	varies
Grants	IAC – various grants	varies
Grants	NFWF – various grants	varies

Title: ********* FOR DISCUSSION PURPOSES ONLY ************ DRAFT

	Species or Critical Habitat Type (Description and Functions provided to salmon	Potential Threats & Stressors	Protective Measures Implemented by Kitsap County	Science & Regulatory Gaps	Measures planned to address threats/gaps & how	Possible actions if funding were available
Pacific Herring (*Clupea harengus*) Habitat	• **General:** Herring deposit eggs on intertidal and shallow subtidal eelgrass and marine algae. Eggs may be deposited anywhere between the upper limits of high tide to a depth of -40 feet MLLW, but most takes place between 0 & -10 feet MLLW (WSDFW 2002a). • **Spawning in Kitsap:** spawning is well documented in several locations such as Agate Pass / Port Madison stock; Dyes Inlet stock; Port Gamble stock; and some smaller areas. Most of the spawning in Kitsap is subtidal. (See Map 1). Herring spawning habitat is well documented in Kitsap County (D. Small, WDFW, *personal communication*, 2005). • **Function to salmon:** Herring represent a considerable percentage of the diet for coho and Chinook salmon (58%) (Nightingale and Simenstad 2001b). Healthy forage fish populations support the following **Viable Salmon Population** (VSP) parameters: 1. Abundance: directly as food source. 2. Population growth rate: directly as food source. 3. Spatial structure: indirectly by supporting individuals from a variety of independent Chinook populations assumed to use the East Kitsap nearshore. 4. Diversity: indirectly by supporting individuals from a variety of independent Chinook populations assumed to use the East Kitsap nearshore.	• Construction of overwater structures (floating docks, fixed piers, marinas, mooring buoys) can directly impact eelgrass and marine algae used for herring spawning by shading or by physical scouring. **Kitsap Focus:** Between 1999-2004 there have been 70 shoreline permits submitted, (SDP, CUP) approximately 85% include over the water structures. In addition there has been an additional 132 shoreline permit exemptions issued. Of these only 25% would be for over the water structures on salt water (Beam, Kitsap County Shoreline Administrator, 2005). • Vessels commonly associated with many overwater structures can cause prop scouring of sediment and submerged vegetation. **Kitsap Focus:** The extent of scouring has not been document for neither moorage facilities nor private docks, piers or buoys. • Water quality impacts are another potential issue associated with overwater structures. Toxic substances associated with the maintenance and operation of marine vessels may also affect herring spawn viability. **Kitsap Focus:** Port Madison Bay is one of three various locations in Puget Sound where mass mortality of herring spawn has been documented but more research is needed to determine cause (Jim West, WDFW, *personal communication*, 2002). • Unregulated mooring buoys can scour & shade marine vegetation. **Kitsap Focus:** The number of buoys showing up locally outnumbers the permit applications and once placed it is difficult to find owners (Small, WDFW *personal communication*). Observations are qualitative and the extent has not been documented.	**Federal**: Corps Section 404 & Section 10 permits initiate ESA Section 7 Consultations & Essential Fish Habitat Consultations. The Corps responsibility includes development activities below the mean, higher-water mark. **State:** All documented forage fish spawning sites in WA are considered "salt water habitats of special concern" and have been given "no net loss" protection in the application of Washington Administrative Code (WAC) "Hydraulic Code Rules". Jurisdiction stops at ordinary high-water line. Direct effects are much easier to address than indirect effects. **Kitsap County:** Shoreline Master Program (SMP) is the primary regulatory tool. County staff rely extensively on WDFW biologists to provide habitat expertise to avoid impacting eelgrass or forage fish spawning habitat. Difficult to deny construction of docks and piers as a feature of single family homes due to existing policies and development standards in SMP – possession of an approved Hydraulic Project Approval permit from the State diminishes local ability to restrict development based on environmental considerations (Beam, personal communication 2005).	**Science Gaps:** • Current knowledge and understanding of cumulative effects of overwater structures on spawning habitat is limited. Methods for measurement of cumulative effects have not been developed • Uncertainties in algal population dynamics (e.g. Ulva blooms, Sargassum intro, attached vs. unattached algae contribution, eelgrass distribution variation) • The extent of habitat alteration or loss of spawning substrate due to vessel related prop-scour or water quality degradation is not quantified. • Ambient water quality monitoring for toxic substances is limited. **Regulatory Gaps:** • The limited knowledge of cumulative and indirect effects limits the ability of regulatory agencies to address some threats. • Regulations manage the shoreline through site-by-site consideration and do not allow for ecosystem management. • County staff is not available to look at cumulative impacts of overwater structures.	• Nearshore Assessment (Complete April 2007). The nearshore assessment will 1) conduct a baseline characterization of the East Kitsap nearshore environment and assess its ecological health and function, 2) identify restoration and preservation opportunities and develop a strategy for ranking and prioritizing opportunities, and 3) develop a management framework based on functions and processes of nearshore ecology. The assessment will provide a baseline from which results of nearshore protection/restoration actions may be evaluated allowing an adaptive management approach to future nearshore activities. The same methodology used on Bainbridge Island will be used for East Kitsap. • The nearshore assessment will use existing forage fish data and at this time is not budgeted to do a comprehensive forage fish survey. • Adopt Kitsap County Draft Shoreline Environmental Designations • Update Shoreline Master Plan (2011). o Evaluate criteria for allowing docks and piers to protect herring habitat. o Identify herring habitat spawning areas as habitats of local importance requiring habitat management plans. o Consider cumulative effects from overwater structures in updating SMP (For example, build out scenarios w/overwater structures). Take into account processes that control functions. o Information from studies will be used to inform land use planners and managers to best manage natural resources • Actively seek funding to support protection of existing herring spawning areas.	• Develop methods to quantify cumulative effects from overwater structures. • Develop long range planning tools to manage potential cumulative impacts of shoreline development on herring spawning areas. • Develop incentive programs to encourage community docks vs. single family docks. • Education and Outreach o Fund Education/ Outreach position o Implement shoreline stewardship program o Shoreline educational workshops o Develop video on how salmon are using Kitsap and what citizens can do to protect and improve conditions. Distribute videos widely. • Offer Sound Boater Program to educate recreational boaters on boating best management practices.

Title: ********* FOR DISCUSSION PURPOSES ONLY ************ DRAFT

Species or Critical Habitat Type (Description and Functions provided to salmon)		Potential Threats & Stressors	Protective Measures Implemented by Kitsap County	Science & Regulatory Gaps	Measures planned to address threats/gaps & how	Possible actions if funding were available
Surf Smelt (*Hypomesus pretiosus*) & Pacific sand lance (*Ammodytes hexapterus*)	**Surf Smelt:** • **General:** Surf smelt are obligate spawners on the upper beach, with a specific mixture of coarse sand & pea gravel. Freshwater seepage areas or overhanging vegetation may be preferred spawning habitat due to lower fluctuation in gravel moisture and temperature. • **Spawning in Kitsap:** See Map #2 & 2a. There are many documented beaches throughout upper intertidal of protected beaches. • **Function to salmon:** Adult salmon eat smelt but to a lesser extent than sand lance and herring (Gearin et al., 1994). **Pacific sand lance:** • **General:** Sand lance are thought to be obligate spawners in the upper beach, over a variety of beach substrates, including soft sandy beaches, muddy low energy beaches & beaches of higher energy w/ gravel up to 3-cm diameter (Pentilla 1995, WDFW 2002a). • **Sand Lance Spawning in Kitsap:** See Map #3 & 3a. There are many documented beaches throughout upper intertidal of protected Kitsap beaches. However, sand lance spawning in Kitsap is the least understood of the forage fish (Small, WDFW, personal communication, 2005). • **Function to salmon:** On average, 35% of juvenile salmon diets are comprised of sand lance and are particularly important to juvenile Chinook, where 60 percent of their diets are sand lance (WDFW Web page, 2005). • **VSP Parameters:** See *Pacific herring* above.	• Shoreline armoring can have effects on physical processes, primarily sediment transport, that can reduce the number and diversity of habitats (Douglas and Pickel 1999). These modifications can have effects on nearshore processes and the ecology of spawning habitat for surf smelt and sand lance. Armoring can also reduce prey production and refuge areas for juvenile salmonids (Macdonald et al. 1994; Allee 1982). **Kitsap Focus:** Approximately 1/3 of unincorporated shoreline is armored. (Of the approximately 8000 shoreline lots, 5000 are developed. Between 1999-2004 there have been 192 building permits submitted for constructions of bulkheads. The majority of those would have been for replacement or repairs as the county is very conservative about issuing permits for new bulkheads. Approximately 10-20% are new bulkheads (Beam, Kitsap County Shoreline Administrator, 2005) Past shoreline armoring impacts included direct removal of habitat by bulkhead construction and fill. **Kitsap Focus:** It is not known how much habitat was lost in East Kitsap. The nearshore assessment will look at historical surveys (t-sheets) to get an idea of how much habitat was lost due to direct impacts such as fill and bulkheads. • Removing trees and other shoreline vegetation can increase erosion and decrease shading. Areas with shading have been found to experience greater egg viability than areas without shade (Pentilla, 2001. Proceeding from PS Research Conference) **Kitsap Focus:** Removal of "danger trees" in shoreline areas is subject to case by case evaluation. Vegetation removal associated with shoreline armoring is a common occurrence. The extent of vegetation removal is not documented.	**Federal**: Corps Section 404 & Section 10 permits initiate ESA Section 7 Consultations & Essential Fish Habitat Consultations. The Corps responsibility includes development activities below the mean, higher-water mark. **State:** All documented forage fish spawning sites in WA are considered "salt water habitats of special concern" and have been given "no net loss" protection in the application of Washington Administrative Code (WAC) "Hydraulic Code Rules". Jurisdiction stops at ordinary high-water line. **Kitsap County:** Shoreline Master Program (SMP) is the primary regulatory tool. The SMP specifies that a geotechnical survey must be conducted to document that a residence is threatened by erosion if a shoreline permit is to be approved. A shoreline permit to replace or repair an existing bulkhead must document, through a geotechnical survey that the residence is threatened and must show that soft bank protection techniques are not possible[1]. The County relies extensively on WDFW habitat biologists to provide habitat expertise that is otherwise not available at the county due to lack of staff. The shoreline planners said this relationship is very helpful. The Kitsap County Critical Areas Ordinance (Title 19 Kitsap County Code) requires a 35 ft. buffer and 15 building set-back for marine shorelines designated as Urban, Semi-Rural, Rural and Conservancy in the SMP. Shorelines designated as Natural require a 100 ft. buffer and 15 ft. building set-backs. All buffers require the maintenance of native vegetation, however view clearing is allowed.	**Science Gaps:** • Current knowledge and understanding of cumulative effects of shoreline armoring on spawning habitat is limited. • Sand lance spawning areas are the least understood. Only first recognized in 1989. It is the most documented food for Chinook but the documented habitat is probably under-represented (Small, WDFW, personal communication 2005). • Surf smelt documentation is more comprehensive, but funding was cut in mid 1990s so documentation is done site-by-site and does not take into account protracted spawning (9-12 months). Need updated comprehensive survey for sand lance and surf smelt. Largest gap in documentation is from Kingston to Foulweather Bluff (Small, WDFW, personal communication, 2005). **Regulatory Gaps:** • The limited knowledge of "cumulative effects" and how it is assessed or measured limits the ability of regulatory agencies to address these effects. • Regulations manage the shoreline through site-by-site consideration and does not allow for an ecosystem-based management. • County staff is unavailable to look at cumulative impacts.	• Nearshore Assessment (Complete April 2007). The nearshore assessment will 1) conduct a baseline characterization of the East Kitsap nearshore environment and assess its ecological health and function, 2) identify restoration and preservation opportunities and develop a strategy for ranking and prioritizing opportunities, and 3) develop a management framework based on functions and processes of nearshore ecology. The assessment will provide a baseline from which results of nearshore protection/restoration actions may be evaluated allowing an adaptive management approach to future nearshore activities. The same methodology used on Bainbridge Island will be used for East Kitsap. The nearshore assessment will use existing forage fish data and at this time is not budgeted to do a comprehensive forage fish survey. • Adopt Kitsap County Draft Shoreline Environmental Designations (subject to future public review and adoption process) in 2006. • Update Shoreline Master Plan (2011). o Evaluate criteria for allowing shoreline armoring in documented sand lance and surf smelt spawning habitat. o Identify sand lance and surf smelt spawning habitat areas as habitats of local importance requiring habitat management plans. o Consider cumulative effects from shoreline armoring in updating SMP. Take into account processes that control functions. o Information from studies will be used to inform land use planners and managers to best manage natural resources • Actively seek funding to support protection and restoration of existing forage fish spawning areas.	• Conduct comprehensive forage fish spawning survey to update documentation maps, especially for sand lance and for the area from Kingston to Foulweather Bluff. • Develop a method of identifying cumulative effects from shoreline armoring and stormwater on spawning habitat.. • Develop long range planning tools to address potential impacts to surf smelt and sand lance spawning areas. • Develop incentive programs to encourage removing unnecessary shoreline armoring and use of soft bank protection. (e.g. Public Benefit Rating System) • Education and Outreach o Fund Education/ Outreach position o Implement shoreline stewardship program o Shoreline educational workshops o Develop video on how salmon are using Kitsap and what citizens can do to protect and improve conditions. Distribute videos widely. • Offer Sound Boater Program to educate boaters on boating BMPs. • Develop a beach nourishment program to restore lost sediment supply to beachs and restore/maintain spawning area substrate.

[1] However, beach erosion at some level was often taking place and experts debated the causes of erosion and if the rate of erosion was excessive or within the expected range. Local staff and state biologists are hampered by the inability to challenge the geotechnical analysis in an expert capacity and few bulkhead applications have been denied shoreline armoring (Small, WDFW, personal communication 2005)

Title: ********* FOR DISCUSSION PURPOSES ONLY ************ DRAFT

Species or Critical Habitat Type (Description and Functions provided to salmon)		Potential Threats & Stressors	Protective Measures Implemented by Kitsap County	Science & Regulatory Gaps	Measures planned to address threats/gaps & how	Possible actions if funding were available

Eelgrass (*Zostera marina*) Habitat	• **General:** Low intertidal and upper subtidal zone, along protected and semi-protected shorelines.
	• **Eelgrass in Kitsap:** See Maps 4 & 4a. Eelgrass occupies an estimated 48% of East Kitsap shoreline (Washington State DNR 2001).
	• **Function to salmon:** Habitat for fish. Juvenile chum and Chinook are often found feeding and residing in and around eelgrass. Eelgrass is a major contributor to the detritus used in both nearshore and deep-water food webs.
	Healthy eelgrass areas support the following **VSP** parameters:
	1. Abundance: directly by providing shelter; indirectly as the basis for food webs that support prey populations.
	2. Population growth rate: directly by providing shelter; indirectly as the basis for food webs that support prey populations.
	3. Spatial structure: indirectly by supporting individuals from a variety of independent Chinook populations assumed to use the East Kitsap nearshore.
	4. Diversity: indirectly by supporting individuals from a variety of independent Chinook populations assumed to use the East Kitsap nearshore
	.
		• Construction of overwater structures (floating docks, fixed piers, marinas, mooring buoys) can directly impact eelgrass by shading or by physical scouring. **Kitsap Focus:** Unknown Kitsap specific studies. See Pacific herring regarding overwater structures.
		• Vessels commonly associated with many overwater structures can cause prop scouring of sediment and submerged vegetation. **Kitsap Focus:** No specific Kitsap studies.
		• Water quality impacts are another potential issue associated with overwater structures and sewage outfalls. In addition, sediments loads carried by streams may limit available light.**Kitsap Focus:** No specific information available.
		• Unregulated mooring buoys can scour & shade marine vegetation. **Kitsap Focus:** The number of buoys showing up locally outnumbers the permit applications and once placed it is difficult to find owners (Small, WDFW *personal communication*). Observations are qualitative and the extent has not been documented.
		• Boats anchoring in eelgrass and not using designated buoys causes scouring from anchor and anchor chain. **Kitsap Focus:** Lots of examples throughout the shoreline (Small, WDFW, *personal communication* 2005). Observations are qualitative..
			Federal: Corps Section 404 & Section 10 permits initiate ESA Section 7 Consultations & Essential Fish Habitat Consultations. The Corps responsibility includes development activities below the mean, higher-water mark.
			State: All documented eelgrass in WA are considered "salt water habitats of special concern" and have been given "no net loss" protection in the application of Washington Administrative Code (WAC) "Hydraulic Code Rules". Jurisdiction stops at ordinary high-water line.
			Kitsap County: Shoreline Master Program (SMP) is the primary regulatory tool. County staff relies extensively on WDFW biologists to provide habitat expertise to avoid impacting eelgrass or forage fish spawning habitat. Difficult to deny construction of docks and piers as a feature of single family homes due to existing policies and development standards in SMP – possession of an approved Hydraulic Project Approval permit from the State diminishes local ability to restrict development based on environmental considerations (Beam, personal communication 2005).
				Science Gaps:
				• While East Kitsap shorelines support aquatic vegetation the aerial extent and condition of eelgrass has not been accurately and comprehensively surveyed.
				• Current knowledge and understanding of cumulative effects of overwater structures and shoreline development on eelgrass habitat is limited. (proximity, etc.)
				• While eelgrass is known to be important, the ecology of eelgrass and Chinook is still under study. For example, landscape scale (patchy vs. dense) preferences; food sources; variation in distribution over time.
				• Impacts of increased *Ulva sp*. And *Sargassum spp*. distribution
				• Uncertainties in algal population dynamics (e.g. Ulva blooms, Sargassum introduction, attached vs. unattached algae contribution, seasonal/interannual eelgrass distribution variation)
				Regulatory Gaps:
				• The limited knowledge of cumulative effects limits the ability of regulatory agencies to address these effects.
				• Regulations manage the shoreline through site-by-site consideration and does not allow for ecosystem management.
				• County staff is not available to look at cumulative impacts.
				• We do not have a count of the number of un-permitted buoys and it is difficult to find the owners once they are in.
					• Nearshore Assessment will use existing eelgrass data and groundtruth. (Complete April 2007)
					• Adopt Kitsap County Draft Shoreline Environmental Designations (subject to future public review and adoption process) in 2006.
					• Update Shoreline Master Plan (2011). Kitsap County is scheduled to update master plan by 2011.
					  o Evaluate criteria for allowing development activities in documented eelgrass habitat.
					  o Identify eelgrass habitat as Class 1 Wildlife Conservation Areas, requiring habitat management plans.
					  o Consider cumulative effects from shoreline development in updating SMP
					  o Information from studies will be used to inform land use planners and managers to best manage natural resources
					• Actively seek funding to support protection and restoration of eelgrass habitat areas.
						• Develop a method of identifying cumulative effects from overwater structures and other stressors.
						• Instead of the use of site-by-site overwater structure permits, use long range planning tools to address potential impacts to eelgrass areas.
						• Develop incentive programs to encourage community docks versus single family docks.
						• Education and Outreach
						  o Fund Education/ Outreach position
						  o Implement shoreline stewardship program
						  o Shoreline educational workshops
						  o Develop video on how salmon are using Kitsap and what citizens can do to protect and improve conditions. Distribute videos widely.
						• Develop Volunteer Anchor Free Zones modeled after Jefferson County. Provide designated moorage buoys at all public facilities and install marker buoys showing boaters where eelgrass is located so they may avoid anchoring there.
						• Monitor eelgrass sites over time to access health and trend.

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	Species or Critical Habitat Type (Description and Functions provided to salmon	Potential Threats & Stressors	Protective Measures Implemented by Kitsap County	Science & Regulatory Gaps	Measures planned to address threats/gaps & how	Possible actions if funding were available
Kelp/Macro Algae Habitat	• **General:** Intertidal and subtidal distribution. Ubiquitous distribution of macroalgae throughout East Kitsap County. • **Kelp distribution in Kitsap:** See Maps 5 & 5a. **:** Kelp beds occur along approximately 21% of East Kitsap Shorelines (WADNR 2001). Subtidal distribution adjacent to exposed shorelines and high current areas in association with rock or larger cobble substrate. Includes surface canopy forming and submerged species. **Functions to salmon:** • Algae are contributors to the detritus used in both nearshore and deep-water food webs. • Herring spawning habitat. • Habitat for fish and invertebrates; juvenile and subadult salmon have been noted in kelp forests. Healthy macroalgae/kelp habitats support the following **VSP** parameters: 1. Abundance: directly by providing shelter; indirectly as the basis for food webs that support prey populations. 2. Population growth rate: directly by providing shelter; indirectly as the basis for food webs that support prey populations. 3. Spatial structure: indirectly by supporting individuals from a variety of independent Chinook populations assumed to use the East Kitsap nearshore. 4. Diversity: indirectly by supporting individuals from a variety of independent Chinook populations assumed to use the East Kitsap nearshore Note to self: Helen Barry DNR Annual Kelp Surveys.	• Construction of overwater structures (floating docks, fixed piers, marinas, mooring buoys) can directly impact macroalgae by shading or by physical scouring. **Kitsap Focus:** Unknown Kitsap specific studies. See Pacific herring regarding overwater structures. • Shoreline armoring can effect the sediment transport processes along shorelines and increase wave energy resulting in coarser substrates and steeper beach profiles. • Some species of macroalgae are harvested recreationally for direct human consumption. • Water quality: Eutrophication may lead to an overabundance of single species of alage, such as *Ulva sp.*, to the exclusion of a more natural assemblage of species. In addition, turbidity can lead to lower light regimes, decreasing productivity. **Kitsap Specific:** No specific studies identified at this point, however this will be considered during the nearshore assessment.	**Federal**: Same as eelgrass **State:** Same as eelgrass **Kitsap County:** Shoreline Master Program (SMP) is the primary regulatory tool. The SMP specifies that a geotechnical survey must be conducted to document that a residence is threatened by erosion if a shoreline permit is to be approved. A shoreline permit to replace or repair an existing bulkhead must document, through a geotechnical survey that the residence is threatened and must show that soft bank protection techniques are not possible[2]. County staff rely extensively on WDFW biologists to provide habitat expertise to avoid impacting habitat. Difficult to deny construction of docks and piers as a feature of single family homes due to existing policies and development standards in SMP – possession of an approved Hydraulic Project Approval permit from the State diminishes local ability to restrict development based on environmental considerations (Beam, personal communication 2005). The Kitsap County Critical Areas Ordinance (Title 19 Kitsap County Code) requires a 35 ft. buffer and 15 building setback for marine shorelines designated as Urban, Semi-Rural, Rural and Conservancy in the SMP. Shorelines designated as Natural require a 100 ft. buffer and 15 ft. building setback. All buffers require the maintenance of native vegetation, however view clearing is allowed.	**Science Gaps:** • Actual use of macroalgae assemblages and kelp beds by salmon is poorly documented. • It is not known how much habitat was lost in East Kitsap due to armoring and filling to create upland building sites. • Impacts of increased *Ulva sp*. And *Sargassum spp*. distribution. • Effects of eutrophication have not been studied locally. Nutrient data is not currently being collected in a timely manner. **Regulatory Gaps:** • The limited knowledge of cumulative effects limits the ability of regulatory agencies to address these effects. • Regulations manage the shoreline through site-by-site consideration and does not allow for ecosystem management. • County staff is not available to look at cumulative impacts.	• Nearshore Assessment (Complete April 2007). Note the abundance of Ulva at field sites. The nearshore assessment will also look at historical surveys (t-sheets) to get an idea of how much habitat was lost due to direct impacts such as fill and bulkheads. • Adopt Kitsap County Draft Shoreline Environmental Designations (subject to future public review and adoption process) in 2006 • Update Shoreline Master Plan (2011). Kitsap County is scheduled to update master plan by 2011. o Identify Kelp habitat as Class 1 Wildlife Conservation Areas, requiring habitat management plans. o Consider cumulative effects of shoreline activities in updating SMP. o Information from studies will be used to inform land use planners and managers to best manage natural resources • Actively seek funding to support protection and restoration of kelp beds and macroalgae habitat areas.	• Fully fund Kitsap County PIC program. Expand program to look at nutrient loading. • Develop incentive programs to encourage removing unnecessary shoreline armoring and use of soft bank protection. (e.g. Public Benefit Rating System) • Education and Outreach o Fund Education/ Outreach position o Implement shoreline stewardship program o Shoreline educational workshops o Develop video on how salmon are using Kitsap and what citizens can do to protect and improve conditions. Distribute videos widely. •

[2] However, beach erosion at some level was often taking place and experts debated the causes of erosion and if the rate of erosion was excessive or within the expected range. Local staff and state biologists are hampered by the inability to challenge the geotechnical analysis in an expert capacity and few bulkhead applications have been denied shoreline armoring (Small, WDFW, personal communication 2005)

Species or Critical Habitat Type (Description and Functions provided to salmon)		Potential Threats & Stressors	Protective Measures Implemented by Kitsap County	Science & Regulatory Gaps	Measures planned to address threats/gaps & how	Possible actions if funding were available
Native Marine Riparian Habitat	**General:** The role of marine riparian vegetation is not clearly understood. Much of the functions associated with this element are derived in part from studies focused on fresh water riparian functions and limited site-specific nearshore studies. **Functions to salmon:** • Water quality protection: riparian vegetation serves as a sink for upland derived contaminants. It also traps sediments. • Hydrology regulation: riparian vegetation intercepts and regulates storm water inputs to the nearshore environment. • Shade: riparian vegetation supports viability of forage fish eggs (Pentilla, 2001) and presumably viable populations of other prey organisms subject to mortality due to increased desiccation. • Organic/Nutrient input: Riparian vegetation contributes organic materials utilized in nearshore food webs. • Prey input for salmon: direct input of insects and other terrestrial organisms have been documented as food source for juvenile salmon (Brennan, 2004). • Bank stabilization: vegetation root systems stabilize shorelines and contribute to regulation of sediment supply. • Large woody debris (LWD): provides habitat structure, assumed to provide refuge and cover for juvenile salmon and other marine organisms. Healthy riparian vegetation support the following **VSP** parameters: 1. Abundance: directly by providing food and shelter. 2. Population growth rate: directly by providing food and shelter. 3. Spatial structure: directly by supporting individuals from a variety of independent Chinook populations assumed to use the East Kitsap nearshore. 4. Diversity: directly by supporting individuals from a variety of independent Chinook populations assumed to use the East Kitsap nearshore o	• Shoreline develop is associated with increased impervious surfaces and runoff and loss of riparian vegetation effecting water quality and potential impacts to salmon transitioning from fresh to saltwater. • Shoreline armoring is typically associated with loss of riparian vegetation and the corresponding function loss. • Altered riparian vegetation due to shoreline modifications may lead to a decrease in primary and secondary production in the nearshore (i.e. reduced prey abundance and variety) **Kitsap:** Approximately 1/3 of unincorporated shoreline is armored. Of the approximately 8000 shoreline lots, 5000 are developed. Shoreline that is armored is usually accompanied with loss of native marine riparian habitat. The *2003 Kitsap Salmon Refugia Report* (May and Peterson, 2003) classified a significant portion of the East Kitsap shoreline, from Point No Point to Applecove Point (See Map 6) as Category A refugia (“priority refugia with natural ecological integrity”). The majority of remaining East Kitsap nearshore and estuarine habitat areas were designated Category D refugia (“potential refugia with altered ecological integrity”) primarily due to shoreline modification and loss of riparian vegetation. May and Peterson (2003) also note that their assessment of nearshore habitat conditions for salmon should be considered “interim” due to the sparse data.	**Federal**: N/A **State:** N/A **Kitsap County:** The Kitsap County Critical Areas Ordinance (Title 19 Kitsap County Code) requires a 35 ft. buffer and 15 building setback for marine shorelines designated as Urban, Semi-Rural, Rural and Conservancy in the SMP. Shorelines designated as Natural require a 100 ft. buffer and 15 ft. building setback. All buffers require the maintenance of native vegetation, however view clearing is allowed. The Critical Areas Ordinance also classifies all streams in the County where listed salmonids are present as Category I wetlands, requiring a 200 ft. buffer. Estuarine areas associated with streams that do not contain listed salmon may also be categorized as Category II wetlands with a buffer requirement of 100 ft.	**Science Gaps:** • Limited Puget Sound specific marine riparian buffer research. • Do non-native species function in similar manner to native species? • How can we use adaptive management to vary buffer areas to provide suitable function? **Regulatory Gaps:** • Enforcement: hard to enforce what happens in buffers after the permits are issued. No monitoring. • Lack of regulatory awareness to property owners who purchase lots already developed. They many not know that the property is subject to CAO.	• Nearshore Assessment (Complete April 2007). The nearshore assessment will also look at historical surveys (t-sheets) to get an idea of how much habitat was lost due to direct impacts such as fill and bulkheads. • Adopt Kitsap County Draft Shoreline Environmental Designations (subject to future public review and adoption process), which includes dual designations for some areas that include important habitat types or forage fish spawning. Dual designations provide one designation for the above ordinary high water (OHW) to reflect current and surrounding land uses and a more restrictive designation for nearshore areas below OHW. • Adopt proposed revisions to the Critical Areas Orinance, including extending buffers for shorelines designated as Conservancy to 50 ft. and adopting the new DOE’s wetland rating system and recommended flexible buffers option • Actively seek funding to support protection and restoration of marine riparian areas.	• Revegetate public lands wherever possible. • Protect existing riparian habitat through acquisitions and conservation easments. • Fund more enforcement activities. • Identify intact habitat and look into purchasing or conservation easements to protect them. • Develop incentive programs to encourage removing unnecessary shoreline armoring and use of soft bank protection. (e.g. Public Benefit Rating System) • Education and Outreach o Fund Education/ Outreach position o Implement shoreline stewardship program o Shoreline educational workshops o Develop video on how salmon are using Kitsap and what citizens can do to protect and improve conditions. Distribute videos widely. • Native vegetation workshops for local shoreline owners and master gardeners (Mason county model

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	Species or Critical Habitat Type (Description and Functions provided to salmon	Potential Threats & Stressors	Protective Measures Implemented by Kitsap County	Science & Regulatory Gaps	Measures planned to address threats/gaps & how	Possible actions if funding were available
Tidal Marsh Habitat (Vegetated)	Tidal Vegetated Marsh Habitat • Primary production • Juvenile fish and invertebrate production support • Adult fish and invertebrate foraging • Salmonid osmoregulation and overwintering habitat • Water quality • Detrital food chain production • Wave buffering • Juvenile salmon reside in tidal marshes and forage on prey resources produced in and imported to the marsh system, where significant growth has been recorded (Shreffler et al. 1992). Tidal marshes are believed to be one of the most important habitats contributing to juveniles salmon growth and survival (Bottom et al. 2001). Kitsap doesn't have a bunch of this from large river systems (such as the studies cited) but does have marsh habitat in upper tidal inlets. This may not be our habitat of highest importance for chinook, but may be more so for multispecies approach • **Viable Salmon Population (VSP) Parameters:** o Abundance: o Population growth rate: o Spatial structure: o Diversity:	• Disturbed community structure, disturbed plant growth, presence of non-native species, buffer encroachment, runoff scour, alteration of dendritic tidal channels, alteration of sediment dynamics, loss of upland hydraulic connectivity, elevated soil contaminant concentrations, presence of man-made debris, physical disturbances from dredging, filling and diking, & chemical contamination. • Past land use practices; similar to tidal flats, these are likely areas for development.	**Federal**: Same **State:** Same **County:** Wetland buffer protection.	**Science:** Not sure how much salt marsh we have lost historically.	• Nearshore Assessment • Adopt Kitsap County Draft Shoreline Environmental Designations (subject to future public review and adoption process). • Apply for SRFB Grants	• Protect and Restore • Education and Outreach

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	Species or Critical Habitat Type (Description and Functions provided to salmon	Potential Threats & Stressors	Protective Measures Implemented by Kitsap County	Science & Regulatory Gaps	Measures planned to address threats/gaps & how	Possible actions if funding were available
Beaches (sand and rocky)	Beaches (sand and rocky) and Backshore • Primary production • Nutrient cycling • Refuge for multiple species • Prey production for juvenile salmon Forage fish spawning habitat • **Viable Salmon Population (VSP) Parameters:** o Abundance: o Population growth rate: o Spatial structure: o Diversity:	• Fecal and chemical contamination, alteration of natural habitats, alteration of sediment supply, alteration of groundwater hydrology, loss of riparian habitat.	**Federal:** **State:** **County:**		• Nearshore Assessment • Adopt Kitsap County Draft Shoreline Environmental Designations (subject to future public review and adoption process). • Apply for SRFB Grants	• Protect and Restore • Education and Outreach
Banks and Bluffs	Banks and Bluffs • Source of sediments to beaches • Support for marine riparian vegetation Notable eroding bluffs include the shoreline from Foulweather Bluff to Port Madison Bay, Murden Cove to Point Monroe, Wing Point to Murden Cove; Fletcher Bay to Arrow Point, Manzanita Bay to Agate Point. • **Viable Salmon Population (VSP) Parameters:** o Abundance: o Population growth rate: o Spatial structure: o Diversity:	• Shoreline armoring and development. • Alteration of hydrology	**Federal:** **State:** **County:** WDFW is good at providing identification of feeder bluffs. In order to armor bluff, property owner must show good cause that structure is threatened.		• Nearshore Assessment • Adopt Kitsap County Draft Shoreline Environmental Designations (subject to future public review and adoption process). • Apply for SRFB Grants	• Protect and Restore • Education and Outreach

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	Species or Critical Habitat Type (Description and Functions provided to salmon	Potential Threats & Stressors	Protective Measures Implemented by Kitsap County	Science & Regulatory Gaps	Measures planned to address threats/gaps & how	Possible actions if funding were available
Tidal Mud Flats	Tidal Mud Flats • Primary production • Nutrient cycling • Habitat/support for juvenile and adult fish • Prey production for juvenile salmon (harpacticoid copepods, amphipods) • Detritus sink • Predator protection for sand lance • Wave dissipation for salt marsh and fish • Extensive tidal flats are present in areas such as Carpenter Creek/Appletree Cove, Miller Bay, Liberty Bay, Dyes Inlet, Sinclair Inlet, Clam Bay, Pleasant Cove, Manzanita Bay, Murden Cove, Rolling Bay to Point Monroe, Fletcher Bay, Blakely Harbor, and Eagle Harbor.Kitsap protected shallow shoreline habitat is of regional importance in Puget Sound • **Viable Salmon Population (VSP) Parameters:** o Abundance: o Population growth rate: o Spatial structure: o Diversity:	• Unnatural erosion or deposition of sediment • Overabundance of organic matter loading including ulvoid mats • Alteration of dendritic tidal channels • Fecal and chemical contamination • Physical disturbances from shoreline armoring, marina construction. • Competition from non-native species. • Spartina • Maybe change to direct effects & indirect effects to make it clearer • Note that habitat changes affect biological community – this is the main link you are looking for.	**Federal**: Army Corps Section 10 (Dredging & Filling) **State:** same **County:** Protected	Can we restore tidal flats in highly urbanized settings or where physical processes have been highly disturbed? Can we substitute other measures for highly disturbed physical processes when they cannot be restored? (e.g. beach feeding)	• Nearshore Assessment (Complete April 2007) • Update Shoreline Master Plan (2011) • Develop method of identifying cumulative effects. • Find funding to implement comprehensive monitoring to look at cumulative impacts. • Monitor for Spartina infestation and curtail growth. • Apply for SRFB Grants	• Protect and Restore • Education and Outreach

Appendix A: References

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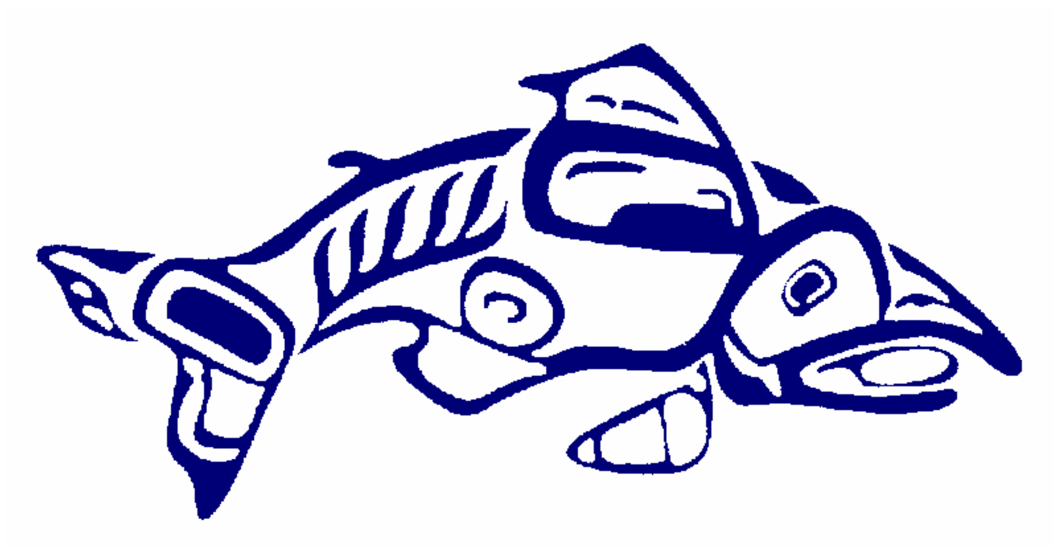
East Kitsap Peninsula Salmon Recovery Strategy, 2004	Puget Sound Chinook Management Plan

Appendix B: 2003 Kitsap Salmon Refugia Report – Executive Summary

Landscape Assessment and Conservation Prioritization of Freshwater and Nearshore Salmonid Habitat in Kitsap County



Christopher W. May, Ph.D. and Gretchen Peterson

Prepared for Kitsap County

2003 KITSAP SALMONID REFUGIA REPORT

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Revision Date: October 31, 2003

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- Dr. Ron Thom, Battelle Marine Science Laboratory
- Steve Todd, Point No Point Treaty Council
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The following County staff contributed to this report:

- David Nash, Kitsap County DCD GIS analyst, contributed data and technical assistance.
- Dave Christensen, Jefferson County Natural Resources Division, project manager for the East Jefferson Refugia Study, contributed significantly to the final report.
- Keith Folkerts, Kitsap County DCD, was the Project Manager and author of Executive Summary.

EXECUTIVE SUMMARY

The goal of this project is to *identify* and *characterize* potential salmonid conservation and restoration areas located within Kitsap County. After identification of these areas, a primary objective of this project was to analyze and prioritize these *salmonid refugia* to assist in conservation, enhancement, and restoration efforts. A major aim of the project is to support the early salmon recovery actions necessary to preserve the remaining areas of high-quality salmonid spawning and rearing habitat in the region. Protection of these "last best places" is likely an essential part of the salmon recovery process, but alone will not be sufficient to ensure the restoration of natural runs of native salmonids.

Definition of Salmonid Refugia

"Salmonid" means "of the salmon family." Salmonids in the study area include coho, chum, chinook, and pink salmon, as well as steelhead and cutthroat trout. This report is based upon a multi-species approach and does not give special consideration to any individual species of salmon.

One ecological definition of *refugia* is an area where special environmental circumstances have enabled a species or community of species to survive after decline or extinction in surrounding areas. For the purpose of this report, *salmonid refugia* can be defined as "habitats or environmental factors that provide spatial and temporal resistance and/or resilience to aquatic communities impacted by natural and anthropogenic disturbances"

Refugia can be stream corridors, watersheds, or shoreline areas. No single factor leads an area to be designated as refugia, rather it is a convergence of several ecological (physical and biological) factors.

Areas that qualify as *refugia* typically have habitat features such as intact streamside forests, undeveloped floodplains, wetlands, and natural shorelines. Refugia are used intensively by salmon compared to non-refugia areas—they are biological "hot-spots."

Refugia areas are important for maintaining *populations* of salmon. Refugia act to "re-seed" nearby areas after natural or man-made disturbances. Figure ES-1 shows how a "core population" on the mainstem of a river can be a source for naturally re-stocking outlying populations. For wild salmon to continue to survive, these core populations (and their habitat) must remain viable. It is from these core populations found in refugia areas that salmon populations will recover and begin to use less ideal habitat, forming "satellite populations."

The refugia concept is similar to the thinking that led to the formation of the National Wildlife Refuge System. Migratory waterfowl and other wildlife benefited and thrived during the last century because key habitat was protected.

Refugia areas are not only important for salmon but also for other wildlife and plant communities.

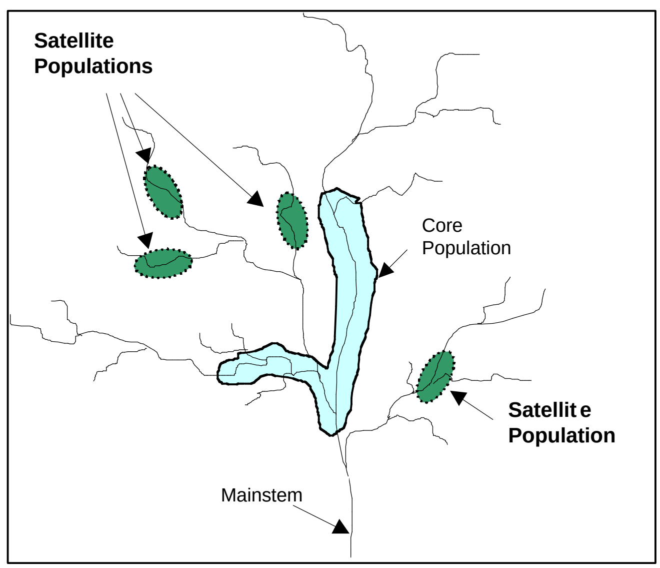


Figure ES-1: Refugia concept showing core populations and satellite populations.

Why was this study undertaken?

This study was undertaken because refugia are critical for wild salmon to survive and funds to recover salmon are limited. One of the first crucial steps to cost-effectively maintain or restore wild salmon populations is to identify areas that are critical for wild salmon. This study, in conjunction with more detailed Limiting Factors Analyses, comprise the initial steps in a comprehensive, long-term salmon recovery process.

Refugia areas identification and categorization process

To determine if a watershed, stream corridor, or marine shoreline is a refugia area, the study looked at several "landscape-centered" factors and several "fish-centered" factors. Examples of "landscape-centered" data used:

- LandSat images showing watershed conditions such as the amount of development and forest cover.
- LandSat images showing the amount and quality of streamside forests and floodplain development.
- Nearshore marine conditions such as bulkheads and presence of eelgrass.

Examples of "fish-centered" data used:

- Records related to salmon presence, abundance, diversity, and productivity.
- Field data about the condition of instream habitat (such as the amount of large woody debris, the quality of spawning gravels, and the stability of streambeds).

Figure ES-2 shows how the freshwater refugia scores were determined. Since some factors are more important than others, each factor (top line of boxes) was given a certain "weight" (depicted by the pie charts in the middle of the graphic) before incorporating it into a "fish score," a "watershed score," and a "riparian score." These three scores were combined to come up with a "final score." Based upon each refugia's final score (and interjecting best professional judgment to make modifications as necessary) the author assigned a category to each refugia. A similar process was used to categorize shoreline refugia (see ES-3).

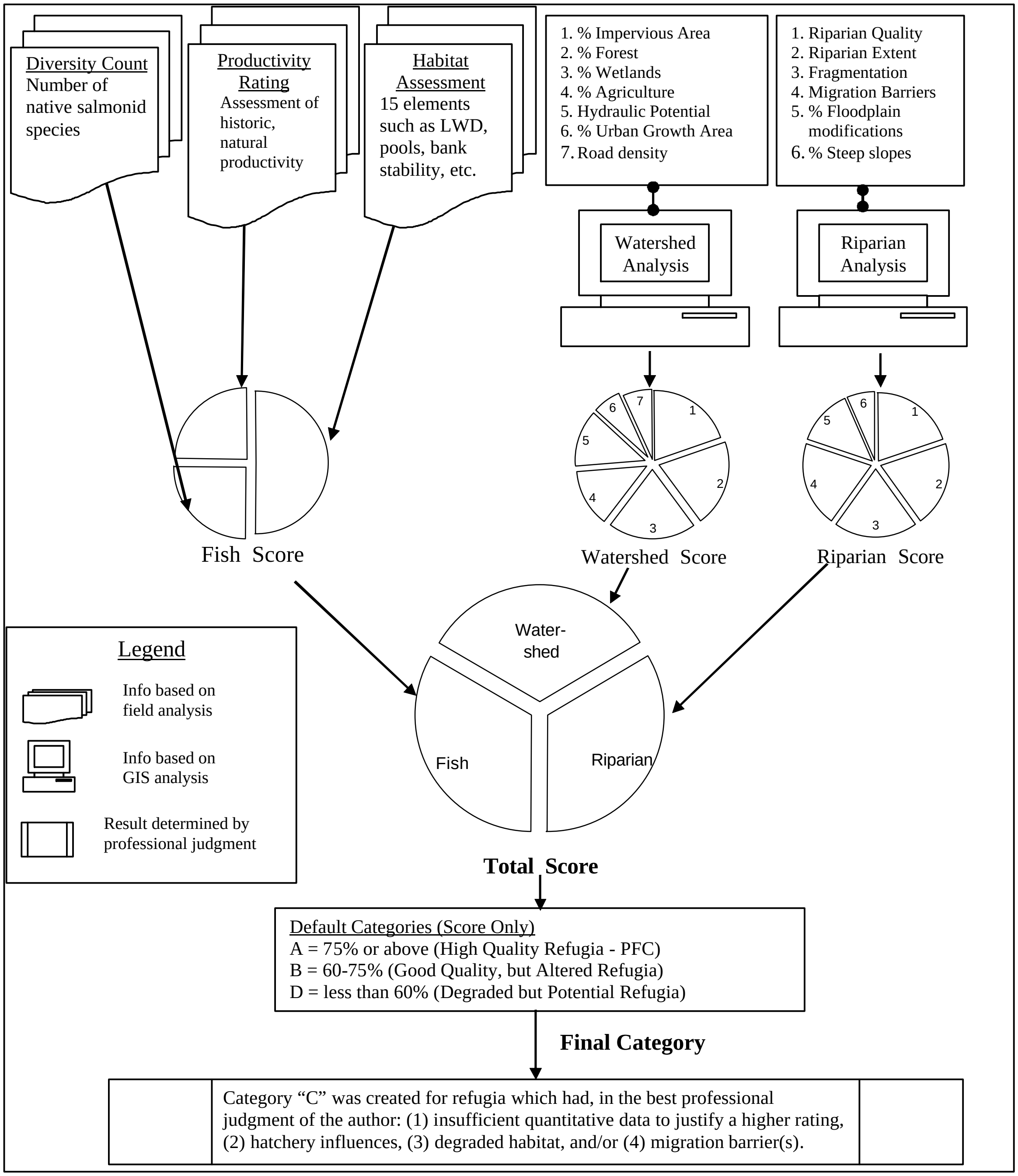


Figure ES-2: Freshwater Refugia Scoring and Categorization Process.

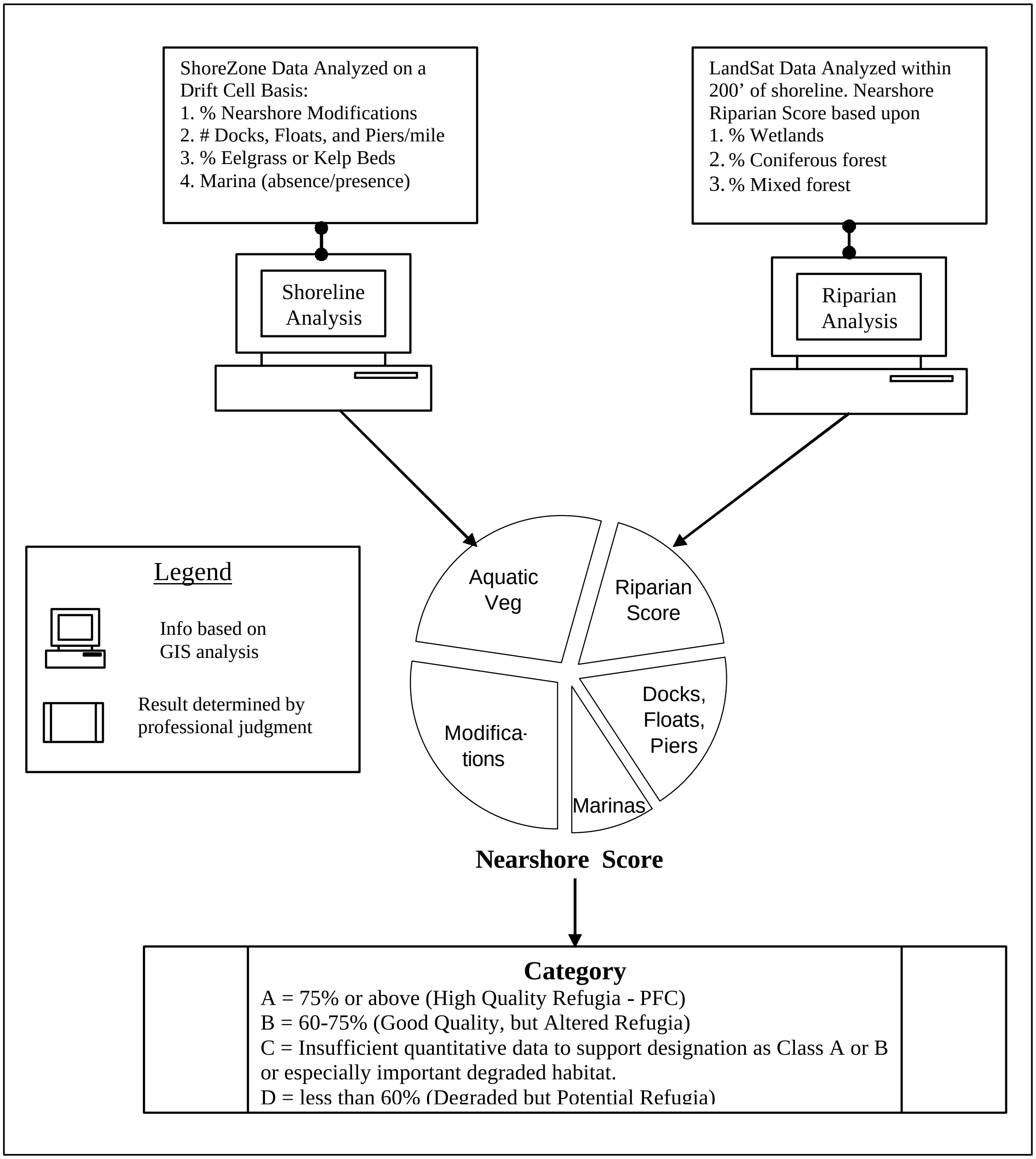


Figure ES-3: Nearshore and Estuarine Refugia Scoring and Categorization Process.

Definition of Refugia Categories

Category "A" means: "Priority refugia with natural ecological integrity." While not necessarily pristine, these areas are nearly intact, relatively undisturbed, and generally exhibit *properly functioning conditions*. These are generally in excellent condition.

Category "B" means: Primary refugia with altered ecological conditions." These are refugia with somewhat disturbed conditions, but which still support natural assemblages of native salmon. These are generally in good condition.

Category "C" means: "Secondary refugia with altered ecological integrity." These areas may belong in Category "A" or "B" if not for hatchery influences, migration barriers and/or degraded habitat. These are generally in fair condition. The author also placed in this category refugia that did not support a higher rating due to a lack of quantitative data. This could be called "Possible refugia."

Category "D" means: "Potential refugia with altered ecological integrity." These areas are best described as "potential future refugia" due to significantly degraded habitat conditions. These areas were likely historically important for salmon, but today do not support anywhere near natural levels of salmon productivity.

Areas that did not meet these criteria were considered non-refugia.

Stavis Creek Estuary. Stavis Watershed is watershed with the highest score in the study area.

The Lower Reach of the Dewatto River is the stream reach with the highest score (88%). It is part of a Category A Focal Sub-Watershed Refugia.

The South Fork of Dogfish Creek is the stream reach with the lowest score (37%). It is designated as a Category D Nodal Riparian Corridor refugia.

The Point No Point nearshore is the shoreline with the highest Nearshore-Estuarine score (83%). It is designated as a Category A Nearshore-Estuarine Refugia.

Sinclair Inlet is the shoreline with the lowest Nearshore-Estuarine score (19%). It is designated as a Category D Nearshore-Estuarine Refugia.

Types of Refugia

The report delineates freshwater refugia as one of two types: (1) "Focal Sub-Watershed" (FSW); or (2) "Nodal-Riparian Corridor" (NRC). Generally, a "Focal Sub-Watershed" designation is more appropriate for headwater areas, while a "Nodal-Riparian Corridor" designation is more appropriate for lower reaches of a stream, or streams that are confined within steep-sloped valleys. One type is not necessarily "better" than the other; it is more a matter of which type of refugia fits the specific situation in the field and which type will be more effective for conserving salmon habitat.

For marine areas, the report delineates "Nearshore and Estuarine" (NSE) refugia for those stream estuaries, nearshore migration corridors, and shoreline areas that provide refuge habitat for migrating and rearing salmon. Nearshore and Estuarine refugia are based upon *drift cells*. Drift cells are reaches of shoreline where waves move sediment from eroding "feeder" areas (such as bluffs) to "deposition" areas (such as sand spits).

"Critical Contributing Area" (CCA) is a fourth area delineated by the report (these areas are not shown on the map). The Critical Contributing Area itself is not itself a refugia area, but directly influences downstream refugia with stream flows and/or water quality. Natural conditions such as seasonal flow or natural barriers typically prevent these areas from supporting viable salmon populations. There is typically one or more CCA associated with a Nodal Riparian Corridor. All seasonal streams draining to Nearshore and Estuarine refugia are considered Critical Contributing Areas.

Results

The map (Figure ES-4) shows the results of the study. A complete listing of refugia can be found in Table 16, pages 91-93.

Importance of non-refugia areas

Based upon the findings of this report, areas not proposed for refugia status should not be considered unimportant for regional salmon recovery efforts. Every watershed, stream, and nearshore area deserves protection and stewardship to some degree. Even the smallest watershed or nearshore area has some salmon habitat value, which may be critical to the survival of a population of fish. By the same token, degraded watersheds, streams, or nearshore areas may also still retain some measure of habitat value and therefore should be managed appropriately.

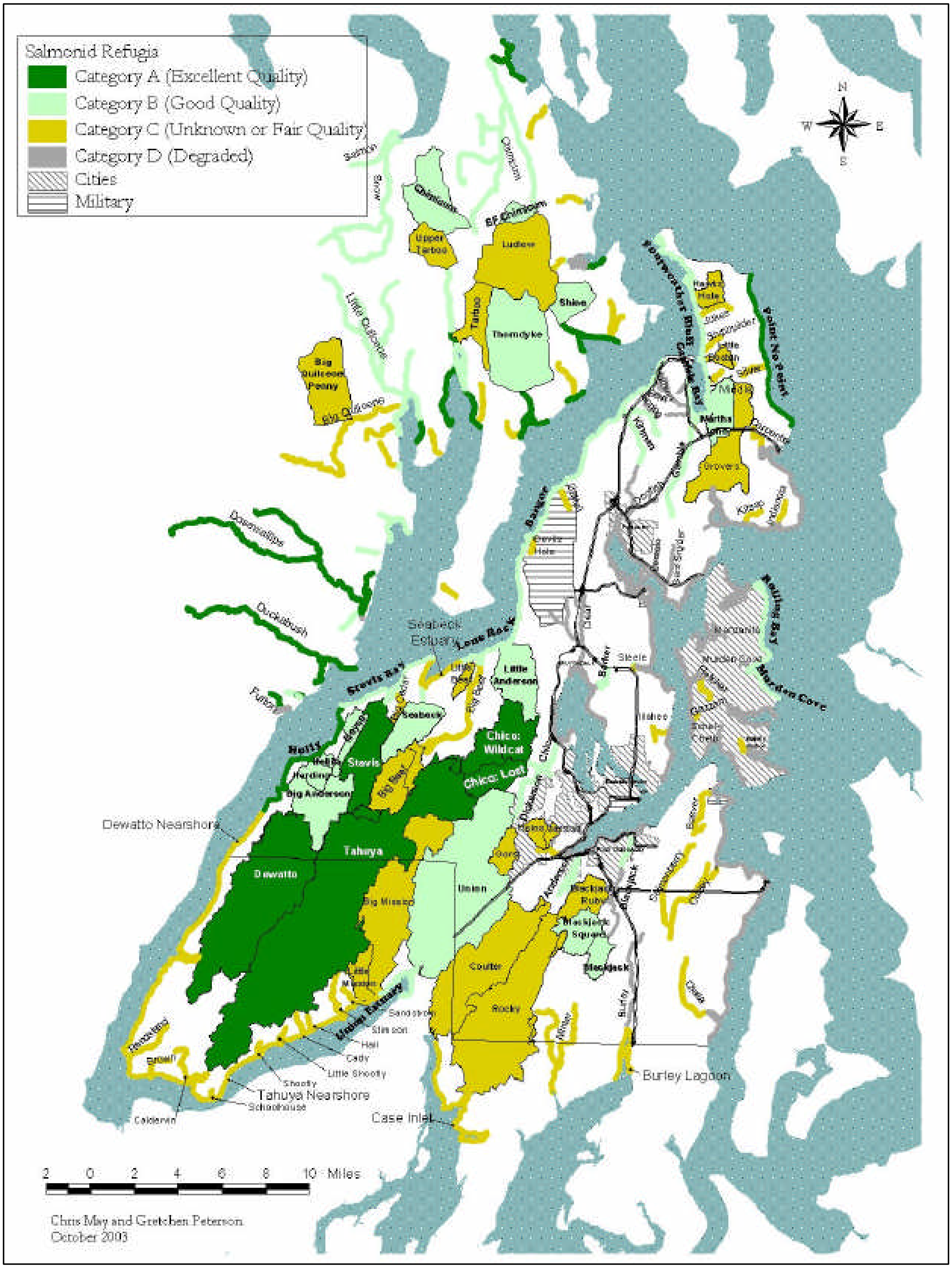


Figure ES-4: Map of Kitsap Focal Sub-Watershed, Nodal-Riparian Riparian Corridor and Nearshore-Estuarine Refugia.

Highest quality refugia and range of refugia scores

The 26 streams and nearshore areas that contain Category A & B refugia are shown in Table ES-1. There are five nearshore areas and 26 streams and in Category C. In Category D there are 18 streams and 16 nearshore areas. There were 44 streams analyzed that were deemed to be non-refugia and were not assigned to Categories A-D.

The highest freshwater refugia score was 88% for the lower reaches of the Dewatto River (the overall average for the Dewatto watershed is 82%). The lowest score was 37% for the South Fork of Dogfish Creek.

For nearshore areas the high score was 83% for the Point No Point Nearshore; the low was 19% for Sinclair Inlet.

Highest Category for this Stream	Stream/Nearshore Name	Average Score for this Stream
A	Point-No-Point Nearshore	83%
A	Stavis Creek	83%
A	Dewatto River	82%
A	Holly Nearshore	79%
A	Tahuya River	78%
A	Chico Creek	71%
B	Murden Cove Nearshore	75%
B	Harding Creek	74%
B	Big Anderson Creek	74%
B	Nellita Creek	73%
B	Union River	72%
B	Boyce Creek	72%
B	Foulweather Bluff	69%
B	Stavis Bay Estuary	69%
B	Martha John Creek	69%
B	Seabeck Creek	67%
B	Lone Rock Nearshore	67%
B	Rolling Bay Nearshore	66%
B	Little Anderson Creek	64%
B	Port Gamble Bay	64%
B	Union Estuary	63%
B	Kinman Creek	61%
B	Gamble Creek	61%
B	Blackjack Creek	59%
B	Barker Creek	56%
B	Steele Creek	54%

Table ES-1: Category A and B refugia.

Number of Refugia

Report classified a total of 160 individual sub-watersheds, stream reaches, and nearshore areas as refugia. The breakdown of these refugia by Category and type is shown in Table ES-2.

Interim nature of nearshore results

At the present time, our knowledge of nearshore salmonid utilization is relatively basic and is rapidly expanding. In addition, the database on nearshore salmonid habitat conditions is also relatively sparse. Therefore, this assessment of nearshore salmonid conditions should be considered as "interim" until more and better data is developed.

	FWS	NRC	NSE	Total
Category A	6	0	2	*8 (5%)*
Category B	10	18	8	*36 (23%)*
Category C	14	45	5	*64 (40%)*
Category D	0	36	16	*52 (32%)*
Total	*30 (19%)*	*99 (62%)*	*31 (19%)*	**160**

Table ES-2: Frequency of Refugia by Type and Category.

Prioritizing habitat conservation vs. habitat restoration

It is generally understood that it is more successful and much more cost-effective to prevent habitat degradation rather than restore damaged areas. Protecting the "last best places" is an essential part of the salmon recovery process. This report is designed to identify where to focus resources to efficiently and cost-effectively protect key areas.

Where habitat conditions have been degraded, restoring natural runs of native salmon will require that stream corridors, watersheds, and nearshore areas be brought back to a higher quality condition.

This study does not imply that protection of the designated refugia areas alone is ecologically sufficient to support salmon recovery or even to maintain current conditions within the region. Maintaining refugia is considered a necessary first step in a comprehensive, long-term ecosystem conservation program.

Conclusions

The available data indicate several common problems throughout the study region. These include (in no specific order):

- Natural stream ecological processes have been significantly altered due to the cumulative effects of watershed land-use practices and human encroachment into the stream-riparian ecosystem.

- There has been a significant shift in the natural hydrologic regime of many watersheds, especially those undergoing urbanization. This is characterized by increases in peak flow frequency, duration, and magnitude due to increased stormwater runoff from lands that have been converted from native forest and wetlands to developed landscapes dominated by impervious surfaces.

Example of a Kitsap stream with altered riparian vegetation, a lack of LWD, and an altered stream channel.

- Streambed stability and spawning gravel quality have been degraded by high stormflow scour and fine sediment deposition. Major fine sediment sources include logging roads, construction sites, and agricultural fields.

- Stream channel morphological changes have resulted from direct alterations such as agricultural channelization or floodplain diking. In addition, streambank erosion has increased in frequency and extent due to higher stormflows, loss of natural vegetation cover, and subsequent streambank armoring.

- There is a general lack of adequate large woody debris (LWD) in streams, particularly large, stable coniferous "key" pieces that are critical to forming pools, providing cover for juvenile fish, retaining organic matter, and maintaining instream habitat complexity. In addition, there is a general lack of adequate, high-quality rearing habitat (pools) for juvenile salmonids and the lack of deep "holding" pools for adult salmon migration.

- There has been a significant degradation and loss of natural floodplain processes in our rivers and larger stream systems, including the loss of functional off-channel wetland habitat. This is mainly due to dredging, bank armoring, and stream channelization. Past and current agricultural land-use has had a significant impact on floodplain and riparian processes in a number of lowland watersheds. In addition, development has also continued this process of stream channel manipulation.

- Almost all local streams have experienced a loss of natural riparian function due to removal or alteration of natural riparian forest vegetation. This degrades water quality, increases streambank erosion, reduces shade needed for water temperature regulation, and impacts instream habitat conditions through the decline in LWD recruitment.

- Stream-riparian corridor fragmentation is a major problem in many watersheds. This fragmentation has impacted the structure and function of our stream-riparian ecosystems. In addition, there are a significant number of culverts, diversion dams, and other fish passage barriers throughout these same watersheds.

- Estuarine and nearshore processes have been significantly impacted by physical alteration of nearshore ecological structure and function. These impacts include extensive shoreline bulkhead construction, loss of shoreline forest and large woody debris recruitment, loss of shoreline riparian cover and shade, and degraded water quality. In addition, natural sediment transport and beach nourishment processes have been disrupted as nearshore drift-cells have been altered by shoreline armoring, dock construction, and other human activities. All of these modifications have impacted salmonid habitat in the nearshore environment to some extent.

- Other impacts (e.g. hatcheries and harvest) have also significantly affected salmonid populations, however those issues are beyond the scope of this report.

Recommendations

Throughout the report, the author makes several general recommendations, including:

- Protection and restoration activities should be prioritized to focus on critical watersheds, streams, or reaches that have the potential to protect and reestablish core populations at strategic locations within mainstem river systems, estuaries, and tributaries.

- Preserve native vegetation as much as possible in critical nearshore areas, estuaries, and sensitive (steep banks and landslide-prone) shorelines.

- Reduce to negligible levels the impacts of shoreline development in all Nearshore and Estuarine refugia areas.

- Investigate Category C refugia where insufficient quantitative data existed to justify a Category A or B rating.

- Integrate monitoring and feedback with management so that conservation efforts may be continually refined ("*adaptive management*").

- Develop integrated watershed plans to manage current and future human activities in a way that minimizes our impacts on the natural environment. This is necessary to sustain our natural resources and protect our own quality of life.

The report concludes with the following recommendations:

- Continue to evaluate freshwater habitat conditions throughout watershed and correct identified salmonid habitat limiting factors.

- Develop salmonid habitat conservation programs that include protective purchases, conservation easements, and voluntary stewardship elements.

- Because salmonids are adapted to spatially and temporally varied local habitat conditions, it does not make sense to manage for the same conditions at all locations, or to expect conditions to remain constant at any one location. A "one-size-fits-all' solution is rarely appropriate in the case of salmonid habitat conservation and restoration.

- Evaluate all known and potential adult and juvenile salmonid migration barriers in the watershed. Prioritize and correct all migration barriers as necessary.

- Protect stable natural hydrology within the watershed. Conserve native forest cover throughout the watershed and minimize impervious surfaces in all developed areas.

- Restore floodplain function, natural channel configuration, and stream channel migration zone. This should include consideration of dike and levee removal, road and residential relocation, and restoration of off-channel and historic slough habitat.

- Develop and implement a forest road management plan to reduce erosion and other impacts from logging roads. Ensure timber harvest operations are conducting with long-term sustainability as a goal. The principles of ecosystem management should guide all logging activities.

- Protect and enhance natural estuarine structure and function. Maintain connectivity with the adjacent nearshore.

- Restore natural riparian integrity throughout the watershed; encourage conifer regeneration in deciduous stands that historically had a conifer component, particularly in disturbed areas. This effort should include planting conifers (cedar, hemlock, and spruce), reducing riparian corridor fragmentation, and the establishment of ecologically appropriate riparian buffer zones.

- Reconnect and restore historic riparian wetlands and other off-channel habitat, where possible.

- Develop and implement a short-term large woody debris strategy until full riparian function is restored.

- Reduce impacts of roads and road crossings, including increased stormwater runoff to surface waters, non-point source water quality impacts from stormwater runoff, and increased fine sediment delivery from road surfaces and associated ditch maintenance. Correct all fish passage barriers as soon as practicable.

- Reduce habitat impacts from hobby farms and agricultural lands, including development and implementation of farm plans that restore stream functions; identify and correct areas in the watershed that have unrestricted livestock access.

- Implement a long-term biological monitoring program for the creek using the macroinvertebrate-based benthic index of biotic integrity (B-IBI). Biological monitoring is an excellent tool for diagnosing and qualifying watershed health and is a good way to involve citizens in the assessment process.

- Implement an exotic vegetation management program in the watershed.

- Identify and correct sources of known water quality problems. Continue to monitor for water quality problems.

Appendix C: Salmon Distribution Maps

1. WRIA 15 - Salmon Distribution
2. WRIA 15 - Chinook Distribution
3. WRIA 15 - Chum Distribution
4. WRIA 15 - Coho Distribution
5. WRIA 15 - Steelhead Distribution
6. WRIA 15 - Cutthroat Distribution
7. WRIA 15 – Fish Passage Barriers

Map 1, WRIA 15, KITSAP:
East WRIA 15 Salmonid Distribution

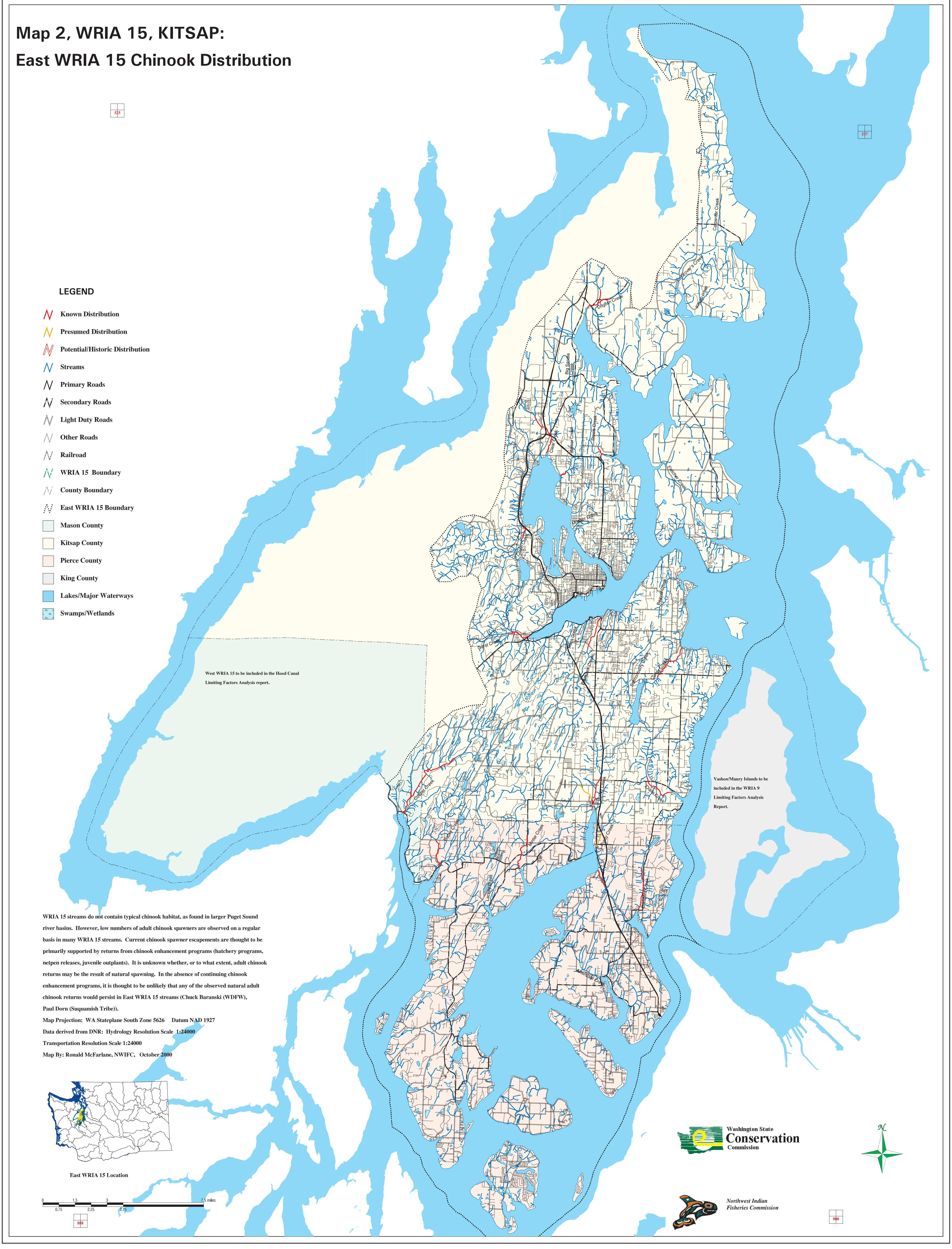
This map represents composite known or presumed salmonid distribution for streams in East WRIA 15. Salmonid species considered and included in this composite are chinook, chum, coho, steelhead, and cutthroat. Identified salmonid presence in East WRIA 15 streams is the result of professional observations and experience of TAG participants, and other recorded observations. The represented distribution is an under-representation of actual distribution, as there are streams or reaches where no spawner surveys have been conducted. There are also a large number of streams where salmonid presence has been limited by fish passage barriers. Although many barriers have and are being corrected, recolonization upstream of the previous barriers will occur gradually over time.

Map Projection: WA Stateplane South Zone 5626 Datum NAD 1927

Data derived from DNR: Hydrology Resolution Scale 1:24000 Transportation Resolution Scale 1:24000

Map By: Ronald McFarlane, NWIFC, October 2000

Map 2, WRIA 15, KITSAP:
East WRIA 15 Chinook Distribution



WRIA 15 streams do not contain typical chinook habitat, as found in larger Puget Sound river basins. However, low numbers of adult chinook spawners are observed on a regular basis in many WRIA 15 streams. Current chinook spawner escapements are thought to be primarily supported by returns from chinook enhancement programs (hatchery programs, netpen releases, juvenile outplants). It is unknown whether, or to what extent, adult chinook returns may be the result of natural spawning. In the absence of continuing chinook enhancement programs, it is thought to be unlikely that any of the observed natural adult chinook returns would persist in East WRIA 15 streams (Chuck Baranski (WDFW), Paul Dorn (Suquamish Tribe)).

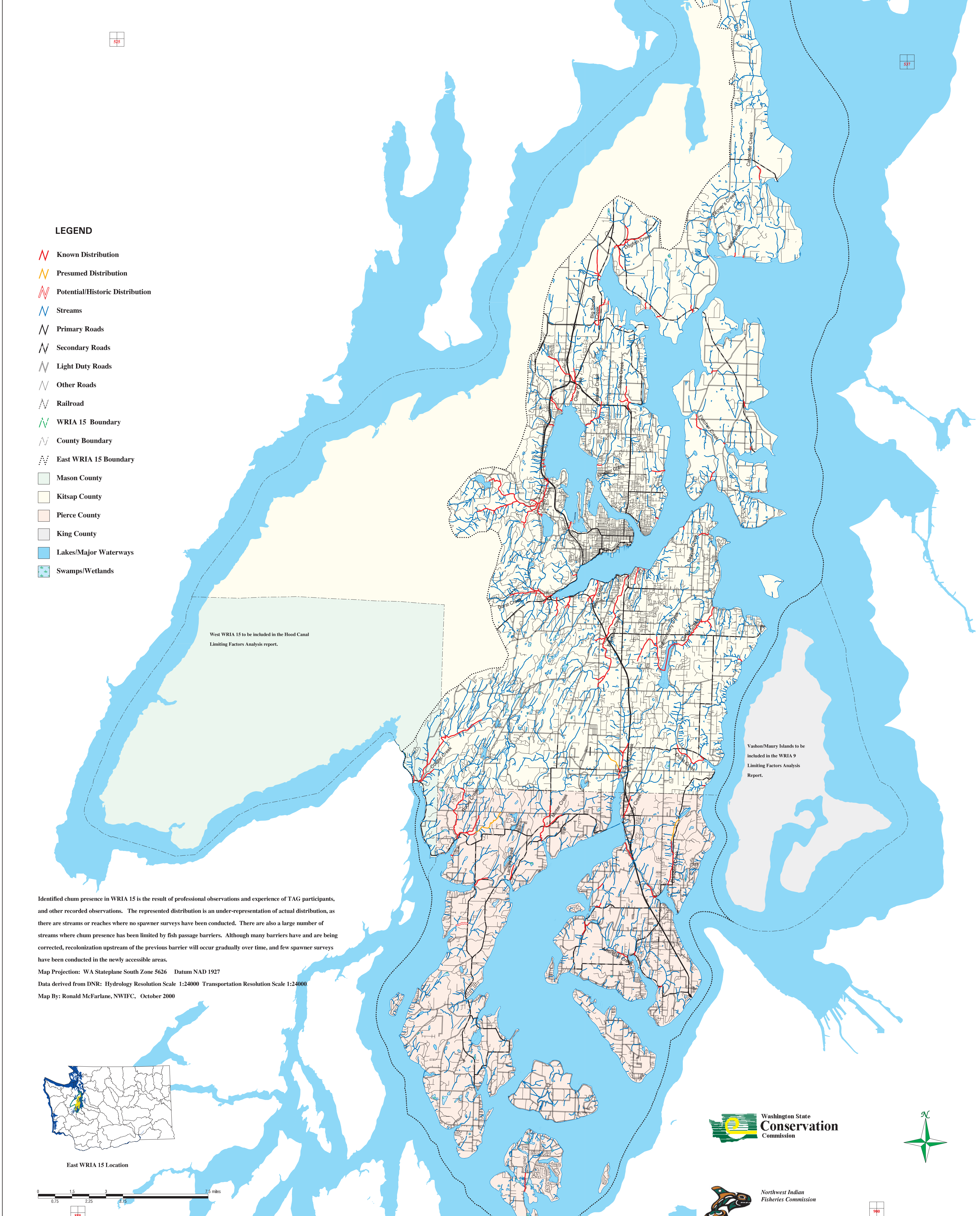
Map Projection: WA Stateplane South Zone 5626 Datum NAD 1927

Data derived from DNR: Hydrology Resolution Scale 1:24000

Transportation Resolution Scale 1:24000

Map By: Ronald McFarlane, NWIFC, October 2000

Map 3, WRIA 15, KITSAP:
East WRIA 15 Chum Distribution



Map 4, WRIA 15, KITSAP:
East WRIA 15 Coho Distribution

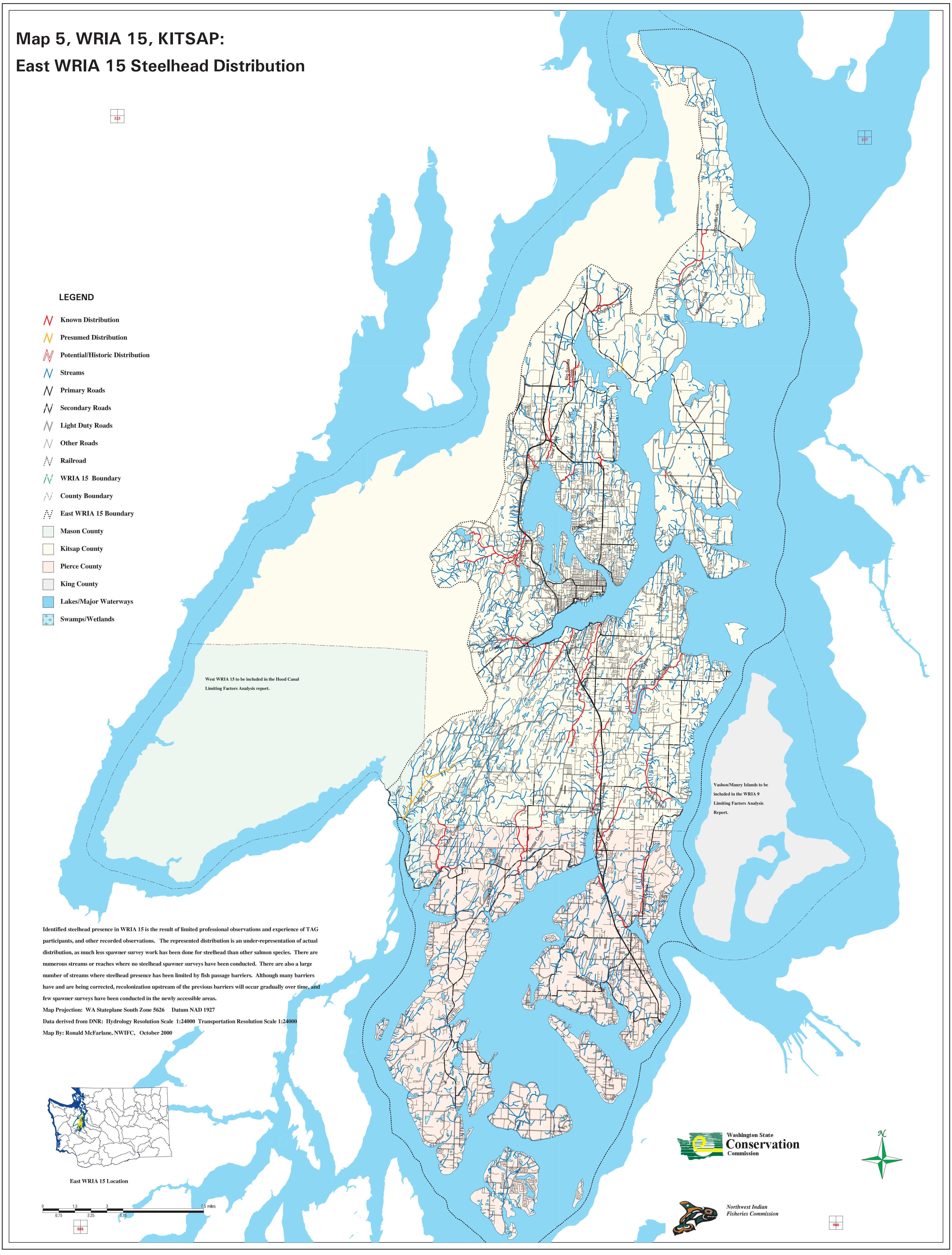
Identified coho presence in WRIA 15 is the result of professional observations and experience of TAG participants, and other recorded observations. The represented distribution is an under-representation of actual distribution, as there are streams or reaches where no spawner surveys have been conducted. There are also a large number of streams where coho presence has been limited by fish passage barriers. Although many barriers have and are being corrected, recolonization upstream of the previous barriers will occur gradually over time, and few spawner surveys have been conducted in the newly accessible areas.

Map Projection: WA Stateplane South Zone 5626 Datum NAD 1927

Data derived from DNR: Hydrology Resolution Scale 1:24000 Transportation Resolution Scale 1:24000

Map By: Ronald McFarlane, NWIFC, October 2000

Map 5, WRIA 15, KITSAP:
East WRIA 15 Steelhead Distribution



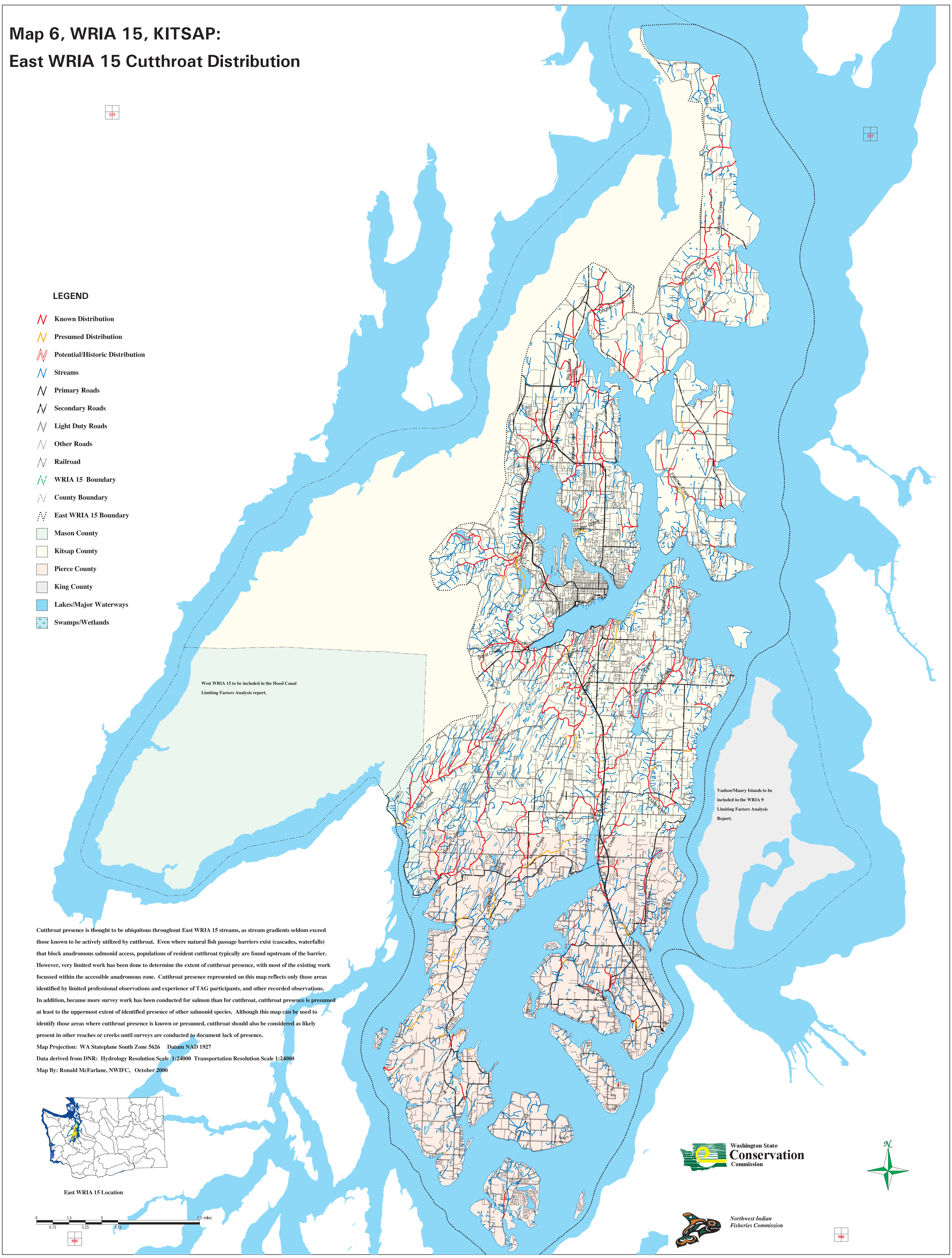
Identified steelhead presence in WRIA 15 is the result of limited professional observations and experience of TAG participants, and other recorded observations. The represented distribution is an under-representation of actual distribution, as much less spawner survey work has been done for steelhead than other salmon species. There are numerous streams or reaches where no steelhead spawner surveys have been conducted. There are also a large number of streams where steelhead presence has been limited by fish passage barriers. Although many barriers have and are being corrected, recolonization upstream of the previous barriers will occur gradually over time, and few spawner surveys have been conducted in the newly accessible areas.

Map Projection: WA Stateplane South Zone 5626 Datum NAD 1927

Data derived from DNR: Hydrology Resolution Scale 1:24000 Transportation Resolution Scale 1:24000

Map By: Ronald McFarlane, NWIFC, October 2000

Map 6, WRIA 15, KITSAP:
East WRIA 15 Cutthroat Distribution



Cutthroat presence is thought to be ubiquitous throughout East WRIA 15 streams, as stream gradients seldom exceed those known to be actively utilized by cutthroat. Even where natural fish passage barriers exist (cascades, waterfalls) that block anadromous salmonid access, populations of resident cutthroat typically are found upstream of the barrier. However, very limited work has been done to determine the extent of cutthroat presence, with most of the existing work focussed within the accessible anadromous zone. Cutthroat presence represented on this map reflects only those areas identified by limited professional observations and experience of TAG participants, and other recorded observations. In addition, because more survey work has been conducted for salmon than for cutthroat, cutthroat presence is presumed at least to the uppermost extent of identified presence of other salmonid species. Although this map can be used to identify those areas where cutthroat presence is known or presumed, cutthroat should also be considered as likely present in other reaches or creeks until surveys are conducted to document lack of presence.

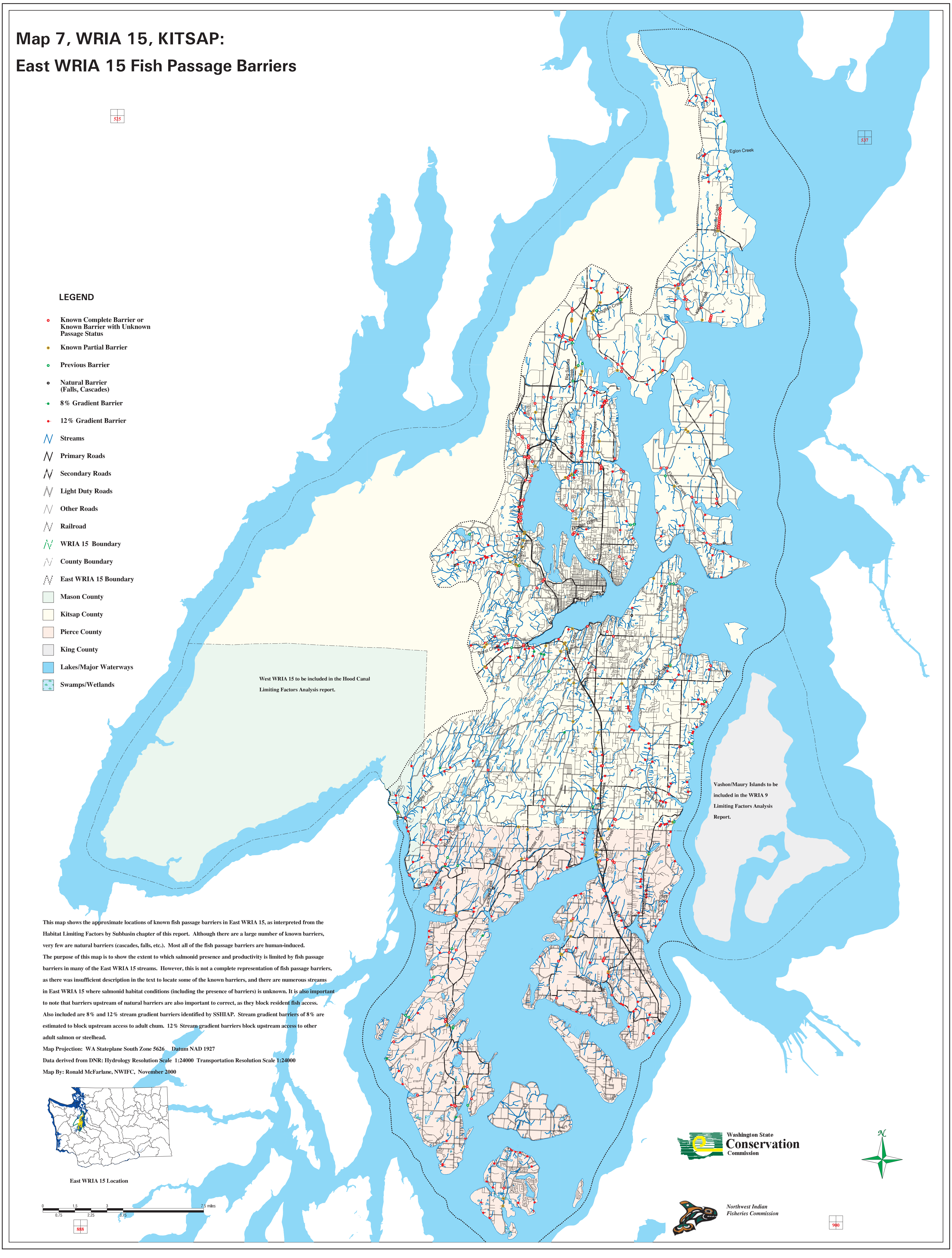
Map Projection: WA Stateplane South Zone 5626 Datum NAD 1927

Data derived from DNR: Hydrology Resolution Scale 1:24000 Transportation Resolution Scale 1:24000

Map By: Ronald McFarlane, NWIFC, October 2000

Map 7, WRIA 15, KITSAP:

East WRIA 15 Fish Passage Barriers



This map shows the approximate locations of known fish passage barriers in East WRIA 15, as interpreted from the Habitat Limiting Factors by Subbasin chapter of this report. Although there are a large number of known barriers, very few are natural barriers (cascades, falls, etc.). Most all of the fish passage barriers are human-induced.

The purpose of this map is to show the extent to which salmonid presence and productivity is limited by fish passage barriers in many of the East WRIA 15 streams. However, this is not a complete representation of fish passage barriers, as there was insufficient description in the text to locate some of the known barriers, and there are numerous streams in East WRIA 15 where salmonid habitat conditions (including the presence of barriers) is unknown. It is also important to note that barriers upstream of natural barriers are also important to correct, as they block resident fish access.

Also included are 8% and 12% stream gradient barriers identified by SSHIAP. Stream gradient barriers of 8% are estimated to block upstream access to adult chum. 12% Stream gradient barriers block upstream access to other adult salmon or steelhead.

Map Projection: WA Stateplane South Zone 5626 Datum NAD 1927

Data derived from DNR: Hydrology Resolution Scale 1:24000 Transportation Resolution Scale 1:24000

Map By: Ronald McFarlane, NWIFC, November 2000

Appendix D:
Kitsap County Comprehensive Plan Vision, Goals & Policies

A VISION FOR THE FUTURE **(Kitsap County Comprehensive Plan, 2002)**

Kitsap County citizens, through an extensive public involvement process, have described how they see their Kitsap County today and tomorrow, and what they do and don't like. They have made it clear what they want Kitsap County to look like 20 years from now.

They envision a future in which our natural systems are protected; the water quality in our lakes, streams and Puget Sound is enhanced; the village character of some of our smaller towns is preserved; the historical nature of our communities is respected in order to preserve our heritage for future generations; a diversified economic base supports good jobs, contributes to healthy downtowns in our cities and affordable housing choices; and the rural appearance of our county is perpetuated.

This vision of the future – which is shared by citizens and elected officials – includes the following elements:

- Protection and enhancement of the natural environment, including wetlands, streams, wildlife habitat, water quality and natural resource activities;
- Creation of a system of open space, parks and greenbelts, that provide opportunities for recreation and that give structure and separation to urban areas;
- Healthy cities that are the region's centers for employment, affordable housing choices, and civic and cultural activities;
- A vital and diversified economy that provides living wage jobs for residents, supported by adequate land for a range of employment uses and that encourages accomplishment of local economic development goals;
- Maintenance of the traditional character, appearance, functions and lifestyles of Kitsap County's rural communities and areas;
- Creation of an efficient multi-modal transportation system – including roads and highways, ferries, and opportunities for non-motorized travel – that provides efficient access and mobility for county residents and supports our land use pattern; and
- An efficient and responsive government that works with citizens, governmental entities and Tribes to meet collective needs fairly; and that supports education, environmental protection and human services.

Natural Systems

Surface Water - Goals

- Develop a critical areas ordinance that protects surface water resource areas including fish and wildlife habitats and wetlands.
- Enhance and restore degraded wetland, stream and shoreline areas.

Plant, Fish and Wildlife Habitat Conservation Areas - Goals

- Preserve the biological diversity of Kitsap County and Puget Sound.
- Identify and protect habitat conservation areas and other important habitats throughout Kitsap County.
- Develop a critical areas ordinance and development regulations, which protect habitat conservation areas and important habitat elements.
- Protect, enhance and restore aquatic habitat areas, such as streams, wetlands, lakes, shellfish beds, herring and smelt spawning areas, and kelp and eelgrass beds.
- Encourage voluntary protection of species and habitat.
- Identify species of local importance within Kitsap County.
- Work to restore anadromous fish runs in Kitsap County.

Shorelines

Conservation and Resource Protection – Goals

- Preserve natural shoreline resources wherever possible.
- Promote shoreline conservation and resource protection.

Shoreline Use – Goals

- Encourage shoreline diversity by recognizing the distribution and location requirements of housing, commerce, industry, transportation, public buildings, education, recreation and natural resources.

Water Quality– Goals

- Protect and enhance water quality in Puget Sound, Hood Canal and inland lakes while allowing for compatible growth and development.

Natural Systems – Goals

- Minimize human interference of natural systems occurring along shorelines.

Circulation – Goals

- Create transportation systems that protect and enhance shoreline features and habitat.

Appendix E: City of Bainbridge Island Comprehensive Plan Vision, Goals & Policies

[This section needs to be updated with 2004 Comp Plan]

Excerpts from the COBI Comprehensive Plan

Vision
Development should not be haphazardly imposed upon the landscape, but should be sensitive to its natural environs, recognizing the natural carrying capacity of Bainbridge as an Island, based on the principle that the Island's environmental resources are finite and must be maintained at a sustainable level.

Goals
- Preserve environmentally sensitive areas
- Preserve a reasonable use of the land for all landowners

EN 1: Preserve and enhance Bainbridge Island's natural systems, natural beauty, and environmental quality.

FW [1]: Protect and enhance wildlife and natural ecosystems on Bainbridge Island.

AQ 1: Preserve and protect the Island's remaining aquatic resources' functions and values.

AQ 1.1: Achieve no overall net loss of the City's remaining, regulated, aquatic resources.

AQ 1.2: Development shall not be approved in regulated wetlands, streams, or buffer areas, unless a property owner would be denied all reasonable economic use of property.

AQ 1.3: Require that vegetated buffers be maintained between proposed development and the aquatic resource in order to protect the functional values of such systems.

AQ 1.4: Require that buffers be retained in their natural condition wherever possible, while allowing for appropriate maintenance. Where buffer disturbance has occurred, require revegetation with native species to restore the buffers' protective values.

AQ 1.5: Ensure that development activities are conducted so that aquatic systems and natural drainage systems are maintained and water quality is protected.

AQ 1.8: Discourage herbicide and pesticide use in wetlands, streams, and buffer areas, and in the areas that drain into them.

AQ 1.11: Restoration, creation or enhancement of wetlands, streams, and their buffers shall be required in order to offset the impacts of alteration of a wetland/stream or buffer area.

AQ 1.15: Maintain the Island's streams and creeks in their natural state wherever feasible through:

- Preservation of their courses, their banks, and the vegetation next to them
- Restoration of areas that have already been degraded
- Protection of areas that have not been disturbed

AQ 1.18: Anadromous fish streams and adjacent land should be preserved and enhanced to ensure the propagation of salmonid fish.

FL 1: Protect the natural functions of frequently flooded areas.

FL 1.2: Control the alteration of natural floodplains, stream channels, and natural protective barriers which help accommodate or channel flood waters.

GH 1: Protect landslide hazard areas, erosion hazard areas, and steep slopes from the impacts of use and development.

Excerpts from COBI Shoreline Management Master Program

I.A. Master Goal

The City's shorelines are among the most valuable, scarce, and fragile of our natural resources that provide a significant part of our way of life as a place of residence, recreational enjoyment, and occupation. It is the intent of this program to manage the shorelines of Bainbridge Island, giving preference to water-dependent and water-related uses, and to encourage development and other activities to co-exist in harmony with the natural conditions. Uses that result in long-term over short-term benefits are preferred, as are uses which promote sustainable development.

I.B. Shoreline Use Element

1. Establish and implement policies and regulations for land use consistent with the Shoreline Management Act of 1971, as amended. These policies and regulations should ensure that the design and land use of shoreline areas are compatible with shoreline environment designations and will be sensitive to and not degrade ecological systems and other shoreline resources.
2. Identify and preserve shoreline and water areas with unique attributes for specific long-term uses, including commercial, industrial, residential, recreational, and open space uses.
3. Designated Shorelines of State-wide Significance are of value to the entire state and should be protected and managed. In order of preference, the priorities are to:
    a. Recognize and protect the state-wide interest over local area or individual interest.
    b. Preserve the natural character of the shoreline.
    c. Produce long-term benefits over short-term benefits.
    d. Protect the resources and ecology of shorelines.
   e. Increase public access to publicly-owned areas of the shorelines.
   f. Increase public recreational opportunities on the shoreline.

4. Ensure that proposed shoreline uses are distributed, located, and developed in a manner that will maintain or improve the health, safety, and welfare of the public.
5. Ensure that proposed activities and facilities located on the shorelines retain or improve the quality of the environment as it is designated for that area.
6. Ensure that proposed shoreline uses give consideration to the rights of private property ownership and the rights of others.
9. Encourage restoration of shoreline areas that have been degraded or diminished in ecological value and function.

I.C. Economic Development Element

1. Promote sustainable economic development.
2. Ensure healthy, orderly, economic development by allowing those activities which will be an asset to the economy of Bainbridge Island and which result in the least adverse effect on the quality of the shoreline and surrounding environment, giving consideration to the other goals in the Shoreline Master Program.

I.E. Conservation Element

1. Acknowledge natural shoreline processes and seek alternatives to structures that adversely affect the shoreline.
2. Develop and implement renewable resource management practices that will ensure a sustainable yield while preserving, protecting, and restoring unique and non-renewable shoreline resources or features (including shellfish, eel grass, forested areas, wetlands, and wildlife habitat).
3. Ensure that natural resource utilization minimizes adverse impacts to the shoreline environment.
4. To the greatest extent feasible, reclaim and restore areas which are geologically, biologically and/or aesthetically degraded while maintaining appropriate use of the shoreline.

III.C. Environmental Impacts

The adverse environmental impacts of shoreline uses and activities should be minimized during all phases of development (e.g., design, construction, and management).

III.D. Environmentally Sensitive Areas

1. Unique, rare, and fragile shoreline resources including, but not limited to, aquifer recharge areas; fish and wildlife habitat; fish breeding, rearing or feeding areas; frequently flooded areas; geologically hazardous areas; marshes, bogs, swamps and streams; tidal lagoons; mud flats; and salt marshes and aquatic vegetation should be preserved.
2. All shoreline uses and activities should be located, designed, constructed, and managed in ways which protect and/or do not adversely affect those natural features which are valuable, fragile, or unique.
3. Development should be located away from shorelines that have been identified as unstable and/or sensitive to erosion to prevent hazardous conditions and property damage as well as to protect valuable environmental features. See also Section IV, Environment Designation, Subsection E Conservancy Environment for additional provisions.

4. Some areas, because of unique and/or fragile geological or biological characteristics, should be protected from public access (e.g., wetlands, shoregrass, kelp beds, etc.).
5. In areas adjacent to environmentally sensitive features and their native vegetation zones, use intensities should be regulated to protect environmentally sensitive features.

III.E. Native Vegetation Zone

1. Preservation of native plant species is key to maintaining the ecology of the shoreline as well as preserving the Island's natural character.
2. Native plant communities within the shoreline jurisdiction should be protected, maintained, and enhanced.
3. Degraded shorelines should be restored to provide native habitats and enhance water quality.
4. Development should preserve existing environmental features to minimize disturbance of natural systems.
5. A native vegetation zone, immediately upland of OHWM, should be established for each shoreline use and shoreline environment, recognizing the pattern of development and the ecology of the shoreline.
6. The City should implement a public education program emphasizing the importance of maintaining native vegetation in the shoreline.

III.K. Water Quality

1. All shoreline uses and activities, including sewers and/or septic systems, should be located, designed, constructed, and maintained to minimize adverse impacts to water quality and fish and wildlife resources including spawning, nesting, rearing, feeding areas, and migratory routes.
2. Setbacks, native vegetation zones, and stormwater management should be required to minimize negative impacts to water quality.
3. Surface water runoff should be treated on-site, unless precluded by slope or other sensitive area conditions.
4. Dredging and filling should be conducted to minimize impacts to water quality and should be consistent with applicable agency policy (e.g., Washington State Department of Fish and Wildlife, U.S. Army Corps of Engineers).

Appendix F: County-wide Planning Policies

[This section needs to be updated with 2004 CWPP]

Attached is an excerpt from the Kitsap Countywide Planning Policy as adopted by the Kitsap County Board of Commissioners on November 24, 2003, and by ordinance December 15, 2003 (Ordinance 312-2003). The Countywide Planning Policy as revised is currently in effect in Kitsap County.

As of January 22, 2004, these revisions have been ratified by City of Bainbridge Island, City of Bremerton, City of Poulsbo, Suquamish Tribal, and Port Gamble S'Klallam Tribal Councils.

The Kitsap Countywide Planning Policy is the framework for growth management in Kitsap County. Under the Growth Management Act, the Puget Sound Region is defined as King, Kitsap, Snohomish and Pierce Counties. The Puget Sound Regional Council is responsible for developing the four-county regional transportation and land use vision. The Kitsap Countywide Planning Policy tailors the Puget Sound Regional Council's regional growth management guidelines to Kitsap County and are the policy framework for the County's and the Cities' comprehensive plans. The Kitsap Countywide Planning Policies address 15 separate elements, ranging from urban growth areas to affordable housing.

Element D. Open Space, Resource Protection, and Critical Areas

Open space is defined as land area consisting of natural systems, resource lands and critical areas that include building limitations for future development. These critical areas include wetlands, wildlife conservation areas, steep slopes, frequently flooded areas and areas with a critical recharging affect. These open space lands also include aesthetic functions such as view sheds of the water or ridgelines. Many of these natural systems are inter-connected and cross multi-jurisdictional boundaries within the County. The strategy is to conserve these areas and connect them to create a regional open space network to protect critical areas, conserve natural resources, and preserve lands and resources of countywide and local significance

1. The following policies relate to creating a regional network of open space:

a. The County and the Cities shall implement the Kitsap County Open Space Plan and the Kitsap County Consolidated Greenway Plan which identify a countywide green space strategy that incorporates planning efforts of the County, Cities, state agencies, non-profit interest groups and land trusts in the County.

b. The County and the Cities shall preserve and enhance, through inter-jurisdictional planning, significant networks and linkages of open space, regional parks and public/private recreation areas, wildlife habitats, critical areas resource lands, water bodies and trails.

c. The County and the Cities shall frame and separate urban areas by creating and preserving a permanent network of urban and rural open space, including parks, recreation areas, critical areas and resource lands.

2. The following policies relate to conserving and enhancing the County's natural resources, critical areas and environmental amenities while planning for and accommodating sustainable growth:

a. The County's and the Cities' Comprehensive Plans shall each address regional air and water quality protection.
b. The County and the Cities shall protect critical areas (wetlands, aquifer recharge areas, fish and wildlife habitat conservation areas, frequently flooded areas, steep slopes, and geologically hazardous areas) and other environmental amenities such as view corridors, canopy cover, and ridgelines.
c. The County and the Cities shall establish and implement best management practices to protect the long-term integrity of the natural environment, adjacent land use, and the productivity of resource lands.
d. The County and the Cities shall establish procedures to preserve significant historic, visual and cultural resources including views, landmarks, archaeological sites, and areas of special locational character.
e. The County and the Cities shall encourage the use of environmentally sensitive development practices to minimize the impacts of growth on the County's natural resource systems.
f. The County and the Cities shall work together to identify, protect, and restore networks of natural habitat areas and functions that cross-jurisdictional boundaries.
g. The County and Cities shall protect and enhance ecosystems that support Washington State's Priority Habitat and Species as identified by the Washington Department of Fish and Wildlife.
h. All jurisdictions shall maintain or enhance water quality through control of runoff and use of best management practices to protect aquatic resources.

3. The following policies relate to listed species recovery under the Endangered Species Act (ESA):

a. The County and the Cities shall preserve, protect, and where possible restore the functions of natural habitat to support ESA-listed species, through the adoption of comprehensive plan policies, critical area ordinances, shoreline master programs and other development regulations that seek to protect, maintain or restore aquatic ecosystems associated habitats and aquifer through the use of management zones, development regulations, incentives for voluntary efforts of private landowners and developers, land use classifications or designations, habitat acquisition programs or habitat restoration projects.
b. The County and the Cities shall provide incentive-based non-regulatory protection efforts such as acquisition of priority habitats through fee-simple and conservation easements from willing sellers.
c. The County and the Cities shall jointly establish and implement monitoring and evaluation program to determine the effectiveness of restoration, enhancement, and recovery strategies for salmonids including ESA-listed species. Each jurisdiction shall apply an adaptive management strategy to determine how well the objectives of listed species recovery and critical habitat preservation/restoration are being achieved.

4. The following polices relate to coordination of watershed and land use planning:

a. The County and the Cities shall participate in a planning program that determines changes in stream hydrology and water quality under different land use scenarios at full build-out of designated land use classifications.
b. The County and the Cities shall coordinate land use planning using watersheds or natural drainage basins to implement strategies for restoration of aquatic habitat and to reduce impacts to other natural systems.
c. Kitsap County shall coordinate and maintain a regional database of best available science for the purpose of modifying Critical Areas Ordinances, if funding is available.
d. Upon adoption of a state classification system, the Cities and the County shall establish a single system for stream typing.

Appendix G: East Kitsap Peninsula Salmon Recovery Strategy

The East Kitsap Peninsula Lead Entity

Salmon Recovery Strategy

Final Draft – Version March 1, 2004

For more information, please contact:

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Table of Contents

1. INTRODUCTION

Mission

The mission of the East Kitsap Lead Entity is to ensure local salmon habitat is preserved and restored to support salmon populations and human communities.

Goal

The goal of this strategy is to restore healthy, self-sustaining wild populations of the salmon species native to the streams and shorelines of Kitsap Peninsula. Healthy populations depend on the condition of local habitat, the level of harvest, hatchery practices and oceanic conditions. This strategy addresses local habitat conditions and is therefore an integral part of the larger regional salmon recovery effort. As our knowledge increases and as habitat conditions change, this strategy will be updated.

Objectives

- **Increase population levels:** Population numbers in many streams are depressed due, in part, to years of habitat degradation that has resulted in lower quality habitat, loss of spawning and rearing habitat and the survival of fewer smolts per spawner.

- **Maintain geographically diverse populations:** Salmon are native to most streams on the Peninsula and maintaining widely distributed populations is critical to genetic diversity and to ensuring that rare, catastrophic events don't eliminate the population. Individual stream populations may be devastated by occasional natural or human-caused events but recolonization from nearby streams will occur if healthy populations are encouraged in all historic salmon streams.

- **Promote the preservation and restoration of healthy, functioning ecosystems:** Salmon depend on healthy ecosystems and healthy ecosystems depend on salmon. Salmon are "indicator" species because they depend on a healthy watershed, not just an intact streambed. Likewise, salmon contribute to the overall health of watersheds and estuaries by providing ocean-derived nutrients to plants and animals.

- **Increase public understanding and support for salmon recovery:** Salmon are a vital part of the natural and cultural history of this region. Restoring salmon will require the support of the citizens who live here, and their support depends on an understanding of the importance of watershed and nearshore health to salmon.

Local Conditions

The Kitsap Peninsula provides a uniquely diverse geography for salmon. Between the backbone of the peninsula and the shoreline, a narrow strip of land results in many short streams rather than a single large river system. The size of the peninsula, and the many small estuaries also provides an extensive and very diverse shoreline.

The quantity of fresh water draining the east side of the peninsula and the number of salmon utilizing the habitat are roughly the same as is found in a major river draining a similar sized territory. However, rather than flowing into a single large river, the water runs through many independent, short streams, directly into the Puget Sound. Salmon spawn and rear in 125 of these streams. Though small, the streams are highly productive for salmon because of their low gradient and extensive associated wetlands. Our geography results in spatially diverse salmon populations, widely distributed in many small streams throughout the region. Spatial diversity is a key component of healthy salmon populations and will be critical to regional salmon recovery.

The numerous streams in East WRIA 15 primarily support chum and coho salmon, steelhead, and cutthroat trout. In addition, low numbers of spawning adult chinook are observed on a regular basis in larger East WRIA 15 streams. These streams are not considered “primary spawning habitat”, but are still utilized at certain times by wild chinook. In many of these instances, the origin of the naturally spawning chinook currently present is most likely due to strays from nearby hatchery production. It is unknown whether, or to what extent, adult chinook returns are the result of natural spawning. Pink salmon are occasionally found as strays in East Kitsap streams. East WRIA 15 known stocks of salmon, steelhead and cutthroat distribution is identified in the Salmonid Habitat Limiting Factors (Haring 2000) and the 2003 Kitsap Salmonid Refugia Report (May 2003).

At least as or more important as the 240 miles of freshwater salmon habitat in this area is the 360 miles of marine shoreline on the east side of the Kitsap Peninsula. This nearshore habitat plays a critical role in the productivity of salmon stocks throughout Puget Sound. All salmon species, but particularly chinook and chum, spend many months as juveniles feeding in the highly productive nearshore waters in preparation for their ocean migration. Although the importance of estuaries and other nearshore habitats to salmon have been largely underestimated in the past, we are now discovering that these marine environments are every bit as important to salmon productivity as the freshwater streams where they are born.

The east side of the Kitsap Peninsula constitutes almost half of the nearshore habitat in central and south Puget Sound. The many estuaries and other marine habitats in this stretch of shoreline are used not only by the salmon produced in our own streams but also by juveniles from major rivers throughout Puget Sound as they migrate towards the open ocean. The Kitsap shoreline provides the safest migration route for small fish and use of this migration pathway by juveniles from east Sound rivers is well documented. The Kitsap shoreline is probably even more important today than in historic times due to the highly urbanized and loss of habitat in the east shoreline of Puget Sound. One result of the large number of streams that drain into the Kitsap Peninsula marine shoreline is an unusually diverse nearshore habitat with many small and medium sized estuaries, spaced relatively closely along the coast. This distributed network of estuaries provides a rich and relatively easy migration path for young salmon.

Challenges of a Diverse Geography: While a diverse geography may be beneficial for salmon, it creates some challenges for habitat restoration and management. Working within a single, large drainage basin results in closer ecological connections and a greater ability to extrapolate trends from sampling efforts. It also facilitates closely coordinated restoration projects and the leveraging of individual efforts. Having many small, independent drainages creates greater challenges for restoration efforts. Sharing a drainage basin provides a unifying theme around which local citizens and entities can organize. When an area the size of the Kitsap Peninsula contains dozens of small independent basins rather than a single large one, coordination among local entities requires a special effort and commitment.

Salmon recovery efforts have historically been organized around watershed groups that focus on freshwater habitat. If these efforts address nearshore issues at all, they do so only to the extent of the river estuary. The prominent role played by nearshore salmonid habitat on the Kitsap Peninsula provides the challenge of identifying a new model for organizing recovery efforts that specifically targets nearshore habitat as a priority. Taken together, these attributes indicate the critical importance of a coordinated effort to salmon recovery and the need to be innovative and energetic in our response.

2. PRIORITIES FOR RECOVERY ACTIONS

Salmon recovery will require the actions of many people and must occur throughout the historic range of salmon. The decline of salmon came about, in part, due to the gradual degradation of habitat in nearly all the watersheds that historically supported salmon. Salmon recovery will require the gradual restoration and preservation of habitat at the same geographic scale. However, the need to restore salmon populations quickly and to use salmon recovery dollars efficiently requires us to give priority first to those actions that have the greatest effect on increasing population numbers and diversity of salmon. To prioritize actions, the following factors were considered:

- **Benefit to Salmon**
- **Geographic Location**
    - **Watershed Prioritization**
    - **Nearshore Prioritization**
- **Project Type Priorities**
- **Priorities within Watersheds**
- **Education, Outreach and Partnerships**

- **Benefit to Salmon**

The most important factors to consider in prioritizing actions are the number of fish and diversity of species that will be affected. Actions that benefit large numbers of salmon and multiple species are the highest priority. While ESA-listed species are highlighted, the basis for this strategy is a multi-species, ecosystem approach and all salmonids are treated equally.

- **Geographic Location**

Watersheds and nearshore habitats that support the greatest number and diversity of salmon receive the highest priority for action. Likewise, habitats that support state or federally listed declining species, such as Puget Sound chinook, will receive priority.

- **Watershed Prioritization**

  The 125 salmon bearing streams on the east Kitsap Peninsula differ from each other in the number of salmon stocks they sustain and the number of fish they are capable of producing. Resources available for salmon recovery activities are finite and should therefore be distributed strategically in those places where it will have the greatest impact on preserving and restoring the diversity and productive capacity of our watersheds. To achieve this objective, the east Kitsap Peninsula strategy places the greatest priority on streams that have been identified as important salmon refugia, harboring the greatest diversity, productive capacity and quality habitat.

These priority watersheds were identified using information from a number of sources including the *Kitsap Peninsula Salmonid Refugia Study* (Kitsap 2003), the *Salmonid Habitat Limiting Factors for WRIA 15 East* (Haring 2000) and the *Watershed Analysis for the Development of Salmonid Conservation and Recovery Plans Within Pierce County* (Pierce County 2001).

Habitat for Puget Sound chinook, listed as threatened under the Endangered Species Act (ESA), receives the highest priority for preservation and restoration. Chinook utilize the largest streams on the Peninsula. These streams also support the highest diversity of salmonids and the greatest productive capacity for all species.

Watersheds are prioritized in recovery tiers based on their salmonid diversity, habitat quality and watershed size (See Appendix A). A flow chart that describes how watersheds were assigned to tiers is provided in Figure 1 in Appendix A. The ranking scheme reflects the best available data we have at this time and it will be updated as better information becomes available.

Tier	***Watersheds***
1	Coulter, Rocky, Chico, Gorst, Minter, Nearshore
2	Blackjack, Burley, Crescent, Curley, Dogfish, Grovers, Ollala
3	Anderson, Barker, Big Scandia, Clear, Eglon/Silver, Steele, Carpenter, Illahee
4	Artondale, Beaver, Dutcher, Fletcher, Fragaria, Goodnough, Johnson, Klaebel, Lackey, Mark Dickson, McCormick, Mosher, Mosquito Bay, Murden Cove, North (Donkey), Olney, Purdy, Ross, Sam Snyder, Silver, Strawberry, Sullivan Gulch, Wilson (Southworth), Wollochet
5	all other salmonid streams

Refer to Appendix B for the Watershed Integrity Index Calculations and flow chart

Table 1. Watershed Prioritization

- **Nearshore Habitat Prioritization**

Nearshore habitat is critical to juvenile rearing and migration for all species of salmonids. In this document the nearshore includes both estuaries and marine shoreline areas, upland and backshore areas that directly influence conditions along the shoreline, and from the upper extent of the tidal influence to the lower boundary of the photic zone. Different nearshore habitats are used by salmonids for different purposes including feeding, shelter, travel corridors and physiological adjustment to salt water. Some habitats are more critical than others are, such as estuaries, salt marshes, eelgrass beds and forage fish spawning and holding grounds.

In addition to local salmonids, juvenile salmonids from throughout Puget Sound are known to utilize the shore of Kitsap Peninsula as a nursery and migration route as they travel to the open ocean. The marine shoreline of this area therefore plays a critical role in the recovery of salmon populations in Puget Sound. For this reason, the nearshore is a high priority area for protection and restoration.

To help guide the development and selection of recovery actions within this high priority area the following elements will be used to develop a comprehensive nearshore strategic plan[1]:

1. Identify and prioritize habitat types and attributes needing protection and conservation. Completing an inventory of habitat types is the first step in an effort to protect existing important habitats.

   In general, protecting portions of ecosystems with functioning natural processes has a high chance of success. Simply protecting habitats without protecting the underlying processes have a low chance of contributing to ecosystem recovery. Areas targeted for protection will be based upon a thorough analysis of critical and vulnerable natural areas. Those areas that are in imminent risk of being converted to an alternate use should have priority for protection.

[1] Element numbers 1-5 are cumulative. Currently, a nearshore assessment has been completed for Key Peninsula, Gig Harbor, and Islands (KGI) Watershed in Pierce County and Bainbridge Island is finalizing a nearshore assessment. A gap exists for the remaining East WRIA 15, which includes the East portion of Kitsap County. In the meantime, the Lead Entity has used the nearshore assessments that have been completed along with the Limiting Factors Analysis to identify and prioritize specific actions in the nearshore (Appendix B). This is only intended as a starting place to help guide protection and restoration actions. When an assessment is complete for the entire area, the list will be replaced with a list based on the findings and results of all three assessments.

2. Identify what ecosystem processes are impaired and where they are impaired. This would include:

   a. An analysis of historic and current conditions to identify the changes in habitat that have occurred. The historic condition of the nearshore ecosystem may provide the best template for restoration planning because it indicates where habitats formerly occured, their natural, size, shape, community composition, and connections to other elements of the ecosystem. Critical questions to be addressed is how much of various types of ecosystems were present, where were they located, and how were they organized/arranged?
   b. An assessment of current conditions to obtain data that can be used to compare historic conditions and assess change in the ecosystem condition.
   c. Comparison of historic and current conditions to document changes that have occurred (Understanding that there are constraints that now exist).

3. Measure spatial and temporal utilization of the nearshore habitats by salmonids and compare habitat conditions and salmonid use among different habitat types.

4. Identify specific actions needed. The following actions are listed in order of certainty with which they can contribute to ecosystem recovery (most certain to contribute to the least certain):

   - Protection[2]
   - Restoration
   - Rehabilitation
   - Substitution/Creation

5. Develop appropriate criteria and prioritize habitat types to be protected and restored.

   The LE has identified and prioritized a preliminary list of nearshore actions that can be found in Appendix B. The list of action recommendations are to be used as a guide for the LE and should be considered “interim” until more and better data is developed to prioritize habitat types in East Kitsap.

6. Monitor the effectiveness of habitat protection and restoration projects.

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[2] Protection should include policy, regulatory and non-regulatory measures.

- **Project Type Priorities**

Preserving and protecting existing high quality habitat is critical to future recovery. Restoring degraded habitat is a relatively long and expensive process, making preservation of existing habitat and restoring access to blocked habitat the highest priority.

However, the extent of habitat degradation is such that salmon will not recover unless significant restoration occurs. Restoration of ecosystem processes will result in long-term benefits to salmon with a higher certainty of success than projects that simply replace habitat components or rely on engineered solutions. As a result, priority is given to restoration projects that address or take into account ecosystem processes. This is not to say that replacing habitat components is unimportant. Restoring ecosystem processes such as large woody debris (LWD) recruitment may require a century or more. Therefore temporary or engineered solutions may be necessary, such as installing LWD while a young riparian forest is maturing.

When prioritizing projects, the relative impact of the project on salmon should always be foremost in consideration. For example, a preservation project that protects relatively few salmon may be less important than a restoration project that improves habitat conditions for thousands of fish.

- **Priorities within Watersheds**

Within each watershed, the known limiting factors for salmonids have been prioritized in the report *Salmonid Habitat Limiting Factors in WRIA 15* (Haring 2000). Projects will be prioritized based on these lists. Project proponents are encouraged to strategically select projects that address the most important limiting factors. Additional studies have been or will be conducted to further refine the list of known limiting factors and these additional studies should be used to update the prioritized project lists.

- **Education, Public Outreach and Partnerships**

Healthy salmon populations require an informed and involved public, with communities dedicated to stewardship of their own watersheds. Greater awareness will lead to stronger protection and recovery of salmon. There is also a much-needed connection and partnering among different agencies and public interests. Therefore, projects that are beneficial to salmon populations increase education and improve coordination among government agencies and interests will receive increased consideration when the projects are prioritized. These actions are seen as paramount for fostering public stewardship and protecting and restoring salmon populations. Much of the human population is concentrated in smaller watersheds (lower geographic priority), but the positive impact on salmon recovery of building public support makes projects in these watersheds vital to future recovery efforts.

The following are examples of Education, Public Outreach and Partnerships that could be used to foster public stewardship:

- **Community Support**: People in the community support the project mission. If there is not backing for the project how will you arrive to get community support?
- **Education**: There is a continual need to connect ourselves as individual, corporate, and community citizens to salmon recovery. Greater awareness will lead to stronger protection of salmon habitat. Examples of education include involving children and adults in hands-on workshops, open houses, or developing educational materials such as kiosks and newsletters about the project and salmon recovery.
- **Volunteers**: Volunteer opportunities provide information and education, fosters stewardship and can help reduce the level of financial support needed. Examples of existing volunteer opportunities include stream teams, school projects or salmon enhancement groups.
- **Public Access**: There should be places where, with minimal damage or degradation, citizens can view evidence of salmon recover projects to encourage good stewardship. While public access is important, we must ensure that increased access does not further degrade water quality or habitat. Projects will not be penalized if access is not appropriate or possible, yet the benefits to salmon are high.
- **Citizen Groups**: Citizen groups mostly comprised of citizens within a particular watershed that support and encourage natural resource protection efforts. They could be a formalized, not-for-profit organization for a stream, a grass-roots neighborhood group, watershed stewardship group, a sub-area planning committee and the like. The importance and impact of these existing groups should be recognized and leveraged into broader public support for salmon recovery goals.
- **Native American Culture:** The region's Native American tribes have fished for salmon in the waters of East Kitsap for thousands of years and view salmon recovery as essential. Examples could include sites or projects of special significance to the local Native American tribes.
- **Partnerships:** Partnerships encourage cooperation and coordination between multiple agencies and public interests. Projects should encourage partnerships between multiple agencies, non-government and school groups.

Volunteers planting trees at the Gorst Creek restoration site

3. MONITORING

Progress in salmon recovery requires monitoring to determine the success of past efforts and to allow us to adapt our methods with the lessons learned. Every recovery action should be considered an experiment with an explicit objective being to learn how to do things better the next time. Monitoring allows you to manage adaptively. All recovery projects undertaken in this region should include a monitoring component and the results should be shared with other groups and community members to celebrate successes and to share the knowledge gained when projects do not function as planned.

REFERENCES:

Haring, D. 2000. Salmonid Habitat Limiting Factors in WRIA 15 East. Washington State Conservation Commission. Olympia, WA.

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Pierce County. 2001. Watershed Analysis for the Development of Salmonid Conservation and Recovery Plans Within Pierce County. Tacoma, WA.

Bainbridge Island Nearshore Assessment (In draft)

Pierce County. 2003. Key Peninsula, Gig Harbor, and Islands Watershed Nearshore Salmon Habitat Assessment. Prepared by: Pentec Environmental.

PSNERP 2003. Guidance For Protection and Restoration of the Nearshore Ecosystems of Puget Sound (Draft 5, 5/2/03)

APPENDIX A

Watershed Geographic Prioritization Method Calculations, Flowchart and Watershed Maps

APPENDIX A

WATERSHED GEOGRAPHIC PRIORITIZATION METHOD

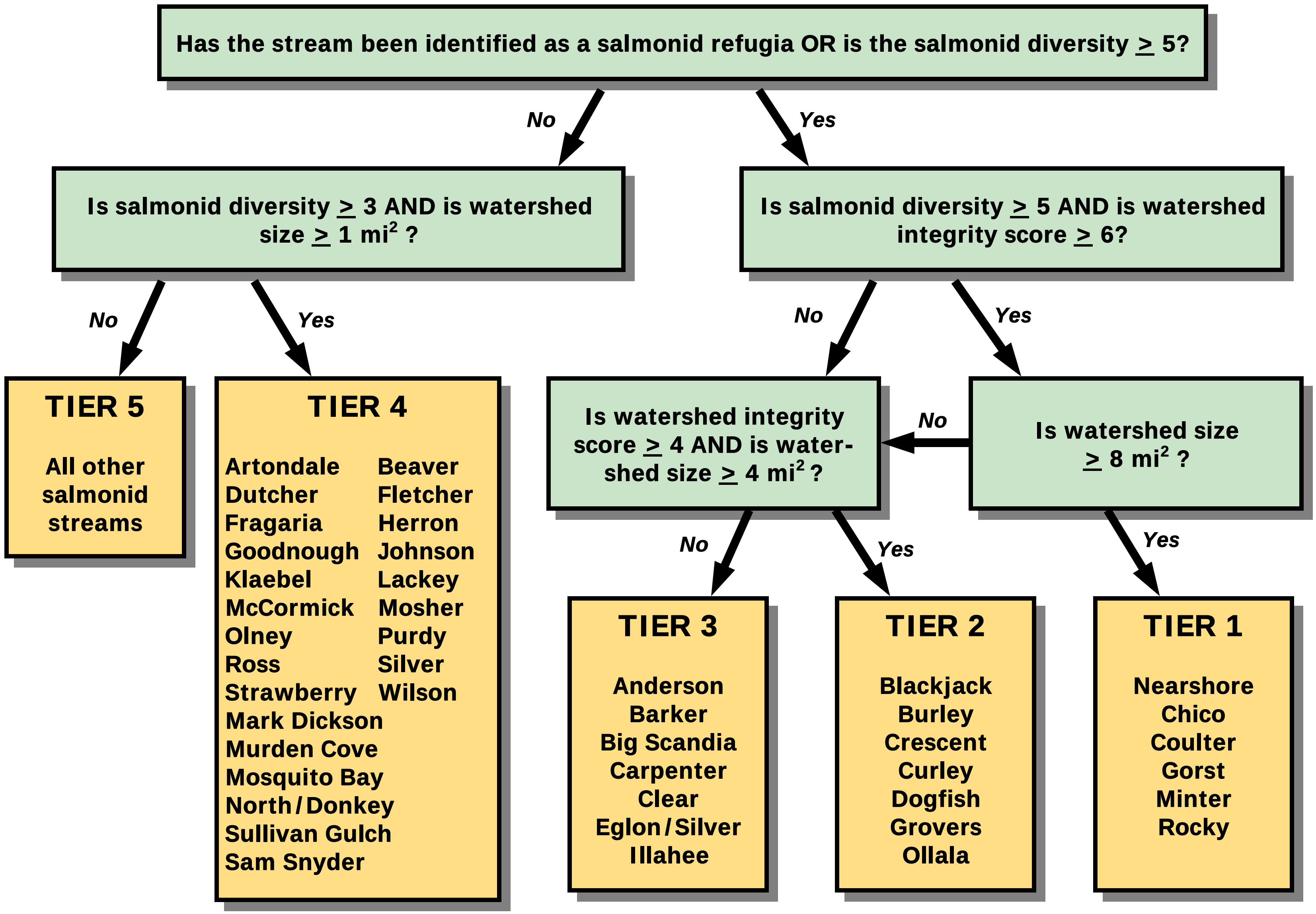
Watershed Integrity Index Calculations: Impervious surface area and forest cover in a watershed are commonly used to gauge the point at which significant harm is likely to happen to a stream. The following metrics were used and the index scores added together (A score of 8 is the maximum):

Impervious Area		Forest Area	
% Imp. Area	Index #	%Forest Area	Index #
0-3	4	70+	4
3-8	3	60-70	3
8-15	2	50-60	2
15+	1	50 and below	1

Watershed Integrity Index Calculations

Stream (watershed size (mi^2))	Impervious Surface Area		Forest Cover		**Watershed Integrity Index**
	%	Index Score	%	Index Score	
Coulter (11.70)	0.2	4	78.1	4	**8**
Rocky (12.12)	1.5	4	71.7	4	**8**
Grovers (6.76)	1.6	4	73.3	4	**8**
Olalla (7.93)	3	4	63.1	3	**7**
Eglon/Silver (2.34)	1.1	4	66.5	3	**7**
Minter (10.25)	2.6	4	60.4	3	**7**
Gorst (9.53)	7	3	74.6	4	**7**
Anderson (Gorst) (2.04)	3.7	3	77.6	4	**7**
Chico (16.32)	6	3	68.3	3	**6**
Big Scandia (2.27)	4.6	3	69.9	3	**6**
Carpenter (2.95)	6.18	3	66.4	3	**6**
Blackjack (13.48)	13.5	2	53.3	2	**4**
Curley-Salmonberry (14.25)	9.6	2	58	2	**4**
Dogfish (8.50)	12.7	2	57.9	2	**4**
Burley (10.83)	10.6	2	55.1	2	**4**
Illahee (1.28)	16.7	1	53.9	2	**3**
Barker/Hoot (3.95)	22.2	1	42.7	1	**2**
Steele (5.01)	16.7	1	46.4	1	**2**
Clear (8.59)	29.3	1	47.9	1	**2**

Percent forest cover and impervious surface area were based on 2001 Landsat 7 ETM+ (30 meter pixel resolution)



Appendix A: Figure 1: The flowchart indicates how watersheds were assigned to geographic tiers. The watershed integrity score was calculated according to the guidelines on the previous page.

APPENDIX B

Preliminary Nearshore Action Recommendations and Prioritization Criteria

(Note: A preliminary list of nearshore conservation and restoration areas for Bainbridge Island is included but the list has not been scored with the criteria yet. The nearshore working group will update this list as we gain more knowledge)

APPENDIX B

PRELIMINARY NEARSHORE ACTION RECOMMENDATIONS: The following criteria, which was adapted from Correa 2002, was used to prioritize **preliminary** nearshore actions identified in East Kitsap WRIA 15. The actions were identified using the KGI[3] Watershed Nearshore Salmon Habitat Assessment, Draft Bainbridge Island Nearshore Assessment, Limiting Factors Analysis for East WRIA 15 and by professional local knowledge[4]. This list is intended to be a starting place and as we gain more knowledge the criteria and list will be updated based on the findings. If additional actions are identified, the criteria can be used prioritize them relative to the actions in this list. Therefore, these criteria and list of action recommendations should be considered as **"interim"** until more and better data is developed.

In addition to the list of nearshore actions, the following general nearshore actions should be considered when identifying nearshore protection and restoration projects or implementing policy and/or regulatory decisions.

- Protection of naturally eroding bluffs
- Removal of intertidal fill
- Removal of shoreline armoring or replacement with alternatives such as large woody debris and/or riparian plantings
- Protection of estuaries
- Proper treatment of stormwater and wastewater
- Protection and/or restoration of salt marsh habitat
- Removal of unused creosoted pilings

Prioritization Method

<u>Proximity to priority watersheds, maximum 3 points</u>
The proximity to priority watersheds, as determined by the Watershed Geographic Prioritization Method (Appendix A) was evaluated as follows:

- If the nearshore project action was within 0.0 to 1.0 miles from a Tier 1 estuary, the action received 3 points.
- If the nearshore project action was within 0.0 to 1.0 miles from a Tier 2 estuary, the action received 2 points.
- If the nearshore project action was within 0.0 to 1.0 miles from a Tier 3 estuary, the action received 1 point.

[3] KGI refers to the Key Peninsula, Gig Harbor, and Island Watershed in Pierce County.
[4] Our knowledge of nearshore habitat use by salmonids is relatively basic but is expanding and the database on nearshore salmonid habitat conditions is also sparse. The KGI and Bainbridge Island Nearshore assessments will help fill those gaps. However, an assessment is required for the remainder of East Kitsap before a comprehensive list of actions can be developed.

Spatial Scale, maximum 5 points

The size of the benefit was evaluated as follows:

- The action received 5 points if the project protected and/or restored greater than 10 acres of habitat.
- The action received 4 points if the project protected and/or restored 5 to 10 acres of habitat.
- The action received 3 points if the project protected and/or restored 2 to 5 acres of habitat.
- The action received 2 points if the project protected and/or restored 1/2 to 2 acres of habitat.
- The action received one point if the project protected and/or restored less than 1/2 acre of habitat.

Ecological Scale, maximum 5 points

Ecological scale was designed to evaluate impacts to nearshore processes. If the action addressed multiple processes, species and life histories, it received a higher value. For example, if an action recommendation involved estuary restoration that would affect both nearshore and riverine processes, such as dike removal in the lower floodplain, it received a higher score than one that involved a single process, such as the removal of individual creosoted pilings, which systematically received one point.

Temporal Scale, maximum 3 points

Temporal scale was designed to evaluate the longevity of a benefit(s) gained through implementation of a recommendation. For example, if the action recommendation restored a nearshore process that provided long-term benefits, it received a higher score than a project that provided short-term benefits and required considerable maintenance.

ID	Location	Action Type	Action Recommendation	Criteria (Correa 2002)					Comments
				Proximity to Priority Watersheds (max 3)	Spacial Scale (max 5)	Ecological Scale (max 5)	Temporal Scale (max 3)	Total (max 16)	
Protection Projects (No Scoring)									
7	Doe-Keg-Wats	Protection	Protect 35 acre pristine Salt Marsh. Look into the acquiring a conservation easement to protect salt marsh.						Edmonds oil spill hit this marsh in January 2004. Most of the salt marsh belongs to The Suquamish Tribe and part belongs to Camp Indianola.
8	Nooschkum Point, Miller Bay	Protection	Protect 3 acre spit and marsh. Good candidate for conservation easements. Approach Kitsap County to purchase marina (North of point)						There are 7 cabins located adjacent to the spit. The spit is privately owned but currently in open space designation.
12	Dogfish Bay Salt Marsh	Protection	Protect Salt Marsh located at NE Virginia Pt Road. Look into a conservation easement. Investigate culvert at road to determine if there is a tidal constriction.						Private ownership (currently Donald Monroe)
18	Mosher Creek Estuary, Dyes Inlet	Protection	Protect estuary						Possible restoration. Need more information.
36	Southworth Point	Protection	Protect habitat						Ecology photo: 105148

46	Burley Lagoon/Burley Creek (Upper Lagoon)	Protection	Protect functioning estuary habitat							
47	Minter Creek Estuary	Protection	Preserve riparian zone. Pursue conservation easements							Identify specific actions or move to general recommendations?
52	Rocky Bay	Protection	Protect functioning estuary habitat							Tier 1 Stream
53	Coulter Creek Estuary	Protection	Investigate what can be restored after the hatchery closes down. Protect functioning habitat							
15	Illahee Creek Estuary	Protection	Protect small salt marsh. Approximately .73 acre							There is a current permit to build a 5000 ft^2 house directly on the spit.
42	Wollochet (Bitter) Creek 15.0080/0081, Garr Creek 15.0080, and tributaries	Protection								Need more information. Artondale is somewhat restricted. Wollochett restricted

Restoration Projects									
21	Chico Creek Estuary, Dyes Inlet	Restoration	Replace the culverts at the SR 3 and Kittyhawk Drive crossings with bridges of sufficient size to allow unrestricted fish passage at all flows, as well as passing sediment and debris; this would allow removal of the upstream Dept. of Transportation trash rack, which is a fish passage barrier when clogged with accumulated debris. Restore stream utilization of historic estuarine delta.Estuarine conditions downstream of the culvert at the mouth of Chico creek are generally good, although the extent of estuarine influence is limited by the routing of the creek through a confined culvert at the mouth. Review of historic aerial photos indicates the mouth of the creek may have historically moved across a broader estuarine interface. Estuarine function could be improved by increasing the number and/or width of openings under SR 3, which may also eliminate the need for Dept. of Transportation to maintain the trash rack upstream. Approximately 20 acres	3	5	5	3	16	This is a huge project and will require multi-agency participation. Good PSNERP project.

24	Gorst Creek Estuary 15.0216 and extension as 15.0224, Unnamed (Bailey's) Creek 15.0217, Jarstad Creek 15.0218, Parish Creek	Restoration	Restore estuarine function (will require acquisition of historic floodplain/estuary from the mouth to Jarstad Park). Pull back intertidal fill at old Port of Bremerton landfill north of Gorst; restore natural shoreline configuration and function. Remove collapsed riprap and debris (from roadside armoring from intertidal area. Protect highly productive, shallow intertidal areas of Sinclair Inlet; avoid armoring of additional armoring where practicable. Reconnect estuarine component north of Gorst Creek that was cut off by construction of the rail line.	3	5	5	3	16	Paul Dorn will provide better description of all the actions needed in the Gorst Area of Sinclair Inlet.
6	Carpenter Creek Estuary, Appletree Cove	Restoration	Replace undersized culverts under South and West Kingston roads with bridges to restore natural tidal hydrology and estuarine functions to approximately 26.2 acres. Remove intertidal fill and restore saltmarsh and riparian habitat where disturbed.	1	5	5	2	13	South Kingston Road culvert scheduled to be replaced Summer 2005 (SRFB Grant).
35	Little Clam Bay, Manchester	Restoration	Replace tide gate with a bridge and restore historic estuary/nearshore in Little Clam Bay. Would restore over 23 acres of estuary habitat functions.	0	5	5	3	13	Currently Little Clam Bay is being used to culture Olympia oysters.
54	East Oro Bay, Anderson Island (AU 14.09)	Restoration	Remove dike that separates a large marsh and wetland from the rest of East Oro Bay. Removal of the dike would greatly expand the area of saltmarsh habitat and substantially improve habitat.	0	5	5	3	13	Private property and unwilling landowner

38	Olalla Creek 15.0107 and Unnamed 15.0108-0113	Restoration/Protection	Pursue acquisition of house and property at upper end of estuary that constricts tidal interchange in the Olalla Creek channel and in Unnamed 15.0108; reconfigure to restore estuarine and channel function. Work with landowner to keep livestock out of the saltmarsh and pursue conservation easements. Remove riprap fill on the estuary at the boat ramp. Approximately 29.5 acres	2	5	4	2	13	
1	Blakely Harbor, Bainbridge Island	Restoration	Remove two jetties, rip-rap wall, powerhouse structure and piles. Remove mill waste (metal shaving debris) and restore salt marsh and plant riparian vegetation.	0	5	4	3	12	Bainbridge Island acquired. There is some opposition to the restoration.
11	Keyport Creek 15.0276, Styles Lagoon, Liberty Bay	Restoration	Restore natural tidal regime in Styles Lagoon. Currently impounded by tidegate (Installed by WDFW). Restore marine sediment quality and water quality off the mouth of the creek. Approximately 20.9 acres	1	5	4	2	12	
14	Steele (Crouch) Creek Estuary (Illahee Road), Burke Bay	Restoration	Restore natural rates of recruitment of shoreline slide materials to the nearshore south of Steele Creek; identify options to reduce the intrusion of Illahee Road into the historic intertidal area and/or reduce the extent of armoring of the roadfill. Investigate bridge on Illahee Road for tidal restriction; expand if necessary. Approximately 20 acres	1	5	4	2	12	

19	Clear Creek 15.0249, WF Clear Creek 15.0250, and Unnamed 15.0251-0254, Dyes Inlet	Restoration	Replace culvert at Bucklin Road crossing with a bridge of sufficient length to restore natural sediment transport from Clear Creek to Dyes Inlet. Pursue acquisition to improve buffer around the estuary. Approximately 9.5 acres.	1	4	4	3	12	Excellent education opportunity by putting in a pedestrian bridge and connecting marsh to the rest of Clear creek (extensive trail system)
20	Clear Creek Estuary, Dyes Inlet	Restoration	Pursue conservation easement for lagoon located southeast of mouth of Clear Creek. Improve riparian zone with native plantings. Investigate possibility of channel restoration.	1	4	4	3	12	Peter Namtvedt Best indicated his family may be interested in a conservation easement on part of the lagoon. WDFW will be sampling as part of their pocket estuary project. Chum are know to use the lagoon
50	Whitman Cove, Case Inlet	Restoration	Restore natural estuarine function in Whiteman Cove by removing tidegates. Look into possibility of removing road? Would restore natural estuarine function to approximately 20 acres.	0	5	5	2	12	Look into ownership and how much the road is used.
3	Point No Point Wetland	Restoration	Conduct feasibility study to assess the potential of restoring estuarine functions to the point no point marsh. Restore as much of the salt marsh habitat as possible. Look at the possibility of re-establishing the connection of the marsh to Puget Sound (NW of the lighthouse). Approximately 25 acres.	0	5	5	1	11	Located in area of excellent nearshore refugia (May 2003). Most of the original marsh has been filled and developed. It may be difficult to establish the original outlet due to development and changes in hydrology.

40	Crescent Creek (Gig Harbor)	Restoration	Replace culvert with a bridge to restore tidal function. Evaluate potential removal of bank armoring at city park in Crescent Creek estuary. Assess the impacts of existing alterations to marine nearshore habitat in Gig Harbor; remediate impacts where possible. Protect remaining habitat through conservation easements or purchase. (~3 acres)	2	3	4	2	11	Highest quality habitat in Gig Harbor. City park is located adjacent and could be connected to restoration of estuary.
41	North Creek Estuary (AU 2.07) (Gig Harbor)	Restoration	Pursue acquisition of business property to restore and daylight channel. Expand the park to connect with the restoration. Restore estuarine function in the lower portion of North Creek. Assess the impacts of existing alterations to marine nearshore habitat in Gig Harbor; remediate impacts where possible (~ 4.5 acres)	2	3	4	2	11	
37	Harper Estuary, Yukon Harbor	Restoration	Option 1: Abandon road through marsh (Southworth section) to improve estuary functions. **Option 2** (Scored, more likely scenario): Replace undersized culvert with a bridge to improve estuary functions. Both options: Remove abandoned 400' long abandoned roadbed and restore salt marsh and remove or minimize unpermitted boat ramp. (Would restore natural esturarine function to approximately 7.5 acres)	0	4	4	2	10	Option 1 = 12 for total score (0,4,5,3). USACOE has completed a 10% feasibility study for this project. Do not have the funds to complete it.

34	Beaver Creek, Clam Bay, Manchester	Restoration	Restore the natural estuary at the mouth of Beaver Creek; this would involve removal of the dam at the lake outlet and may involve removal of contaminated sediments. Work with EPA/NOAA Fisheries/DOE/Navy to determine feasibility of restoring natural shoreline and nearshore condition in the extensively filled, bulk headed, and docked shoreline in Clam Bay; assess opportunities to reduce/eliminate creosote presence and exposure at the EPA-operated dock. Approximately 1.63 acre	0	3	4	2	9	Restoration plan for the Manchester Fuel Depot is in progress. Navy is the lead. Legacy funds.
2	Manitou Beach, Murdon Cove, Bainbridge Island	Restoration	Improve tidal connection between high marsh and Murdon Cove. Regrade and restore high marsh.	0	3	3	2	8	Murdon Cove has some of the best habitat on the Island.
4	Eglon Creek 15.0311 and Silver Creek 15.0312	Restoration	Conduct feasibility study to assess potential of relocating/reconfiguring the boat launch and parking at the mouth of the creek. Restore channel function through this reach by removing channel armoring and restore flood plain. Remove dilapidated wood bulkhead south of boat ramp. Put sign up to prohibit vehicles from driving on beach damaging forage fish spawning habitat. Approximately 1 acre.	1	2	2	2	8	Once boat ramp at Point no Point is complete may be able to abandon this boat ramp. Located in area of excellent nearshore refugia (May 2003)

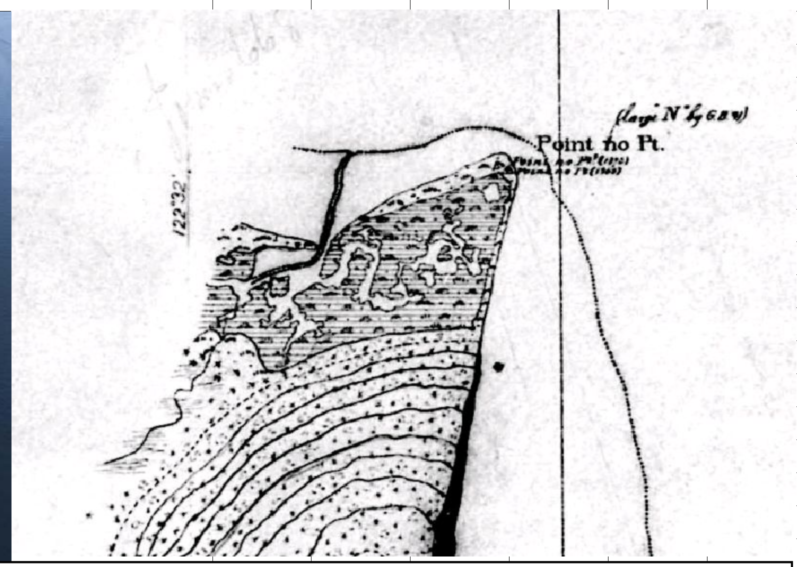
27	Ross Creek 15.0209 and Unnamed 15.0210, Sinclair Inlet	Restoration	Replace culvert at the SR 166 crossing with bridge or a much larger culvert that will restore saltwater tidal influence upstream and flush accumulated sediments to Sinclair Inlet. Restore functional estuarine habitat; eliminate or reduce encroachment from existing development and reestablish functional riparian buffers. Approximately 1.5 acre	0	2	4	2	8	
30	Unnamed 15.0193, Port Orchard (Sinclair Inlet)	Restoration	Conduct feasibility study to look at restriction at Beach Drive. Protect estuarine salt-marsh habitat; evaluate opportunities to increase estuary function upstream of Beach Drive.	2	1	3	2	8	Look at fish usage. Ecology photo: 010512-125532
10	Dogfish Creek Estuary, Liberty Bay	Restoration	Remove pilings and debris (trash/rocks/bulkhead) along shoreline south of Lindvig Avenue. Work with businesses parking lots to restore riparian habitat and improve stormwater management.	2	1	2	2	7	Need to measure feet of shoreline restored.
13	Steele (Crouch) Creek Estuary (Brownsville HWY Crossing), Burke Bay	Restoration	Replace culvert at the Brownsville Highway crossing with a bridge or larger culvert that restores natural tidal exchange and sediment transport, as well as unrestricted fish passage.	1	1	3	2	7	
43	Shaw Cove Spit (AU 5.10)	Restoration	Remove steel/wire framework lying partly on the upper beach and on the riparian shrub-scrub fringe above MHHW. (~.18 acre)	0	1	3	3	7	
23	Wright Creek 15.0225	Restoration/Protection	Replace culvert with bridges of sufficient length to restore tidal processes under SR3 and Navy railroad. Protect integrity of the only natural estuary remaining on the north shore of Sinclair Inlet.	1	1	3	2	7	

26	Ross Point, Sinclair Inlet	Restoration	Remove old homesite foundations, pilings, and associated debris from intertidal area south of Ross Pt. Remove unauthorized moorage, and creosote-treated pile rafting off Ross Pt.	0	1	3	2	6	One of the largest surf smelt areas.
28	Blackjack Creek 15.0203, continued as Square Creek, Ruby Creek 15.0205, and unnamed	Restoration	**Option 1 (Scored)**: Restore riparian corridors as much as possible by pulling parking lot back as much as possible. Option 2 (See comments): Pursue purchasing businesses and relocate. Restore natural delta by removing fill and reestablishing riparian corridors.	2	1	2	1	6	Option 2: Total score would be 10 (2,2,4,2)
39	Colvos Passage (EMU 1;AU 1.03 Pierce County Habitat Assessment)	Restoration	Remove concrete vaults and bulkhead. Restore beach by removing fill and re-grading to natural contours followed by planting native vegetation. (Approximately 390 linear feet, about 0.55 acres of fill)	0	2	3	1	6	Sand lance documented. Superfund site from Manson Construction. May limit restoration potential.
44	Raft Island ((AU 6.15)	Restoration	Remove failed wooden bulkhead. Replace deteriorating concrete bulkhead with bioengineered structure? Remove dilapidated wood and styrofoam float. (AU 6.15 ~220 linear ft, AU 6.17 ~ 200-300 ft)	0	1	3	2	6	
48	Glen Cove (AU8.10 & 8.16)	Restoration	Remove armoring at Camp Seymore. Remove old tires and concrete debris along shoreline. Remove 55 gallon barrels/drums used to stabilize the bank . Remove concrete bulkhead in AU 8.10 (~ 600 ft)	0	1	3	2	6	
55	Fox Island (AU 13.31)	Restoration	Remove abandoned ferry dock and restore natural shoreline.	0	1	3	2	6	

25	Anderson Creek 15.0211 and EF Anderson 15.0212	Restoration	Replace culverts with bridges to improve fish passage and process. Conduct feasibility study to look at reconfiguring stream to route it under the smallest width of the highway. Pursue purchasing property for reconfiguring stream (Old RV sales). Restore natural channel configuration, estuarine function, and natural sediment transport through the SR 166/16 corridor.	1	1	2	1	5	This project is problematic due to SR 166/16.
31	Annapolis Creek 15.0202	Restoration	Replace restrictive culvert with larger culvert.	2	1	1	1	5	
45	Burley Lagoon/Purdy Creek Estuary (AU 7.12)	Restoration	Shoreline habitat improvement could be obtained by removing the debris and abandoned structure(s), and removing and replacing the riprap through bioengineering techniques. (~ 2.2 acres, rip rap ~230 ft)	0	2	2	1	5	
49	Mayo Cove (AU 9.11)	Restoration	Replace decaying bulkhead with alternative. Remove old boats from marsh vegetation.	0	1	2	2	5	
51	Vaugn Bay (AU 12.4)	Restoration	Protect functioning estuary habitat	0	1	2	2	5	
16	Dee (Enetai) Creek Estuary15.0264	Restoration	Investigate soft bank alternatives to concrete bulkhead on the banks. Improve water quality (high bacteria). Educate local community about water quality issues. Improve riparian zone with vegetative plantings.	0	1	2	1	4	Health District is considering posting with a Health Warning due to high bacteria counts. Ecology 924-101928
32	Sullivan (Karch, Karcher) Creek 15.0200	Restoration	Replace culvert at Beach Drive with bridge or larger culvert that will provide unrestricted outflow during high flows and which will restore saltwater exchange into the lower end of Sullivan Creek. Remove invasive vegetation.	0	1	2	1	4	

5	Applecove Point	Restoration	Conduct a feasibility study to look at restoring salt marsh at Applecove Point (possibly salt water has been cut off by tidegate). Protect remaining marsh habitat from further development. Approximately 6.14 acre. Located in area of excellent nearshore refugia (May 2003)	0	4	N/S	N/S	N/S	Need more information about the saltmarsh and tidegate. Field trip planned.
22	City of Bremerton Marine Shoreline: Oyster Bay, Mud Bay, Port Washington Narrows, Ostrich Bay, Phinney Bay	Restoration	Conduct feasibility study to identify possible restoration projects. Monitor Jackson Park and Charleston restoration projects.	N/S	N/S	N/S	N/S	N/S	Need further information.
33	Waterman	Restoration	Protection and possible undersized culvert	N/S	N/S	N/S	N/S	N/S	Need more information. Investigate and rate later.
Completed Restoration Projects									
9	Dogfish (WF Dogfish) Creek 15.0285, SF Dogfish (Wilderness, Harding) 15.0285A, Liberty Bay	Restoration	Replace culvert at Lindvig Avenue with bridge or culvert sufficient to pass sediments and restore tidal influence upstream of the culvert; remove rock weir upstream of Lindvig Way culvert. Approximately 7 acres.						Completed in 2003. SRFB Grant
17	Barker Creek 15.0255 and Hoot Creek 15.0255A	Restoration	Replace the culvert at the Tracyton Boulevard crossing with a bridge of sufficient length to restore natural estuarine function upstream, to ensure unobstructed fish passage, and to restore natural sediment transport. Approximately 2 acres.						34' concrete bottomless culvert scheduled for Summer 2004 (SRFB Grant)
29	Annapolis boat ramp, Sinclair Inlet	Restoration	Remove boat ramp and riprap at the WDFW-owned facility at Annapolis; restore natural shoreline configuration.						Complete

Blakely Harbor (Project ID #1) showing abandoned powerhouse structure, jetties and pilings. (WADOE Oblique



Point No Point (Project ID #3). Figure on left shows the 1872 U.S. Coast Survey

Doe-Keg-Wats Marsh (Project ID #7)

Steele Creek Estuary (Projects ID 13 & 14)

Styles Lagoon, Keyport, Liberty Bay (Project ID #11). Restore natural tidal regime by removing tidegate.

Clear Creek (Project ID #19) Replace culvert at Bucklin Road with bridge and protect buffer around estuary.

Clear Creek Estuary Lagoon (Project ID #20). Pursue conservation easement, restore riparian habitat. (possible channel restoration).

Chico Creek Estuary (Project ID # 21)

Gorst Estuary (Project ID #24)

Little Clam Bay showing tidegate (Project ID #35)

Harper Estuary Restoration (Project ID # 37)

Olalla Creek Estuary (Project ID # 38)

North Creek Estuary, Gig Harbor (Project ID # 41)

Crescent Creek, Gig Harbor (Project ID #40)

1

2

Whitman Cove (Project ID 50) - Photo 1 shows the two tidegates and the small lagoon and marsh in the bottom left that is separated from Whiteman Cove by a sheet pile wall (WSDOE Oblique Aerial Photos, 2000 Series). Photo 2 - Tidegate (one of two in Whiteman Cove.

East Oro Bay, Anderson Island showing tidegate (Project ID #54)

APPENDIX C

PROCESS GUIDE

East Kitsap Lead Entity Evaluation and Prioritization of SRFB Project Proposals and Timeline for the 5th SRFB Grant Round

Attachment 1: **Pre-application Questionnaire**
Attachment 2: **Criteria for Evaluation of Project Proposals.**
Attachment 3: **Presentation Feedback Forms**
Attachment 4: **Initial Citizen Rating Form**
Attachment 5: **Initial TAG Rating Form**
Attachment 6: **Final Project Evaluation Form**

APPENDIX C

PROCESS GUIDE
East Kitsap Lead Entity Evaluation and Prioritization of SRFB Project Proposals and Timeline for the 5th SRFB Grant Round

Purpose: Funding for a project is awarded on a competitive basis by the state Salmon Recovery Funding Board (SRFB). Kitsap County is the Lead Entity (LE) East Kitsap for the portion of Kitsap Peninsula that drains into the Puget Sound, including portions of Kitsap, Pierce and Mason counties and several nearby islands, including Bainbridge Island, Fox Island, and Anderson Island. Project proposals are submitted by applicants to the lead entity, which evaluates the proposals, ranks them according to a local salmon recovery strategy and selects a package of proposals to submit to the SRFB for funding consideration.

At the Lead Entity level, state law requires that the projects be evaluated and ranked by a committee of citizens with the assistance of a technical advisory group (TAG). The TAG evaluates projects based on their technical merits with an emphasis on the project's benefits to salmon and certainty of success. The citizen's committee works with the TAG and determines the final ranking of projects based on their technical merits as well as how well the project fits within the local salmon recovery strategy, public involvement and cost appropriateness. The lead entity then puts the proposals together and submits them as one strategic package accompanied by a lead entity application that describes how the package addresses the local salmon recovery strategy.

To help ensure that every project submitted to the SRFB is technically sound, the local Kitsap TAG and citizen committees, with assistance from the SRFB technical advisors will identify projects they believe have low benefit to salmon, a low likelihood of being successful, and/or have costs that outweigh the anticipated benefits of the projects. The TAG and citizens committee will make every effort to work with project sponsors and give the applicants an early opportunity (pre-applications, presentation feedback and field visits) to improve the proposal before the final application is due for local evaluation. If the TAG and citizens committee determine that the final application is not technically sound, the citizens committee will not move the application forward to the SRFB, but will provide project applicants with recommendations for other funding sources, if appropriate.

Process Steps for 5th SRFB Round (All meetings are open to the public)

All applicants must submit their applications through the East Kitsap Lead Entity. Starting this year all applicants will submit and modify their grant applications on-line through PRISM (Grant Management Tool). SRFB staff and the local LE

Coordinator will provide guidance for PRISM use. The SRFB will release DRAFT SRFB policy manual & application forms on February 2, 2004 and FINAL SRFB policy manual & application forms on February 27, 2004. Please refer to the following steps for instructions, due dates, workshops and required materials for the East Kitsap Lead Entity local process. The final project list from each lead entity is due to the SRFB by July 16, 2004 and the SRFB will decide on final funding in December 2004.

If you have any questions please contact the local LE Coordinator, Monica Daniels at (360) 337-4679 or mdaniels@co.kitsap.wa.us.

Thanks!

2004 SRFB 5th Round Grant – East Kitsap LE Timeline

Please refer to the following pages for the description of steps 1-10. I will post the times and locations as soon as they are confirmed.

March 3	**Application Workshop (Step 1)** 10am –12pm, Givens Community Center, Kendall Room, Port Orchard
March 24	**Pre-application Due to local LE Coordinator (Step 2)**
April 1-2	**Presentations (Step 3)** Two days if necessary from 10 am – 3 pm
April 14-15	**Field Trips to sites (Step 4)** Two days if necessary.
May 5	**Final SRFB Applications due (Step 5)**
May 21	**Citizens committee and TAG initial ratings due to LE Coordinator (Step 6)**
May 27	**"Tool for Discussion" Workshop (Step 7)**
June 4	**Citizens Committee Final Ranking Due (Step 8, if necessary)**
June 22	**Adopt Final Prioritized List Meeting (Step 9)**
July 9	**LE Application Packet sent to SRFB (Step 10)**

Step 1 - Application Workshop - Kickoff for the Salmon Recovery Funding Board 5th round grant cycle. The LE Coordinator for East Kitsap and possibly SRFB staff will provide applications, timelines for state and local processes, identify sources for technical assistance and will have a question and answer session. The intended audiences are potential project applicants, citizens committee and TAG members. The SRFB will have another workshop at a later date to go over using PRISM to enter applications.

WORKSHOP DATE: **March 3, 2004**

Step 2 - Project applicants will provide a short description of their project along with answering the pre-application questionnaire that addresses how the proposed project fits within the East Kitsap Peninsula Salmon Recovery Strategy (See Attachment 1, Pre-application). Pre-applications will be submitted to the LE Coordinator and distributed to citizens committee and TAG members. Applicants must submit a pre-application by the due date to be considered for the 5th Round SRFB Grant. Pre-applications can be mailed, dropped off or sent electronically to:

Monica J. Daniels, LE Coordinator
Kitsap County Department of Community Development
614 Division Street MS 36: Port Orchard, WA 98366
mdaniels@co.kitsap.wa.us
(360) 337-4679

March 24, 2004 **Pre-application DUE DATE**

Step 3 - Proposed Project Presentation Workshop (pre-applications). Project applicants will give a presentation to the citizens committee and TAG members on their proposed project. A time limit for each presentation will be announced and will depend on how many applications are submitted to the LE. Feedback forms (See Attachment 3) will be provided to the citizens committee and TAG members to provide constructive comments. The LE will provide the applicants feedback after the LE has made a consensus opinion on how the project could be improved. If the project is low benefit/low certainty, the applicant will be informed at this time.

The forms will include preliminary high, medium or low scores on the evaluation factors. The goal of the workshop is to educate the Citizens and TAG members and to provide the project applicants with constructive, verbal and written pre-application evaluations. Examples of feedback could be:

Example 1: Improve educational component by involving nearby school in restoration plantings. (Not: poor educational involvement)
Example 2: Improve Certainty of Success by providing a detailed "user friendly" restoration plan. (Not: Low certainty of success)

April 1-2, 2004 Presentation Workshop DATES (April 2 will be used only if needed. We will try to have all presentations on April 1 but it depends on how many applications are received.)

Step 4 - Field trips to all proposed application sites. A time limit for each field trip presentation will be announced and will depend on how many applications are submitted to the LE. The citizens committee and TAG members (& possibly SRFB staff, &/or review members) will go to each site together to learn about the projects and greatly improve their ability to evaluate and rate proposed projects. It is also an opportunity for the project applicants to highlight their project and highlight changes they have made in regards to the feedback from the presentation workshop.

April 14-15, 2004 Field Trips to proposed project restoration sites. (Number of days needed depends on the number of restoration projects)

Step 5 - Final SRFB applications (including the pre-application supplemental questionnaire, attachment 1) due to the Lead Entity Coordinator. LE Coordinator will distribute application copies to citizens committee and TAG members. The project applicant must enter applications into PRISM. We will download the application on May 6, 2004 to distribute to the committees.

May 5, 2004 FINAL SRFB APPLICATION DUE DATE

Step 6 - Initial citizen committee and TAG member ratings of projects (see attachments 4 & 5). The ratings will be used to educate each other on all merits to better evaluate and rate the projects.

Citizens will rate high, medium or low for the following factors:

- Consistency with the East Kitsap Peninsula Salmon Recovery Strategy
- Education, Outreach and Partnerships

- Cost of Project

TAG will rate high, medium or low for the following factors:

- Benefits to Salmon from Project
- Certainty of Success of Project
- Cost Appropriateness of Project

The outcome of this initial rating will be a "Tool for Discussion" presentation which the LE Coordinator will pull together for the "Tool for Discussion" workshop in Step 7. Each of the six factors will be averaged for each proposed project and put in a graphic to promote discussion.

May 21, 2004 Initial ratings due to LE Coordinator

Step 7 - " Tool For Discussion" cooperative workshop to gain perspective of proposed project merits. The goal is to educate each other and come to a consensus on the various merits of each project. The outcome will be a full discussion of each project (holistic approach), to point out or differentiate the nuances of projects with similar ratings. For example, if Project 1 and Project 2 both have high ratings for Benefits to Salmon, then the TAG should differentiate the benefits in order to more accurately prioritize and rate the benefits to salmon . Another example would be if several projects have high ratings in Community Outreach, the citizens committee should differentiate the merits at this meeting). For the record, the TAG will recommend a ranked list of projects based on the technical merits of benefits to salmon and certainty of success.

After both the citizens committee and TAG have discussed all the projects, both groups will come together to produce a final ranked list, to be adopted by consensus by the citizen committee, which will then be released to the public for comment. If the citizen committee does not come to consensus on a final list, then the citizens committee will go to Step 8 and individually rank the list using all five ranking factors. The LE Coordinator will summarize the outcome of this workshop and produce a report. **Citizens committee attendance is mandatory for committee members to rank the final list.**

May 27, 2004 "TOOL FOR DISCUSSION" Workshop Date.

Step 8 - If a final ranked list is not produced from Step 7 then the citizens' committee members will take home the meeting summary and TAG recommended list and individually rank projects using all five ranking factors: (See Attachment 6)

1. Benefit to Salmon from Project (40%)
2. Certainty of Success of Project (30%)
3. Consistency with the East Kitsap Peninsula Salmon Recovery Strategy (15%)
4. Education, Outreach and Partnership (10%)
5. Cost Appropriateness of Project (5%)

The LE Coordinator will summarize the rankings and develop a DRAFT prioritized project list. The list and summary comments will then be distributed to the citizens committee and TAG members along with the applicants and public for a comment period.

June 4, 2004 Citizens' Committee FINAL RANKINGS DUE to LE Coordinator.

Step 9 - At least one week after the draft prioritized list has been distributed to the committees, project sponsors and public there will be a Final Prioritization meeting. There will be a public comment period (3 minutes/person testimony or written comments accepted). After the public comment period is closed, the Citizens committee will further discuss the draft prioritization list. After discussion of the list, the Citizens committee will adopt a "Final Prioritized List" by consensus. (If consensus is not successful, then a majority vote will occur).

June 22, 2004 Final Prioritization Meeting to adopt a final prioritized list of projects.

Step 10 The LE Coordinator will take the final prioritized list of projects and prepare the application packet to forward to the SRFB. The packet will include the East Kitsap Salmon Strategy and summary, the prioritized list of projects and the ranking criteria. LE Coordinator needs to have the packet finished by July 9, 2004.

July 16, 2004 Lead Entity Packet due to SRFB

The SRFB will then have a review period, which will include Lead Entity presentations, reports and public comment period. The SRFB will allocate funding at an open public meeting December 2-3, 2004.

Attachment 1: Pre-application Questionnaire

Projects will be rated based on your SRFB application and to the following pre-application questions that address how your project fits within the East Kitsap Peninsula Salmon Recovery Strategy. Please limit your response to no more than a total of three (3) typed pages, plus any maps, pictures or graphics needed. The Lead Entity will assist you with references and technical assistance as needed.

1. Applicant name, organization and contact information.

2. Summary of funding request. Please include total project cost, sponsor match contribution and grant request.

3. Please provide a short description of your project. Identify the specific problems that will be addressed and why it is important to do this at this time. Describe how and to what extent (e.g. percent change, acres, miles, etc.) the project will protect, restore or address salmon habitat. Describe the general location, geographic scope and targeted species.

4. Does your project address a limiting factor for salmon that has been identified in the Salmonid Habitat Limiting Factors – WRIA 15 East Report the Bainbridge Island Nearshore Assessment, or the Key Peninsula Nearshore Assessment (Contact LE Coordinator for a copy of these reports)? If so, where does it rank in the list of Action Recommendations for your watershed? If your project is not specifically recommended in this report, explain what limiting factor(s) this project addresses and how this project would be likely to rank with other Action Recommendations for your watershed.

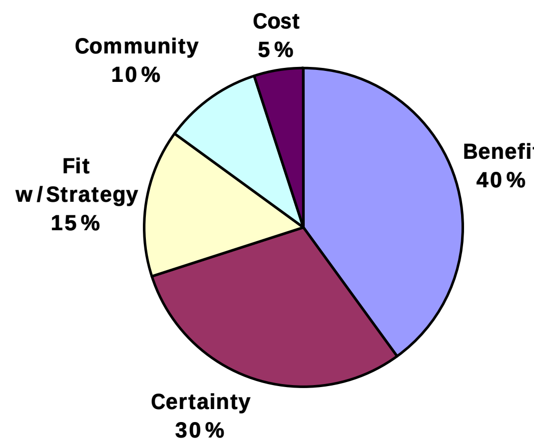
5. Is your project in a salmonid refugia identified in the Kitsap Peninsula Salmonid Refugia Study (Contact LE for a copy of the study)? If so, in what type of refugia does it occur, in which category is it and what is the overall refugia score?

6. Geographic locations have been prioritized into tiers within the East Kitsap Peninsula Salmon Recovery Strategy (See Table 1 of the strategy). In which tier does your project occur?

7. Projects that increase education, outreach and improve coordination among the community lead to stronger protection and recovery of salmon. How does your project incorporate education, outreach and improve partnerships? Please be specific (examples can be found in the East Kitsap Peninsula Salmon Recovery Strategy).

Attachment 2: Explanation of Criteria for evaluation project proposals

1. Benefits to Salmon from Project



High Benefit: High benefit would go to projects addressing multiple salmonid species (4 species or greater), large salmon runs, unique populations of salmonids essential to recovery, or stocks listed under the Endangered Species Act (ESA) or non-listed populations primarily supported by natural spawning. The proposed project addresses a critical life history stage or habitat type or addresses multiple life history requirements. Additionally, the project should address a key habitat condition or watershed process that significantly protects or limits the productivity of the salmonid species in the area and has been identified through a documented habitat assessment. For acquisitions a high benefit would include projects with a majority of the habitat is intact (greater than 60%), or if less, is a combination restoration/acquisition project. The project is located in a high priority geographic area (Tier 1 or Tier 2). Nearshore projects are a Tier 1 in East Kitsap and support multiple species and life histories for salmon throughout Puget Sound (Appendix C further prioritizes nearshore actions). For proposed assessments, a high benefit rating can be received if the assessment addresses an information need that is crucial to understanding the watershed structure and dynamics, is directly relevant to project development or sequencing, and will clearly lead to projects of high benefit.

Medium Benefit: Medium benefit would go to projects addressing a moderate number of species (2 to 3 salmonid species) or unique populations of salmonids essential for recovery, medium size runs or ESA or non-listed species populations primarily supported by natural spawning. The project may not address the most important limiting factor or access to habitat is restricted but will improve habitat conditions. The project is located in a high priority geographic area (Tier 3 or Tier 4). For acquisitions a medium benefit would include projects where 40-60% of the total project area is intact habitat, or if less the project must be a combination that includes restoration.

Low Benefit: Low benefit would go to projects that address a single species and/or fish use may not have been documented. In addition, the proposal has not been proven to address an important habitat condition in the area, addresses a lower priority geographic area (Tier 5 streams) and has not been documented in a habitat assessment. If the acquisition project area is less than 40% intact the project is a low beneficial project.

2. **Certainty of Success of Project: The level of certainty that the project would produce its intended benefits for fish**

High Certainty: High certainty would go to a project that has an approach that is appropriate to meet the project objectives; uses well-tested techniques; a completed comprehensive assessment; and the project is consistent with a scientifically based habitat protection and restoration strategy. The project will be viewed as having high certainty if it has a solid understanding of conditions and watershed processes that cause or contribute to the problem being addressed versus just replace a missing structural element and is in the correct sequence. Projects that compliment other protection/restoration actions can receive high scores of certainty. Landowners are willing to have the work done.

A high certainty of success should be considered for projects that have the potential for the project sponsor to complete the project (this includes having a design or scope of work completed, whether necessary partnerships/property access are established and the sponsor has experience to design, plan, implement and monitor a project or have indicated how they would acquire needed experience).

Medium Certainty: A Medium certainty project is moderately appropriate to meet the project objectives; uses scientific methods that may have been tested but the results are incomplete; is dependent on other actions being taken first that are outside the scope of this project. The landowners have been contacted and are likely to allow work to be done but have not conclusively agreed at the time of the application. The project has few or no known constraints to successful implementation.

Low Certainty: A Low certainty project is unclear on how the goals and objectives will be met; uses methods that have not been tested or proven to be effective in past uses; may be in the wrong sequence with other protection and restoration actions; addresses a low potential threat to salmonid habitat. A low certainty score will go to projects where the landowner willingness is unknown or the landowner is currently unwilling. Low certainty will go to actions that are unscheduled, matching funds are not secured and has several constraints to successful implementation.

3. **Consistency with the East Kitsap Peninsula Salmon Recovery Strategy**

The following factors will be considered to determine how consistent a project is with the regional goals and priorities set out within the East Kitsap Peninsula Salmon Recovery Strategy. The site-specific merits of a project are considered in the other four evaluation criteria.

- ✓ **Benefit to Salmon –** See number 1 above.
- ✓ **Geographic Location** - Projects that are located in a high priority area based on the East Kitsap Peninsula Salmon Recovery Strategy will receive the highest priority for this factor (See Geographic locations in Appendix B).
- ✓ **Education, Outreach and Partnerships**
- ✓ **Project Type Priorities** - Since restoring degraded habitat is a relatively long and expensive process, projects that make preservation of existing high quality habitat and restoring access to blocked high quality habitat are a high priority. However, when prioritizing projects, the relative impact of the project on salmon will be foremost in consideration.
- ✓ **Priorities within Watersheds** - Projects should address the most important limiting factors that have been prioritized in the report, Salmonid Habitat Limiting Factors in WRIA 15 (Haring 2000).
- ✓ **Monitoring** - Monitoring plan is included and fully described in the project proposal.

4. Education, Outreach and Partnership

Projects that encourage building community support and partnerships will be of the highest benefit to salmon. Projects that are designed and implemented in a manner that include the following outreach components (not inclusive) will receive a higher rating. Proposals must include a detailed description of community support and participation of the public or partnerships. If the project is located in an area that is inaccessible to the public the proposal should include how they intend to get the public involved whether it be the use of volunteers, news media, strong partnerships, etc.

- High level of community support
- Educational component
- Contribution of volunteers
- Public access
- Involvement of established citizen group stewards
- Cultural significance by Native American Tribes
- Encourages different partnerships

5. Cost Appropriateness of Project

The highest benefit will be projects that are cost-effective, well designed and demonstrate the project cost is appropriate for the benefits gained. The project must be appropriate for SRFB funding according to their policies. A higher ranking could include a project that brings in a larger match from other sources or makes more funds available for salmon recovery.

A medium score for cost appropriateness of the project would be for a project that has a reasonable cost relative to the predicted benefits for the project type in that location.

A low score for cost appropriateness of the project would be for a project that has a high cost relative to the predicted benefits for that particular project type in that location.

Attachment 3: Pre-Application Project Presentation Workshop Feedback Form

Citizens committee and TAG members will provide feedback to the applicants on their pre-applications and presentations. The constructive comments and pre-application evaluations will include preliminary high, medium or low scores. This will not be the final evaluation and applicants will have the opportunity to incorporate recommendations provided at this workshop into their final application. The LE Coordinator will summarize the comments with the citizens and TAG committees and forward them to the applicants as soon as possible.

Project Name and Applicant:________________________________

1. Benefits to Salmon from Project (High, Med, Low)

2. Certainty of Success of Project (High, Med, Low)

3. Consistency with East Kitsap Peninsula Salmon Recovery Strategy (High, Med, Low)

4. Education, Outreach & Partnerships component (High, Med, Low)

Any additional comments: (costs, general, informational need):

Attachment 4: Initial Citizen ratings of final applications

Results of the following initial ratings will be used to develop a "Tool for Discussion" to be used at the workshop on May 27, 2004. Please provide a rating of high, medium, low for the following factors and provide comments.

Evaluators Name:____

Project Name and applicant: ____

Rate the following high, medium or low and **provide comments** for the following factors:

1. Consistency with East Kitsap Peninsula Salmon Recovery Strategy (High, Medium, Low):

2. Education, Outreach, Partnerships (High, Medium, Low):

3. Cost Appropriateness of Project (High, Medium, Low):

Attachment 5: Initial TAG ratings of final applications

Results of the following initial ratings will be used to develop a "Tool for Discussion" to be used at the workshop on May 27, 2004. Please provide a high, medium, low for the following factors and provide comments.

Evaluators Name:____

Project Name and applicant: ____

Rate the following High, Medium or Low and **provide comments** for the following factors:

1. Benefits to salmon from Project (High, Medium, Low):

2. Certainty of Success of Project (High, Medium, Low):

3. Cost Appropriateness of Project (High, Medium, Low):

Attachment 6: Final Project Evaluation Form

Results will be summarized and a DRAFT prioritized list will be distributed for public review and comment. The citizens' committee will meet on June 22, 2004 to hear public comments, review and discuss the list and come to consensus on adopting a "Final Prioritized List".

Evaluator Name:____

Project Name and Applicant Name: _____________________________________

Using the results from the "Tool for Discussion" Workshop and the final applications rate the following factors.

1. Benefit to Salmon from Project (0-40 points): _________
   Comments:

2. Certainty of Success of Project (0-30 points):_________
   Comments:

3. Consistency with the East Kitsap Peninsula Salmon Recovery Strategy (0-15 points): _______
   Comments:

4. Education, Outreach and Partnerships (0-10 points): ________
   Comments:

5. Cost Appropriateness of Project (0-5 points): __________
   Comments:

MEMBERS OF EAST KITSAP SALMON HABITAT RESTORATION COMMITTEE (CITIZEN'S COMMITTEE)

Paul Austin
Central Kitsap Kiwanis, Bremerton

Cathy Chadwick
Bainbridge Island Watershed Committee, Bainbridge Island

John Collins
Pierce County Water Programs, Bremerton

Merle Hayes
Suquamish Tribal Member, Fisheries Policy Analyst, MidSound Fisheries Enhancement Group, Suquamish

Diane Jones
Kitsap County Salmon Advisory Council, Commercial Fisherman, Hansville

Frederick Karakas
Olympic Bike Shop, Port Orchard

Alan Miller
Trout Unlimited, Mid Puget Sound Fisheries Enhancement Group, Indianola

Jack Minert
Hood Canal Salmon Enhancement Group, Kingston

Patrick Mus
Chums of Barker Creek, Kitsap County Stream Team, Bremerton

Joleen Palmer
Stillwaters Environmental Education Center, Cutthroats of Carpenter Creek, Kingston

Herb Shinn
Clear Creek Council, Kiwanis Salmon in the Classroom program, Bremerton

Devin Shoquist
Avid Fisherman, Port Orchard

Three Vacancies (as of March 1, 2004)

MEMBERS OF EAST KITSAP TECHNICAL ADVISORY GROUP (TAG)

Jim Bolger
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Doris Small, Chair
WDFW Watershed Steward, smalldjs@dfw.wa.gov

Christopher P. Tatara, Ph.D.
NOAA Fisheries, Chris.P.Tatara@noaa.gov

Jay Zischke
Suquamish Tribe Biologist, jzischke@suquamish.nsn.us

Appendix H:
Bainbridge Island Nearshore Assessment

Electronic copies of the Nearshore Assessment documents can be downloaded from:

www.ci.bainbridge-isl.wa.us/Nearshore-BAS
and
www.ci.bainbridge-isl.wa.us/nearshore-report

Appendix I: Policies & Regulations

The following information is provided as a summary of policy direction and regulations as they relate to salmon populations. This information is general and is not intended as a substitute for actual codes and regulations adopted under County Code (Go to Kitsap.gov.com for the entire copy of the County Code) or the Bainbridge Island Municipal Codes (go to www.ci.bainbridge-isl.wa.us for the entire copy of the Municipal Code). Please refer to the references for specific information.

KITSAP COUNTY

Kitsap County Critical Areas Ordinance

The Kitsap County **Critical Areas Ordinance (CAO)** regulates the use of land near **wetlands, streams, saltwater, lakes, aquifer recharge areas, flood-prone areas, and geologically hazardous areas**. This CAO fact sheet describes the County's protections for some of these environmentally critical areas.

Parcels with pre-CAO development existing inside currently designated buffers and setbacks may be repaired, remodeled and expanded by up to 120% of the existing development footprint so long as new construction does not encroach further on the regulated critical area or creates additional adverse impacts.

Streams

Buffers and Building Setbacks: A "buffer" of native vegetation is designed to protect critical areas from human activities. Clearing or grading is not allowed within a buffer. In addition, structures must be set back 15 feet from the edge of the buffer. The inner edge of the buffer is measured from the stream's bankfull width (ordinary high water). Existing structures within a buffer may be remodeled, reconstructed or replaced.

Stream Buffers are tailored to the stream type. *Standard buffer requirements:*

- Type 1 Stream (fish bearing)–100 feet
- Type 2 Stream (fish bearing)–100 feet
- Type 3 Stream (fish bearing)–100 feet
- Type 4 Stream (Year-round stream/no fish)–50 feet
- Type 5 Stream (Seasonal/no fish)–25 feet

Depending upon site-specific conditions, staff may have the authority to administratively decrease these buffers by up to 25%.

Stream Buffers for Threatened Salmon: *"Class I Wildlife Conservation Areas" are habitats needed by fish and wildlife listed as* endangered, threatened, *or* sensitive by *the federal or state government. Streams with listed species have a default buffer of 200 feet. This default may be decreased based upon a site-specific Habitat Management Plan.*

Class I Wildlife Conservation Areas for Hood Canal Summer Chum:

- *Big Beef Creek*
- *Seabeck Creek*
- *Stavis Creek*
- *Anderson Creek*
- *Dewatto Creek (within Kitsap County)*
- *Tahuya River (within Kitsap County)*
- *Union River (within Kitsap County)*

Wetlands

Wetland Buffers are tailored to the wetland type:

- Category I Wetland (highest value)–200 feet
- Category II Wetland–100 feet
- Category III Wetland–50 feet
- Category IV Wetland–25 feet

Wetlands contiguous with Class I Wildlife Conservation Areas are regulated as Category I.

Structures must be set back 15 feet from the edge of the buffer. Depending upon site-specific conditions, staff may have the authority to administratively to allow buffer averaging or decrease these buffers by up to 25%.

Shorelines

Shoreline Buffers for Threatened Salmon: *All saltwater shorelines are designated as "Class I Wildlife Conservation Areas" and have a default buffer of 35 feet (with an additional 15 foot building setback). This default may be decreased based upon a site-specific Habitat Management Plan, or increased on sites with steep slopes.*

Shorelines without Threatened Salmon: *Lakes larger than 20 acres that do not have listed species, have setback requirements based upon the Shoreline Master Plan designation. Most shorelines are designated as "Urban" (with a 25 foot setback), "Semi-rural" or "Rural" (each with a 35 foot setback).*

Comments

CAO revisions are currently underway to evaluate the adequacy of critical areas regulations. A committee has been formed representing a balanced mix of interests to ensure that the Best Available Science is considered by DCD staff. Revisions should be complete by the end of 2004.

References

Kitsap County Code, Title 16, Critical Areas Ordinance
Kitsap County DCD Departmental Interpretation: Habitat Management Plans for Threatened Salmon Species.
Building Limitations Map

Kitsap County Comprehensive Plan (Amended December 8, 2003)

The comprehensive plan is intended to actively guide growth in Kitsap County and effectively respond to changes in conditions or assumptions. The Comprehensive plan amendment process is intended to provide individuals an opportunity to propose amendments to the County's Comprehensive Plan adopted pursuant to the Growth Management Act (GMA) and to Develop Regulations (if required) to maintain their consistency with the plan.

The Kitsap County County commissioners approved the following 2003 Comprehensive Amendments on 12/08/03 as they relate to Hood Canal Summer Chum populations: (description follows)

- *Interim Rural Forest (IRF) Lands now identified as RURAL WOODED (RW) lands.*
- *South Kitsap Industrial Area (SKIA)*

Kitsap County Rural Wooded Amendment (2003)

The major components of the amendment are as follows:

- The "Rural Wooded" designation will replace the formerly designated "Interim Rural Forest" (Approximately 50,000 acres county wide)
- The base density of lands will remain one dwelling unit per 20 acres.
- Prior to accepting any applications pursuant to this policy, the County shall adopt development regulations that specifically address the criteria and objectives including but not limited to how rural character will be preserved and urban growth in the rural area will be prevented.
- A variety of incentive-based land conservation programs will be developed, including Transfer of Development Rights program, tax incentives, coordinating and directing private, state and federal funding for land acquisition or conservation easement, and allowing clustering of residential development.
- A density of one dwelling per 5 acres is allowed if residential units are clustered, subject to specified criteria:
  - 50% of the site placed in "Wooded Reserve" where forestry would be permitted (pursuant to he State Forest Practices Act). The Wooded Reserve may not be developed or subdivided earlier than 40 years.
  - Remaining 50% may be developed provided: 25% of the total site area shall be placed in a permanent open space or 50% of the property set aside as "Wooded Reserve" is designated as permanently undevelopable, where forestry may be practiced.
- On the portion to be developed, clustered and innovative rural planning techniques are encouraged.
- No more than 25 units per cluster and no new urban services provided.
- No more than 1,000 contiguous acres may use this mechanism for a single project.

- The developed portions of those properties seeking to utilize this mechanism shall comply with all existing Kitsap County development regulations including but not limited to the Critical Areas Ordinance in order to protect environmental features.
- Rural Wooded parcels larger than 40 acres in size that adjoin shoreline may utilize a density of one dwelling per 2.5 acres if residential units are clustered and landowner commits to permanently continue forestry use on a portion of their land that included the shoreline.
- The County will monitor the effectiveness of all Rural Wooded incentive programs on an annual basis and a 'stop and assess' report will be implemented at a 10,000 acre or 5 year threshold (whichever comes first) where all applications will be halted until a report has been generated and submitted.
- The implementation ordinance will be completed no later than July 31, 2004

Comments

Refer to the attached map, which identifies these Rural Wooded Lands (formally Interim Forest Lands). From the map you can see that portions of the Rural Wooded designations are within the Big Beef, Seabeck, Stavis, Anderson, Dewatto and Tahuya Watersheds. It is possible that development could increase in these areas.

References

Errata sheet, - Kitsap County Comprehensive Plan (December 8, 2003)
Interim Forest Lands Map (attached)
Ordinance No. #311-2003

South Kitsap Industrial Area (SKIA) and Implementing Regulations:

The South Kitsap Industrial Area (SKIA) consists of an undeveloped multiple-parcel area north, south and east of the Bremerton National Airport. The sub-area boundary, will include approximately 2000 acres and will have two non-residential land use designations: Industrial and Business Center, both of which require Master Planning by sub-basin if not determined to be "ready for development" prior to final implementation. The SKIA Sub-area Plan and implementing regulations are available on the County website: Kitsap.gov.com.

Comments

Part of the SKIA falls within the upper Union River Watershed (See attached map). However, development within a Master Plan area shall comply with the substantive environmental standards identified in other regulations pertinent to the specific sub-area and KCC Title 19 (Critical Areas) in effect at the time a Master plan is prepared. The Union River supports Hood Canal summer chum, however according to the plan, low flows and natural obstructions prevent Union River salmonids from reaching the SKIA site.

References

Errata sheet, Kitsap County Comprehensive Plan (December 8, 2003)
Figure 8: Watershed Location Map

Ordinance No. #311-2003
SKIA Plan: Development Regulations

Kitsap County Stormwater Ordinance

A Site Development Activity Permit (SDAP) **ensures stormwater quantity and quality concerns** are addressed prior to site development. This is accomplished by:

- Requiring temporary erosion and sediment control plans for construction activities,
- *Requiring drainage construction plans and other stormwater documents for development,*
- Inspecting stormwater facilities during construction.

When is an SDAP required?

- When grading resulting in movement of 150 cubic yards or more of earth.
- When clearing land or grading any land that is:
  - on slopes steeper than 30% or
  - within the mandatory buffer/setback of a wetland, stream, lake, or Puget Sound.
- When connecting to a public storm drainage system.
- When clearing of greater than one acre occurs.
- When developing impervious surface greater than 5000 square feet.

What are impervious surfaces?

Typical impervious surfaces include driving surfaces and rooftops. Lawns are not considered impervious.

Comments

Kitsap County is required to comply DOE's revised stormwater manual. The County is currently exploring how to best achieve compliance with NPDES Phase II requirements.

References

Ordinance No. 199-1996 Stormwater Management Ordinance. Kitsap County Code Title 12.

Kitsap County Road Standards 2003

The Kitsap County Road Standards apply to all newly constructed or reconstructed public roads within a Kitsap County right-of-way or right-of-way to be dedicated to Kitsap County by any person, firm, corporation or other entity. All road plans submitted to the County for review and approval shall be consistent with the Standards and current or amended County standards and ordinances, including Land Use and Development Procedures, Stormwater Drainage and Critical Areas Ordinance.

Comments

The Kitsap County Public Works has adopted the ESA 4(d) compliant regional road maintenance quidelines. Kitsap County encourages the use of low impact development techniques, which conserve natural areas and minimize development impacts. The County Engineer will support deviations from adopted standards when low impact development techniques are employed without risk to the traveling public or critical infrastructure.

References

Kitsap County Road Standards, Kitsap County Department of Public Works. Adopted January 13, 2003. Kitsap County Code Title 11, Chapter 11.22.

Kitsap County Zoning Ordinance

The Zoning Ordinance classifies, designates, and regulates the development of land for agriculture, forest, mineral resource extraction, residential, commercial, industrial, and public land uses for the unincorporated area of Kitsap County. Further, it is the purpose of the ordinance codified in this title to provide for predictable, judicious, efficient, timely, and reasonable administration respecting due process set forth in this title and other applicable laws; and to protect and promote the public health, safety and general welfare.

Comments

References

Kitsap County Zoning Ordinance, Kitsap County Code Title 17 Zoning.

Kitsap County Shoreline Management Master Program

Uses, developments, and activities regulated by the master program are also reviewed pursuant to the Kitsap County Comprehensive Plan, the Washington State Environmental Policy Act, the Kitsap County Zoning Code (Title 17 of this code), the Critical Areas Ordinance (Title 19 of this code), the View Blockage Resolution (Chapter 17.450 of this code), and various other provisions of federal, state, and county law. The applicant must comply with all applicable laws prior to commencing any use, development, or activity. This applies to the above-referenced codes as amended in the future.

In order to plan and manage shoreline resources effectively, a system of categorizing shoreline areas is required for use by local governments in the preparation of master programs. The system is designed to provide a uniform basis for applying policies and use regulations within distinctively different shoreline areas. To accomplish this, a shoreline environment designation is given to specific areas based on the existing development pattern, the biophysical capabilities and limitations of the shoreline being considered for development and the goals and aspirations of local citizenry. Such information was compiled in a shoreline inventory and was utilized as the basis for the environmental designations. Critical areas located within shoreline jurisdiction shall be subject to regulation pursuant to the Kitsap County Critical Areas Ordinance (Title 19 of this code).

This master program classifies shorelines into five distinct environments (natural, conservancy, rural, semi-rural and urban and one sub-environment, conservancy-public lands) which provide the framework for implementing shoreline policies and regulatory measures.

The master program is designed to encourage, in each environment, uses which enhance the character of that environment. At the same time, local government may adopt reasonable standards and place restrictions on development so that such development does not disrupt or destroy the character of the environment.

The shoreline environmental designations are not intended to be land use designations. They do not imply development densities, nor are they intended to mirror the Comprehensive Plan designations. The system of categorizing shoreline environment designations is derived from WAC 173-26.

The basic intent of this system is to utilize performance standards which regulate activities in accordance with goals and objectives defined locally rather than to exclude any use from any one environment. Thus, the particular use or type of developments placed in each environment must be designed and located so that there are no effects detrimental to achieving the objectives of the shoreline environment designations and local development criteria.

This approach provides an "umbrella" environment class over local planning and zoning on the shorelines. Since every area is endowed with different resources, has different intensity of development and attaches different social values to these physical and economic characteristics, the environment designations should not be regarded as a substitute for local planning and land-use regulations.

Should a conflict occur between the provisions of this SMP or between this SMP and the laws, regulations, codes or rules promulgated by any other authority having jurisdiction within Kitsap County, the more restrictive requirements shall be applied, except when constrained by federal or state law, or where specifically provided otherwise in this SMP. (Res. 27-1999 Exh. A, Part I (§ 14), 1999)

Comments

Shoreline Buffers for Threatened Salmon: *All saltwater shorelines are designated as "Class I Wildlife Conservation Areas" and have a default buffer of 35 feet (with an additional 15 foot building setback). This default may be decreased based upon a site-specific Habitat Management Plan, or increased on sites with steep slopes.*

References

Shoreline Management Master Program, Kitsap County Code, Title 22

BAINBRIDGE ISLAND

Bainbridge Island Critical Areas Ordinance

The City's Critical Areas Ordinance (CAO) regulates land uses within the vicinity of streams, wetlands, fish and wildlife habitats, aquifer recharge areas, frequently flooded areas, and geologically hazardous areas. Each of these categories is discussed below. The CAO also includes provision related to agricultural lands, forest resources, and mining. The City does not have an independent critical areas permitting process, but rather integrates CAO review into other permitting procedures.

Streams & Wetlands

The CAO requires buffer widths for streams (measured from top of bank, or top of ravine bank if in a ravine) and wetlands (measured from delineated boundaries) as described below along the edge of streams and wetlands to protect the functions and values they provide. In addition of these buffer widths, a 15-foot building setback is required. Some limited uses are allowed within these buffers. The CAO also allows for limited reductions in buffer widths and buffer width averaging. When a property is encumbered by the CAO regulations so as to leave no reasonable use of the property, a reasonable use exception process can grant relief from CAO requirements. Adverse impacts to streams and wetlands are required to be mitigated. Class I streams, which on Bainbridge Island include only marine shorelines, are regulated by the City's Shoreline Management Master Program.

Stream Class	Buffer Width
I	50 feet
II	50 feet
III	50 feet
IV	25 feet
V	Top of bank
Voluntarily Enhanced	As determined by the category prior to enhancement

Wetland Category	Buffer Width
I	150 feet
II	100 feet
III	50 feet
IV	25 feet
Voluntarily Enhanced	As determined by the category prior to enhancement

Fish and Wildlife Habitats

The CAO regulates land and waters containing plant and animal species listed by the state or federal governments as threatened, endangered, or monitor species lists as well as species of local significance (as adopted by City resolution). The CAO requires that activities allowed within fish and wildlife habitat areas be consistent with the WA

Department of Fish and Wildlife priority habitat and species management recommendations and all applicable state, federal, and local regulations regarding the species.

Geologically Hazardous Areas

The CAO regulates geologically hazardous areas primarily as they relate to public health and safety. Some limited activities are exempt from some geologically hazardous area regulations. A 50-foot minimum buffer is required along the top, bottom, and edges of geologically hazardous slopes. This buffer can be reduced based on a professional geotechnical report showing that the proposal will not adversely impact the geologically hazardous area. Regulation of geologically hazardous areas along shorelines with respect to the environmental functions and values they provide in the nearshore is addressed in the City's Shoreline Management Master Program.

Aquifer Recharge Areas

The CAO regulates areas with high, moderate, and low aquifer recharge rates. For high aquifer recharge areas, the CAO requires the protection of both the quality and quantity of water transmitted to aquifers. For moderate and low aquifer recharge areas, the CAO requires the use of best available technology for on-site sewer systems and requires a conditional use permit for underground storage of petroleum products.

Frequently Flooded Areas

The CAO requires that development will not reduce the effective base flood storage volume within the 100-year floodplain.

Comments

The CAO is currently being updated consistent with the GMA requirements regarding the use of best available science and for providing special consideration for anadromous fisheries. Adoption will likely occur by the State's extended deadline of December 2005.

References

Bainbridge Island Municipal Code, Chapter 16.20

Bainbridge Island Shoreline Management Master Program

The City's Shoreline Management Master Program (SMMP) is a comprehensive plan for the marine waters surrounding Bainbridge Island and shorelands extending 200-feet landward of the ordinary high water mark. In addition to containing goals and policies related to shoreline use, conservation, recreation, economic development, public access, cultural/historic preservation, and others; the SMMP also regulates land uses, including residential, commercial, industrial, recreational, transportation, and utilities. The SMMP also attempts to strike the balance, embodied in the policies of the Shoreline Management Act, between protecting the nearshore environment and fostering reasonable and appropriate uses within the nearshore. All development with the jurisdiction of the SMMP is required to apply for and receive an authorization from the City and in some cases both the City and the WA Department of Ecology.

As stated above under the Bainbridge Island Critical Areas Ordinance, the SMMP is the principle program for protecting geologically hazardous areas, many of which are feeder bluffs and provide important ecological functions. The SMMP contains requirements for the protection of feeder bluff functions and alongshore sediment drift, including limitations on the development and redevelopment of bulkheads. The SMMP also contains requirements for protecting water and sediment quality. One of the tools for protecting water quality and nearshore habitat in the SMMP are Native Vegetation Zones (i.e. shoreline buffers). Native Vegetation Zones vary in width from zero-feet to 200-feet depending upon the land use and the shoreline environment designation, which range from Natural to Urban. The SMMP also has an Aquatic Conservancy shoreline environment designation, which limits use to basically passive recreation and covers most estuarine, mudflat, and eelgrass habitats around the Island.

Most of the Island is designated Semi-Rural and zoned for residential development, which requires a 50-foot wide Native Vegetation Zone. Native Vegetation Zones can be 100-feet to 200-feet wide in the Natural and Conservancy shoreline environment designations and as little as 0-feet wide for water-dependent development in the Urban shoreline environment designation. Table 4-1 in the SMMP summarizes Native Vegetation Zone widths for different uses in the various shoreline environment designations. The SMMP allows limited uses within the Native Vegetation Zone, which also vary depending on the shoreline environment designation.

Comments

The SMP is currently being updated consistent with the WA Department of Ecology Guidelines (WAC 173-26). Adoption anticipated to occur in 2006 or 2007. This is before the State's mandated deadline of 2011.

References

Shoreline Management Master Program, available at:
www.ci.bainbridge-isl.wa.us/documents/SMMP

Bainbridge Island Surface and Stormwater Management Ordinance

The City's Surface and Stormwater Management (SSWM) Ordinance regulates new development and redevelopment and illicit discharges to protect surface and stormwater quality and quantity. The SSWM Ordinance requires water quality and quantity control measures for development with over 800 square feet of impervious surfaces. The City's SSWM Ordinance emphasizes the infiltration of stormwater. The SSWM Ordinance utilizes the WA Department of Ecology 1992 Stormwater Management Manual.

Comments

The SSWM Ordinance is currently being updated and is expected to substantially adopt the 2001 Stormwater Management Guidelines for Western Washington, with some adaptation for local conditions and consistency with local regulations as well as some incorporation of low-impact design concepts. The City also has a stormwater facilities maintenance program which requires the inspection, maintenance, and repair of public and private stormwater facilities.

References

Bainbridge Island Municipal Code, Chapter 15.20 (SSWM Ordinance)
Bainbridge Island Municipal Code, Chapter 15.21

Bainbridge Island Road Maintenance Program

The City of Bainbridge Island created a road maintenance manual by modification and selective adoption of portions of the Tri-County Road Maintenance Manual to meet NPDES Phase II requirements. The Road Maintenance Manual includes elements on the following:

1. Regional Forum participation
2. Training
3. Compliance Monitoring
4. Emergency Response
5. Biological Data Collection
6. BMPs and Conservation Outcomes
7. BMPs for various Maintenance Categories
8. Routine Road Maintenance Practices
9. Road Maintenance Practices for Work in Critical Areas

Comments

At this point, the City has chosen not to pursue an ESA 4(d) exemption for its Road Maintenance Program.

References

Bainbridge Island Roads Maintenance Manual (2003)

Appendix J: Non-Regulatory Programs

[Needs to be reviewed for updates to COBI content.]

INCENTIVE PROGRAMS:

Open Space Land – Kitsap County and City of Bainbridge Island

Chapter 84.34 RCW **provides property tax relief** for properties that meet certain use requirements and will be kept in the open space program for a minimum of ten years. There are approximately 371 acres of open space lands on Bainbridge Island.

Open space land means:

(a) land zoned for open space or

(b) any land area, the preservation of which in its present use would:

1. conserve and enhance natural or scenic resources, or
2. protect streams or water supply, or
3. promote conservation of soils, wetlands, beaches or tidal marshes, or
4. enhance the value to the public of abutting or neighboring parks, forest, wildlife preserves, nature reservations or sanctuaries or other open space, or
5. enhance recreation opportunities, or
6. preserve historic sites, or
7. preserve visual quality along highway, road, and street corridors or scenic vistas, or
8. retain in its natural state tracts of land not less than one acre situated in an urban area and open to public use on such conditions as may be reasonably required by the legislative body granting the open space classification, or

(c) land that was previously classified as agricultural land that no longer meets the qualifications of said classification, or traditional farmland, not classified, that has not been irrevocably devoted to a use inconsistent with agricultural uses, and that has a high potential of returning to commercial agricultural. http://www.kitsapgov.com/assr/os-gen.htm

Agricultural Land - Kitsap County and City of Bainbridge Island

Chapter 84.34 RCW provides **property tax relief** for properties that meet certain use requirements. There are approximately 222 Acres of open space agricultural lands on Bainbridge Island.

Farm and agricultural land means either:

(a) land in any contiguous ownership of twenty or more acres (i) devoted primarily to the production of livestock or agricultural commodities for commercial purposes, (ii) enrolled in a federal conservation reserve program, or (iii) other similar activities as may be established by rule, or

(b) land of five to twenty acres devoted primarily to agricultural uses with a gross income from such uses equivalent to two hundred dollars or more per acre per year for three of the five calendar years preceding the date of application, or

(c) land of less than five acres devoted primarily to agricultural uses which has produced a gross income of $1500 or more per year for three of the five calendar years preceding

the date of the application. Agricultural lands shall also include farm wood lots less than 20 and more than 5 acres, land on which additions necessary to the production or sale of agricultural products exist, and land of one to five acres, which is not contiguous but which constitutes an integral part of farming operations as conducted on land qualifying as farm and agricultural land.
http://www.kitsapgov.com/assr/ag.htm

Timber Land - Kitsap County and City of Bainbridge Island

Chapter 84.34 RCW **provides property tax relief** for properties that meet certain use requirements. There are approximately 60 acres of open space timber lands on Bainbridge Island.
Timber land means land in contiguous ownership of five or more acres which is devoted primarily to the growth and commercial harvest of forest crops. If there is a residence on the parcel, a minimum one-acre building site is excluded from classification and it must be at least six acres in total area to qualify for this program. Twenty-acre and larger parcels may qualify for the Designated Forest Land Classification (Chapter 84.33 RCW).
http://www.kitsapgov.com/assr/timber.htm

Designated Forest Land - Kitsap County and City of Bainbridge Island

Chapter 84.33 RCW provides that **land of twenty or more contiguous acres primarily devoted to and used for growing and harvesting timber may be assessed, for purposes of property tax collection, based on the current use of the land**. However, if there is a residence on the parcel, a minimum one-acre building site is excluded from the classification. Smaller parcels may be eligible for the Timber land classification. There are approximately 500 acres of designated forest lands on Bainbridge Island.
http://www.kitsapgov.com/assr/dfl.htm

Hood Canal Salmon Sanctuary – WDFW/Kitsap County

This $7M effort has purchased 700 high quality acres of streamside habitat from willing sellers at market value in the Big Beef, Stavis, and Tahuya River watersheds. Funding comes primarily from state capital funds through the Washington Wildlife & Recreation Program.

CREP (Conservation Reserve Enhancement Program) - USDA NRCS

Federal-State conservation partnership program that targets significant environmental effects related to agriculture. **Uses financial incentives to encourage farmers and ranchers to enroll** in the Conservation Reserve Program (CRP) in contracts of 10 to 15 years in duration to remove land from agricultural production.
www.fsa.usda.gov/dafp/cepd/crep.htm

CRP (Conservation Reserve Program) - USDA NRCS

The CRP is a voluntary program that offers **annual rental payments and cost-share assistance** to establish long-term resource-conserving covers on eligible land. Reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. www.wa.nrcs.usda.gov/Cons_Assist/FarmBillPrgms.htm

EQIP (Environmental Quality Incentives Program) - USDA NRCS

Provides technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner.
www.wa.nrcs.usda.gov/Cons_Assist/FarmBillPrgms.htm

FIP (Forestry Incentives Program) - USDA

FIP **shares up to 65 percent of the costs** of tree planting, timber stand improvements, and related practices on non-industrial private forest lands. Eligible practices are tree planting, timber stand improvement, site preparation for natural regeneration, and other related activities. www.nrcs.usda.gov/NRCSProg.html#Anchor-Forestry

WHIP (Wildlife Habitat Incentives Program) - USDA

Provides financial incentives to develop habitat for fish and wildlife on private lands. Participants agree to implement a wildlife habitat development plan and USDA agrees to provide cost-share assistance for the initial implementation of wildlife habitat development practices. www.wa.nrcs.usda.gov/Cons_Assist/FarmBillPrgms.htm

WRP (Wetlands Reserve Program) - USDA

A voluntary program to restore wetlands. Participating landowners can establish conservation easements of either permanent or 30-year duration, or can enter into restoration cost-share agreements where no easement is involved.
www.wa.nrcs.usda.gov/Cons_Assist/FarmBillPrgms.htm

Planning Efforts

Kitsap County is involved with several planning efforts designed to improve natural resources.

Watershed Planning: Kitsap Peninsula

Since 1999 Kitsap County, along with dozens of other local governments and citizen stakeholders, has been at the forefront of a 6-year, $600,000 effort to plan for the future of Kitsap's water resources. The goal of this effort is "to develop a practical plan to sustainably manage water resources for humans, fish and wildlife."

Watershed Planning: Chico

Kitsap County, in partnership with the US EPA and Puget Sound Water Quality Action Team, is leading a citizen-based planning effort to determine how various "alternative futures" would impact the natural resources of the area. Upon completion of the citizen's work, the County will move into a sub-area planning process to update the Comprehensive Plan based upon the citizen's preferred alternative.

Kitsap County Habitat Restoration Efforts

Culvert Replacement: Undersized culverts block fish from reaching spawning and rearing habitat. Since the mid-1980's—long before state and federal funding was widely available—Kitsap County's Public Works Department has worked cooperatively with WA Dept of Fish & Wildlife (WDFW) to identify, prioritize, and replace County-owned problem culverts. This effort has improved access to over 195,000 square meters of habitat—that's about 75 miles of habitat(assuming streams average five feet in width)!

In the past fifteen years, the County's efforts have corrected 36 blockages—with five more projects in the pipeline. WDFW has said this effort is a statewide model of how local jurisdictions can improve fish passage.

Related to East Kitsap County:

Stream	***Road***	**Sq m Gained**
Barker	Barker Cr Lane	28,002
Barker	Nels Nelson	21,461
Puget Sound trib	Hoffman	21,294
Big Scandia	Scandia	12,435
Big Scandia (summer 2002)	Viking Way	11,110
Little Bear	Bethel-Burley	9,580
Steele trib (Summer 2004)	Gluds Pond	8,977
Johnson (Summer 2002)	Viking Way	7,975
Anderson (Summer 2002)	Anderson Hill	7,303
Salmonberry trib	Phillips	5,992
Dickerson	North David	5,899
Schutt (Illahee)	Illahee	5,280
Curley trib	Locker	5,073
Spring	Scenic Dr	2,678
Gamble	Rova	2,512
Gorst	Old Belfair Hwy	2,344
Dogfish trib	Pugh	1,691
Johnson	Cedar	1,565
Grata	Gold Creek	1,529
Dogfish	Little Valley	1,383
Curley trib	Sedgwick	1,056
Dogfish	Pugh	622
Thomas	Holly Beach Dr	486
Knapp	Silverdale Way	447
Beaver	Beaver Creek	Improvement
Beaver	Beach	Improvement
Chico	Erdlands Point	Improvement

Stream	***Road***	**Sq m Gained**
Chico	Golf Course	?
Chico	Taylor	Improvement
Clear (west fork)	Clear Creek	?
Curley	Locker	?
Dickerson	Taylor	?
Fragaria	Fragaria	Improvement
McCormick?	Old Clifton	?
Mosher	Central Valley	?
Mosher (design)	Tracyton Blvd	?
Olalla	Forsman	?
Total		**166,694**

Table 1: East Kitsap County Culverts Replaced Since 1988

County-facilitated efforts: In 1999 the state and federal governments began funding salmon restoration projects. Kitsap County has aggressively identified, prioritized and sought these funds to accomplish public and private restoration and preservation projects throughout the County. The table on the following page highlights several of these projects, including projects within Hood Canal summer chum habitat.

Funding Round	Amount Awarded	Local Match	Examples of Projects Accomplished
1999	406,250	82,781	UW Big Beef Spawning Channel (Kitsap Co/UW/ Hood Canal Salmon Enhancement Group)
Early 2000	560,950	208,500	Gorst Restoration (Bremerton), Gamble Restoration (Kitsap Conservation District)
IRT (2000)	120,109	6,922	Johnson Creek culvert (Kitsap Co), UW Big Beef (HCSEG)
Late 2000	3,083,050	765,150	Stavis Acquisition (Kitsap Co), Dogfish Estuary Bridge (Poulsbo), Nearshore Assessment (Bainbridge Island)
2001	3,154,000	1,854,393	Barker Acquisition (Kitsap Co), Gluds Pond @ Steele Cr (Kitsap Co)
Total	**7,324,359**	2,917,746	

Table 2: Projects facilitated by Kitsap County since 1999

INBRIDGE ISLAND HABITAT RESTORATION & PRESERVATION EFFORTS

Habitat restoration efforts on Bainbridge Island have been increasing during the past decade and will continue to with guidance from the recent Bainbridge Island Nearshore Habitat Assessment and improved coordination amongst salmonid recovery and conservation stakeholders.

Habitat Preservation: The City of Bainbridge Island, Bainbridge Island Park and Recreation District, Bainbridge Island Land Trust, as well as other organizations and individuals have been active in the preservation of habitat that benefits salmonids. The table below lists many, but not likely all, of these projects.

Year	Project	Cost
?	Meig's Park (67 acres w/ extensive wetlands and stream)	?
?	Grand Forest (240 acres w/forest and stream)	?
?	Gazzam Lake Park and Wildlife Habitat Preserve (318 acres w/ forest and wetlands)	?
1999-2003	Blakely Harbor Park (40 acres w/ estuary)	?
2002	Hall Property (12 acres w/ extensive wetlands, 600ft of shoreline)	$785,710
2002	Rockaway Beach (0.47 acres w/ rocky outcrops, 200ft of shoreline)	$585,000
2002	IslandWood Environmental Learning Center (255 acres w/ forest, wetlands, lake, and stream)	?
2003	Kane Property (1.03 Acres w/ 200ft of shoreline and adjacent to estuarine wetlands and stream – to be restored as estuarine wetlands)	$350,000
Ongoing	Cooper Creek Watershed (54 Acres w/ forest and stream)	?
Ongoing	Close Property (64 acres w/ forest and 560ft of shoreline)	$2.55 million ($1.45 million raised)
Ongoing	Wyckoff/Pritchard Park (22 acres w/ forest and 1800ft of restored beach)	$4.9 million ($4.75 million raised)

Fish Passage: The City of Bainbridge Island and others have been active in replacing or upgrading culverts and other artificial barriers to fish passage and have several projects currently underway. The table below lists many, but not likely all, of these projects.

Year	Stream	Road	Cost
1998 ?	Spring Book (Fletcher Ck)	Fletcher Bay Road	?
2002	Mac's Dam Ck	Blakely Avenue	?
2002	Unnamed (Manitou Beach Ck)	Private Driveway	?
2003	Issei Ck	Battle Point Drive	$100,000
2004 (under construction)	Cooper Ck	Municipal Water Diversion	$55,000
2005 (planned)	Manzanita Creek (@ 2 separate road crossings)	1. Peterson Hill Road 2. Bergman Road	$30,000 (design) ? (construction)

Habitat Restoration: In addition to correcting artificial barriers to fish passage, the City of Bainbridge Island and many other organizations and individuals have been active in restoring habitat that benefits salmonids. The table below lists many, but not likely all, of these projects.

Year	Project	Cost
1996	Schel-Chelb Estuary	
2002-2003	Vincent Road Landfill Remediation (remediated ? of unlined landfill that posed a threat to water quality)	?
Ongoing	Wyckoff/Eagle Harbor Superfund Remediation (clean-up and containment of heavy metals and PAHs)	?

Appendix K: East Kitsap Salmon Recovery Funding Board Projects

Kitsap County Lead Entity
Salmon Recovery Funding Board (SRFB) Funded Projects 1999-2003

Curley Creek Estuary Acquisition
Sponsors: Great Peninsula Conservancy
SRFB: $294,500
Sponsor Match: $52,000
Total Cost: $346,500
Status: Active

This project will preserve the Curley Creek estuary, by acquiring the lands (20 acres) that comprise its entire shoreline, the surrounding steep slopes, and 6 adjacent forested upland parcels.

The Curley/Salmonberry Creek system, one of the largest watersheds in south Kitsap, supports 5 species of salmonids: Chinook, coho, chum, steelhead and cutthroat. Its estuary is currently in a relatively natural state and in good condition, without any armoring or other development on its shoreline or slopes.

Estuaries are critical to the survival of salmon, providing rearing habitat for juveniles and refugia for adults and juveniles, and serving as crucial transition zones for smolts moving from fresh to salt water. Extensive alterations of estuaries and other nearshore areas by humans have seriously harmed these habitats and the species most dependent on them -- particularly chum and Chinook, both present in the Curley Creek estuary.

90% of the estuary lands are in one ownership and are for sale. If developed, the mature native forest will be replaced with residences, drainfields and impervious surfaces, with attendant impacts to the property's steep slopes, the shoreline and the estuary itself. The opportunity to protect the integrity of this estuary will be lost.

Acquiring these 20 acres for conservation and educational use will protect this estuary in its natural state and preserve it for use by the diversity of salmonids that use this system and adjacent nearshore areas.

Barker Creek Estuary Culvert Replacement
Sponsors: Mid Puget Sound Fisheries Enhancement Group
SRFB: $417,000
Sponsor Match: $83,000
Total Cost: $500,000
Status: Active

Historically, Barker Creek, which flows into Dyes Inlet of South Puget Sound, has always been an important stream for migration, spawning and rearing habits of Coho, Chum, Cutthroat, and

Steelhead. However, in order to meet the needs of a rapidly growing population, pipe culverts were installed and natural systems were interrupted while overlooking the criteria required for successful salmon runs. Years later, these same species, in addition to a limited number of Chinook still utilize this system. Chums of Barker Creek, a 501(c) (3) organization of stewards incorporated in 1993, has been successful in protecting the riparian zones by obtaining a SRFB grant (2001) to acquire parcels and conservation easements along the corridor. In addition, in 1999 Kitsap County Public Works removed two partial fish barriers upstream replacing them with bottomless concrete culverts. The one remaining culvert installed in 1939 at the estuary at Tracyton Blvd. is seriously deficient. As per "Action Recommendation #1. Replace the culvert at Tracyton Blvd. Crossing with a bridge of sufficient length to restore natural estuarine function up stream, to ensure unobstructed fish passage, and to restore natural sediment transport."(Limiting Factors Analysis 2000) Requests for funding for an aluminum bottomless culvert would address: the high tidal flows which cause velocity barriers for juveniles; and the low flows which limit the natural process for ideal fish habitat at all stages.

Carpenter Creek Estuary Restoration
Sponsor: Kitsap County Public Works
SRFB: 618,905
Sponsor Match: 1,609,493
Total Cost: $2,228,398
Status: Active

This project is located in Carpenter Creek estuary, which flows into Appletree Cove and drains into Puget Sound near Kingston, WA. This site is a large high quality estuary located in a critical position for migrating salmon from river basins throughout Puget Sound, including ESA listed Puget Sound Chinook. High rates of juvenile chinook and coho have been consistently encountered in commercial purse seine fisheries at Apple Cove Point near the restoration site. Other salmonids inhabiting Carpenter Creek include chum, coho, and cutthroat trout.

An undersized culvert at S. Kingston Rd. prevents adequate flow between the salt marsh and estuary and is a partial fish barrier. Significant portions of the marsh are filling in with sediment and freshwater wetland species are encroaching into the upper salt marsh. The 6' wide box culvert has also created large, deep scour holes at both ends of the culvert, trapping juvenile salmonids at low tide, where they become easy prey. The proposed project (Phase 1) would replace the S. Kingston Rd. culvert with a 70' single span bridge. The project would reestablish natural tidal flow to approximately 26.2 acres of estuary/saltmarsh habitat. As the last significant functioning estuary before leaving Puget Sound, Carpenter Creek Estuary plays an important role in the life history of resident and migrating salmonids.

Salmonberry Creek Restoration
Sponsor: Mid Puget Sound Fisheries Enhancement Group
SRFB: $288,600
Sponsor Match: $59,000
Total Cost: 348,500

Status: Active

The Salmonberry Creek restoration project will create a side channel that will flow through a series of ponds that mimic beaver pond rearing areas for coho and cutthroat. This channel will help to alleviate the adult stranding that takes place annually due to stream channelization and invasive plant species within this agricultural area. This stranding is occurring before the salmon reach their spawning grounds. The side channel will add approximately 5,000 lineal feet of rearing habitat and ease adult migration through this channelized segment. This project is expected to significantly increase the juvenile coho and cutthroat numbers and survival rates. This area is completely devoid of riparian vegetation, therefore, a riparian buffer will also be re-established for an average of 100 feet wide along the created channel and the area between the new channel and the existing creek. Conservation easements will be secured for long-term protection of the project and the resource.

Glud's Pond Fish Passage Improvements
Primary Sponsors: Kitsap County Public Works
SRFB: $830,872
Sponsor Match: $146,625
Total Cost: $977,497
Status: Active

WDFW has identified two culverts under Brownsville Hwy. and one adjacent to the Hwy. as complete barriers to chum, coho salmon and sea-run cutthroat trout, listing this project as Priority #2. In addition, a private flow diversion structure located at the upper end of the project site creates adverse conditions for migrating fry/smolt.

This project will realign the South Fork of Steele Creek through the Glud's Pond area. Both ponds will be removed and replaced with a meandering stream channel. The proposed channel will be located on the west side of Brownsville Highway discontinuing the use of both barrier culverts. The total channel length will increase by 40' and the width will average 12'.

A series of three log sills will be used to provide grade control and allow fish passage. The restored channel will have a gradient of 1.25 percent in the reaches without log sills and a slope of 5% in areas with log sills. Alternating grades will provide reaches where fish can rest. Small plunge pools will be located below each log sill with woody debris located at meander bends to enhance instream habitat.

The project is located in the vicinity of the Gluds Pond St./Brownsville Hwy. Intersection, in northeast Central Kitsap County. Project activities include design, land acquisition and construction to realign and restore the South Fork of Steele Creek with a meandering stream channel. Coho, chum salmon and sea-run cutthroat trout are the target species for passage.

Barker Creek Corridor Acquisition
Primary Sponsor: Kitsap County Parks and Recreation

SRFB: $761,000
Sponsor Match: $384,059
Total Cost: $1,145,059
Status: Active

Barker Creek, located on the Kitsap Peninsula, with headwaters at Island Lake flows primarily through large undeveloped and single family parcels, emptying into Dyes Inlet. This project will purchase 54 acres of conservation easements and 50 acres of real property along this stream corridor. The acquisitions constitute phases 2 and 3 of a 4-phase project which began with the purchase of Three Springs property in 2000. This parcel, considered a cornerstone of the project, contributes 13% of the total streamflow of Barker Creek. Purchase of the parcel was contingent on an agreement that the local community pursue protection of the entire riparian corridor. This proposal constitutes their effort to meet that requirement.

The proposal was initiated and developed by the Chums of Barker Creek, a 501(c)(3) organization incorporated in 1993 for the purpose of protecting and enhancing the salmon stream and its habitat. The area is heavily forested with cedar, Douglas fir, deciduous trees and a lush ground cover of rainforest vegetation.

Salmonids to benefit from the acquisition project include chinook, chum, coho, steelhead and cutthroat. Numerous migratory and resident birds utilize the corridor for nesting and feeding. Problems addressed by this proposal include effects of logging activities, a rapidly developing urban growth area, and increased taxes which could force some landowners to sell land they would otherwise prefer to preserve.

Dogfish Creek Estuary Bridge Restoration
Primary Sponsor: City of Poulsbo
SRFB: $1,430,000
Sponsor Match: $253,000
Total Cost: $1,683,000
Status: Complete

The City of Poulsbo will restore habitat and ecological functions to the upper Liberty Bay/Dogfish Creek estuary by removing the culvert that blocks saltwater exchange over 4 acres of tidelands. This shoreline/tideland complex is listed as critical habitat by NMFS to the recovery of Puget Sound chinook. The benefits gained from this project include recovery of the intertidal marine algaes, epibenthic production of primary juvenile salmon food items including copepods and amphipods and other invertebrates, and enhancement of associated habitat attributes. Dogfish Creek has runs of chinook, coho, and chum salmon and steelhead and cutthroat trout that will benefit form this project. This bridge project will tie into City Parks Department's passive use/salmon education trail and riparian property acquisition to protect and restore Dogfish Creek's salmon runs.

Bainbridge Island Nearshore Assessment

Primary Sponsor: City of Bainbridge Island
SRFB: $190,750
Sponsor Match: $14,250
Total Cost: $205,000
Status: Almost complete

This project will develop baseline physical and biological conditions of the natural and altered nearshore and estuarine features/habitats of Bainbridge Island's 45 miles of shoreline and 8 estuaries. The project will identify opportunities for habitat preservation and restoration and strategically prioritize them. The prioritized projects will effect recovery of listed chinook salmon, and other salmonid species that forage in the nearshore environment. The project will serve as an implementation tool in Bainbridge Island's land use policy development/modification. The project will help target shoreline public education and outreach programs. The project will characterize present and historic coastal drift (net shore-drift) patterns and the degree of discontinuity that shoreline modifications have created. Properly functioning conditions will be determined by tying coastal geology and biology (targeted fish species) and fisheries habitat distribution (quantity and quality). By assessing properly functioning conditions within drift cells such as feeder bluffs, substrate and riparian and aquatic habitat, this project will provide baseline information that is imperative to monitor the success of future preservation and restoration efforts. Due to the nature of the project, it is necessary for some activities to take place over four seasons. Partnership efforts are being discussed with King county nearshore Technical group, the Suquamish Tribe, and Kitsap County.

Key Peninsula Nearshore Salmon Habitat Assessment
Primary Sponsor: Pierce County Water Programs Division
SRFB: $178,500
Sponsor Match: $31,500
Total Cost: $210,000
Status: Complete

While it is known that estuaries and other near shore areas provide critical habitat for juvenile salmon, little is known about the habitat provided in specific areas. As part of its salmon recovery effort, Pierce County is proposing an assessment of salmonid habitat for the 144 miles of shoreline on Key and Gig Harbor Peninsulas, and Fox and Anderson Islands. This scientific assessment will provide the habitat information needed to develop a strategy for protection of remaining good habitat and restoration of other near shore salmonid habitat. The assessment is intended to be a rapid evaluation of the near shore areas, based on dividing the near shore into biologically and physically similar segments that can be distinguished in the field by a team of experts using a set of established criteria. The characteristics of these segments are evaluated in terms of their size and the habitat functions they support.
A team of experts familiar with the area is being assembled as a steering committee to help guide the work. The team will help Pierce County gather existing information, prepare a scope of work, assist a consultant to adapt an assessment methodology for local conditions, and then review the strategy document.

Barrier Prioritization Survey – WRIA 15
Primary Sponsor: Pierce County Conservation District
SRFB: 73,700
Sponsor Match: $48,000
Total: $121,700
Status: Complete

The Pierce Conservation District is in the process of completing an inventory of fish passage barriers in the andromous zone of East WRIA 15. Over 140 structures have been identified, with 56% of those determined to be barriers to fish passage. The next step is to prioritize those barriers, so higher priority projects can be adressed first. Prioritization is conducted following WDFW protocol as described in the Fish Passage Barrier Assessment and Prioritization Manual, and involves completing a field habitat survey of stream reaches above fish passage barriers to determine the quantity and quality of available habitat. Prioritization also considers species utilization, stock status for species utilizing the stream, and project cost. The result is a Priority Index (PI) score, which can be used to directly compare priorities of proposed projects. PI scores on some culverts identified by the Conservation District identified culverts in the Puyallup watershed have been used to rank projects for the 2000 construction season. After prioritization has been completed, the top ten barrier culverts will be addressed and preliminary design work will be completed. The prioritized list will also be available for Enhancement Groups, Conservation Districts, Cities, Counties, and other entities to use as a project list from which to work.

Minter Creek Watershed Fish Passage Restoration
Primary Sponsor: South Puget Sound Salmon Enhancement Group
SRFB: $665,882
Sponsor Match: $117,509
Total Cost: 783,391
Status: Active

This proposal employs a"watershed-based approach" to the identification and removal of five culvert barriers to salmonid migration in the Minter Creek watershed. This project will replace the blockages with structures that allow unimpeded fish passage for salmonids at all life stages. The project sites are scattered throughout the basin on Minter Creek and its two major tributaries, Little Minter Creek and Huge Creek, and were identified by the pierce Conservation District Culvert Inventory for the key Peninsula and Gig Harbor Watersheds (2001). Newly accessible habitat will be suitable for chinook, chum and coho salmon, steelhead, and sea-run and resident cutthroat trout. The Salmon and Steelhead Stock Inventory (SASSI) stocks in this basin are considered wild and mixed. This project will not only increase available spawning and rearing habitat, but will also allow downstream migration of streambed material, upstream movement of nutrients in the form of salmon carcasses, and will reduce the risk of road failure at aging and undersized crossing structures. A partnership may be formed with the Pierce Conservation District on some or all of these culvert replacements, as discussion has been initiated amongst new staff at each organization concerning long-term cooperation on such projects.

Dogfish Creek Estuary Restoration
Primary Sponsor: City of Poulsbo
SRFB: $450,439
Sponsor Amount: 695,400
Total Cost: $1,145,839
Status: Active

This project will restore 1,200' of estuarine shoreline and 13 acres of adjacent upland habitat along Dogfish Creek estuary within the City of Poulsbo. The project is located on Liberty Bay on the west side of central Puget Sound. This project is contiguous to a major 2nd Round SRFB project: removal of a culvert/construction of a bridge to restore over 4 acres of estuarine habitat. This shoreline/estuary complex is listed as critical habitat by NMFS for the recovery of Puget Sound chinook salmon and is a designated shoreline conservancy area by Poulsbo zoning. Dogfish Creek has important runs of chinook, coho, chum, steelhead salmon and searun cutthroat trout. This project is an integral component of the City Parks Department's future Salmon Park and planned Poulsbo Environmental learning Center.

The project will prevent development of a shopping center/office complex, restore native conifers and complex habitat structure to the shoreline, and restore the stream that crosses the property. The land will be designated as passive open space and set aside for habitat restoration. The public will access the property through designated, environmentally friendly trails to learn about habitat restoration, the ecological interaction between the terrestrial and aquatic (freshwater and estuarine) environments, and observe fish and wildlife.

Sinclair Inlet North Shore Estuary Restoration
Primary Sponsor: Port of Bremerton
SRFB:$318,307
Sponsor Match: $57,000
Total Cost: $375,307
Status: Funded

The purpose of this project is to restore to 1942 vintage the western most 1500 feet of the Northern shoreline of Sinclair Inlet and to increase the productive area of existing estuary by 1.7 acres. (See enclosed, photos, mapping, and drawings) Sinclair Inlet along with it's shoreline and estuary is a major passage way and nursery for Chinook, Coho, Chum Steelhead Salmon and Searun Cutthroat trout entering and leaving Gorst Creek. Several miles of the Northern shoreline have been hardened with riprap to accommodate SR 16 and PSNS railroad. The only portion of Northern shoreline between Gorst and Navy Yard City Interchange that can be restored is the subject of this grant request.

This project will include two phases. Both phases together will restore 1,820 feet of shoreline and 4.2 acres of estuary. Phase 1 of the project, the subject of this grant, will effect the cleanup of all 1160 feet of the existing shoreline, restore 620+ feet of shoreline, and create 1.7 acres of additional estuary. Phase two of the project will be the subject of further grant requests and will be completed when additional funding is available. (See enclosed chart for further site information).

The importance of estuarine and shoreline habitat to salmon productivity is well documented. There is a direct correlation between outgoing wild chinook smolt survival from Gorst Creek and the health, and configuration of the shoreline of Sinclair Inlet. Over 1000 wild Chinook spawn in Gorst Creek.

East Fork Rocky Creek Bridge Project
Primary Sponsor: Pierce County Public Works
SRFB: $330,696
Sponsor Match: $110,232
Total Cost: $440,927
Status: Complete

he existing barrier consists of an 8' x 8' concrete box structure supporting the Wright-Bliss road. The box structure outlet elevation is about 4 feet above the outlet streambed. The structure size restricts normal flood water flow causing a backwater and flooding effect. Extreme velocities through the box structure result in downstream erosion. The proposed correction is to remove the box structure and replace it with a 61-foot long single span, pre-cast, pre-stressed concrete bridge.

SW ESU Pierce County (KGI Watershed)
Primary Sponsor: Pierce County Conservation District
SRFB: $67,373
Sponsor Match: $52,230
Total Cost: $119,602
Status: Complete

All four projects will be conducted by Pierce Co, in cooperation with Peninsula Salmon and Pierce Co CD. Both projects involve replacing undersized or perched culverts at road crossings with appropriately sized, countersunk culverts or bridges. At each site, the fish-blocking culvert represents the limiting factor for salmon production by inhibiting adult and juvenile salmon migration for spawning and rearing.

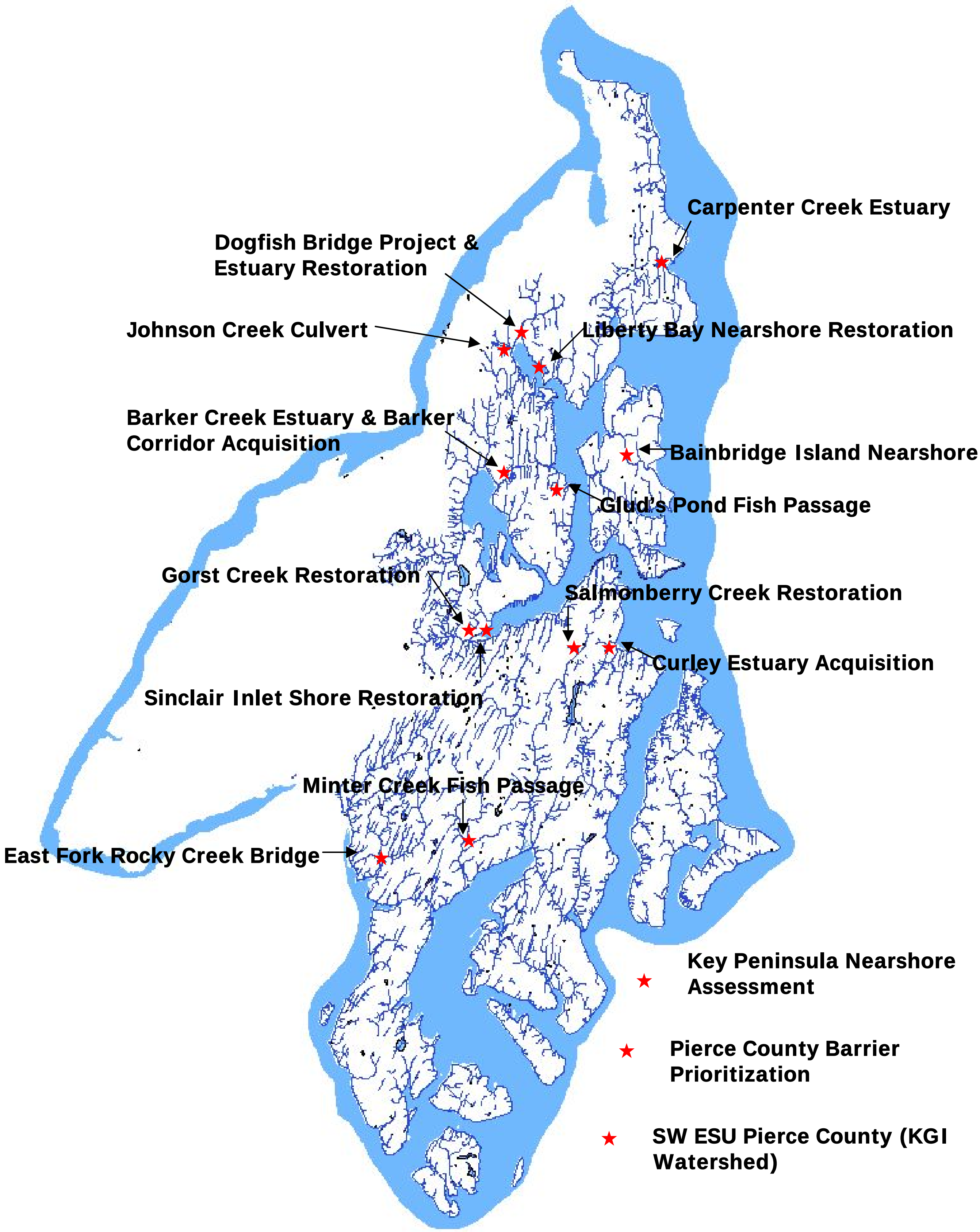
Minter Creek is one of two streams located in Pierce County west of the Narrows Bridge that is identified in the Washington State Stream Catalogue as a chinook bearing stream. The project would replace a private road crossing that consists of five separate small pipes with a small bridge. The result will be an additional 3.5 miles of stream accessible to salmon.

Herron Ck is a private road crossing with a history of erosion, siltation and fish-blocking. This site is impacted by natural sediment and gravel movement through the stream that exceeds the culvert capacity. The culvert is also at the bottom of a steep-gradient unpaved road, which contributes additional sediment. The project removes two 36" concrete pipes with a single arched culvert to accommodate flows & the opening of 1.4 miles of habitat to salmon.

Gorst Creek Restoration
Primary Sponsor: Bremerton Public Works
SRFB: $368,150
Sponsor Match: $166,500
Total Cost: $534,650
Status: Complete

The proposed Gorst Creek Restoration project removes approx. 720 ft. of stream from a concrete lined channel to restore segment to a natural configuration. Existing conditions: sparse shallow substrate, absence of pools, LWD, and natural vegetation. These conditions limit spawning and rearing, especially during high flow. Proposed restoration: 1) construct approx. 1000 ft. of naturally configured earthen channel; 2) place substrate suitable for spawning medium; 3) construct adjacent backwaters and wetlands; 4) place natural log, root wad, and rock structures; 5) Establish native trees and shrubs within riparian zone. Project benefits: augment and improve spawning areas; create new rearing and resting areas; enhance overall salmonid habitat and migration; restore natural riparian conditions. Salmonids utilizing this system include fall native chum, mixed stock coho, winter wild steelhead, cutthroat, and hatchery fall chinook (Grover Cr. stock).

Gorst Creek, on the Kitsap Peninsula SW of Bremerton drains approx. 5800 acres to Sinclair inlet in south Puget Sound. The project site and half of the upper watershed is owned by the City of Bremerton Water Utility. The habitat upstream of the project site is in excellent condition, with most of the basin being forested. The existing concrete channel was part of the original supply system and has been in place 60+ yrs. Design plans will be completed early 2000. Project is supported by the Kitsap PUD and the Suquamish Tribe.


Carpenter Creek Estuary
Dogfish Bridge Project & Estuary Restoration
Johnson Creek Culvert
Liberty Bay Nearshore Restoration
Barker Creek Estuary & Barker Corridor Acquisition
Bainbridge Island Nearshore
Glud's Pond Fish Passage
Gorst Creek Restoration
Salmonberry Creek Restoration
Curley Estuary Acquisition
Sinclair Inlet Shore Restoration
Minter Creek Fish Passage
East Fork Rocky Creek Bridge
Key Peninsula Nearshore Assessment
Pierce County Barrier Prioritization
SW ESU Pierce County (KGI Watershed)

Appendix L: Education and Outreach Programs

The following program descriptions are summaries of recent education and outreach efforts addressing salmon recovery in the East Kitsap Salmon Recovery Watershed Planning Area. The following list is representative and not meant as an exhaustive survey. It is important to note that education comes in many forms and this sampling intends to highlight some of the many avenues Kitsap County employs to educate about salmon in our area.

Kitsap County Public Works –Surface & Storm Water Management Education & Outreach Program (SSWM) (www.kitsapgov.com/sswm)

The Surface and Stormwater Management (SSWM) Program is a multi-agency program designed to address non-point pollution and flood control. The program was developed in response to the Federal Clean Water Act, the Puget Sound Water Quality Management Plan, and locally developed Watershed Action Plans. The core purpose of the program is to address non-point pollution, which has been identified as the primary source of pollution in Kitsap County's streams, lakes and marine waters. Non-point pollution is pollution that is carried from roofs, yards, streets and other land surfaces by stormwater runoff. SSWM Program funding supports programs implemented by the Kitsap Conservation District, Kitsap County Department of Community Development (DCD), Kitsap County Health District, and Kitsap County Public Works. The Program is administered by Kitsap County Public Works.

Kitsap County Department of Community Development, Natural Resources Division (http://www.kitsapgov.com/nr/)

The Natural Resources Department contributes to salmon recovery on multiple levels. The website provides up-to-date outreach materials and announcements for the general public. The department partners with multiple entities to educate the public and provide opportunities for involvement. Several efforts of note are included below.

Kitsap County Stream Team (www.kitsapgov.com/nr/nr/streamteam)

Kitsap Stream Team, a program of the Natural Resources Division and funded by the Surface and Stormwater Management Program focuses on getting citizens out to salmon habitat, monitoring their migrations and continually growing citizens' awareness of salmon in their local streams and achieving success in recovery efforts. Stream Team's mission is to coordinate and facilitate volunteer projects that protect and enhance the health and productivity of aquatic ecosystems by promoting reliable stewardship of county streams and wetlands by individuals, schools and community groups through outreach and public involvement.

As recorded in Stream Team's annual report: *Fifteen revegetation and stabilization projects were implemented throughout 2003. Of these, five were conducted in the Dyes Inlet watershed, two in the Curley Creek watershed, which drains into Yukon Harbor, and one in the Burke Bay, Sinclair, and Liberty Bay watersheds. 206 volunteers participated and contributed approximately 458 hours of time revegetating sites throughout the year. Clear Creek, which drains into Dyes Inlet, and Salmonberry and Cool Creeks, which drain into Yukon Harbor, required more than one site visit to complete the planting portion and monitoring. Additionally, one nearshore site along Sinclair Inlet was revegetated with the assistance of West Sound*

Technical Skills Center's Natural Resource classroom, with on-going efforts to restore and maintain the shoreline. Furthermore, maintenance was provided at two sites along Barker Creek as well as two county owned wetland mitigation sites. These sites, located at West Kingston Rd and the Central Kitsap Wastewater and Treatment Plant, are monitored annually to free the newly installed native vegetation from encroaching weeds and determine success of the project.

In a cooperative effort between the Stream Team, North Kitsap School District and Central Kitsap Kiwanis/Clear Creek Task Force, KC Surface and Stormwater Management, Kitsap PUD, a total of 18 watershed tours were conducted with well over 1,200 students attending throughout the spring season. Approximately 30 teachers and parent/adult chaperones provided assistance during the tours – involving tree planting, salmon release, benthic "bug" sampling, and water quality monitoring - at Clear Creek, Gamble Creek, and Buck Lake.

To celebrate Earth Day 2003, the Stream Team participated in the celebration festivities at Stillwaters Environmental Education Center in Kingston, on April 19. In addition, the Stream Team helped prep the area prior to the celebration by joining volunteers of SEEC in building a boardwalk that extends from the main office to the critical wetland area and estuary. In another supportive role, the Stream Team sponsored one Eagle Scout project that involved restoring the shoreline of Salisbury Park with walking paths and native vegetation.

Stream Team performed twenty-six public presentations and training workshops to youth and civic groups, schools and streamside property owners and community groups during this reporting period. Included were a stream monitoring and results workshop for the Cutthroat of Carpenter Creek, and training workshops for volunteers who participated in the Benthic Macroinvertebrate Biomonitoring Program and spawner surveys. Stream Team also participated in the planning and implementation of the Kitsap Water Festival at Olympic College and Salmon Tours, and helped coordinate the Kitsap County Fair Watershed displays. Additionally, the Stream Team conducted presentations at both of the Water Festival and Salmon Tours events, in which over 1,000 students and 60 participants, respectively, were given ideas for best management practices (BMP's) and the opportunity to learn about salmon and how to conserve our natural resources. Furthermore, the Stream Team conducted eight school visits throughout the North to the Central Kitsap School District to talk to teachers about water quality test kits and their proper usage as well as to present to the students water quality issues that are caused by human influence and what we could do to act more responsibly.

In a coordinated effort between Stream Team and the Washington Department of Fish and Wildlife (WDFW), Stream Team has for the 4th year collected information on summer chum by conducting spawner surveys of Harding, Thomas, Seabeck, Stavis and Little Anderson Creeks. This year, an "extra help" person was hired to help lead the spawner survey effort and help train three new volunteers who also participated in the fall chum and coho spawner surveys of two East Kitsap streams, coordinated through the Suquamish Tribal Fisheries Department.

Twenty-two volunteers were recruited and trained to conduct biological monitoring and spawner surveys donating over 180 hours. Volunteers collected benthic macroinvertebrate samples at twenty-one sites from nineteen streams between August 15 and October 15, 2003, including four replicate samples for QA/QC requirements. A lab analyzed the samples and the results will be *incorporated into a trend study, with results compiled from the efforts of Puget Sound Naval Shipyard and County Surface and Stormwater Management. A Centennial Clean Water Fund – Section 319 grant for $26,360.00 awarded to Stream Team by the Washington State Department of Ecology fund years 2001 – 2003 of the study.*

Community Salmon Fund

The Natural Resources Division also administers the Community Salmon Fund, which provides the means for landowners to actively participate in habitat restoration. In 2004 the Kitsap County formed a partnership with the National Fish and Wildlife Foundation to establish the Community Salmon Fund (CSF). The Community Salmon Fund offers grants of up to $5,000 to stimulate small scale, voluntary action by landowners, community groups, and businesses to support salmon recovery on private property. The goals of the CSF are to fund habitat protection and restoration projects that have a substantial benefit to watershed health by stimulating creativity and leadership among various constituencies to address conservation needs. Target constituencies that can be particularly helpful in salmon recovery include farmers, rural forest owners, suburban homeowners, and owners of businesses and industries. In 2004, The CSF awarded nearly $60,000 to 11 habitat restoration projects, with an additional total of $139,617 of matching funds contributed by award recipients. Grantees combine both restoration and community outreach as part of their projects, thereby accomplishing two major goals of salmon recovery.

Kitsap County Public Works –Surface & Storm Water Management Education & Outreach Program (SSWM) (http://www.kitsapgov.com/sswm)

Numerous successful programs are generated through the SSWM Program's education and outreach efforts. SWMM funded programs through Public Works include school programs, youth camps, tours, adult and youth educational events, and public outreach on stormwater issues. The program is currently completing installation of watershed boundary signage throughout the County.

Since 2003, the program has been working with local carwash fundraising efforts to reduce their contributions to stormwater loads. This innovative program introduces alternatives to the youth waving signs for charity carwashes and soaping and rinsing cars in parking lots areas, not meant to filter such loads. This program provides coupons from local carwashes that have proper mechanisms to manage their runoff so that organizations and schools can still offer carwashes as fundraisers, but the activity now can occur at proper facilities, thus reducing heavy soapy water loads to the stormwater system. The program works with six automatic car washes and three self-serve operations and is currently advertising this new program to the community.

In collaboration with numerous other agencies, schools and youth groups, SSWM education & outreach staff participates in World Water Quality Monitoring Day held each October. In 2003, over 30 groups and individuals participated in monitoring water quality and reporting results to an international database.

SSWM is a key player in producing the annual Water Festival, as outlined below. Additional youth education programming includes a salmon puppet show, and a salmon habitat enhancement activity for the Enviroscape watershed model that travels to classrooms in the County. Classroom presentations average about 30 per year in addition to the 1000+ students that are reached annually through the Water Festival. Students also have the opportunity to tour their own school's stormwater system. SSWM and Kitsap Public Utility District collaborate annually to present a Water Wonders Day Camp. The camp includes three days of watershed activities for kids ages 7-12, including games, art, exploration, stories and songs.

Kitsap Stormwater Consortium

The SSWM Outreach Program coordinates the Kitsap Stormwater Consortium. The Consortium includes representatives from nine government agencies around Kitsap County including local Navy establishments. The Consortium's goal is to increase the general public's knowledge of how their everyday activities contribute to water pollution in Puget Sound and provide them with information on how they can minimize their impact. Recent projects have included a successful pet waste issues and disposal education program. Other efforts include written publications, booths at outreach events and education with local veterinarian and pet supply retail outlets.

Kitsap County Public Works - Solid Waste (http://www.kitsapgov.com/sw/default.htm)

Public Works' efforts benefiting salmon are numerous. The department produces and disseminates literature on salmon friendly gardening, composting, native plants, and waste reduction and hazardous waste. Workshops, outreach to schools and the media and an extensive website keeps the public knowledgeable in ways they can lessen their impact on salmon through individual actions. New programs include mercury for digital thermometer exchanges in an effort to keep hazardous mercury out of the waste stream. The department is focusing on hazardous waste reduction outreach with new publications and programs and provides opportunities for Kitsap County residents to easily and properly disposes of hazardous waste items.

The Green Works program reaches out to the business community by providing free information, assistance and referrals to help Kitsap County businesses improve their environmental performance. Green Works staff educates business owners and mangers by focusing on waste prevention, recycling, energy conservation and water conservation.

A developing program, Climate Wise Kitsap will increase awareness of recommended actions to reduce greenhouse gas emissions. The concepts of sustainability and how business practices affect climate change will be introduced to Kitsap County businesses and residents.

Kitsap County Facilities, Parks & Recreation (http://www.kitsapgov.com/parks/)

The department now operates with an Integrated Solid & Hazardous Waste Management Plan (based on the Tri-County Model which was created in response to initial ESA salmon listings). The program reduces use of toxic chemicals and pesticides and phases-in least toxic control methods. Parks has interpretive signage on some County Parks properties. County Parks partners with Seabeck Alki Salmon Team, Stillwaters and the Chums of Barker Creek on properties near Kingston, Seabeck and Barker Creek. Working with Chums of Barker Creek to buy riparian habitat along the Creek with a long-term goal of interpretive work with schools.

Kitsap County Health District (http://www.kitsapcountyhealth.com)

The Kitsap County Health District Water Quality Program works to protect public health by identifying Kitsap County surface waters impaired by bacterial contamination, prioritizing them for clean-up, and conducting pollution identification and correction projects to identify and correct sources of pollution. The Pollution Identification and Correction Program (PIC) is a watershed-based data collection, education, and enforcement effort geared toward property owners/occupants. Failing on-site sewage systems are the primary vehicle for bacterial contamination. While agency's efforts are aimed at decreasing threats to human health, salmon habitat can benefit indirectly by improving water quality and educating landowners about individual impacts on water quality. Educational efforts are bolstered by extensive outreach techniques, volunteer opportunities and proactive educational workshops providing landowners the necessary tools for maintaining their on-site sewage system.

The agency offers repair fee waivers for extreme financial hardship; extensive technical assistance for failing on-site systems; proactive door-to-door educational talks; publications; and pre and post project public presentations, proactive educational programming. Other outreach includes press releases (i.e. PIC projects, water quality data reports, shellfish closures); media interviews; news articles; cable access spots; informational door hangers in PIC areas; public signs water quality hotline; mailings; contamination signage in aquatic areas (i.e. swimming, shellfish harvesting); and presentations and displays at water quality conferences.

Kitsap County Health District participates in the Kitsap Stormwater Consortium and co-produced and disseminates an excellent brochure on pet waste and provides pet waste education at outreach events and the media. Health District funded Mutt Mitt dispensers are available at public sites where pet waste is prevalent.

Kitsap Public Utility District (http://www.kpud.org/education/education.html)

The Public Utility District (PUD) offers wellhead protection workshops, school presentations, day camps, water conservation programs and wise-water gardening education and teacher education. The PUD Education Programs are offered for the citizens of Kitsap County to educate them about water resources. Programs focus on effect of human actions on water resources in the local watershed. Issues of water quality and quantity and solutions to non-point pollution in the local watersheds are highlighted. The agency provides suggestions for practices and volunteer activities that will ensure a continued supply of clean water. Also offered are community workshops for adults and programs for children including Junior Water Watchers and the Water Festival. Individual presentations or field trips on non-point pollution solutions, groundwater model demonstrations, stream insects as indicators of water quality and water story telling are available. Teacher workshops to train teachers to use water curriculum in their classrooms are sponsored. Educators may borrow groundwater and watershed models as well as curricula, books and videotapes are also available.

<u>Kitsap Conservation District</u> (http://www.kitsapcd.org/)

The Conservation District (CD) works upon request with landowners on best management practices for agricultural lands. The Conservation District works one-on-one with landowners on farm management plans, habitat restoration, fencing projects, incentive programs, reducing runoff to streams and nutrient management. The CD also produces workshops on manure management, mud management, native plants, and preparing your farm for winter. Outreach is also achieved through brochures, newsletters, special events, community meetings, demonstration sites and direct mailings to 5,300 landowners.

<u>Suquamish Tribe</u> (www.suquamish.nsn.us)

The Suquamish Tribe partners and collaborates in salmon education & outreach throughout the County. The Tribe work with state, local and community entities on research and restoration projects, school presentations, and works with volunteers on several salmon related projects. The Tribe partners with the City of Bainbridge Island on a long-term beach seining research effort involving volunteers to further research knowledge and community education in a citizen-based monitoring effort.

<u>City Of Bainbridge Island</u> (www.ci.bainbridge-isl.wa.us)

The City provides workshops, conferences, and other events about shoreline & watershed stewardship, stormwater management, habitat, pesticides, including co-sponsoring the annual Environmental Conference and the annual Salmon Homecoming. Educational literature and a website are produced and maintained to distribute information to residents. The City works with schools to provide salmon education activities, including participating in National Water Quality Monitoring Day; speaking to local school classes and participating in school field trips. Visible means of outreach include roadside stream & name signage and information booths at local community festivals, including annual 4th of July and Blackberry Festivals.

The Shoreline Stewardship Program incorporates workshops, technical and financial assistance, and project partnerships that lead to shoreline habitat restoration & enhancement. The Wildlife Corridor Network works with neighborhood groups to maintain voluntary riparian and upland wildlife corridors. The City sponsors the Watershed Council, an active citizen stewardship coordination body. In partnership with the Suquamish Tribe, trained volunteers assist with beach seining efforts to monitor fish populations. Volunteers also assist with restoration & enhancement projects, including riparian planning and noxious weed removal. Volunteers, including school and youth groups, help with stormdrain stenciling.

<u>Washington Sea Grant Program – University Of Washington</u> (www.wsg.washington.edu)

The Washington Sea Grant Program brings research-based University resources to bear on marine water quality issues in Kitsap County. Sea Grant provides education, information and technical resources to local governments, tribes, industry, schools, community groups and individuals. Working collaboratively with other Kitsap area agencies and organizations, the WA Sea Grant Program provides workshops, educational events, technical assistance and publications on water quality, nearshore habitat, stormwater, shoreline slope stabilization techniques, monitoring and restoration. Sea Grant coordinates local entities working on nearshore outreach efforts and encourages ongoing collaborative approaches. Sea Grant is a co-sponsor and co-chair of Water Festival, and helps fund and produce shoreline workshops and other educational efforts that benefit Kitsap County.

Puget Sound Action Team (www.psat.wa.gov)

Local liaisons form the outreach and technical assistance arm of the Action Team partnership to protect and restore Puget Sound. They provide local and tribal governments, citizens and businesses with tools and information such as model programs and ordinances, scientific research, educational materials and sources of funding. They build partnerships and support community-based education. Linked as a team, the liaisons bring a Soundwide knowledge of issues involving water quality, habitat, and shoreline and watershed planning. They offer practical solutions to deal with local problems.

Kitsap County WSU Extension (www.kitsap.wsu.edu)

WSU Master Gardeners maintain and provide extensive resources and education on native plants and least-toxic pest control methods. Native vegetation and water quality are key elements to healthy salmon habitat. Trained master gardeners create demonstration projects; staff outreach booths at garden stores and outreach events; and are a source of technical expertise on native plantings. Master Gardeners also serve as Master Composters and Master Weed Advisors accomplishing the goals of reducing the waste stream and toxics thus enhancing native plant habitat and salmon habitat. WSU also runs a Coached Forest Stewardship program enabling small forest owners to better steward their land as habitat.

Kitsap Environmental Education Programs Network (KEEP)

The Kitsap Environmental Education Programs (KEEP) Network is an informal bi-monthly gathering of representatives from private, non-profit and governmentally sponsored environmental education programs in Kitsap County. The purpose of these meetings is to exchange program, event and organizational information and build a relationship network that supports environmental education volunteers and programs throughout the county.

NON-PROFIT ORGANIZATIONS

Mid Puget Sound Fisheries Enhancement Group (MPSFEG) www.midsoundfisheries.org

The Mid Puget Sound Fisheries Enhancement Group works with communities to maximize self-sustaining salmon populations. They work cooperatively with private landowners, agencies, tribes and others to identify, design and implement projects that improve salmon habitat. MPSFEG operates in both King and East Kitsap. The group has an outreach and education program that works with local schools, sports groups and businesses to provide salmon education programs and restoration projects. Mid Sound puts on the annual Enumclaw salmon festival and participates in numerous Kitsap County events.

The Pogie Club

The Pogie Club is a community fishing club that is active in both restoration and education activities. The group feeds fish in the Gorst rearing ponds; participates in the Suquamish Tribe's outmigration study; and volunteers with WDFW seining efforts. The Pogie Club hosts an annual salmon viewing and open house at Jarstad Park.

Stillwater Environmental Education Center (www.stillwatersenvironmentalcenter.org/)

An independent, non-profit organization, Stillwaters runs numerous volunteer-driven projects and educational programs on limited resources and personnel. In partnership with Stream Team and the County biologist, Kitsap Conservation District, Washington Sea Grant Program, and others, Stillwaters works at the youth and adult levels to engender stewardship and action in their local region.

Stillwaters oversees the Cutthroats of Carpenter Creek that monitors water quality at four sites on Carpenter Creek and are expanding efforts to the Appletree Cove estuary. Volunteers conduct benthic macroinvertebrate monitoring, salmon spawning surveys and beach seining, all supervised by Kitsap County natural resources staff. Stillwaters is involved with numerous restoration projects on their own land and neighboring lands. Outreach and education are integral components to these projects that include culvert replacement for fish barrier removal, stream remeandering, and invasive plant removal and wetlands restoration.

Beyond monthly meetings, face-to-face outreach with neighbors, newsletters and special events, Stillwaters maintains and is expanding a nature center and classroom for integration into N. Kitsap School District programming. Their land includes boardwalks and trails incorporated within view of beaver ponds and wetlands and will soon include interpretive signage. At another site, the boardwalk leads to a salt marsh viewing platform. The Stillwaters trail system connects to trails throughout 200 acres of adjoining lands, providing citizens an unusual opportunity to explore and learn about their watershed and is connections to salmon habitat.

Other products include:

- Growing Green Residents & the EcoBinder – A household education program on septic, stormwater, and smart growth principles. The EcoBinder, an environmental resource guide, is distributed through workshops.
- EcoFest – Annual Earth Day celebration for the community, with 600 participants and over 40 educational exhibits and displays
- Sustainability Discussion Courses – Using a text from the Northwest Earth Institute for small group discussion over 8 or 9 sessions.
- Summer Classes for the Family – Various topics and schedules
- Community Outreach – Educational booth at Kingston Farmers Market and presentations for community groups
- Creek Tours – Public tours of watershed
- Newsletter & Newspaper articles – Educational articles in quarterly
- SW newsletter and monthly Kingston Community News
- Carpenter Creek Integrated Watershed Curriculum – including skill standards for Natural Resource Careers
- School-Based Estuary Curriculum
- Field Studies Design – On-site programs at Stillwaters
- On-Site Visits – teachers & classes from nearby schools using SW for field studies
- Programming with private schools, youth clubs and homeschoolers utilizing Integrated Watershed Curriculum
- Children's Summer Classes – multi-day classes for children from 4 -12, on various topics

<u>Chums Of Barker Creek</u> (www.kitsapgov.com/nr/nr/organizations/cbc.htm)

The overarching mission of the Chums of Barker Creek is the preservation of the Barker Creek ecosystem. The major educational goal of this non-profit focuses on the Three Springs Outdoor Classroom site. This 10-acre site was purchased by Kitsap County after much advocacy for the land on behalf of the Chums of Barker Creek. They are now in the process of obtaining grant money to design/create trails/viewing platforms that will protect the sensitive environment while allowing students to study in this natural area of bogs, springs, old growth trees, native plants. This endeavor is listed on the WA Dept of Ecology as a Success story.

The Chums of Barker Creek maintains an extensive mailing list to educate local citizens on activities and actions in the area that have bearing on the watershed. The group is a member of the Washington Environmental Council and the West Sound Conservation Council and the Fairgrounds Neighborhood Coalition. Board members have been represented on County Commissioner Appointed committees such as the Central Kitsap Community Council, the Open Space, Parks and Recreation Committee, the East Kitsap Salmon Recovery Committee, the WRIA 15 committee.

The Chums have acquired more than one million dollars for acquisition and restoration projects on Barker Creek. (SRFB funding for acquisition of sensitive environmental parcels total $761,000. A private foundation(Bella Vista) has donated $30,000 for acquisition of an additional parcel The County had previously spent at least $800,000 on replacement of culverts to improve salmon runs at Barker Creek and Nels Nelson Rds. The culvert at the estuary will be replaced because of SRFB funding. $30,000 from Bella Vista Foundation has been added as matching funding for the replacement of this culvert. Without the efforts of the Chums of Barker Creek, these improvements would not have been accomplished. The group is currently working to secure protection for additional areas of the watershed to maintain habitat in this rapidly growing part of the County.

Clear Creek Task Force (/www.clearcreektrail.org/)

This non-profit organization relies almost exclusively on volunteer efforts to accomplish their goals. Clear Creek Task Force, a partnership of numerous organizations, works on salmon enhancement projects; stream sensitive trail development with interpretive signage; creating an interpretive center, greenway preservation, and stream habitat restoration. They partner with Kitsap County Stream Team, the Central Kitsap Kiwanis and local schools on riparian restoration projects and salmon fry release programs.

Seabeck Alki Salmon Team (http://homepages.donobi.net/salmon)

This group focuses mainly on K-12 education work. Classroom presentations (by the student group members) on salmon habitat and recovery issues are tremendously successful and popular. The group helped obtain a site near Seabeck named Nick’s Lagoon, after a student Nick who helped discover salmon usage of the lagoon area there. Student meet weekly for discussions, outings, speaking engagements and art projects all woven together with the theme of stewardship and the positive outcomes that are possible through dedication and effort.

Liberty Bay Foundation (www.libertybayfoundation.org)

In collaborative partnership, this volunteer driven group works to restore habitat and water quality of Liberty Bay through native revegetation projects, water quality and macroinvertebrate monitoring, education and community stewardship.

West Sound Conservation Council (WSCC) (www.weave.org/wsccweb.htm)

West Sound Conservation Council is a coalition of conservation groups in the West Puget Sound dedicated to bringing the voice of environmental responsibility the public debate.

- Attain a balanced use of natural resources
- Rehabilitate damaged ecosystems
- Increase public commitment to environmental stewardship
- Achieve responsible public environmental policies

- Ensure enforcement of environmental regulations
- Hold public officials accountable as stewards of public resources

Member Organizations include:
Chums of Barker Creek, Hood Canal Coordinating Council, Kitsap Audubon Society, Kitsap Citizens for Responsible Planning, Kitsap Conservation Voters, Friends of Miller Bay and the North Kitsap Coordinating Council.

Kitsap Audubon Society (www.kitsapaudubon.org)

The Kitsap Audubon Society provides stewardship and learning opportunities for their members and the community at large. The group partners with other local groups to provide volunteers for restoration and maintenance projects and species and habitat studies. While mainly focused on avian issues, the group has regular educational events on an array of issues related to habitat and various species. Their website has information to involve their members in education and policy events in addition to listing field trips and volunteer projects. Kitsap Audubon Society is a professional member of the Marine Science Society.

Poulsbo Marine Science Center (www.poulsbomsc.org)

The Marine Science Center in conjunction with the Naval Undersea Museum, provide the Science Education Alliance outreach programs on salmon. Staff goes to the classrooms and provide the following units:

Grade 1 - Salmon, Egg to Adult: Students compare the life cycles of fish and insects. They observe, touch and draw adult salmon (non-living specimen) and observe preserved eggs and developmental stages of baby salmon. They sequence cutouts, matching an adult salmon and insect to their corresponding life cycles. In addition to the teacher, 4-5 volunteers are needed.

Grade 3 - Fish Body Language: Students observe how humans use their sense organs to choose and ingest food. They compare the external parts of a salmon with the human structure counterparts. Next, they investigate the internal organs of a salmon, contrasting the digestive system with that of humans. In addition to the teacher, 4-5 volunteers are needed for this lesson.

Extension Lesson – Salmon-Inside/Outside: Students observe the external parts of a salmon. They describe, discuss and label these parts, focusing on the unique characteristics of fish. They then examine the internal organs of the fish, locating and naming as many as they can, using handouts. They compare the fish's external and internal parts to those of humans.

The Marine Science Center also offers educational beachwalks; marine naturalist workshops for adults; outreach to programs to daycares, preschools, libraries and community groups; and children's summer day camps.

Bainbridge Island Land Trust (www.bi-landtrust.org)

Bainbridge Island Land Trust seeks to preserve and steward lands providing wildlife habitat and other significant conservation values. In addition to acquisition, the Land Trust engages landowners in discussions on ways to preserve their land, often through tax benefit programs. The group also co-sponsors the Environmental Conference and holds annual native plant sales. Land Trust volunteers actively maintain and restore land trust properties and participate in noxious weed removal.

The Great Peninsula Conservancy (www.greatpeninsula.org)

The Great Peninsula Conservancy, a Washington non-profit organization, is a regional land trust working to protect forever the rural landscapes, natural habitat and open spaces of our region. The Conservancy works with private and public landowners to protect habitat for salmon and other species through the acquisition or donation of conservation easements -- agreements in which the landowner agrees to restrict uses of the land that are incompatible with conservation of the habitat. Occasionally the Conservancy also purchases land outright in order to protect it, as recently occurred at the Curley Creek Estuary. Current acquisition or restoration projects related to salmon habitat in Kitsap County (the Conservancy also works in Mason and Pierce County) include Chico Creek, Curley Creek and Salmonberry Creek. The Conservancy also sponsors several community groups working on projects that benefit salmon habitat such as the Clear Creek Task Force and Friends of Miller Bay.

Kitsap Diving Association

Kitsap Diving Association spearheads an annual clean-ups of Sinclair Inlet in partnership with numerous local groups and agencies. The group promotes understanding and stewardship of local marine resources.

Kitsap TREES

Kitsap Trees cultivates a public awareness and appreciation of trees, fostering community forestry programs; emphasizing development of educational programs for schools and training for the public; stimulating increased funding for acquisition and maintenance of new and existing trees and forests; and promoting partnerships with private enterprise and residents in Kitsap County.

EVENTS

Kitsap Water Festival (www.kitsapgov.com/nr/waterfestival)

Water Festival is a one-day event that reaches 1,000 Kitsap County 4th graders each year since 1994. Students learn about the salmon life cycle; hydrologic cycle; habitat; pollution prevention; groundwater; watersheds; marine science and other pertinent topics. Federal, state, local agencies, non-profit organizations and the private provide presentations sector. This event provides students an unparalleled opportunity to learn about water and who use it in fun, educational environment.

The goals of Water Festival are to:

- Increase community awareness of the importance of water and natural resource issues
- Allow children to see the causes of and effects of pollution
- Teach children how their actions affect water quality
- Encourage children and their families to be good stewards of the environment
- Enable teachers to gain the skills and knowledge necessary to routinely include water education in their classrooms
- Teach children the concept and importance of water conservation
- Teach children the importance of preserving salmon and other habitat
- Introduce teachers to the latest in natural resource curricula and available local resources
- Give the community an opportunity to directly participate in the education of our youth
- Teach children the necessity of clean water

Kitsap Salmon Tours (www.kitsapgov.com/sswm/outreach.htm)

Each year, Kitsap County SWMM, Kitsap Public Utility District and the Washington Sea Grant Program partner with other agencies and organizations to produce the annual Salmon Tours. Held in the fall, this event provides an opportunity for participants to travel by bus to three or four different sites around the county to view salmon and learn about salmon. At each site, biologists meet with the group to discuss salmon, habitat, human impact, and how that particular site is important to salmon.

K-12 Education

A thorough discussion of all K-12 efforts specific to salmon is beyond the scope of this section. It is important to note the effort put forth by both the Kitsap County and Bainbridge Island schools to integrate salmon education into their curricula. Both partner with tribes, agencies and organizations to present educational units and lectures in the classrooms, field trips and hands on restoration and learning opportunities. Both school districts participate in the annual Water Festival. Individual teachers have full units on salmon utilizing salmon in the classroom, lessons and field trips. The integration of professional and volunteer community expertise integrated into the learning experience presented to Kitsap County school children relating to salmon is extensive and provides rewarding and meaningful educational experiences throughout the K-12 educational systems.

Appendix M: Scientific Basis for Ecosystem Management – Executive Summary

[*Modified from: The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management (Christianson et al. 1996); also cited in Spence (1996)*]

During this century, human populations and their demands for space, commodities, and amenities from ecosystems have increased by over five-fold. At the same time, evidence has mounted that there are limits to the stress such systems can withstand and still remain viable. Recent symptoms of ecological stress include the collapse of agricultural ecosystems in the southeastern United States and western "Dust Bowl," the spread of desert into rangeland in the Southwest, controversy over the management of old-growth forests in the Pacific Northwest, and the decline of marine fisheries. The impact of forest management activities on breeding habitat for migratory fishes is a dramatic reminder that the sustainability of many ecosystems depends on connections to other systems that do not respect individual ownerships, management borders, or international boundaries.

In recent years, sustainability has become an explicitly stated, even legislatively mandated, goal of natural resource management agencies. In practice, however, management approaches have often focused on maximizing short-term yield and economic gain rather than long-term sustainability. Several obstacles contribute to this disparity, including: 1) inadequate information on the biological diversity of environments; 2) widespread ignorance of the function and dynamics of ecosystems; 3) the openness and interconnectedness of ecosystems on scales that transcend management boundaries; 4) a prevailing public perception that the immediate economic and social value of supposedly renewable resources outweighs the risk of future ecosystem damage or the benefits of alternative management approaches.

Defining Ecosystem Management

Ecosystem Management is management driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function.

Ecosystem Management must include the following: *1. long-term sustainability as fundamental value, 2. clear, operational goals, 3. sound ecological models and understanding, 4. understanding complexity and interconnectedness, 5. recognition of the dynamic character of ecosystems, 6. attention to context and scale, 7. acknowledgment of humans as ecosystem components, and 8. commitment to adaptability and accountability.*

Sustainability. Ecosystem management assumes intergenerational sustainability (Lubchenco et al. 1991) as a precondition for management rather than an afterthought. Thus, the manager accepts the responsibility up front of managing in such a way as to ensure provision of the opportunities and resources we enjoy today to future generations.

Goals. Ecosystem management is as applicable to intensive utilitarian objectives as it is to the conservation of pristine wilderness; however, goals should not focus exclusively on "deliverables" such as board feet of timber, total catch, or visitor days. Goals must be explicitly stated in terms of specific "desired future trajectories" and "desired future behaviors" for the ecosystem components and processes necessary for sustainability. Furthermore, these goals should be stated in terms that can be measured and monitored.

Sound ecological models and understanding. Ecosystem management is based on sound ecological principles and emphasizes the role of processes and interconnections. Ecosystem management should be rooted in the best current models of ecosystem function. The name "Ecosystem Management" is confusing and has been taken by some to suggest that only science done at the ecosystem level is relevant. Ecosystem Management depends on research performed at all levels of organization, from investigations of the morphology, physiology and behavior of individual organisms, through studies of the structure and dynamics of populations and communities, to analysis of patterns and processes at the level of ecosystems and landscapes.

Complexity and connectedness. The importance of ecosystem complexity and the vast array of interconnections that underlie ecosystem function is certainly one of the most important lessons of ten decades of ecological research and natural resource management experience (Peterson 1993). Biological diversity and structural complexity of ecosystems are critical to such ecosystem processes as primary production and nutrient cycling. Complexity and diversity also impart resistance to and resilience from disturbance, and provide the genetic resources necessary to adapt to longterm change. Extractive or utilitarian management systems such as agriculture, aquaculture or plantation forestry that explicitly reduce complexity and diversity in order to increase productivity of particular ecosystem components may be deficient in key ecosystem processes and, therefore, less stable and less sustainable than intact and diverse natural ecosystems.

With complexity comes uncertainty. Some of our uncertainty regarding or lack of precision in predicting ecosystem behavior derives from the fact that we do indeed have more to learn. However, we must recognize that there will always be limits to the precision of our predictions set by the complex nature of ecosystem interactions and strive to understand the nature of those limits. Ecosystem management cannot eliminate surprises or uncertainty; rather, it acknowledges that, given sufficient time and space, unlikely events are certain to happen.

Recognition of the dynamic character of ecosystems. Sustainability does not imply maintenance of the status quo. Indeed, change and evolution are inherent characteristics of ecosystems, and attempts to "freeze" ecosystems in a particular state or configuration are generally futile in the short term and certainly doomed to failure in the long term. Crises associated with the management of our forests, fisheries, and wildlife have driven home the points that individual resources cannot be managed outside of the context of the full array of ecosystem components and processes and that the spatial and temporal domains of critical ecological processes are rarely congruent with the spatial boundaries and temporal schedules of management.

Context and scale. Ecosystem processes operate over a wide range of spatial and temporal scales, and their behavior at any given location is very much affected by the status and behavior of the systems or landscape that surrounds them (e.g., Levin 1992). There is no single appropriate scale or timeframe for management. Our ignorance of the importance of processes operating over ranges of spatial and temporal scale permitted society to define the boundaries of management jurisdictions with little or no reference to such processes. The importance of context in determining the behavior of ecosystems at a particular location has been the impetus for the advocacy of a "landscape approach" in terrestrial ecosystems (e.g., Noss 1983, Noss and Harris 1986) and the development of the "large marine ecosystem concept" (Sherman et al. 1990).

Humans as ecosystem components. Ecosystem Management acknowledges the role of humans, not only as the cause of the most significant challenges to sustainability, but as integral ecosystem components who must be engaged to achieve sustainable management goals (McDonnell and Pickett 1993, Peterson 1993). Human effects on ecosystems are ubiquitous. Although we should strive to reduce deleterious impacts, current trends in population growth and demand for natural resources will undoubtedly require more intensive and wiser management, particularly to support human needs in a sustainable way. Thus, identifying and engaging stakeholders in the development of management plans is a key ecosystem management strategy. Humans who are part of the ecosystems will, of necessity, define the future of those ecosystems.

Ecosystem management is a necessary but insufficient condition for achieving long-term sustainability. We must also address such daunting issues as human population growth, poverty, and human perceptions regarding the use of energy and natural resources.

Adaptability and accountability. As in all areas of science, current models and paradigms of ecosystem function are provisional and subject to change. Ecosystem managers must acknowledge that our knowledge base is incomplete and subject to change. Management goals and strategies must be viewed as hypotheses to be tested by research and monitoring programs that compare specific expectations against objective measures of results (Holling 1978, Walters 1986, Likens 1992).

Adaptability and accountability are central elements of ecosystem management. Managers must be able to adapt to the unique features or needs of a particular area and to inevitable temporal changes as well. Management must also be able to adapt to new information and understanding. To be adaptable and accountable, management objectives and expectations must be explicitly stated in operational terms, informed by the best models of ecosystem functioning, and tested by carefully designed monitoring programs that provide accessible and timely feedback to managers. Public understanding and acceptance of the experimental nature of all natural resource management are critical to the implementation of ecosystem management protocols.

Ecological Science as a Basis for Ecosystem Management

An ecosystem is defined as *"a spatially explicit unit of the Earth that includes all of the organisms , along with all components of the abiotic environment within its boundaries"* (Likens

1992). Ecosystems vary spatially and change with time, and no ecosystem is closed with respect to exchanges of organisms, matter, and energy.

Spatial and temporal scale are critical. Ecosystem function includes inputs, outputs, cycling of materials and energy, and the interactions of organisms. In order to monitor and manipulate these processes, scientists define ecosystem boundaries operationally. But boundaries defined for the study or management of one process are often inappropriate for the study of others; thus, Ecosystem Management requires a broad view.

Ecosystem function depends on its structure, diversity and integrity. Ecosystem Management seeks to maintain biological diversity as a critical component in strengthening ecosystems against disturbance. This challenge is compounded by the fact that diversity itself is a dynamic property of ecosystems. Thus, management of biological diversity requires a broad perspective and recognition that the complexity and function of any particular location is influenced heavily by the surrounding system.

Ecosystems are dynamic in space and time. Ecosystem Management is challenging in part because ecosystems are constantly changing. Over time scales of decades or centuries, many landscapes are altered by natural disturbances that lead to mosaics of successional patches of different ages. Such patch dynamics are critical to ecosystem structure and function.

While the earth's environment has changed dramatically over its four billion-year history, at no time have its ecosystems experienced change at the rate or in the manner at which it is occurring today. The rapidity of change and the novel character of many human impacts present special challenges to our ability to manage ecosystems sustainably.

Uncertainty, surprise and limits to knowledge. Ecosystem Management acknowledges that, given sufficient time and space, unlikely events are certain to occur. Adaptive management addresses this uncertainty by combining democratic principles, scientific analysis, education and institutional learning to increase our understanding of ecosystem processes and the consequences of management interventions, and to improve the quality of data upon which decisions must be made.

Humans as Ecosystem Components

Ecosystem Management is as concerned with managing human activities as with managing lands and waters. There is little doubt that the resources upon which humans depend are delivered from ecosystems in finite quantity. Even more daunting is the fact that the delivery capacity of these resources is not distributed uniformly across the globe or in patterns that necessarily correlate with human demand.

The mismatch between the scales at which humans make resource management decisions and at which ecosystems operate presents the most significant challenge to Ecosystem Management. Because management jurisdictions rarely match the domain of ecosystems, such mismatches often lead to irreconcilable resource disputes. But to say that ecosystem management is about managing human activities is not necessarily to call for increased regulation; rather, management strategies must deal constructively with such growing concerns as the rights of private property owners and local loss of jobs.

Science as a Model for Ecosystem Management.

Like scientists, managers and those they serve must accept that knowledge and understanding of ecosystem function and best management practice are provisional and subject to change with new information. Thus, management approaches should be viewed as hypothetical means to achieve clearly stated operational goals. In testing these hypotheses, monitoring programs should provide critical and timely feedback to managers.

Implementing Ecosystem Management.

Ecosystem Management requires application of ecological science to natural resource actions. Moving from concepts to practice is a daunting challenge and will require the following steps and actions.

Defining Sustainable Goals and Objectives. Ecosystem Management recognizes that in order to meet resource demands sustainably, we must value our ecosystems for more than economically important goods and services. *Sustainable strategies for the provision of ecosystem goods and services cannot take as their starting points statements of need or want such as mandated timber supply, water demand, or arbitrarily set harvests of shrimp or fish. Rather, sustainability must be the primary objective, and levels of commodity and amenity provision must be adjusted to meet that goal.*

However good our intentions, management that focuses on commodity resources alone, that does not acknowledge the importance of diversity and complexity, that is not aware of influences of and impacts on surrounding areas, and that concerns itself with short time frames is not likely to be sustainable in the long term.

Reconciling Spatial Scales. Implementation of Ecosystem Management would be greatly simplified if management jurisdictions were spatially congruent with the behavior of ecosystem processes. Given the variation in spatial domain among processes, one perfect fit for all processes is virtually impossible; rather, Ecosystem Management must seek consensus among the various stakeholders within each ecosystem.

Reconciling Temporal Scales. Whereas management agencies are often forced to make decisions on a fiscal year basis, Ecosystem Management must deal with timescales that transcend human lifetimes. Thus, while recognizing the need to make short-term decisions, and while acknowledging that unlikely events do happen, Ecosystem Management requires long-term planning and commitment.

Making the System Adaptable and Accountable. Successful Ecosystem Management requires institutions that are adaptable to changes in ecosystem characteristics and in our knowledge base.

But to view management as experimental is not to advocate capricious implementation of untried or avant garde actions. It is rather to acknowledge the limits of our understanding of even conventional management procedures to the complex array of ecosystem components necessary for sustained functioning.

The Role of Scientists in Ecosystem Management. Adaptive management by definition requires the scientist's ongoing interaction with managers and the public. Communication must flow in both directions, and scientists must be willing to prioritize their research according to which information is most critical. Scientists have much to offer in the development of monitoring programs, particularly in creating sampling approaches, statistical analyses, and scientific models. As our knowledge base evolves, scientists must develop new mechanisms to communicate research and management results. More professionals with an understanding of scientific, management, and social issues, and the ability to communicate with scientists, managers, and the public are needed.

Ecosystem management is not a rejection of an anthropocentric for a totally biocentric worldview. Rather it is management that acknowledges the importance of human needs while at the same time confronting the reality that the capacity of our world to meet those needs in perpetuity has limits and depends on the functioning of ecosystems.

Appendix N: Properly Functioning Condition Pathways & Indicators

(*Excerpted from: NMFS 1996*)

Note: These criteria will need to be reviewed and revised, as appropriate, for application to the size of Bainbridge Island subwatershed and the salmon species that occupy the Island's streams.

TABLE 1. MATRIX of PATHWAYS AND INDICATORS

(Remember, the ranges of criteria presented here are not absolute, they may be adjusted for unique watersheds. See p. 3)

PATHWAY	INDICATORS	PROPERLY FUNCTIONING	AT RISK	NOT PROPERLY FUNCTIONING
Water Quality:	Temperature	50-57° F[1]	57-60° (spawning) 57-64° (migration &rearing)[2]	> 60° (spawning) > 64° (migration & rearing)[2]
	Sediment/Turbidity	< 12% fines (<0.85mm) in gravel[3], turbidity low	12-17% (west-side)[3], 12-20% (east-side)[2], turbidity moderate	>17% (west-side)[3], >20% (east side)[2] fines at surface or depth in spawning habitat[2], turbidity high
	Chemical Contamination/ Nutrients	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches[5]	moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach[5]	high levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach[5]
Habitat Access:	Physical Barriers	any man-made barriers present in watershed allow upstream and downstream fish passage at all flows	any man-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows	any man-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows
Habitat Elements:	Substrate	dominant substrate is gravel or cobble (interstitial spaces clear), or embeddedness <20%[3]	gravel and cobble is subdominant, or if dominant, embeddedness 20-30%[3]	bedrock, sand, silt or small gravel dominant, or if gravel and cobble dominant, embeddedness >30%[2]
	Large Woody Debris	Coast: >80 pieces/mile >24"diameter >50 ft. length[4]; East-side: >20 pieces/ mile >12"diameter >35 ft. length[2]; and adequate sources of woody debris recruitment in riparian areas	currently meets standards for properly functioning, but lacks potential sources from riparian areas of woody debris recruitment to maintain that standard	does not meet standards for properly functioning and lacks potential large woody debris recruitment

	Pool Frequency channel width # pools/mile[6] 5 feet 184 10 " 96 15 " 70 20 " 56 25 " 47 50 " 26 75 " 23 100 " 18	meets pool frequency standards (left) and large woody debris recruitment standards for properly functioning habitat (above)	meets pool frequency standards but large woody debris recruitment inadequate to maintain pools over time	does not meet pool frequency standards
	Pool Quality	pools >1 meter deep (holding pools) with good cover and cool water[3], minor reduction of pool volume by fine sediment	few deeper pools (>1 meter) present or inadequate cover/temperature[3], moderate reduction of pool volume by fine sediment	no deep pools (>1 meter) and inadequate cover/temperature[3], major reduction of pool volume by fine sediment
	Off-channel Habitat	backwaters with cover, and low energy off-channel areas (ponds, oxbows, etc.)[5]	some backwaters and high energy side channels[5]	few or no backwaters, no off-channel ponds[5]
	Refugia (important remnant habitat for sensitive aquatic species)	habitat refugia exist and are adequately buffered (e.g., by intact riparian reserves); existing refugia are sufficient in size, number and connectivity to maintain viable populations or sub-populations[7]	habitat refugia exist but are not adequately buffered (e.g., by intact riparian reserves); existing refugia are insufficient in size, number and connectivity to maintain viable populations or sub-populations[7]	adequate habitat refugia do not exist[7]
Channel Condition & Dynamics:	Width/Depth Ratio	<10[2,4]	10-12 (we are unaware of any criteria to reference)	>12 (we are unaware of any criteria to reference)
	Streambank Condition	>90% stable; i.e., on average, less than 10% of banks are actively eroding[2]	80-90% stable	<80% stable
	Floodplain Connectivity	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession	severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly

Flow/Hydrology:	Change in Peak/ Base Flows	watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography	some evidence of altered peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography	pronounced changes in peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography
	Increase in Drainage Network	zero or minimum increases in drainage network density due to roads[6,9]	moderate increases in drainage network density due to roads (e.g., 5%)[6,9]	significant increases in drainage network density due to roads (e.g., 20-25%)[6,9]
Watershed Conditions:	Road Density & Location	<2 mi/mi^2[11], no valley bottom roads	2-3 mi/mi^2, some valley bottom roads	>3 mi/mi^2, many valley bottom roads
	Disturbance History	<15% ECA (entire watershed) with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area (except AMAs), 15% retention of LSOG in watershed[10]	<15% ECA (entire watershed) but disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area (except AMAs), 15% retention of LSOG in watershed[10]	>15% ECA (entire watershed) and disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; does not meet NWFP standard for LSOG retention
	Riparian Reserves	the riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in all subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural community/ composition >50%[12]	moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian reserve system, or incomplete protection of habitats and refugia for sensitive aquatic species (70-80% intact), and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better[12]	riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitats and refugia for sensitive aquatic species (<70% intact), and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural community/composition <25%[12]

[1] Bjornn, T.C. and D.W. Reiser, 1991. Habitat Requirements of Salmonids in Streams. American Fisheries Society Special Publication 19:83-138. Meehan, W.R., ed.

[2] Biological Opinion on Land and Resource Management Plans for the: Boise, Challis, Nez Perce, Payette, Salmon, Sawtooth, Umatilla, and Wallowa-Whitman National Forests. March 1, 1995.

[3] Washington Timber/Fish Wildlife Cooperative Monitoring Evaluation and Research Committee, 1993. Watershed Analysis Manual (Version 2.0). Washington Department of Natural Resources.
[4] Biological Opinion on Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). National Marine Fisheries Service, Northwest Region, January 23, 1995.
[5] A Federal Agency Guide for Pilot Watershed Analysis (Version 1.2), 1994.
[6] USDA Forest Service, 1994. Section 7 Fish Habitat Monitoring Protocol for the Upper Columbia River Basin.
[7] Frissell, C.A., Liss, W.J., and David Bayles, 1993. An Integrated Biophysical Strategy for Ecological Restoration of Large Watersheds. Proceedings from the Symposium on Changing Roles in Water Resources Management and Policy, June 27-30, 1993 (American Water Resources Association), p. 449-456.
[8] Wemple, B.C., 1994. Hydrologic Integration of Forest Roads with Stream Networks in Two Basins, Western Cascades, Oregon. M.S. Thesis, Geosciences Department, Oregon State University.
[9] e.g., see Elk River Watershed Analysis Report, 1995. Siskiyou National Forest, Oregon.
[10] Northwest Forest Plan, 1994. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. USDA Forest Service and USDI Bureau of Land Management.
[11] USDA Forest Service, 1993. Determining the Risk of Cumulative Watershed Effects Resulting from Multiple Activities.
[12] Winward, A.H., 1989 Ecological Status of Vegetation as a base for Multiple Product Management. Abstracts 42nd annual meeting, Society for Range Management, Billings MT, Denver CO: Society For Range Management: p277.

Appendix O: Bainbridge Island Level II Basin Assessment Recommendations

[*From: Kato and Warren et al 2001*]

The Bainbridge Island Level II Basin Assessment has added greatly to the understanding of the hydrogeologic characteristics of the Island. The report also has revealed several elements that need a greater amount of information to assess. The following recommendations are categorized in order of the assessment organization. Within each category, the recommendations are prioritized by order of perceived importance.

Surface Water

- A City of Bainbridge Island water resource coordinator position should be established to coordinate and deal with water resources issues including the implementation of recommendations made in this report.
- Establish one or more year-round, continuous streamflow gages.
- Establish an effort to annually measure the flow on all creeks under "low-flow" conditions during the late summer.
- Conduct a survey of surface water quality in coordination with local organizations, government agencies, tribes, and Bainbridge Island residents.

Hydrogeologic Characterization

- Continue and expand KPUD's well database on Bainbridge Island, with special attention to accurate well location and elevation.
- Standardize well monitoring procedures, continue and expand the well monitoring network through KPUD as established in the GWMP.
- Expand the well monitoring network to include more Sea Level Aquifer System wells in the Eagle Harbor area and one or more Glaciomarine Aquifer System wells.
- Continue and expand reporting by purveyors of monthly and yearly production amounts and coordinate the collection and reporting of water level, water quality, and production data.

Groundwater Quality

- Groundwater quality testing for selected parameters was conducted by the USGS in 1985 (Dion and others, 1988). This study found not seawater intrusion problems. Recent water quality results also indicate that currently there is no seawater intrusion problem. However, because of the susceptibility of the below sea level aquifers on Bainbridge Island to seawater intrusion, periodic rounds of water quality testing should be conducted to compare with the baseline established in the USGS study.
- This water quality survey should include the study of the nitrate levels of shallow ground water on the island.
- Older individual wells and septic systems are not regulated for maintenance or proper function after construction. An effort to regulate older well and septic systems should be attempted and would ferret-out failing systems, provide a baseline maintenance

program to extend facility life, provide valuable water resources information, and protect public health.

Land Use

- Coordinate land use policies with regard to aquifer recharge areas.
- Coordinate water resource issues with land use planning.
- Assess impacts of different types of land use on stormwater runoff.

Water Budget

- Refine runoff and baseflow rates by establishing year-round, continuous monitoring sites in streams on the Island.
- Establish a precipitation gage on the southern portion of Bainbridge Island.

Water Rights and Water Use

- Collect additional water production records from water purveyors on the island.
- Determine which water rights are valid (being put to beneficial use) and which water rights, especially surface water rights, are inactive.

Appendix P:

Shared Strategy for Puget Sound Summit Resolution

Shared Strategy for Puget Sound
Summit Resolution

January 26 and 27, 2005

WHEREAS,
all of us living in the Puget Sound region know first-hand its stunning beauty; the unique role it plays in our culture and the abundant resources it provides;

WHEREAS,
many of our most prominent businesses could be headquartered anywhere on the globe, but are here because they need bright, talented employees that want to live in areas with a high quality of life;

WHEREAS,
salmon, one of our regional totems and key indicators of environmental health, are in trouble and the threats to them are continuing to mount;

WHEREAS,
people in the Puget Sound region are committed to protect and restore the land and waters that define our quality of life, and we have a rich history of success in addressing natural resource challenges;

WHEREAS,
communities across the 14 major river basins that drain into Puget Sound have joined together through the Shared Strategy for Puget Sound to build on existing efforts and develop plans and actions to protect and restore our watersheds and the marine waters so people and salmon can flourish;

WHEREAS,
The treaty Indian tribal co-managers in western Washington have a unique cultural relationship with the salmon, possess a guaranteed right under the U.S. Constitution to harvest these sacred fish, and are fully committed to their recovery;

WHEREAS,
a comprehensive recovery plan and commitments for implementation are needed to maintain and increase funding from federal, state and local sources;

WHEREAS,
to be successful it's going to take the collective efforts of the entire Puget Sound region to improve and restore the Sound and its watersheds for generations to come;

NOW, THEREFORE BE IT RESOLVED
We commit to our common goal to recover self-sustaining, harvestable salmon runs in a manner that contributes to the overall health of Puget Sound and its watersheds and allows us to enjoy and use this precious resource in concert with our region's economic vitality and prosperity;

BE IT FURTHER RESOLVED
As participants in the Shared Strategy for Puget Sound, we are committed to the completion of a regional salmon recovery plan for Puget Sound by June 2005 that will set local and regional recovery goals and priorities, measures to achieve the goals and priorities, and a schedule and approach for addressing elements still under development.

BE IT FURTHER RESOLVED
That we are committed to create a 10-year detailed set of protection and restoration actions for each watershed and the marine waters that:

- protect habitat functions and ecological integrity through both regulatory and voluntary tools,
- improve habitat functions and ecological integrity to support sustainable fish populations,
- continue to manage harvest and hatchery programs to ensure healthy and fishable salmon populations,
- invest our resources wisely, and
- start us on the trajectory toward recovery.

BE IT FURTHER RESOLVED
That we are committed to creating and advocating for a unified, 10-year funding program that prioritizes the most important actions and level of investment across all Puget Sound and its watersheds and supports the regional and local structures necessary to adapt as we learn, ensuring effective and efficient implementation.

BE IT FURTHER RESOLVED
That we are committed to working collaboratively with all our partners and citizens over the long-term to recover salmon thereby improving the health of Puget Sound, and to building broad-based support for this approach.

We as individuals, affirm the Shared Strategy for Puget Sound Resolution on this 27th day of January, 2005

David Allen, Northwest Regional Administrator, U.S. Fish and Wildlife Service

Bill Baarsma, Mayor, City of Tacoma

M. C.

Norm Dicks, Representative, U.S. House of Representatives

Billy Frank, Jr., Chairman, Northwest Indian Fisheries Commission

Jeff Koenings, Director, Washington State Department of Fish and Wildlife

Darlene Kordonowy, Mayor, City of Bainbridge Island

John Ladenburg, Pierce County Executive

Bob Lohn, Regional Administrator, NOAA Fisheries

Patty Murray, Senator, United States Senate

Aaron Reardon, Snohomish County Executive

Joe Ryan, President, Washington Environmental Council

Ron Sims, King County Executive

Bill Wilkerson, Executive Director, Washington Forest Protection Association

Appendix Q: List of Recommended Salmon Recovery & Conservation Actions in Bainbridge Island Sub-Area

Note: Action items are grouped when similar, they are listed in no particular order, and Action ID does not indicate priority.

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
		Adaptive Management Actions (updates, monitoring, data gaps, etc)										
1	AM-1 AM-4	**Review & update the Bainbridge Island Salmon Recovery and Conservation Sub-Area Plan** ▪ Update at least every 7-years										
		Task: Review and update BI Sub-Area Plan in preparation for 2011 Comprehensive Plan, CAO, and SSWM updates ▪ Update subwatershed projects and prioritization when comprehensive subwatershed assessment is completed ▪ Update nearshore projects and prioritization following the update of the BI Nearshore Assessment (action 12) and completion of the SMMP update and mandatory shoreline restoration plan (action 9)	2009	NRT	.25	Unknown	High	All	All	All	All	GMA mandate: Provides best available science and basis for special consideration for anadromous fisheries
		Task: Review and update BI Sub-Area Plan in preparation for 2018 Comprehensive Plan, SMMP, CAO, and SSWM updates.	2016		.25	Unknown		All	All	All	All	
10	AM-2 AM-3	**Comprehensive Water Quality and Stream Flow Monitoring Program** ▪ Design & pilot funded by Centennial Clean Water Grant, no funding dedicated yet to long term implementation ▪ Ambient level monitoring of WQ in all watersheds and shoreline management areas; exceedance of standards would trigger further investigation ▪ Several continuous in-stream flow gauges will be installed and other streams will likely be monitored using portable equipment. Stream flow monitoring should be coordinated with groundwater monitoring (action 13) ▪ Coordinated with state and local agencies ▪ Will utilize volunteer stewards during implementation, as appropriate ▪ Implements part of recommendations of the BI Nearshore Assessment (Williams et al 2004, Appendix F)										
		Task: Design Monitoring Program • Review of historic data • Will try to be consistent with existing efforts & guidance, including WDFW/GSRO/SRFB/PSAMP monitoring recommendations	2005-2006	SSWM & SSP	.25	$198,650 (grant) $80,000 (COBI) Volunteers	High	All	All	All	All	
		Task: Pilot Implementation & Review ▪ Includes full monitoring effort for 1 year in at least 2 watersheds and shoreline management areas ▪ Protocols and methods reviewed and revised based on pilot ▪ Pilot Implementation Report	2006-2007		.25			TBD	-	TBD	-	
		Task: Full Implementation of program ▪ 11 subwatersheds (28 sq miles) and 9 shoreline management areas (53 miles)	2008 (begin) ongoing		.5 - 1	Unknown: Consultants Operations		All	All	All	All	

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
		▪ Scientific basis for recommended actions and state-mandated policy & regulation updates ▪ Integrate findings into bi-annual report (action 2)				Equipment Volunteers						
11	AM-3	**BI Sub-Watershed Assessment** ▪ Scientific basis for recommended actions and state-mandated policy & regulation updates ▪ Update at least every 7-years ▪ Integrate into future updates of East Kitsap Lead Entity Strategy and Kitsap Refugia Report										
		Task: Conduct Assessment ▪ Inventory and characterize subwatersheds (habitat, fish passage, hydrology, land use, etc) ▪ Assess ecological function/impairment ▪ Identify recommended actions to achieve goals and objectives ▪ Develop tools to evaluate project-level and planning-level cumulative impacts/benefits ▪ Integrate into 2009 Bainbridge Island Salmon Recovery and Conservation Sub-Area Plan ▪ Integrate as BAS into 2011 Comp Plan, CAO, and SSWM updates	2006-2008	NRT	.5 - 1	Unknown	High	All	All	-	-	
		Task: Update Assessment ▪ Integrate into 2016 Bainbridge Island Salmon Recovery and Conservation Sub-Area Plan update ▪ Integrate as BAS into 2018 Comp Plan, SMMP, CAO, and SSWM updates	2015		.25	Unknown						
12	AM-3	**BI Nearshore Assessment** ▪ Inventory and characterization of nearshore ▪ Assesses ecological function/impairment ▪ Scientific basis for recommended actions and state-mandated policy & regulation updates related to nearshore ▪ Provides tools to evaluate project-level and planning-level cumulative impacts/benefits ▪ Update at least every 7-years ▪ Integrate into future updates of East Kitsap Lead Entity Strategy and Kitsap Refugia Report										
		Task: Integrate into 2005-2007 SMMP Update (task 9)	2005-2007	SSP			High	-	-	All	All	
		Task: Update Assessment ▪ Update inventory, characterization, and assessment ▪ Integrate into 2009 Bainbridge Island Salmon Recovery and Conservation Sub-Area Plan ▪ Integrate as BAS into 2011 Comp Plan, CAO, and SSWM updates	2008		.3	Unknown						
		Task: Update Assessment ▪ Update inventory, characterization, and assessment ▪ Integrate into 2016 Bainbridge Island Salmon Recovery and	2015		.3	Unknown						

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
		Conservation Sub-Area Plan update ▪ Integrate as BAS into 2018 Comp Plan, SMMP, CAO, and SSWM updates										
#	AM-2 AM-3	**Salmon Population Monitoring** ▪ Evaluate and monitor salmon distribution (historical, existing, & potential future extent) and abundance. ▪ Work with WDFW, Suquamish Tribe, and watershed council to develop appropriate and efficient methods ▪ Review current beach seining efforts and revise as necessary to further evaluate salmon presence, distribution, and habitat associations/functions ▪ The best methods for distribution and abundance monitoring are likely spawner counts, snorkeling/electroshocking, & beach seining	Watersheds – Start 2006 Nearshore – Continue	NRT w/ Tribe & WDFW	<.1	Unknown	High	All	Many	All	All	GMA, CAO, SMMP
#	AM-2 AM-3	**Forage Fish Surveys** ▪ Existing surveys of forage fish spawning beaches were done sporadically and opportunistically, leaving large areas that were not surveyed as well as areas not surveyed over and extended period of time ▪ Recent comprehensive surveys in Jefferson, San Juan, and Island Counties have shown that significant data gaps are highly likely for spawning beach distribution ▪ Work with WDFW, the Suquamish Tribe, and the Shoreline Stewardship Program to design and conduct a comprehensive survey of beaches with suitable substrate for forage fish spawning activity ▪ Integrate results into 2008 Nearshore Assessment update (action 12)	2006-2008	SSP w/ Tribe & WDFW	<.1-.2	Minimal: Volunteers	High	-	-	All	Many	GMA, CAO, SMMP
#	AM-2 AM-3	**Sea Bed Mapping** ▪ Map the distribution and abundance of submerged aquatic vegetation and other species ▪ Map the distribution of subtidal substrate & bathymetry ▪ Integrate results into 2005-2007 SMMP Update (action 9) ▪ Integrate results into 2008 Nearshore Assessment update (action 12)	2006	SSP	<.1-.2	$50-100,000	High	-	-	All	All	GMA, CAO, SMMP
#	AM-2 AM-3	**Drift-Cell Sediment Budget Analysis** ▪ Map feeder bluffs, transport, and depositional zones ▪ Estimate a sediment budget for each drift-cell using historic and contemporary information ▪ Assess drift-cell function ▪ Integrate results into 2005-2007 SMMP Update (action 9) ▪ Integrate results into 2008 Nearshore Assessment update (action 12)	2006	SSP	<.1-.2	Unknown	High	-	-	All	All	GMA, CAO, SMMP
13	AM-3	**Groundwater Monitoring Program** ▪ Relevant to plan as far as relationship with in-stream flows ▪ Program should integrate with surface water monitoring, as appropriate ▪ Could be integrate into 2006-2008 subwatershed assessment	Unknown	PW	?	Unknown	High	All	-	-	-	GMA; CAO; SSWM; Watershed Planning Act; Level-II Basin Assessment;
14	AM-3	**Subsurface Geologic Mapping** ▪ Underway by UW/USGS ▪ Relevant to plan as far as relationship with in-stream flows ▪ Integrate into 2006-2008 subwatershed assessment	2004-2005	ENG	<.1	??? $180,000+	High	All	All	All	All	GMA; CAO; SSWM; SMMP; Watershed Planning Act; Level-II Basin Assessment;
15	AM-3	**Surface Geologic Mapping** (UW/USGS)	2000-2005	ENG	<.1	Unknown	High	All	All	All	All	GMA; CAO; SSWM;

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
		▪ Underway by UW/USGS ▪ Useful for identifying unstable slopes (nearshore feeder bluffs, possible risk of sedimentation to streams) ▪ Possibly useful for evaluating in-stream flow & interflow ▪ Integrate into 2006-2008 subwatershed assessment										SMMP; Watershed Planning Act; Level-II Basin Assessment;
#	AM-2 AM-3 AM-4	**Data Management** ▪ Coordinate and maintain on an interdepartmental basis ▪ Georeferenced when ever possible ▪ Compatible and shared with local and state databases	Ongoing	NRT	<.1	Minimal	High	-	-	-	-	
		Community Actions										
2	C-2 C-5 C-6	**Salmon Recovery and Conservation Report** Addressing the following: ▪ Are proposed actions getting implemented on schedule and within planning cost estimates? ▪ Are effectiveness and validation monitoring showing overall improvements or declines? ▪ Is the community supportive of efforts? ▪ Are there procedural impediments to implementing the plan? ▪ Are resources and funding adequate to implement the plan? ▪ Are there recommended or needed changes to the plan prior to next iterative update? These could be based on: o New scientific information, o Change in funding/resources (+/-), o Legal issues ➲ Preferably, this would be integrated into a larger bi-annual stewardship/indicators report for the Island's ecosystem, community, and economy.	(Bi-annually) 2006 2008 2010 2012 2014 2016 2018	NRT	<.1	Minimal	High					
3	C-5	**Community Survey** ▪ Measure community awareness and support for salmon recovery and conservation, in part, through the periodic Community Values Survey conducted by COBI.	(At least twice every seven years) 2006 2009 2012 2016	EXEC & NRT	<.1	Unknown	Moderate/ High					
4	C-1 C-2 C-5	**Annual Stewardship Event** ▪ Continue annual shoreline stewardship event and expand to include watershed stewardship ▪ Share stewardship successes/setbacks, discuss trends, build support for next steps ▪ Opportunity for guest speakers, booths, community building, community dialogue ▪ Coincide event with the release of the bi-annual report (task 2)	Annual	NRT & WC	<.1	Minimal	Moderate					
5	C-1	**Annual Salmon Homecoming event**	Annual	WC &	<.1	Unknown	Moderate					

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
	C-2 C-5	▪ Guided community tours of salmon habitat and projects ▪ Guest speakers on relevant current topics		NRT								
		Policy/Regulatory Actions										
6	E-1 - 5 C-3 - 4 C-7	**Comprehensive Plan Update** • Created Environment Element in 2004 • Working on indicators – 2005 (don't know if/how these will relate to salmon recovery yet)	2011 2018	PCD	1.5-2	Unknown	High, Required	All	All	All	All	GMA
7	E-1 - 5 C-3 - 4 C-7	**CAO Update** • Consistent with mandatory BAS requirement [cite RCW/WAC] • Consistent with mandatory special consideration for anadromous fish [cite RCW/WAC] • Include non-regulatory components to improve public awareness, provide community assistance, and encourage voluntary stewardship actions	2005 2011 2018	PCD	.75-1	Unknown	High, Required	All	All	All	All	GMA; Salmon Recovery Act
8	E-1 - 5 C-3 - 4 C-7	**SSWM Ordinance Update** • COBI is NPDES Phase-II city • Adopt 2001 Ecology Manual in 2005 • Encourage Low Impact Development and other green building techniques	2005 2011 2018	SSWM	.25-.5	Unknown	High, Required	All	All	All	All	GMA; Clean Water Act
9	E-1 - 5 C-3 - 4 C-7	**SMMP Update** ▪ Consistent with mandatory No net loss [cite RCW/WAC] • Consistent with mandatory Shoreline Restoration Planning [WAC 173-26-201(2)(f)], which will include appropriate aspects of this salmon recovery and conservation plan • Utilize Nearshore Assessment (task 12) as part of technical basis • Include non-regulatory components to improve public awareness, provide community assistance, and encourage voluntary stewardship actions	2005-2007 (Required by 2011); 2018	PCD	1-1.5	Unknown	High, Required	-	-	All	All	SMA; ESA; Salmon Recovery Act
#	E-1 - 5 C-3 C-7	**Public Benefit Rating System (Open Space Tax Relief)** ▪ Work with Kitsap County to review and revise the existing public benefit rating system, so that it can be reasonably applied to shoreline property and small lots.	2007-2008	PCD	<.1	Minimal	Medium/ High	All	All	All	All	
#	C-8	**Habitat, Harvest, & Hatchery Integration** ▪ Work with WDFW, the Suquamish Tribe, and others to ensure that local and regional salmon populations are recovered and conserved	Ongoing	NRT	<.1	Unknown	High	All	All	All	All	ESA; Salmon Recovery Act
		Nearshore Habitat Actions										
16	E-1 - 5 C-4 C-6 – 7 AM-1	**Shoreline Roads Study** ▪ Planning-level evaluation regarding alternative solutions to shoreline roads with chronic erosion, slide, and flooding problems. ▪ Study is planned to include: Manitou Beach Rd; Country Club Rd; Rockaway Beach ▪ Most of these roads are built on bluffs subject to erosion or fill that has buried intertidal, backshore, and marsh habitat as well as eliminated most, if not all, riparian vegetation. ▪ Use BI Nearshore Assessment to evaluate the benefits/impacts of alternative solutions and determine preferred options.	2005	ENG	<.1-.2	$100,000	High	-	-	BH EH MC Possibly: PW-BP RB-PM		

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
		➲ This study should give serious evaluation to long-term alternatives to armoring and other practices that would help restore and reduce risks to salmon habitat, such as: realignment/ relocation; reclassification to residential and possibly narrowing or even disconnecting through traffic. ➲ Additional shoreline roads that currently or could impact salmon habitat include: Eagle Harbor Drive; Crystal Springs Rd; Moran Rd; and Pt. White Drive. These roads should be integrated into the study or addressed in a similar fashion. ➲ Reducing or eliminating habitat impacts from shoreline roads are among the most significant (in both scale & benefit) habitat projects within the Bainbridge Island nearshore. ➲ Implementing high-visibility public projects becomes a model and motivator for voluntary projects on private property. ➲ Implementing public projects shares burdens and benefits among the community as a whole and allows for potential integration of public amenities, such as non-motorized travel corridors, open space, and shoreline access.										
#	#	**Moran Rd** ▪ The northern portion of Moran Rd is unstable and several slides have occurred during the last 2-3 years. This section of road runs parallel to one of the largest and most functional stream mouth subestuaries on the Island. A significant slide could create a complete blockage of the Murden Cove watershed and bury estuarine habitat. ▪ The BI Nearshore Assessment currently rates this area as "no impact," although the road fill was not accounted for and has likely reduced the extent of the floodplain and resulted in some impacts. ▪ A geotechnical assessment should be conducted and used to evaluate risks to habitat and human safety. ▪ Additional community issues should be evaluated, including traffic connectivity and the functional safety of the nearby intersection with Manitou Beach Rd/SR-305. ▪ Action alternatives should minimize the habitat risk while avoiding new long-term impacts.						MC	Murden Cove/Grisdale Ck	MC	3171	
#	#	**Country Club Rd** ▪ Realign road away from shoreline, remove bulkheading, and restore riparian vegetation. ▪ Integrate public shoreline access and recreation. Could be a good site for a community or public dock. ▪ Current BI Nearshore Assessment rating: xx (xx); ranked xx out of 201 ▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201		PW								
#	#	**Eagle Harbor Drive** ▪ ▪ Current BI Nearshore Assessment rating: xx (xx); ranked xx out of 201		PW								

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
		▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201										
#	#	**Manitou Beach Rd** ▪ ▪ Current BI Nearshore Assessment rating: xx (xx); ranked xx out of 201 ▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201		PW								
#	#	**Crystal Springs Rd** ▪ Realign road away from shoreline where possible, remove bulkheading and fill, nourish beach sediment, and restore riparian vegetation (while maintaining view corridors). ▪ Maintain view corridors of existing homes and improve non-motorized facilities along roadway to enhance recreational enjoyment and safety along this popular biking/walking shoreline roadway. ▪ Current BI Nearshore Assessment rating: xx (xx); ranked xx out of 201 ▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201		PW								
#	#	**Pt. Monroe Drive - Fringe Marsh Restoration** ▪ Fringe marsh in a lagoon like Pt Monroe, is a highly valuable habitat. Significant loss of fringe marsh has occurred in Pt Monroe due to residential and road development. ▪ Restore fringe marsh along the edge of Pt. Monroe Drive by removal of excessive road fill, sculpting to appropriate grade, and planting riparian vegetation in the remaining road shoulder. ▪ PW has agreed to do this project at the same time they are replacing the existing culvert and resurfacing the existing road surface.	2005	PW		?						
#	#	**Strawberry Plant** ▪ Remove significant fill and armoring in stream mouth subestuary and intertidal ▪ Remove 100 piles, mostly creosote treated wood, and small float ▪ Remove significant portion of large concrete area within the riparian area ▪ Restore stream mouth, intertidal, fringe marsh, and riparian vegetation ▪ Current BI Nearshore Assessment rating : Mod/High Impact (-0.725) ; ranked 186 out of 201 ▪ Estimated post-restoration rating: Low Impact (-0.175); ranked 21 out of 201 reaches ▪ With a new dock, the estimated post-restoration rating would be: xx (xx); ranked xx out of 201 ➲ The Strawberry Plant was acquired in 2004 for use as a park. Restoration is very compatible with likely park use. Restoration should be integrated into any park planning process.		SSP & BIPD				NEH	Weaver Creek	EH	3140	
#	#	**Waterfront Park Shoreline Restoration** ▪ Remove bulkhead, & nourish beach sediment. Design may require drift sill, unless boat ramp provides similar function. ▪ Current BI Nearshore Assessment rating: xx (xx); ranked xx out of 201 ▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201										
#	#	**Blakely Harbor Park Shoreline Restoration** ▪ Scenario 1: Remove low-tide fish passage barrier between jetties										

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
		▪ Current BI Nearshore Assessment rating: xx (xx); ranked xx out of 201 ▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201 ▪ Scenario 2: Remove south jetty, remove rip-rap bulkheading near north jetty, remove metal and wood debris on beach and tidelands ▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201 ▪ Scenario 3: Remove both jetties, remove rip-rap bulkheading near north jetty, remove metal and wood debris on beach and tidelands, restore and enhance marsh habitat ▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201 ▪ Scenario 4: Remove both jetties, remove concrete powerhouse, remove rip-rap bulkheading near north jetty, remove metal and wood debris on beach and tidelands, restore and enhance marsh habitat ▪ Estimated post-restoration rating: xx (xx); ranked xx out of 201										
#	#	**Schel-Chelb Estuary** ▪ Restore cattail wetland to brackish marsh, create and enhance wetlands (fresh and brackish) that connect to the existing estuary. ▪ Current BI Nearshore Assessment rating: xx (xx); ranked xx out of 201 ▪ Estimated post-restoration rating: xx (xx); xx out of 201		Owner								
#	#	**Abandoned creosote treated piles and drift wood** ▪ Remove unused creosote treated piles and drift wood from public lands and voluntary private lands.		SSP	<.1	Unknown: Contractor Disposal						
		Close Property										
#	#	Task: Acquisition & Public Access	In Progress, must complete by 12/2005	BILT	.3 - .6	$2.5 Million	High	GL	-	PW-BP	3528	
		Task: Property Management ▪ Invasive plant control ▪ Monitor	Ongoing	BILT								
		Manitou Beach Marsh (Kane Open Space Property)		SSP	.1-.2	Unknown	Medium					
		Agate Passage (SMA-1)										
		Port Madison Bay (SMA-2)										
		Rolling Bay – Point Monroe (SMA-3)										
		Murden Cove (SMA-4)										
		Eagle Harbor (SMA-5)										
		Blakely Harbor (SMA-6)										
		Rich Passage (SMA-7)										

Action ID	Objectives	Description	Status/ Timeframe	Lead[1]	FTE, Cumulative Est. (.1 = 5 wks FT)	Non-staff Cost	Priority	Subwatershed[2]	Stream Reach	Shoreline Management Area[3]	Nearshore Reach	Fulfills Recommendation of Anther Plan or Legal Mandate
		Point White – Battle Point (SMA-8)										
		Manzanita Bay (SMA-9)										
		Watershed Habitat Actions										
#	#	**Road Maintenance Program** ▪ Adopted a modified version of the Tri-County Road Maintenance Manual in 2003 ▪ Street sweeping/vacuuming is probably the most important action for reducing pollutant loads to salmon habitat ▪ Special procedures for working near sensitive habitats, like streams and wetlands ➲ Should be evaluated for sensitivity along shorelines	ongoing	SSWM		Unknown	High	All	All	All	All	Clean Water Act (NPDES Phase II); ESA; Comp Plan; SMMP
#	#	**Street and Stormwater Waste Material (Decant) Facility** ▪ Essential facility for treating contaminated road/ditch/catch basin spoils ▪ The City has been cleaning up the old decant facility, which did not meet current standards and is close to a salmon stream.	Clean up, design, build- 2004-2006 Operations- ongoing	SSWM		Need CIP $	High					
		Fish Passage Barriers ▪ [list NRT priorities]										
		Minimum In-Stream Flows ▪										

1 – Lead for implementing action:
NRT – COBI Natural Resource Team (COBI's interdepartmental natural resource program)
SSP – COBI Shoreline Stewardship Program
PW – COBI Public Works Department
SSWM – COBI Surface and Stormwater Management Program
PCD – COBI Planning & Community Development Department
ENG – COBI Engineering Division
EXEC – Executive Department
LRP – COBI Long-Range Planning Division
Tribe – Suquamish Tribe
WDFW – WA Dept of Fish and Wildlife

2 – Subwatersheds (From Kato & Warren 2001)
AP – Agate Passage

BH – Blakely Harbor
ED – Eagledale
FB – Fletcher Bay
GL – Gazzam Lake
MB – Manzanita Bay
NEH – North Eagle Harbor
PB – Pleasant Beach
PM – Port Madison
S - Sunrise
SB – South Beach

3 – Shoreline Management Areas (From Best 2003; Williams et al 2004)
AP – Agate Passage (SMA-1)
BH – Blakely Harbor (SMA-6)
EH – Eagle Harbor (SMA-5)
MB – Manzanita Bay (SMA-9)
MC – Murden Cove (SMA-4)
PM – Port Madison Bay (SMA-2)
PW-BP – Point White – Battle Point (SMA-8)
RB-PM – Rolling Bay – Point Monroe (SMA-3)
RP – Rich Passage (SMA-7)

Additional items to be integrated into Recommended Management Actions table above.

- Implementation & effectiveness monitoring
  - Habitat, education & outreach, etc
- Groundwater – stream flow impacts

<u>Nearshore Restoration (incomplete)</u>

- In addition to specific projects on public lands and willing private lands, summarize 10-yr restoration & enhancement targets (i.e. % increase, linear feet, square feet, etc) for each shoreline management area based on Nearshore Assessment that will require further effort to recruit willing property owners:
  - Water Quality
    - Septic system & marina surveys & correction assistance
      - Particular emphasis on Eagle Harbor, Fletcher Bay, Port Madison Bay, and lagoons
  - Riparian vegetation restoration & enhancement
  - Bulkhead & Groin removal
    - Prioritizing feeder bluffs and beaches with documented or likely forage fish spawning
    - Prioritize in marsh/lagoon areas where bulkheads are not necessary for erosion protection
  - Bulkhead and groin modification (i.e. pull back, convert to soft-shore, etc)
    - Prioritize where forage fish spawning is documented or likely and some form of stabilization is necessary to protect structures that cannot be moved back
  - Fill removal
    - Prioritize fill removal in marsh/lagoon geomorphic class

<u>Education & Outreach (incomplete)</u>

- Boats & marinas
- Nearshore property owners, particularly:
  - Riparian vegetation
  - Armoring
  - Overwater structures

- Stormwater management
- Fertilizers & pesticides

- Streamside property owners, particularly:
  - Riparian vegetation
  - Stormwater management
  - Fertilizers & pesticides
- Significantly improve printed and web-based educational and guidance materials

Fish Passage Barriers

- Inventory all fish passage barriers and prioritize corrections by 2007. Work with WDFW, the Suquamish Tribe, and the Mid-Sound Fisheries Enhancement Group. Use WDFW's Prioritization Index methodology. Fund in 2006.
- Continue with fish passage correction projects planned for 2005-2007:
  - Bergman Rd culvert (N. Fork Manzanita Ck),
  - Peterson Hill Rd culvert (Manzanita Ck), and
  - Fletcher Bay Rd/High School Rd culverts and channel (Springbrook Ck).
- By 2008, when a comprehensive inventory and prioritization of fish passage barriers is complete, refine long-term goals for correcting all fish passage barriers. Until that time, the following interim goals shall guide the City's level of effort:
  - Correct a minimum of two fish passage barriers per year, up to a local cost share of $300,000 or another limit as set by the City Council.
  - Correct all barriers that completely block fish passage by 2011.
  - Correct all fish passage barriers by 2020.
- Fully integrate fish passage barrier corrections into planning and prioritization of capital projects (i.e. annual CIP process) by 2008. Begin process by mid-2007 for 2008 budget.
- Avoid creating new fish passage barriers and adversely impacting properly functioning conditions by avoiding construction across fish habitat. When necessary, conservatively design fish habitat crossings (e.g. oversized culverts and bridges or overhead and tunneled utilities).
- Time salmon habitat projects with associated and nearby fish passage barrier correction projects in order to efficiently utilize local funds and maximize the potential to win grants and other external funds.
- Give priority to correcting partial barriers and restoring salmon habitat on streams with salmon populations at risk of extirpation if they will reduce the risk of extirpation.
- Work with WSDOT to inventory, prioritize, and correct fish passage barriers along SR-305. Currently there are three culverts identified as partial barriers to fish passage. SR-305 should be thoroughly inventoried for other fish passage barriers. The City's responsibilities regarding these fish passage barriers should be determined before the City takes responsibility for SR-305, and if necessary, an agreement should be made between WSDOT and the City regarding the correction of fish passage barriers.

Habitat Conservation

- Coordinate the City's Open Space Commission with the City's Natural Resource Team to evaluate potential property acquisitions for benefits to salmon as well as watershed and nearshore ecosystems.
- Where possible, utilize open space funds and property acquisitions to leverage external grant funds to maximize the potential of local funds for habitat conservation and to
- Utilize the Bainbridge Island Nearshore Assessment to prioritize habitat conservation efforts in partnership with the COBI Open Space Commission & BI Land Trust.
  - Prioritize areas that have lower impact and support ecosystem processes (i.e. feeder bluff) or important habitat (i.e. pocket estuary)
  - Prioritize non-conforming lots that could result in unmitigated impacts (i.e. septic, bulkhead, stormwater, etc)
  - Prioritize areas with development pressure
  - Use a reserve fund for opportunistic acquisition in priority areas
  - Attempt to use less-than-fee-title conservation methods before fee-title acquisition

Appendix R:

GROVERS CREEK HATCHERY FALL CHINOOK: REARING HISTORY, FISH HEALTH, CODED WIRE TAG STUDY RESULTS, AND OBSERVED ADULT SIZE TRENDS

GROVERS CREEK HATCHERY FALL CHINOOK: REARING HISTORY, FISH HEALTH, CODED WIRE TAG STUDY RESULTS, AND OBSERVED ADULT SIZE TRENDS

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Introduction

Fall chinook have been hatchery reared in Washington since 1895, originally to mitigate for declining local catch and more recently to supplement natural production. Hatchery survival and fishery contribution rates have varied greatly as we have learned the intricacies of nutrition, fish health, stock genetics, and the natural and artificial environments' influence on fish behavior. Hatchery cultural practices continue to evolve as we incorporate new knowledge into our programs.

This paper reviews the Suquamish Indian Tribe's (SIT) fall chinook salmon enhancement program at Grovers Creek Hatchery. The program began in 1978 with the cooperation of the Washington Department of Fish and Wildlife (WDFW). The program was designed to restore Tribal chinook fisheries on the west side of central Puget Sound, adjacent to the Kitsap Peninsula. There are no native runs of fall chinook in this area.

Grovers Creek Hatchery received eyed eggs from WDFW of Soos Creek origin between 1978 to 1981. Adults returning to the hatchery in 1982 represented the first mixed age class used to supply 100% of the hatchery broodstock. Eggs surplus to SIT needs are delivered to WDFW for in-state programs, or sold when the in-state production goals are attained. The hatchery annually releases an average of 537,000 smolts that are in proportion to the adult broodstock return timing. Off-station rearing ponds were established, beginning in 1982 that are supported by the hatchery broodstock. The chinook smolts released from the three off-station rearing sites are represented in proportion to the adult run timing spectrum. WDFW provides the balance of chinook fry to meet off-station production goals in years Grovers Creek Hatchery broodstock returns are low. The SIT terminal fishery does not target the hatchery broodstock, focusing exclusively on the off-station rearing ponds. Grovers Creek Hatchery fall chinook have been coded wire tagged annually since brood year 1981.

Hatchery Management

Adult fall chinook salmon return to Grovers Creek Hatchery in mid-September and continue until the end of October. The peak of the return is the last week of September and first week of October. The adults return to the same earthen pond in which they were reared. Grovers Creek Hatchery's water supply limits the incubation capacity of fall chinook eggs to two million. The SIT program goal is 3.2 million eggs and is satisfied by WDFW incubating one million eggs at Minter Creek Hatchery and the Mid Sound Fisheries Enhancement Group incubating one quarter million eggs at Burley Creek Hatchery.

Grovers Creek adult fall chinook are spawned throughout the entire run. Spawning protocols involve stripping eggs from individual females into a small bucket, with sperm from two different males added. The second male is used to increase the probability that the sperm is viable. Jacks (2-year-old males) are generally separated from the adults used for broodstock, and those, which are spawned, contribute to less than 5% of the spawning population. Stream water is introduced to the bucket and the rinsed eggs are transferred to a 5 gallon bucket for water hardening in a 100 ppm iodophor solution for one hour. Chinook eggs that are transferred off-station are delay-fertilized with five males stripped into individual ziplock bags and thirty females stripped into individual bags inside 30 gallon buckets. All delayed gametes are transferred on ice.

The water-hardened eggs are transferred to heath trays or deep matrix boxes for incubation. Pathogen and silt-free 10^{o} C groundwater is used to incubate all Grovers Creek Hatchery fall chinook eggs. A 1:600 formalin treatment is applied three times a week via a 15 minute pumped treatment. The fungus treatment is discontinued at 425 temperature units, after shocking and egg picking but before the eggs hatch. Swim-up fry are ponded indoors into circular ponds for initial feeding, then transferred outdoors into two ponds for rearing with ambient temperature Grovers Creek water. The chinook fry are introduced into the ponds throughout January. The pond temperature averages 2^{o} C during January, slowing the growth rate of the early spawned chinook fry so they are not significantly larger than the chinook fry spawned late in the run. Grovers Creek flow averages 2,500 gpm in January - February, but diminishes to 300 gpm by late May.

Grovers Creek Hatchery chinook fry are reared in two random groups, with half ponded into a 9,100 ft^3 cement pond and the other half ponded into a 29,000 ft^3 unlined earthen pond. Approximately 200,000 of the 9,100 ft^3 group are coded wire tagged (CWT) at 2.2 gms. The CWT fry are released into the earthen pond after tagging and are reared with their untagged cohort. A moist diet is fed at the manufacturers suggested rate, with changes in pellet size dictated by the smallest fry in the population. No grading or handling of the fry, except for weight samples and fish health inspections, occurs for the duration of their freshwater rearing. Outlet screens are removed from the pond when the chinook reach 5 gms to allow volitional outmigration, typically in late April. The station target is to produce a 9 gm smolt, and feeding continues until late May. A smolt counter is positioned in the fish ladder. The rearing pond is 100 meters from saltwater at high tide.

Avian predation is controlled by the use of a 5 cm knotless polypropylene net stretched over the entire pond. The net is suspended over three cables running the length of the pond. The center cable is the highest and can be raised or lowered by a manual boat winch to prevent snowload damage. An electric fence set 8 cm above the ground eliminates river otter predation upon the young growing chinook fry.

Fish Health

The health status of Grovers Creek chinook has been monitored since 1981 (Table 1). Adult broodstock are screened for the presence of viral or bacterial pathogens and juvenile fish are monitored on a monthly basis to assess general fish health and identify any potential problems occurring in the population. To date, adult broodstock have been relatively disease free. Inspection examinations of returning adults have identified low levels of the bacterium *Renibacterium salmoninarum*, the causative agent of bacterial kidney disease. This pathogen has also been identified in juveniles at very low levels but no mortality has been attributed to this disease. No viral pathogens have been isolated from this stock of fish. However, between 1991 and 1996, two non-pathogenic viral agents (*reovirus, paramyxovirus*) were isolated during normal adult inspection screening.

Surface water flow constraints and variable environmental conditions have made fish rearing challenging. Juvenile chinook reared at Grovers have had a variety of parasites and bacteria. Between 1981 and 1990, environmental gill disease and bacterial gill disease were major problems that resulted in significant losses. These conditions were brought on by a variety of conditions including decreased water flows, increased water temperatures, low dissolved oxygen levels and overcrowding. The parasites *Ichtyobodo* and *Ichthiopthiurius multifiliis* have also caused some elevated mortality over the years. All these diseases were managed through the application of chemical treatments.

In an effort to improve the rearing environment, three rearing strategy changes were implemented between 1989 and 1991: providing aeration to the rearing pond, adding an additional well water source to supplement stream flow, and establishing an in-house fish health monitoring program. A microscope was purchased in 1991 and personnel were trained to evaluate gill condition and identify gill disease bacteria. This allowed for frequent gill condition monitoring. These three factors have made a significant improvement to the program. Environmental and bacterial gill disease are kept under control without experiencing the high mortalities that had occurred in the past. Currently, chemical treatments are used infrequently and due to the increased monitoring capabilities most potential problems are detected early and the appropriate corrective actions are applied.

GROVERS CREEK FACILITY - FALL CHINOOK
FISH HEALTH OBSERVATIONS
(includes any detection of a pathogen or condition, but doesn't necessarily mean a disease condition was associated)

MONITORING YEAR	JUVENILES	AVERAGE MORTALITY	TREATMENT	ADULT INSPECTIONS
1981				*Renibacterium salmoninarum*
1982	Bacterial gill disease	Moderate (0.031-0.10%/day)	Hyamine.	
1983	*Ichtyobodo* (Costia)	Normal to low (<0.01 - 0.03%/day)		*Renibacterium salmoninarum*
1984	Environmental gill disease *Ichtyobodo* (Costia), *Epistylis*	Normal to low (<0.01 - 0.03%/day)		*Renibacterium salmoninarum*
1985	Environmental gill disease Bacterial gill disease, *Ichtyobodo* (Costia)	Low to moderate (0.011-0.10%/day)	Diquat and formalin for gill disease and costia.	*Renibacterium salmoninarum*
1986	Environmental gill disease, *Phoma* sp.	Normal to low (<0.01 - 0.03%/day)		*Renibacterium salmoninarum*
1987	*Ichtyobodo* (Costia), *Ichthyopthirius multifiliis*	Low to moderate (0.011-0.10%/day)	Formalin for costia and ich.	
1988	Environmental gill disease Bacterial gill disease, *Ichtyobodo* (Costia)	Moderate to high (0.31%->0.11%/day)	Diquat for gill disease.	*Renibacterium salmoninarum*
1989	Environmental gill disease Bacterial gill disease *Aeromonas* sp., *R. salmoninarum*	Moderate to high (0.31%->0.11%/day)	No chemical treatments applied.	*Renibacterium salmoninarum*
1990	Environmental gill disease Bacterial gill disease, *Epistylis, Ambiphrya* Coagulated yolk syndrome	Low to moderate (0.011-0.10%/day)	Diquat for gill disease.	
1991	Environmental gill disease Bacterial gill disease *Icthyobodo* (Costia)	Normal to low (<0.01 - 0.03%/day)	Prophylactic diquat treatment initiated prior to tagging for gill disease.	Reovirus
1992	Environmental gill disease *Ichtyobodo* (Costia), *Hexamita sp.* Coagulated yolk syndrome Bacterial kidney disease	Normal (<0.01%/day)	Prophylactically treated for gill disease with KMnO4. Formalin used to treat costia.	
1993	Environmental gill disease Bacterial gill disease *Pseudomonas* sp., *Epistylis, Ambiphrya* Coagulated yolk syndrome	Normal (<0.01%/day)	No chemical treatments applied	Paramyxovirus
1994	Coagulated yolk syndrome	Normal (<0.01%/day)	No chemical treatments applied	Reovirus
1995	*Flavobacterium psychrophilum*	Normal (<0.01%/day)	No chemical treatments applied	
1996	Environmental gill disease Bacterial gill disease *Flavobacterium psychrophilum* *Ambiphrya*, *Phoma* sp. Coagulated yolk syndrome	Normal to low (<0.01 - 0.03%/day)	No chemical treatments applied	Paramyxovirus
1997	Environmental gill disease Bacterial gill disease *Ichthyopthirius multifiliis* Coagulated yolk syndrome	Normal to low (<0.01 - 0.03%/day).	Formalin for ICH, used only on chinook held for yearling program.	

Table 1. Fish health history of Grovers Creek fall chinook

Production and Adult Returns

Grovers Creek Hatchery fall chinook have been raised in a low capital cost facility within a suburbanizing watershed. The earthen pond approach produced quality smolts for the first seven years, but declining water quality and quantity (seasonally) impacted production (Figure 1). Environmental gill disease and bacterial gill disease decreased production in 1987, 1988, and significantly in 1989. Aggressive aeration (with a 5 hp blower and air stone matrix suspended just off the pond bottom), well water supplementation during low stream flows, and application of a soil bacteria solution at water temperatures above 10^{o} C restored fish health and smolt quality at release. Station production has been over 500,000 smolts annually except for the early years and 1993, which was impacted in part by low adult returns and low fecundity.

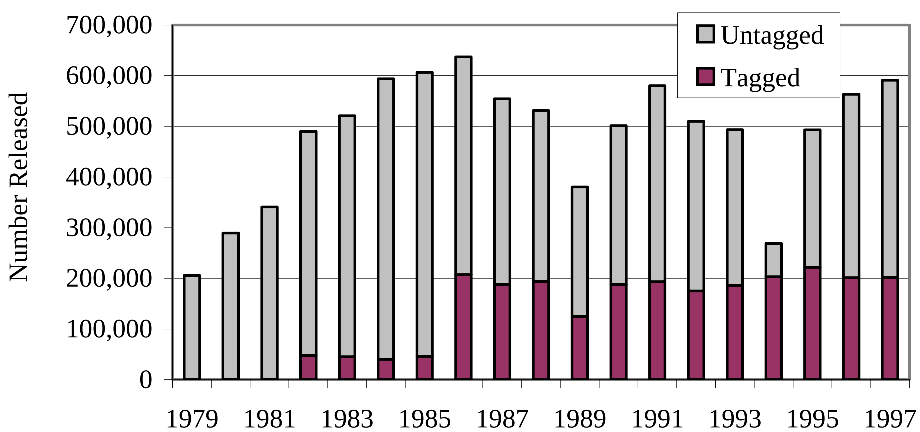

Figure 1. Grovers Creek Hatchery fall chinook releases with coded wire tagged component

The average Grovers Creek Hatchery rack return is 2,500 adults per year, but has varied significantly (Figure 2). Scales are removed from 200 adult fall chinook each week at the hatchery rack for age analysis. The results are used to forecast future runs, both to the hatchery and the off-station rearing ponds, and to evaluate changes to the hatchery population over time. 100% of Grovers Creek fall chinook are inspected for adipose clips and snouts are removed at the time of spawning The length and weight of each fish is recorded on both the scale card and hatchery field logs.

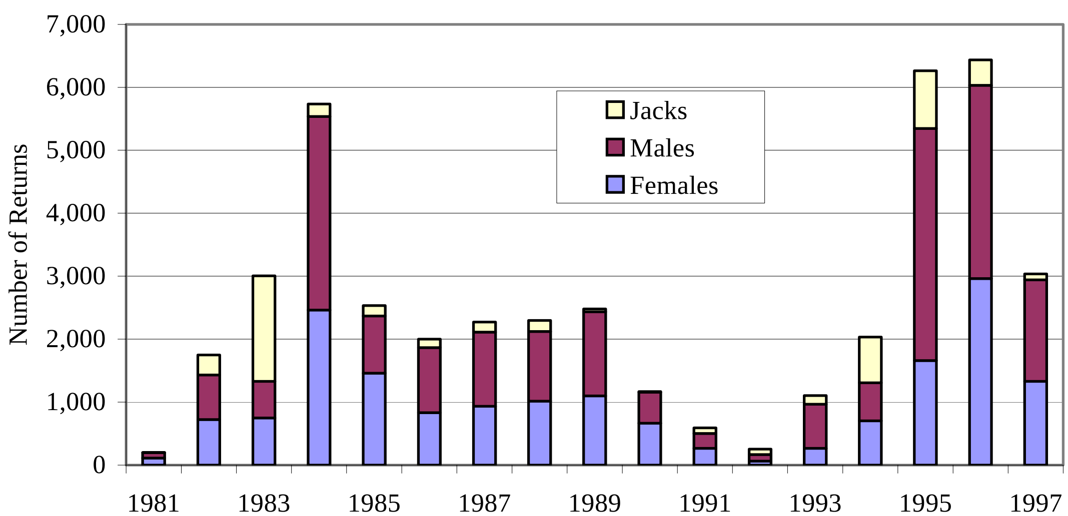

Figure 2. Grovers Creek Hatchery Adult Fall Chinook Return by Sex

Coded Wire Tag Study Results

Expanded coded wire tag recovery data were obtained from the Pacific States Marine Fisheries Commission (PSMFC) and summarized by the NWIFC Coded wire tag Recovery and Analysis System (CRAS). Percent recoveries of brood years 1981 to 1991 were summarized by geographic area and fishery, and the following were estimated: survival rates (Table 2), total marine catch (Table 3), and total catch by area and fishery (Table 3).

					Percent CWT Recoveries by Area and Fishery											
Brood Year	# Tagged	# Released	# Estimated Recoveries	Estimated % Survival	Alaska	Canada	Juan de Fuca Sport	Juan de Fuca Commercial	WA Coast and South	N Puget Sound Sport	N Puget Sound Commercial	Mid Puget Sound Sport	Mid Puget Sound Commercia	S Puget Sound Sport	S Puget Sound Commercial	Hatchery
1981	47,471	489,965	1524.5	3.2	0.2	17.3	3.4	1.7	0.3	0.6	1.0	25.9	7.1	3.9	0.6	37.6
1982	45,284	520,800	345.8	0.8	0.0	32.0	2.9	1.3	2.0	0.7	1.1	18.9	1.3	2.8	0.6	29.9
1983	40,324	594,000	307.9	0.8	0.0	21.5	1.9	11.2	0.7	0.0	0.0	13.2	11.8	0.0	0.0	39.0
1984	45,907	606,500	602.8	1.3	0.3	31.0	4.2	9.9	1.3	0.0	0.2	11.3	9.8	0.8	0.2	31.2
1985	207,155	637,032	1367.2	0.7	0.2	20.7	5.8	11.5	2.5	0.0	2.8	2.5	4.9	0.0	0.4	48.0
1986	187,757	554,163	3045.2	1.6	0.0	18.1	5.6	13.3	1.7	0.7	0.5	10.7	9.7	0.7	0.5	38.3
1987	193,906	531,351	911.2	0.5	0.0	22.2	6.4	16.3	0.7	1.0	0.4	7.4	7.1	0.3	0.3	36.2
1988	124,626	380,239	130.2	0.1	0.0	17.7	6.1	17.0	0.0	3.2	0.0	8.2	5.1	0.0	1.5	41.2
1989	187,640	501,391	303.6	0.2	1.5	16.1	16.3	12.4	2.0	0.0	0.0	6.4	6.7	0.0	0.6	32.6
1990	193,496	580,288	1435.7	0.7	0.1	22.0	5.0	6.3	0.3	2.4	0.2	10.6	4.3	0.1	0.0	48.6
1991	174,949	509,815	477.1	0.3	0.5	14.0	4.1	0.9	0.0	1.8	0.0	12.4	4.8	0.8	0.0	55.8
				Average	0.3	21.2	5.6	9.3	1.0	0.9	0.6	11.6	6.6	0.8	0.4	39.8

Table 2. Estimated Grovers Creek fall chinook survival rate estimates and CWT recoveries by area and fishery

		Estimated Total Catch by Area											
Brood Year	Total Catch	Alaska	Canada	Juan de Fuca Sport	Juan de Fuca Commercial	WA Coast and South	N Puget Sound Sport	N Puget Sound Commercial	Mid Puget Sound Sport	Mid Puget Sound Commercial	S Puget Sound Sport	S Puget Sound Commercial	Escapement
1981	15,681	31	2,726	539	275	44	102	155	4,075	1,118	608	99	5,910
1982	3,719	0	1,274	116	51	79	29	44	750	53	110	23	1,190
1983	4,499	0	977	84	507	31	0	0	600	533	0	0	1,768
1984	7,964	21	2,472	334	789	100	0	13	900	777	62	15	2,481
1985	4,155	7	872	243	484	87	0	119	105	204	0	16	2,017
1986	8,901	0	1,629	501	1,193	91	63	43	962	869	66	43	3,440
1987	2,448	0	555	159	407	12	25	10	186	177	7	6	905
1988	397	0	70	24	67	0	13	0	33	20	0	6	164
1989	758	12	130	132	100	8	0	0	52	54	0	5	265
1990	4,295	6	949	213	273	9	102	10	455	184	3	0	2,091
1991	1,320	7	194	57	12	0	24	0	173	66	11	0	775

Table 3. Estimated total catch of Grovers Creek fall chinook by area, including escapement

Straying

Recoveries of coded-wire tags provide some information on Grovers Creek fall chinook straying, as well as straying of other stocks to Grovers Creek Hatchery. Table 4 shows all Grovers Creek fall chinook freshwater recovery locations from 1985 to 1995. Table 5 shows the hatchery origins of fall chinook recovered at Grovers Creek Hatchery in the same years.

Region	Recovery Location	# Estimated CWT Recoveries
Puget Sound	Baker River	1
	Coulter Creek Hatchery	1
	Hupp Springs Rearing Facility	1
	Issaquah Creek	1
	Minter Creek	1
	Tulalip Salmon Hatchery	1
	Issaquah Hatchery	2
	Newaukum Creek (Green R)	3
	Burley Creek	6
	Capitol Lake Rearing Facility	6
	Soos Creek Hatchery	4
	Minter Hatchery	5
	McAllister Hatchery	7
	Garrison Hatchery	16
	Grovers Creek Hatchery	6478 (99.2% of total)
	TOTAL	6533

Table 4. Freshwater recovery locations of Grovers Creek fall chinook, 1985-1995

Region	Releasing Hatchery	# Tagged Recoveries
Canada	Chemainus River	2
	Cowichan River	1
Columbia River	Little White Salmon	1
	Cowlitz Hatchery	1
Hood Canal	Sund Rock Hatchery	1
	Big Beef Hatchery	2
	Quilcene Hatchery	3
Strait of Juan de Fuca	Elwha Hatchery	1
Puget Sound	Fox Island	1
	Garrison Hatchery	2
	Allison Springs	1
	Portage Bay Hatchery	1
	Grovers Creek Hatchery	6478 (99.7% of total)
	TOTAL	6495

Table 5. Origins of fall chinook recovered at Grovers Creek Hatchery, 1985-1995

Observed Trends in Hatchery Broodstock Size

The body size of adults returning to the hatchery can provide an integrated assessment of the environmental and genetic factors that have affected the fish (Gall 1987). Data were analyzed to determine the trend for body weight and length of Grovers Creek Hatchery fall chinook returning to the hatchery between 1986-96.

For each sex, 3 and 4 year old fish were analyzed separately. A systematic random sample size of 50 was determined necessary to estimate mean weight and length. This sample size was not available for both sexes of each year class because of low returns in 1991, 1992, and 1994, and inadequate data in 1990.

The null hypothesis that the observed mean weight and length from a random sample of the population would not significantly change between 1986-96 was tested against the alternative hypothesis that the observed mean weight and length from a random sample of the population would significantly decrease between 1986-96. The null hypothesis was rejected for 6 of the 8 trends analyzed (all but weight of 3 year old males and length of 4 year old males) (Figures 3 and 4). Therefore, we concluded that fish lengths and weights of the other 6 groups decreased over the time period of the study, but it could not be demonstrated by this study that weight of 3 year old males and length of 4 year old males decreased over time.

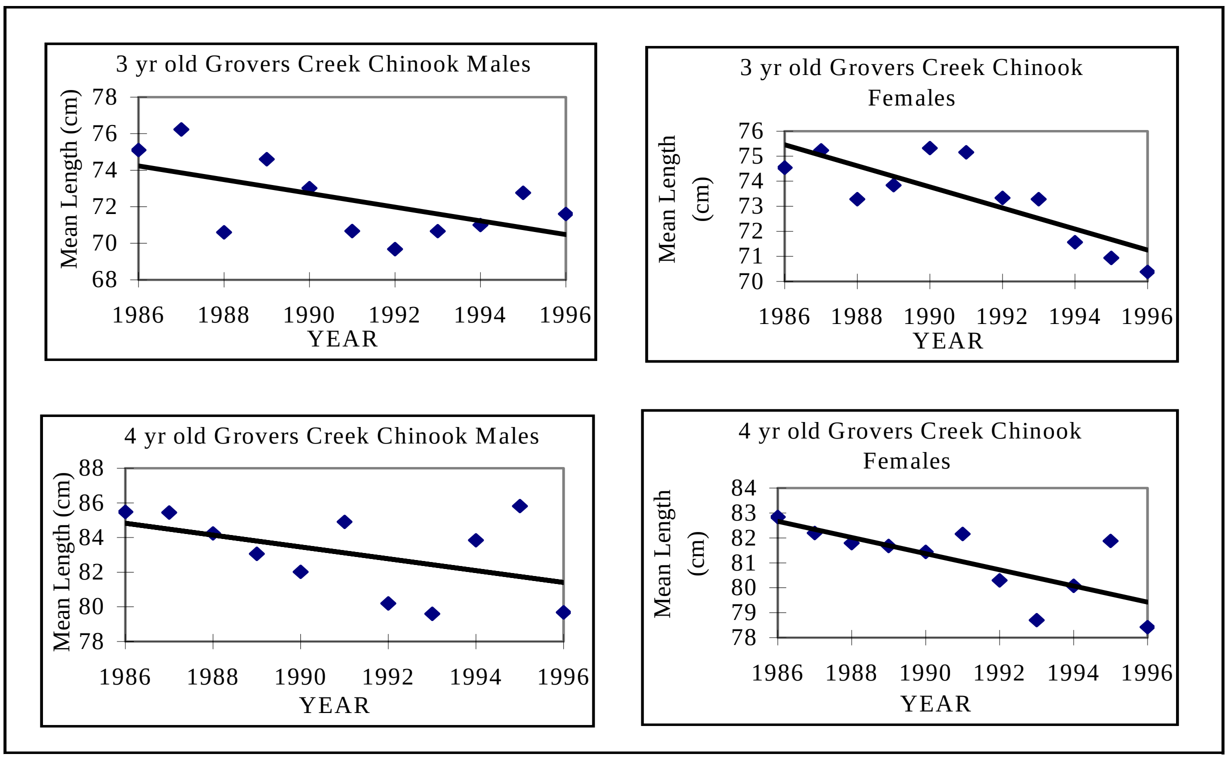

Figure 3. Changes in length of returning Grovers Creek fall chinook, by age and sex, for years 1986-1996.

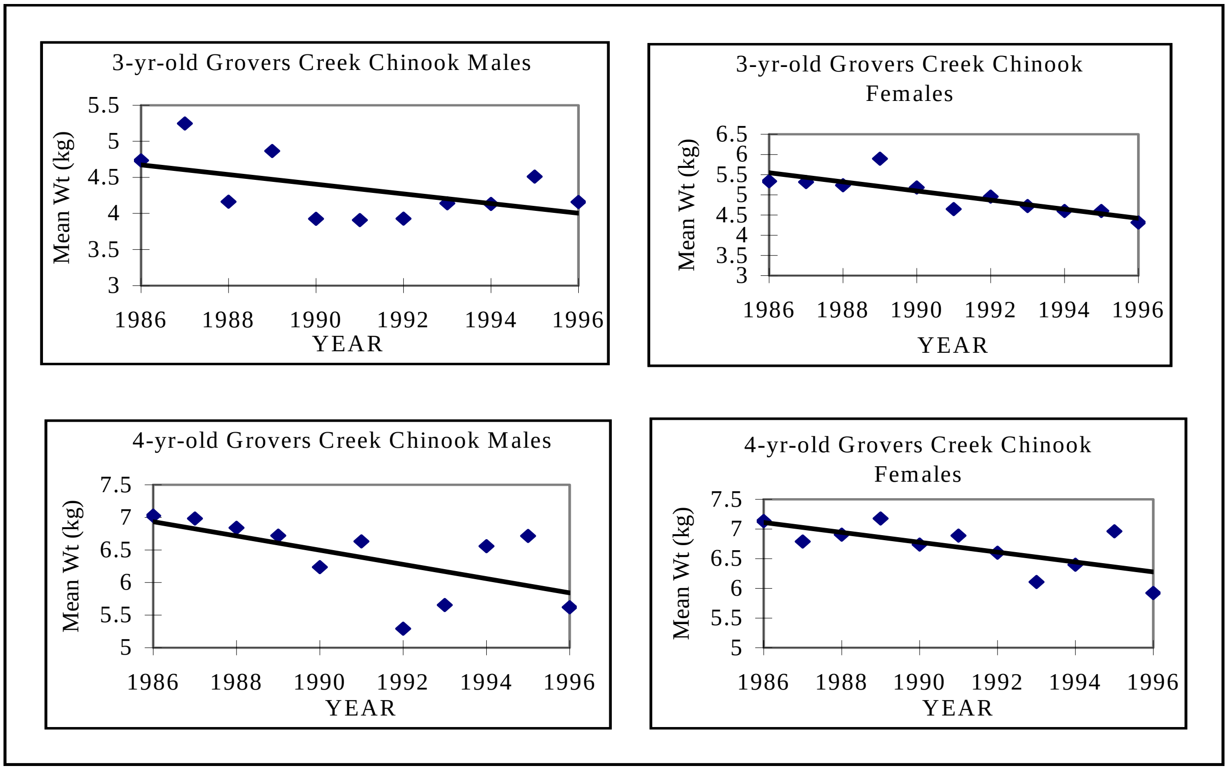

Figure 4. Changes in weight of returning Grovers Creek fall chinook, by age and sex, for years 1986-1996.

The trend toward decreasing body size of Grovers Creek Hatchery fall Chinook corresponds to that seen in other studies of North Pacific salmon (Bigler et al. 1993, Healey 1986, Ricker 1995). Possible causes for the decrease in body size of the Grovers Creek fall chinook stock include fish health effects noted above, as well as ocean climate conditions, density dependent competition, and genetic changes due to size selective fishing or hatchery management practices.

Beamish (1993) found that an increase in the intensity of the Aleutian low pressure system correlated well with strong year classes and above average survival of salmon. But, an inverse relationship between population abundance and mean body size occurred during the same period. This suggests there may be a limit to the salmon sustaining resources of the ocean (Bigler et al.1996).

Pacific salmon enhancement programs have assisted in the near doubling of salmon harvests over the past two decades in the North Pacific (Bigler et al 1996). During the period of favorable ocean climate conditions from 1973-1993, 45 of 47 North Pacific salmon populations studied by Bigler et al (1996) decreased in average body size. Washington chinook salmon stocks caught in the troll and Columbia River fishery declined in average body size 10.09% - 46.70% between 1976-93, possibly due in part to increasing hatchery releases causing a reduction in the available food supply through density dependent competition (Bigler et al 1996).

Ricker (1995) concluded the mean weight of chinook salmon caught by commercial trolling in Puget Sound between 1975-80 decreased ~1.5 kg, and showed little recovery to 1990, although chinook caught between 1985-1987 were larger. He suggests that because early maturing fish grow faster than those that mature at an older age, the selection of larger, slower growing older fish by a fishery may affect the heritable aspects of the growth rate and age at maturity causing a population to shift toward faster growth and younger age at maturity.

Despite using strict genetic conservation measures, hatcheries risk genetic change because their populations are relatively small and closed (Gall 1987). This is mainly due to genetic drift, the random loss of certain genes in small populations and to inbreeding (breeding closely related individuals). Generally, the greater the inbreeding, the more pronounced the reduction in viability, growth, survival and fecundity (Tave 1986 and Gall 1987).

In contrast to our observations of Grovers Creek fall chinook, a study of fall chinook salmon produced at four Washington State Department of Fish and Wildlife hatcheries found no decrease in length over brood years 1971-1992 (Vander Haegen and Appleby 1996). Unlike the Grovers Creek study, however, mean lengths in their study were calculated for males and females combined.

A second analysis was performed using mean lengths of Grovers Creek fish with sexes combined for brood years 1985-1991. The results are shown in Figure 5, along with WDFW Soos Creek Hatchery study results. Soos Creek data were not available for brood year 1989. Grovers Creek results were similar to those from Soos Creek for this interval for this combined-sex study. The data suggest a decrease in length, but the trend line plotted is not statistically significant. It is not known if analysis of the Soos Creek fish by sex would be statistically significant.

The observed decreases in size of 6 of the 8 Grovers Creek Hatchery fall chinook age-sex combinations may not reflect the long-term trend because only 11 years of data were analyzed.

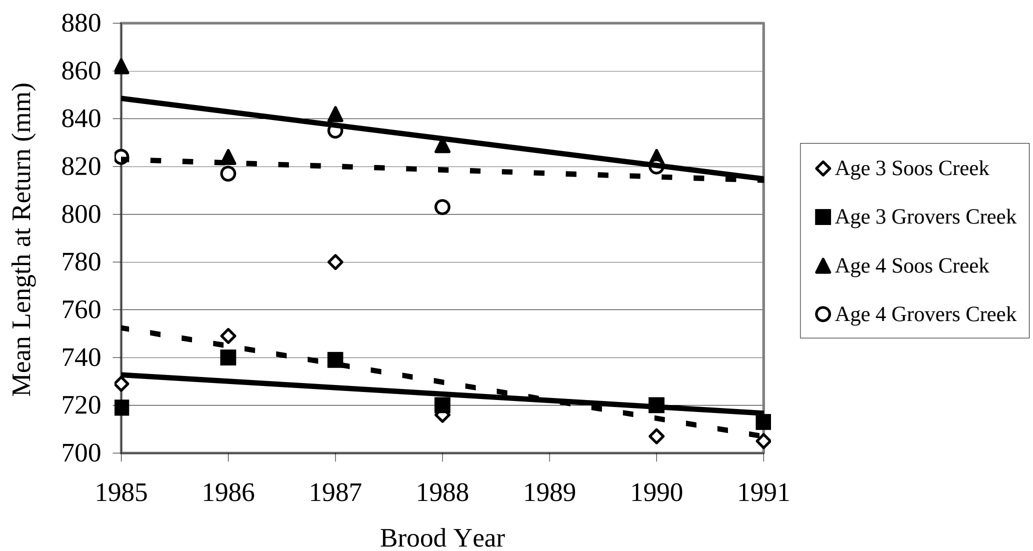

Figure 5. Changes in mean length of Grovers Creek and Soos Creek fall chinook , brood years 1985-1991

Off-station Rearing Pond Production and Fishery Contribution

Grovers Creek Hatchery production supports three off-station rearing ponds that contribute to an important Suquamish treaty fishery (Figures 6 and 7) and local sports fishery. All three sites are operated primarily with sports club volunteers and have limited operations and maintenance funding. SIT provides technical support, project oversight, and Grovers Creek fall chinook fry. WDFW provides fry to make up Grovers Creek broodstock shortfalls and also contributes most of the fish food. No hatchery personnel live on-station and emergencies are handled on a volunteer phone tree basis. This operational strategy-- low budget and limited personnel-- increases the risk of fish loss, and losses have occurred. All the parties recognize the risk of fish loss but have maintained support for the rearing ponds in order to produce fall chinook available to harvest. Efforts to secure additional funding continue, and would be expected to increase smolt quality and survival.

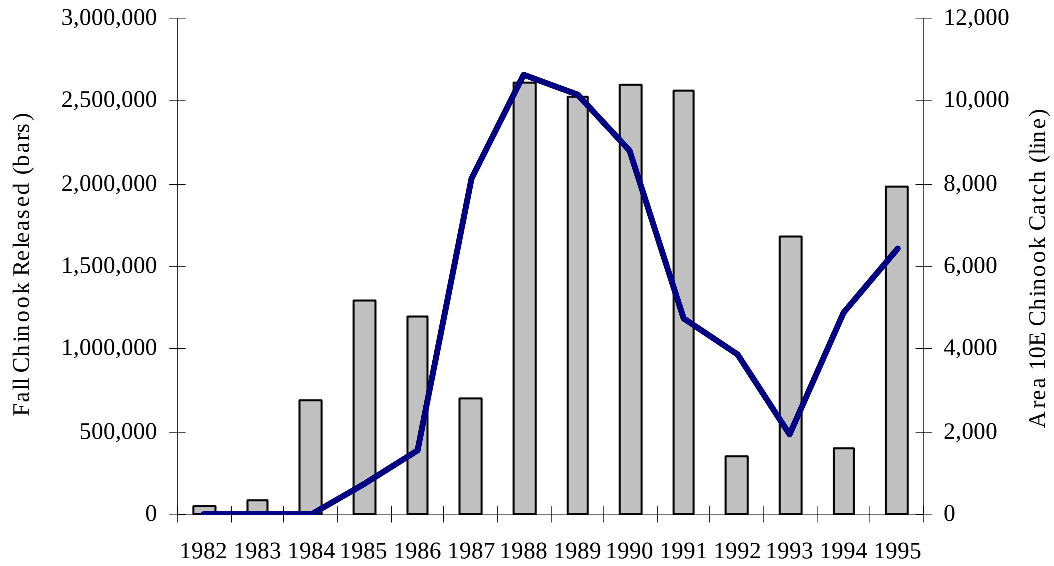

Figure 6. Number of Suquamish off-station fall chinook smolts released (bars) and number of chinook caught in Tribal terminal fishery (line), 1982-1995

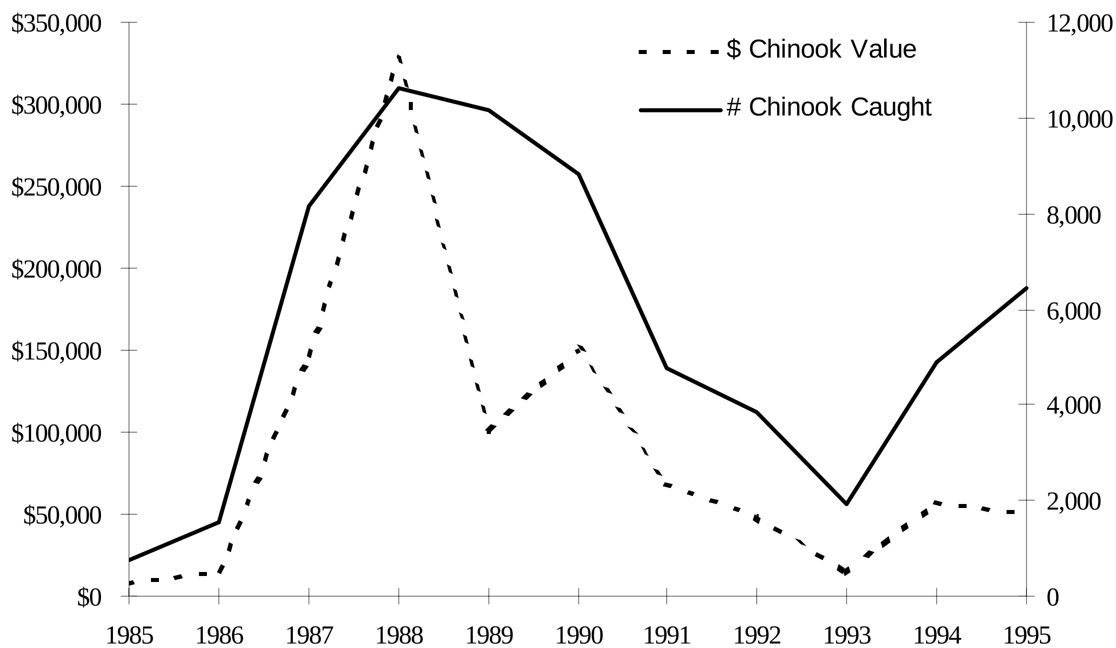

Figure 7. Suquamish Tribe Area 10E commercial chinook harvest and value, 1985-1995

Chinook not caught in the fishery return to spawn in their rearing pond creeks, generating public enthusiasm and ecological benefits. These ecological benefits may be significant. There are no hatchery/wild stock chinook interactions since the only chinook present in East Kitsap streams are Grovers Creek stock. The spawning chinook significantly clean the gravels later used by coho and chum salmon and cutthroat trout The chinook carcasses boost the nutrients available from local salmon and trout populations, enriching the stream ecosystem.

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Appendix S:

THE AGATE PASS SEAPENS COHO PROGRAM: REARING HISTORY, CONTRIBUTION RATES, AND WASHINGTON STATE REVENUES AND BENEFITS

THE AGATE PASS SEAPENS COHO PROGRAM: REARING HISTORY, CONTRIBUTION RATES, AND WASHINGTON STATE REVENUES AND BENEFITS

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Introduction

Marine net pens have been used since 1972 in Washington State to increase survival rates of coho yearlings, promote residency, and to imprint populations to specific geographic areas (Appleby et al, 1989), (Buckley and Haw, 1978). The Agate Pass Seapens are one of 19 marine net pen facilities producing approximately 4,000,000 coho annually (1995 data). These facilities range in capacity from 50,000 to 2,200,000 salmon and are operated either by Washington Department of Fish and Wildlife (WDFW), a Tribe, or jointly as a WDFW cooperative with a Tribe or regional group.

The Suquamish Indian Tribe (SIT) has operated the Agate Pass Seapens continuously since 1981. This program has been made possible by a cooperative agreement with WDFW. WDFW provides the smolts and fish food and the SIT provides the facility and staffing. The Agate Pass Seapens are located directly west of Seattle in Puget Sound adjacent to the Kitsap Peninsula. These waters comprise an important usual and accustomed fishing area for the Suquamish people and for local sport fishers.

This report presents an overview of the Agate Pass Seapens rearing program, fish health and marine mortality, and multiple interpretations of coded-wire tag data. Contribution rates to all fisheries are presented using recovery data of Agate Pass Seapens coded-wire tag (CWT) groups for 11 of the 14 brood years between 1979 and 1992. Total catches of Agate Pass Seapens coho by gear and areas are detailed, with economic values calculated for Washington fisheries. Recoveries of Agate Pass Seapens coho strays are reported. Estimated survival and fishery contribution rates are compared to similar facilities and parent hatchery broodstock. Finally, a planned facility design change to a spar buoy system is discussed.

Program Overview

Two Puget Sound coho stocks (Wallace River and/or Minter Creek) are incubated at Minter Creek Hatchery, reared at Coulter Creek Hatchery, and transferred to Agate Pass Seapens as yearlings in January of each year. Weight at transfer is 15 g/fish (30 fish/lb). Freshwater is replaced by ambient saltwater (28 g/L or 28 ppt salinity) during the 45 minute tow to the Agate Pass aboard the transport barge.

The Agate Pass Seapens consist of four 8.5 m (28 ft) square pens that are 5 m (16 ft) deep and are suspended from wooden surface floats. The full rearing volume of each pen is 361 m^3 (12,500 ft^3) at slack or low current, but is reduced by 50% during full ebb or current flow. Maximum current velocity is 2 knots. The coho are usually feed a frozen diet at 1.2% body weight daily. Hand feeding spans a 3-hour period in the morning and again in the afternoon. Average food conversion is 1.4:1. Loading densities are kept below 1.5 kg/m^3 (1 lb/ft^3) at full volume, with rearing density adjusted by early releases.

Mortalities are removed two to three times weekly by scuba diver, which permits enumeration of adipose fin clipped fish. The diver inspects the fish, repairs nets, and examines the seabed below the pens for food wastage. If necessary, adjustments are made in feeding rates to avoid wastage. The fish are inspected monthly by Northwest Indian Fisheries Commission (NWIFC) pathologists, or more often during epizootics or other events. Target release weight is 45-57 g/fish (8-10 fish/lb) by mid June or earlier if daily surface water temperature exceeds 13^0 C. Feeding information, growth rates, mortality, water quality, fish health data, and related operational data are entered into a hatchery management database.

Fish Health and Marine Rearing Mortality

Coho held at Agate Pass Seapens have experienced cumulative mortality levels ranging from a low of 0.3% in the 1981 brood to a high of 27.4% in the 1991 brood (Figure 1). Bacterial kidney disease (BKD), abdominal distention syndrome (Bloat), and the inability to adapt to the saltwater environment at the time of transfer have been the three major causes of mortality. Additional complications have been associated with anemia due to unexplained causes (BY 91).

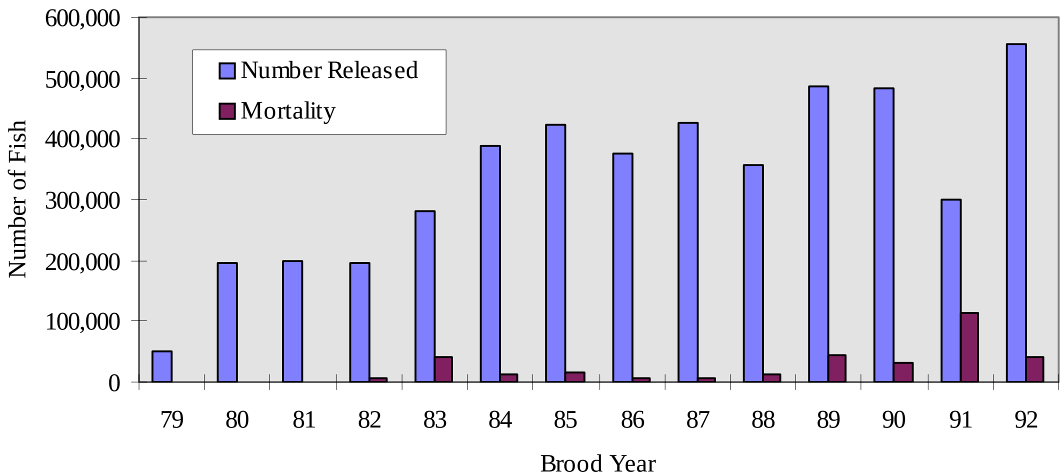

Figure 1. Agate Pass Seapens total coho release and marine mortality by brood year

The level of severity of these conditions has varied over the years. Mortality due to osmoregulatory problems at the time of saltwater transfer has been as high as 16% (BY 91). The condition known as bloat has been a chronic problem and a significant contributor to mortality levels. This condition results in fish with fluid filled stomachs and distended abdomens. Fish with bloat can be found throughout the rearing cycle and do not seem to recover. Bacterial kidney disease progresses rapidly once the fish enter the saltwater netpen environment and ultimately becomes the primary cause of mortality. Mortality due to BKD can be quite devastating. In an effort to reduce the severity of BKD infections, the 1989 and 1990 brood were experimentally treated with the antibiotic oxytetracycline. Fish were fed medicated feed (4g oxytetracycline/45.4 kg fish/day for 21 days) shortly after saltwater transfer. BKD levels were analyzed using the Quantitative Fluorescent Antibody Technique (Cvitanich, Fish Health Lab), which indicated some degree of benefit. Projected mortality due to BKD after release was estimated to be from 1 to 3%.

Other pathogens isolated from fish held in the pens have been *Aeromonas salmonicida* (causative agent of furunculosis) and *Vibrio anguillarum*. In both cases, no signs of disease occurred. Starting with brood year 1987 the coho have received a one hour immersion vaccination against *Vibrio anguillarum* during truck transport to the dock (maximum of 136 kg fish/L of vaccine at a dilution of 1:1000).

Predation accounts for less than 0.5% total mortality. Coho mortality from river otters predation is controlled by electric fences around the perimeter of the floats. Avian predation is restricted by the use of bird nets. Prompt removal of mortalities from the pens alleviates scavenger fish damage to the nets.

The mortality at Agate Pass Seapens follows an annual pattern as represented by brood year 1992 (Figure 2). Early season mortality is characterized by high initial losses due to inability to adapt to saltwater or injury during transfer. Mortality rates decrease to 0.1%/week until water temperatures rise in late April and through May. The increased temperature stress accelerates mortality in diseased or non-smolted fish. The weekly mortality rates continue to increase until release. The late season mortality rates in Figure 2 decline due to a partial release in week 20. The mortality rate for week 22 represents one day.

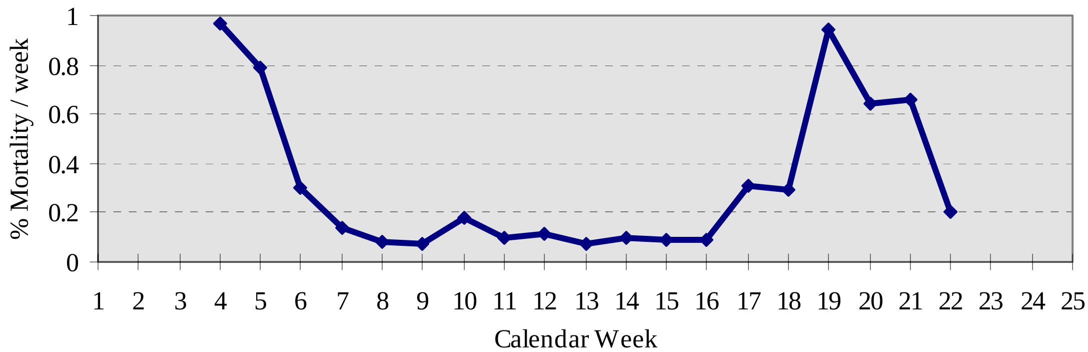

Figure 2. Brood year 1992 Agate Pass Seapens coho mortality by calendar week

Contribution to All Fisheries

Coho releases from Agate Pass Seapens have been represented by CWT groups of 29,000 to 50,000 fish per year, except for three brood years (1979, 1984, and 1991) (Figure 3). The CWT groups ranged from 8.0% (BY 90) to 24.6% (BY 80) of the total release.

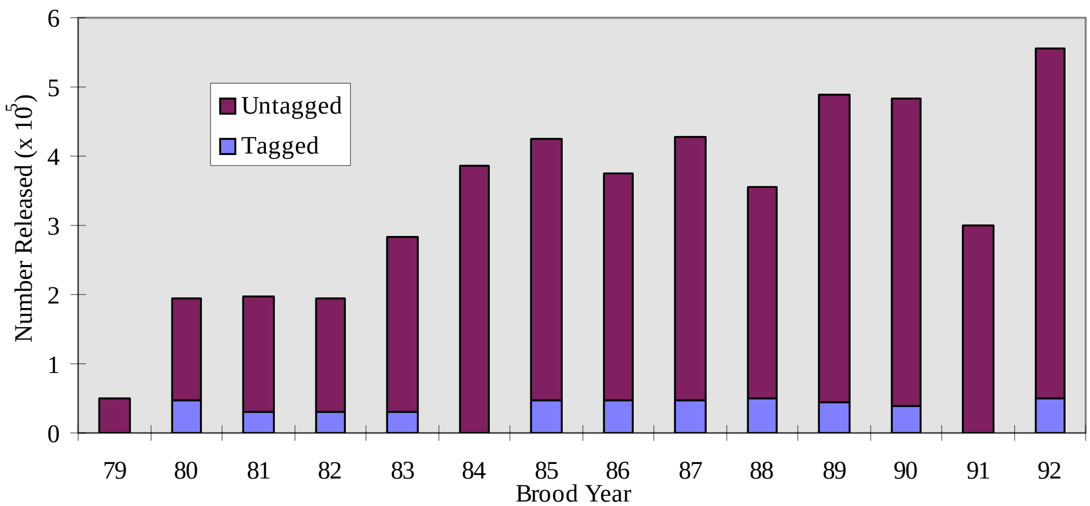

Figure 3. Coho Released by Agate Pass Seapens, showing tagged and untagged fish.

Estimates of total catch and fishery contribution rates (Table 1) and individual fishery catches (Table 2) were made from CWT recovery data obtained from the Pacific States Marine Fisheries Commission.

Brood Year	Number Tagged	Number Released	Estimated Contribution Rate by Area												
			Alaska	Canada	WA Coast and South	Strait Net and Troll	Strait Sport	Hood Canal	North Puget Sound Net	North Puget Sound Sport	Mid Puget Sound Net	Mid Puget Sound Sport	South Puget Sound Net	South Puget Sound Sport	All Freshwater
79	0	49,855	*	*	*	*	*	*	*	*	*	*	*	*	*
80	48,130	195,720	0.0	32.4	2.2	0.9	3.6	0.9	2.0	0.3	45.0	9.8	1.0	0.3	1.5
81	30,029	197,984	0.0	48.8	3.0	2.4	1.5	0.5	4.2	0.0	33.0	3.4	0.2	0.0	3.1
82	29,843	194,560	0.0	40.8	5.4	2.1	1.3	0.3	7.0	0.0	39.1	2.4	0.6	0.0	1.1
83	30,089	282,202	0.0	40.2	3.2	2.0	2.5	3.1	3.8	0.0	40.7	1.3	1.7	0.0	1.6
84	0	387,042	*	*	*	*	*	*	*	*	*	*	*	*	*
85	48,015	424,191	0.0	41.4	4.5	0.3	2.3	0.0	2.2	0.2	45.4	1.1	1.6	0.0	1.0
86	48,494	375,059	0.0	46.9	2.1	1.4	3.7	0.4	1.9	0.3	40.5	1.1	0.5	0.1	1.1
87	47,260	426,806	0.0	40.0	3.3	0.5	6.3	0.0	0.8	0.0	46.2	2.2	0.4	0.0	0.3
88	49,668	355,679	0.0	49.1	3.7	1.8	5.3	0.0	5.8	0.2	31.0	2.0	0.5	0.0	0.5
89	44,809	487,662	0.0	53.1	8.6	0.1	3.6	0.0	0.6	0.5	28.2	4.3	0.5	0.0	0.6
90	38,483	482,959	0.2	60.6	13.8	0.0	4.1	0.0	0.6	2.0	8.7	5.6	1.3	0.0	3.2
91	0	299,487	*	*	*	*	*	*	*	*	*	*	*	*	*
92	49,051	554,987	0.0	67.2	5.1	1.6	0.0	0.0	0.4	0.0	22.0	0.0	3.4	0.0	0.4
		Average	0.0	47.3	5.0	1.2	3.1	0.5	2.7	0.3	34.5	3.0	1.1	0.0	1.3

Table 1. Agate Pass Seapens coho contribution rates by brood year and area (* = No CWT releases)

Brood Year	Total Catch	Estimated Total Catch by Area												
		Alaska	Canada	WA Coast and South	Strait Net and Troll	Strait Sport	Hood Canal	North Puget Sound Net	North Puget Sound Sport	Mid Puget Sound Net	Mid Puget Sound Sport	South Puget Sound Net	South Puget Sound Sport	All Freshwater
79	*	*	*	*	*	*	*	*	*	*	*	*	*	*
80	36,672	0	11,894	799	330	1,320	330	733	110	16,502	3,594	367	110	550
81	19,476	0	9,496	585	467	292	97	818	0	6,427	662	39	0	604
82	21,703	0	8,853	1,165	456	282	65	1,519	0	8,486	521	130	0	239
83	45,685	0	18,345	1,478	891	1,142	1,416	1,713	0	18,571	594	777	0	708
84	*	*	*	*	*	*	*	*	*	*	*	*	*	*
85	76,039	0	31,512	3,414	228	1,749	0	1,673	152	34,522	836	1,217	0	760
86	61,540	0	28,846	1,288	862	2,277	246	1,169	185	24,924	677	308	62	677
87	96,271	0	38,478	3,186	481	6,065	0	770	0	44,477	2,118	385	0	289
88	44,915	0	22,055	1,654	808	2,380	0	2,605	90	13,924	898	225	0	225
89	43,957	0	23,320	3,783	44	1,582	0	264	220	12,396	1,890	220	0	264
90	23,682	41	14,350	3,278	0	971	0	142	474	2,060	1,326	308	0	758
91	*	*	*	*	*	*	*	*	*	*	*	*	*	*
92	13,509	0	9,078	684	216	0	0	54	0	2,972	0	459	0	54
	Average	4	19,657	1,937	435	1,642	196	1,042	112	16,842	1,192	403	16	466

Table 2. Agate Pass Seapens estimated total coho catch by brood year and area (* = No CWT releases)

Washington State Revenues and Benefits

Agate Pass Seapens coho contribute substantially to fisheries outside of Washington State as illustrated in Tables 1 and 2. However, Agate Pass Seapens operation is contingent upon benefits to Washington fishers exceeding the costs of providing these benefits. Revenues and benefits to Washington fisheries were calculated using values from Tables 10-12 in the 1988 Washington State Department of Community Development (DCD) Report “Economic impacts and net economic values associated with non-Indian salmon and sturgeon fisheries”. Total revenue and benefit per coho to each fishery is shown in Table 3. These values are estimates and limited to non-Indian salmon harvested within Washington waters.

Fishery	Revenue and Benefit
NPS Sport	$178.41
NPS Net	$5.60
SPS Net	$5.81
SPS Sport	$245.53
Strait Net & Troll	$6.42
Strait Sport	$147.63
WCS Charter	$115.53
WCS Net	$13.09
WCS Private	$70.06
WCS Troll	$13.51

Table 3. Total Washington State revenue and benefits per fish by selected fishery (NPS=North Puget Sound, SPS=South Puget Sound, WCS=Wa Coast and South)

Commercial revenue was calculated as total revenue generated per area divided by catch. Recreational sport benefits were calculated as total recreational benefits per area divided by catch. The values were calculated for the period 1982-1985.

These revenue and benefit values are used for discussion purposes only. It is assumed that if these values were adjusted for the Agate Pass Seapen coho brood years 1980-1992 they would be different, but within the same order of magnitude. No argument is being made that one fishery should be favored over another fishery. In addition to not valuing Canadian harvests, no value is calculated for escapement.

Tribal net catches were added to the DCD report to calculate estimated revenues and benefits to selected Washington State fisheries (WDFW memo, 1996) (Table 4). These values do not include spiritual, religious, and cultural attributes that increase the real value of salmon to Native American fishers.

Brood Year	NPS Sport	NPS Net	SPS Net	SPS Sport	Strait Net and Troll	Strait Sport	WCS Charter	WCS Net	WCS Private	WCS Troll	Total Value
80	$306,227	$12,090	$91,253	$325,329	$3,655	$187,816	$7,914	$0	$3,154	$661	$938,099
81	46,978	5,355	36,760	81,179	2,923	41,798	2,287	181	4,577	5,429	227,467
82	40,611	9,022	46,610	57,801	2,934	36,479	19,555	0	10,086	9,776	232,876
83	25,211	11,927	59,970	41,355	3,555	76,075	9,730	0	2,600	10,778	241,199
83	40,058	8,880	48,208	20,887	2,166	85,857	4,350	730	1,954	4,935	218,026
85	54,331	10,957	191,402	106,524	1,553	252,512	17,832	819	9,645	31,555	677,130
86	129,811	9,347	140,910	24,864	5,609	333,335	9,099	589	3,153	9,625	666,341
87	219,558	23,385	245,992	183,381	2,696	905,305	20,591	0	12,487	26,196	1,639,592
88	105,970	14,919	80,644	79,469	5,205	369,146	15,615	0	15,947	12,683	699,599
89	93,092	2,813	70,097	347,229	344	218,865	38,874	0	32,114	27,797	831,226
90	109,427	2,326	14,221	252,574	0	136,898	75,325	0	31,805	15,917	638,492
92	1,980	2,611	19,371	21,802	1,247	23,761	6,412	0	3,110	4,723	85,017

Table 4. Estimated revenues and benefits to selected Washington State fisheries

Actual Agate Pass Seapens coho harvest and value to the Suquamish Tribal fishers is calculated from Salmon Management Area 10E Tribal fish ticket data (Zischke, 1996) (Table 5). Table 5 does not Include the value of tribally caught Agate Pass Seapens coho harvested in mid Puget Sound.

Brood Year	# Coho Caught	Coho Value
80	1,314	$3,626
81	2,084	$11,085
82	1,927	$13,084
83	8,411	$13,251
84	18,032	$141,842
85	14,368	$299,741
86	7,957	$93,131
87	8,685	$139,174
88	2,720	$64,164
89	1,634	$44,812
90	2,298	$12,743
91	8,676	$54,216

Table 5. Suquamish Tribal Area 10E commercial coho harvest and value

Observed Straying

The Agate Pass Seapen coho CWT data provide an opportunity to observe straying patterns. Straying is defined for this paper as freshwater recoveries outside of Washington Salmon Management Area 10E. These coho were Wallace River, Minter Creek, or George Adams Hatchery stock, transferred to Coulter Creek Hatchery for freshwater rearing. Coulter Creek Hatchery is now part of the Minter Creek Hatchery Complex. Minter Creek Hatchery stock is now the dedicated stock for the Agate Pass Seapens. Recovery locations of Agate Pass Seapens coho strays are enumerated in Table 6.

Mid and South Puget Sound	Distance from Agate Pass (km)	Wallace River Stock	Minter Creek Stock	Minter + George Adams Stock
Grovers Creek Hatchery	6	62	1	93
Cowling Creek Hatchery	6	13		
Blackjack Creek	20	1		
Seattle Aquarium	25	1		
Univ of WA Hatchery	25	3		
Garrison Springs Hatchery	55	5		3
Soos Creek Hatchery	70	1		1
Minter Creek Hatchery	75	38	1	25
North Puget Sound				
Tulalip Hatchery	50	4		
Wallace River Hatchery	130	237		
Hood Canal				
Big Beef Creek Research Hatchery	80	56		1
Quilcene National Fish Hatchery	95	1	1	
Hoodsport Hatchery	120	4		1
George Adams Hatchery	125			9
Total Number of Tagged Recoveries		50,576	1,194	9,018

Table 6. Freshwater recovery locations of Agate Pass Seapen coho by broodstock, brood years 80-92 combined, including distance from the Agate Pass Seapens

The recovery patterns of Agate Pass Seapen coho observed in Table 6 cannot be used to determine straying rates because (1) each tagged fish does not have an equal probability of being recovered during spawning ground surveys and (2) each fish in a run can not be classified as a home or stray recovery. The data support observations of Vander Haegen and Doty (1995) that hatchery salmon do not stray randomly, but return to their natal hatchery or another hatchery. The two nearest hatcheries, Grovers Creek Hatchery and Cowling Creek Hatchery, together received proportionally more strays than any other recovery locations, except for Wallace River Hatchery. All Agate Pass Seapens coho straying to Wallace River Hatchery were of Wallace River origin, suggesting the genetic component of hatchery straying. Similar results are observed for George Adams Hatchery strays from Agate Pass Seapens-- the only recoveries at that hatchery were of the single year that George Adams Hatchery broodstock was used.

Survival and contribution rate analyses

The Agate Pass Seapens estimated survival rate and estimated total fishery contribution rate was compared to three similar net pen facilities and the parent broodstock hatcheries (Figure 4). The results are based on a computer model and show that extended marine rearing may have a positive effect on survival and fishery contribution over freshwater releases. The high estimated survival of Agate Pass Seapens coho, relative to the other net pens, may be in part due to better quantification of CWT mortalities in the pens.

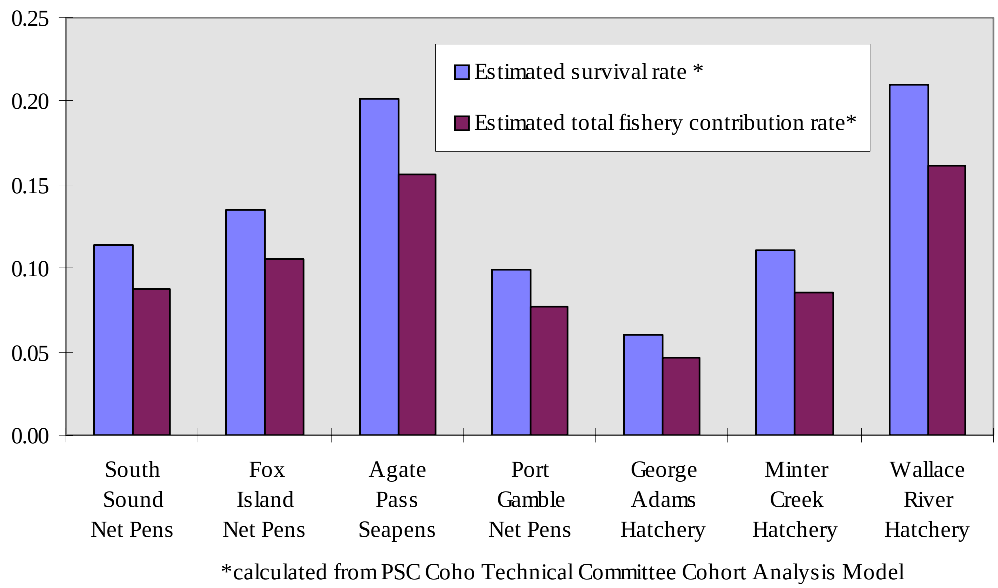

Figure 4. Survival and contribution rates of 7 selected Puget Sound and Hood Canal coho facilities.

Summary

WDFW has determined the average direct cost of salmon smolts produced in Washington State to be $3.00/lb. The cost to produce 500,000 smolts is therefore $50,000. SIT has determined the Agate Pass Seapens program direct cost to be $35,000. WDFW provides $30,000 for fish food during the extended marine rearing period. These figures total $115,000. The revenue and benefit to selected Washington fisheries ranged from $85,017 to $1,639,592 and averaged $591,255 for brood years 1980 to 1992. Given the assumptions of this simple analysis, the Agate Pass Seapens have a benefit costs ratio of 5:1 for the Washington fisheries alone.

Planned Facility Modifications

The SIT plans to replace the wood surface floats of the current Agate Pass Seapen facility with an Ocean Spar three-pen complex in the near future (Figure 5). The SIT and the Muckleshoot Indian Tribe own and operate an Ocean Spar complex in Elliott Bay, adjacent to downtown Seattle. These systems provide a constant rearing volume and more protection from predators and storms, thereby reducing stress and promoting fish health. The new Agate Pass Seapens will operate at half the rearing density of the existing system.

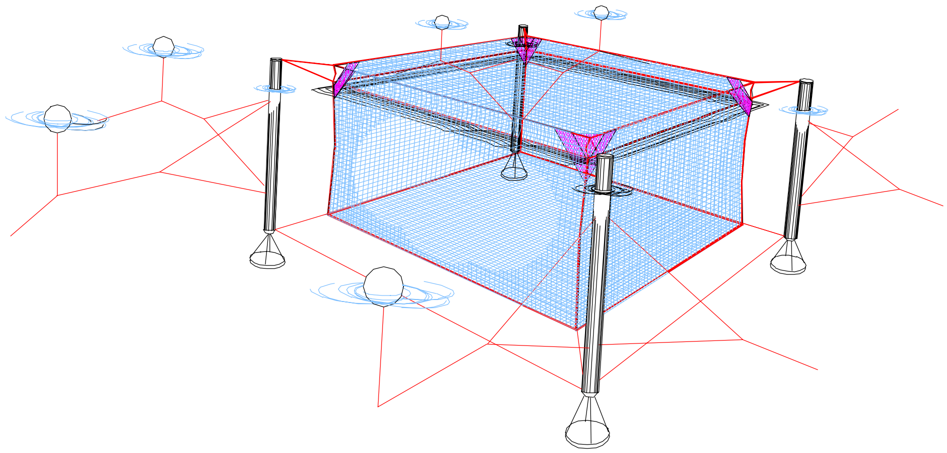

Figure 5. Schematic of an Ocean Spar net pen. The new Agate Pass Seapens will consist of three in series.

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Appendix T:

The Suquamish Tribe's Approach to Successful Chum Salmon Enhancement

The Suquamish Tribe's Approach to Successful Chum Salmon Enhancement

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Introduction

The Suquamish Tribe initiated a chum salmon enhancement program in 1977 to rebuild salmon populations in east Kitsap County streams. Most of these streams have small fractions of their historic salmon populations, having been heavily impacted by urbanization and other human activities. The larger streams have low flows that range from 5 to 10 cubic feet per second (cfs). The program objective is to restore Tribal chum salmon fisheries on, and near, the Port Madison Reservation. Cowling Creek Hatchery was constructed to maintain a hatchery run and to support satellite eggboxes installed on selected local streams. Most of the hatchery chum eggs are transferred to these eggboxes. The unfed fry volitionally migrate from the eggboxes, with the adults returning to spawn in their "new" natal streams. The Suquamish Tribe does not direct a terminal fishery on the adult chum returning to Cowling Creek in order to obtain the maximum possible genetic diversity within the hatchery population.

Cowling Creek Hatchery released Hood Canal origin chum in 1977 and 1978, but switched to local Chico Creek stock in 1979 to preserve genetic stock integrity within east Kitsap County. All Hood Canal adult chum returning to the hatchery were destroyed. Chico Creek, located near Bremerton, Washington, was famous for the thirty-nine Orcas that followed, then consumed, most of the chum returning to the stream in 1997. The Chico Creek chum run represents over 90% of wild chum escapement into east Kitsap County

Hatchery Design and Management

Cowling Creek Hatchery was designed to be simple to construct and operate. Pre-cast concrete modules were used to build the intake dams on the north and south forks and the south fork rearing pond dam. The intake dams bypass flood water around the settling pond. The fiberglas hatchery incubators are based on the Netarts design and assembled on site by hand. The rearing pond is a natural in-stream earthen pond (Figure 1). The adult recapture pond was located intertidally with a dam and fish ladder constructed out of sheetpile. The entire hatchery was constructed by staff and is designed for gravity flow operation with minimal electrical requirements. The spawning shed is located a short distance above the recapture pond and adult chum are transported to the racks via a custom fish lift. The fish lift is portable and is also used at the Tribe's Grovers Creek Hatchery to move fall chinook.

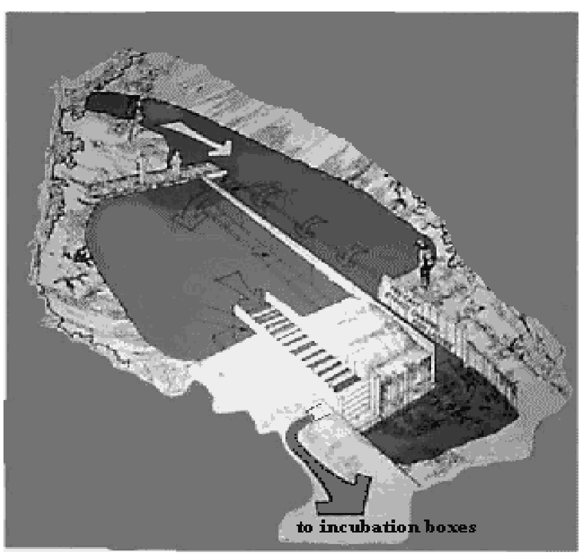

Figure 1. South Cowling Creek Hatchery intake dam schematic

Adult chum return to the hatchery in late October and continue running into December of each year. The adult chum successfully home in on Cowling Creek's low flow of 100 gallons per minute (gpm). The average winter

Cowling stream flow is 400 gpm with the highest flow recorded to date of 20,000 gpm. Limited natural spawning occurs in the intertidal recapture pond because it is saltwater. Hatchery staff seine the pond every weekday and harvest all adults present, up to 1,000 fish/day. Ratios of male to female Cowling chum remain approximately constant between years (Figure 2). Most of the females are ripe and are ready to be fertilized. Excess ripe eggs and any green eggs are sold to the caviar market. Cowling Creek chum are spawned throughout the entire run, with the eggs of two females fertilized by two males in one small bucket. Stream water is introduced to the bucket and the rinsed eggs are transferred to a 5 gallon bucket for water hardening in a 100 parts per million (ppm) iodophor solution for one hour. The water hardened eggs are transferred to the incubators and remain immersed in ambient temperature surface water. A 1:600 formalin treatment is applied three times a week via a 15 minute drip bottle at the head of each incubator raceway. Fish pathologists inspect 120 adults for viruses and other potential pathogens to certify the stock prior to transferring eggs out of the watershed. Scales are sampled weekly to determine age, and all chum adults are sampled for any tags that may have applied at sea.

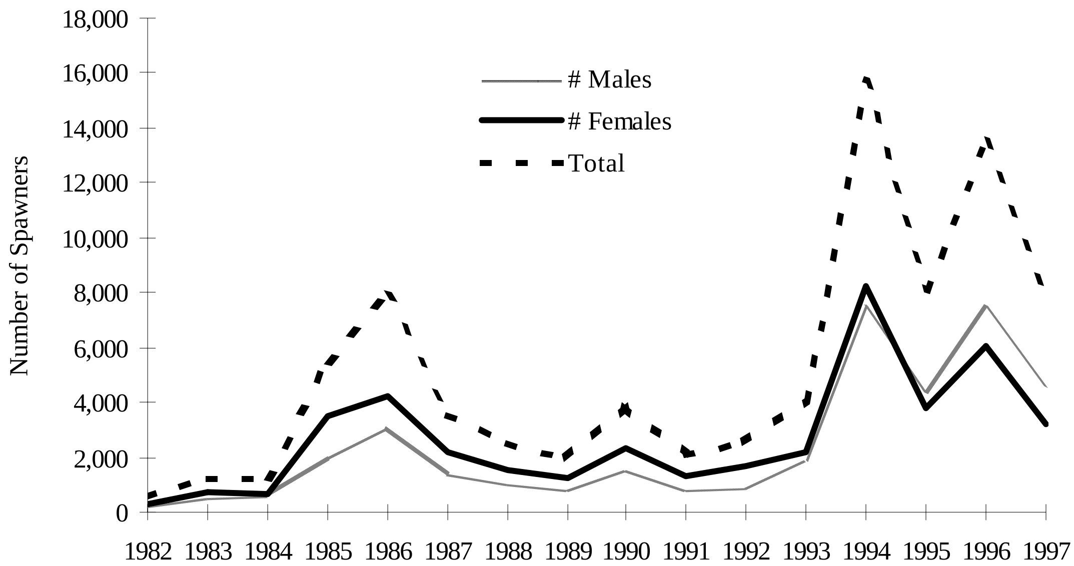

Figure 2. Cowling Creek Hatchery adult chum salmon return by sex, 1982 to 1997

Eyed-up eggs are picked, sorted by spawning date, and approximately 2,000,000 are transferred to the satellite eggboxes in proportion to the adult run timing. Approximately 500,000 are hatched in Cowling Creek incubators for release on station (Figure 3).

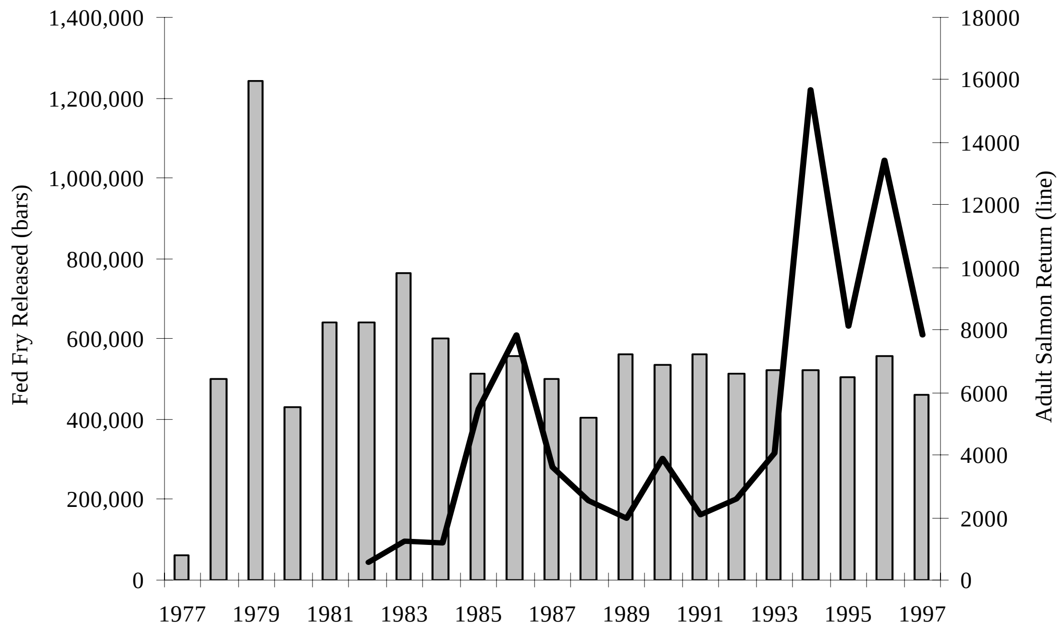

Figure 3. Cowling Creek Hatchery fed fry release and adult salmon return, 1977-1997

The early-emerging chum fry are fed in six-foot diameter ponds for several days until they are actively feeding, then released into the 1,000 ft^3 natural pond. All subsequent fry volitionally migrate into the rearing pond without handling except for a few stragglers. The fry initially start feeding at a weight of 0.3 gms and are fed for four to six weeks in an attempt to achieve a 1 gm body weight. Cowling Creek chum fry have not been observed to exhibit a feeding response behavior towards hatchery personnel, but instead randomly school throughout the pond searching for food during their residence in the pond. Several cutthroat trout are usually found in the pond during release, but avian predation is minimized by a birdnet over the pond. Releases occur after midnight on high tide and scuba diving observations verify marine predation is low during the first hours that the fry acclimate to Miller Bay estuary. Approximately one quarter of the chum fry typically display flared gills and may rest near the bottom when they first encounter saltwater. This response may last ten to twenty minutes before the fry regain normal swimming activity, and potentially renders them more vulnerable to predators.

Results

Cowling Creek Hatchery chum scale data can be used to determine adult spawner age ratios (Table 1). Although age 4 adults predominate in the run years observed, no consistent pattern is apparent because the numbers of adults returning each year varies. The age of the adult spawners can be used to generate survival of each brood year (Figure 4). This data set displays the trend for Cowling Creek chum to return in higher proportion as age 4 adults. The average survival to the hatchery rack was 0.5% for the years 1977 to 1989. This survival to rack rate will increase significantly when the age data for brood years 1990 to 1995 is available. Significant non-treaty commercial gillnetting and purse seining occurred from 1987 until 1993 outside of Miller Bay and may have harvested up to half the returning adult chum. The decrease in commercial value for chum salmon resulted in very reduced non-treaty fishing effort after 1993 and may explain the increased hatchery return. No Cowling Creek chum salmon are tagged.

Run Year	% Age	% Age 4	% Age 5
1980	100	0	0
1981	13	87	0
1982	27	72	1
1983	48	41	11
1984	41	56	3
1985	82	17	1
1986	24	74	2
1987	27	67	6
1988	35	58	7
1989	45	52	3
1990	4	93	3
1991	47	47	6
1992	10	84	6
1993	63	25	10
1994	17	81	2

Table 1. Cowling Creek Hatchery chum age by run year, 1980 to 1994

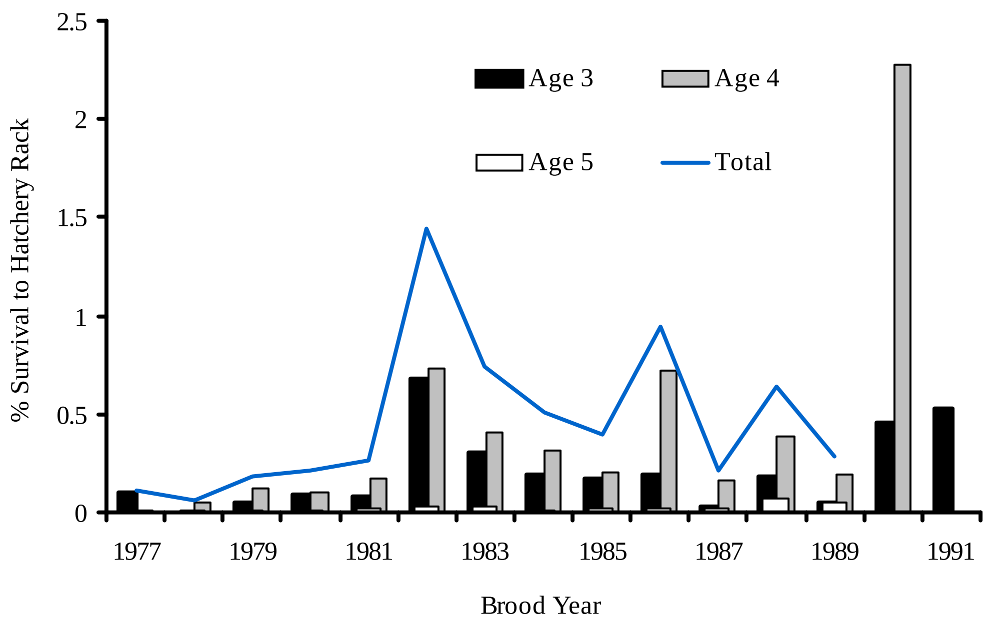

Figure 4. Cowling Creek Hatchery % survival to hatchery rack by brood year, 1977 to 1991

Cowling Creek Hatchery satellite chum eggbox releases have stabilized or increased escapement to Dogfish, Big Scandia, and Barker Creeks even with directed terminal fisheries on these streams (Figure 5). Chico Creek chum reflect primarily wild escapement, but one of its tributaries, Dickerson Creek, has a substantial eggbox component to its escapement. Dickerson Creek had two blocking culverts rendering it impassable to chum salmon for decades. There were few spawning adult chum in Dickerson Creek even after fish ladders were installed in the early 1980's. The first significant Dickerson Creek chum returns coincided with the expected returns from the eggbox releases. The majority of the chum returning to Dickerson Creek in the mid to late 1980's displayed the same behavior observed below the Dogfish, Big Scandia, and Barker Creek eggboxes: the adults attempt to swim up the eggbox water source instead of staying in the main stream channel. The main streams generally have flows 25-50 times greater than the eggbox tributaries. Most of the chum will finally spawn in the main stem instead of the tributary.

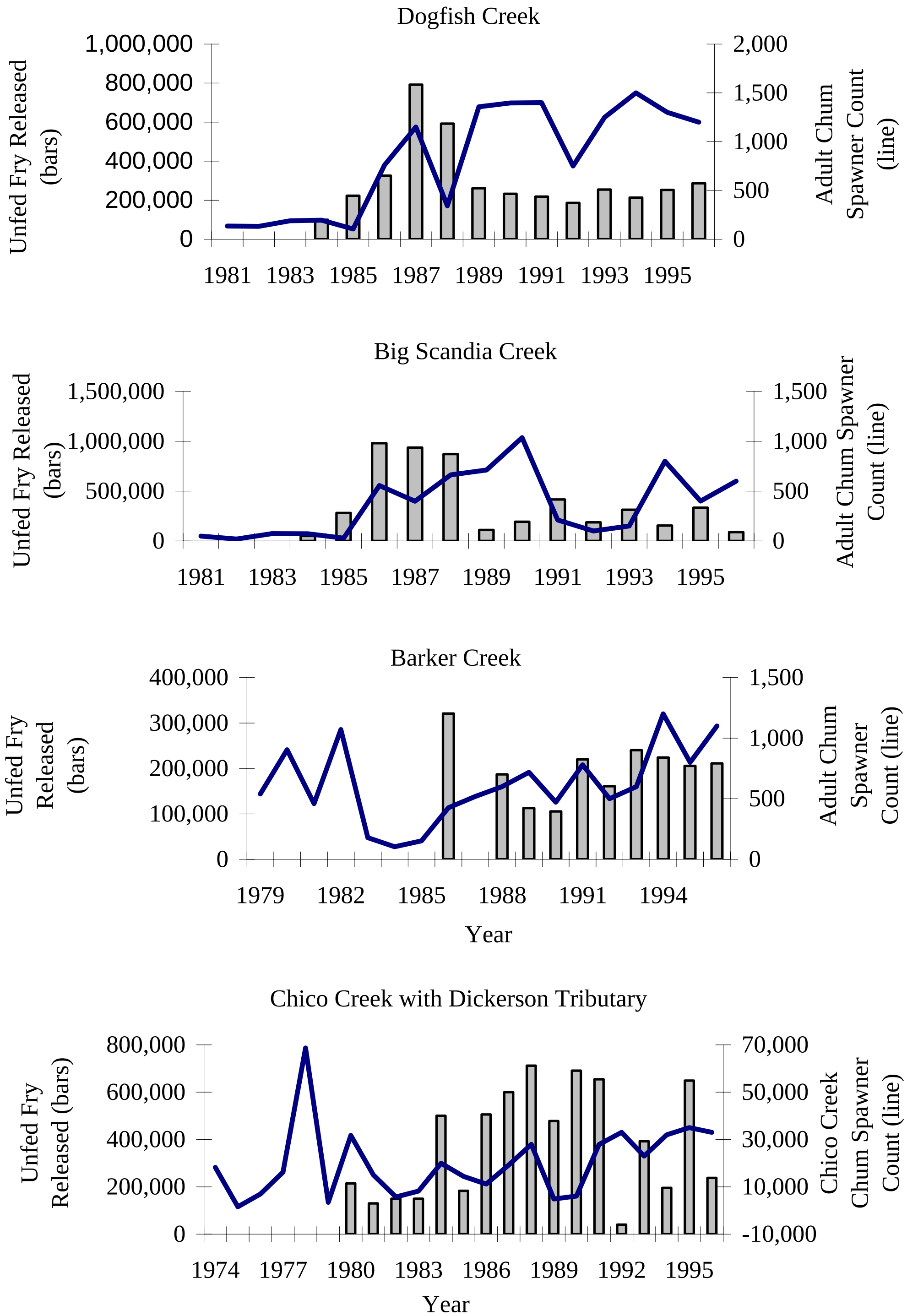

Figure 5. Unfed fry eggbox releases and adult spawner counts

The other satellite eggbox sites have smaller releases but show similar patterns except Clear Creek. Clear Creek, located near Silverdale, has had consistently low survival from two chum eggbox release sites. Chinook and coho reared in Clear Creek also have very low survival, and natural salmon spawning is almost nonexistent. Possible explanations include pollution, but exact causes are unknown at this time.

Survival of the satellite eggbox unfed volitional releases is estimated to be 0.1 to 0.2% back to the stream. Increased eggbox production since the mid-1980's have coincided with an increased commercial catch (Figure 6; also see Figure 7 for the value of the Tribal catch). This relationship may not be significant overall because east Kit sap's primary chum production is wild Chico stock. The relationship is significant in Liberty Bay, fed by Big Scandia and Dogfish Creeks, because a Tribal chum fisher y has been reestablished for the first time in decades.

Orca predation had a significant impact on the Chico Creek run in 1997 by consuming an estimated 20,000 adult chum. Escapement into Chico Creek for 1997 will probably be less than 5,000 adults, below the desired escapement of 16,000 to 18,000 adults. Orca had not been observed feeding upon Chico chum for four decades. If the Orca return more frequently, their impact to the wild Chico chum population could be significant given the urbanizing watershed.

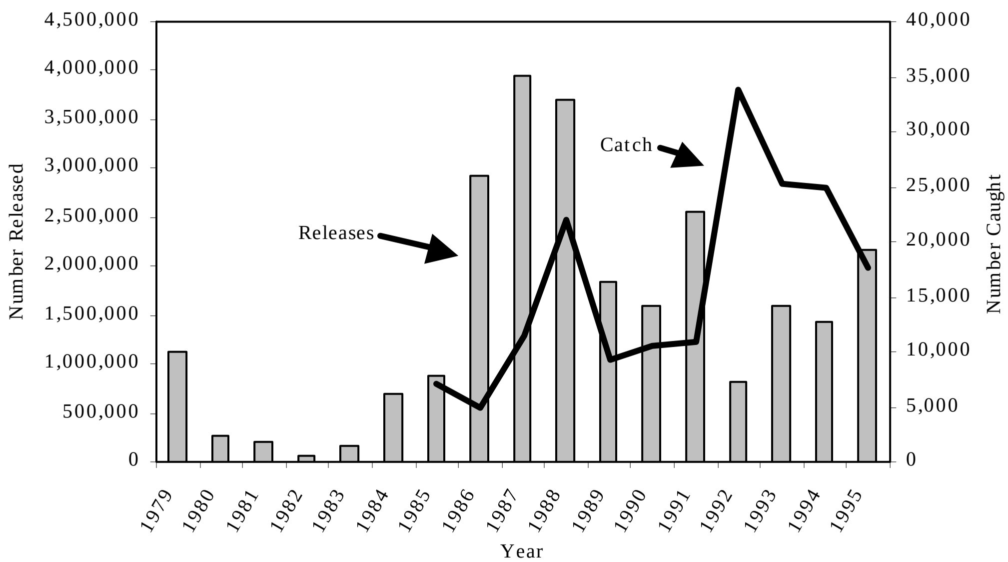

Figure 6. Suquamish Tribe Area 10E commercial chum harvest and east Kitsap chum enhancement

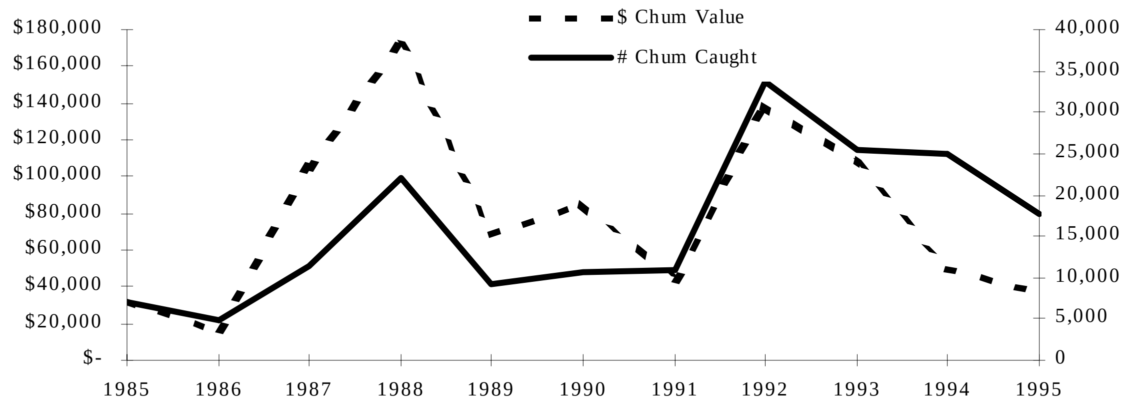

Figure 7. Suquamish Tribe Area 10E commercial chum harvest and value

All of the streams with eggboxes are presently undergoing projects related to restoration and barrier removal. The Boy Scouts, sports groups, tribes, local cities, county government, WDFW, USFWS, and other agencies are involved, and these projects will probably increase with the current emphasis on the Wild Salmonid Policy. The eggboxes were originally intended to "seed" streams, then be removed as chum salmon management is based on natural production. However, Kitsap County's urbanization rate has been rapid and the impacts are quickly felt within the small watersheds. The Tribe is presently evaluating the costs and benefits of a longer-term eggbox program as well as implementing a feeding strategy to increase the survival rate of selected enhanced chum populations.

Appendix U:

Integration of Joint City of Bainbridge Island/Suquamish Tribal Beach Seining Results into Shoreline Management and Salmon Recovery Efforts in Kitsap County, Washington

Additional information on the Bainbridge Island Beach Seine Project is available at:
http://www.ci.bainbridge-isl.wa.us/seine

Integration of Joint City of Bainbridge Island/Suquamish Tribal Beach Seining Results into Shoreline Management and Salmon Recovery Efforts in Kitsap County, Washington

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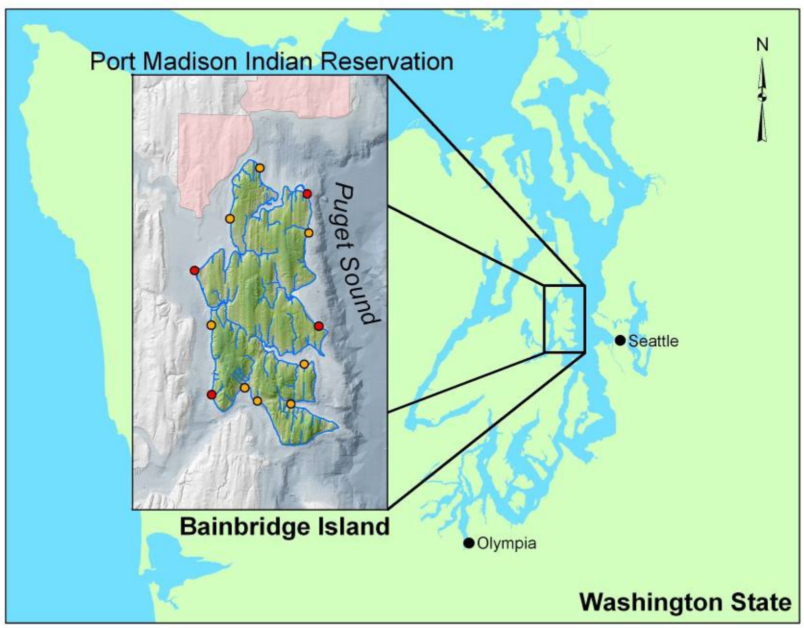
Introduction. Puget Sound estuarine and nearshore habitats support a rich assemblage of numerous vertebrates, invertebrates, and marine algae. This habitat is not as well understood as the terrestrial landscape, but is affected by, and modified by human land use activities (Aitkin 1998; Haring 2000; May and Peterson 2003). The recovery of listed Puget Sound salmon populations depends, in part, upon the quality of these marine habitats (Fresh, 2004). The City of Bainbridge Island (COBI), Suquamish Tribe (Tribe), and Washington Department of Fish and Wildlife (WDFW) have partnered since 2002 on a beach seining study designed to identify fish populations utilizing most shorelines of Bainbridge Island, WA. Bainbridge Island is located in Central Puget Sound, is approximately 28-square miles in size, has 53 miles of shorelines, and contains no Chinook bearing streams. Bainbridge Island is adjacent to the Tribe's Port Madison Indian Reservation. All Bainbridge Island marine waters are within the Tribe's usual and accustomed fishing grounds and are utilized by both the Tribe's salmon enhancement program and local natural salmon runs. Fifty-six fish species were identified over the first three years of this study, 2002-2004, and the study continues in 2005.

Figure 1: Study Area and Sample Sites (red = regular, orange = rotating sites).



The study's multiple objectives are to (1) identify the distribution, abundance, origin (by coded wire tag recovery), and timing of both wild and hatchery salmon, (2) compare the condition factors of hatchery to wild Chinook juveniles, (3) identify forage fish use of the nearshore, and (4) document all other fish and most of the larger invertebrate species encountered. A unique aspect of this research was the use of trained volunteers to provide most of the field labor. Eighty volunteers donated 640 hours of their time. The results of this study represent a baseline inventory that will be incorporated into the City's shoreline management programs and salmon recovery activities and will be used by the Suquamish Tribe to modify its hatchery program, if necessary, to avoid impacting listed species. Future seine efforts are anticipated to be used in adaptive management elements of these COBI and Tribal programs.

This beach seine project is just one component of larger management efforts. Some aspects of COBI's shoreline management efforts were presented at the 2003 Georgia Basin/Puget Sound Research Conference (Best 2004). The Bainbridge Island Nearshore Assessment and Summary of Best Available Science may be downloaded from the COBI website (www.bainbridge-isl.wa.us\nearshore.asp) (Williams et al. 2003 and 2004). The Tribe's Hatchery Genetic Management Plans and Resource Management Plan may be downloaded from (www.nwr.noaa.gov/lsrd/Propagation).

Methods. Sampling frequency occurred approximately every other week at four regular sites and ten rotating sites shown in Figure 1. Winter sampling was conducted monthly and not all winters were sampled as shown in Table 1. Sites were chosen to represent different habitat conditions (altered, natural, and vegetation), within different geomorphic settings, and geographically distributed around Bainbridge Island. The sites were generally seined only once each day and during daylight hours. The sites were randomly sampled during different tidal elevations to capture variability associated with depth, tidal direction, and current.

Table 1: Number of Beach Seine Sampling Days (x) by Year and Month

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2002				1x		2x	2x	2x	2x			
2003				1x	2x	2x	2x	2x	2x	1x	1x	1x
2004	1x	1x	2x	2x	2x	2x	1x	2x	2x	1x	1x	1x

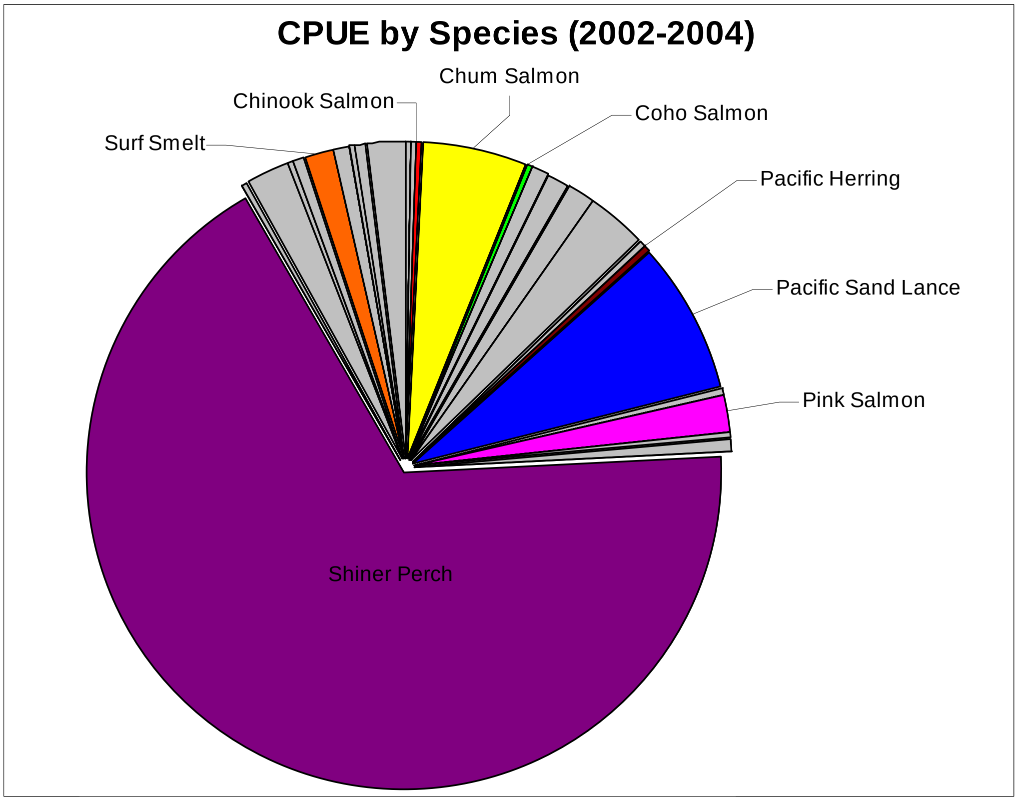
Sampling methodology employed a 37 m floating beach seine with tapered wings sized 2 m at the bag to 1 m at the end. The mesh sizes were 3 cm in the wings and 3 mm knotless nylon in the bag. The seine was deployed from a boat set approximately 33 m and parallel to shore. Lines on the end of the net were pulled towards the shore by several people on each end. The net was pulled so that it remained approximately parallel to shore for the first 20 m. The two lines were then drawn together for the last 10 m to close the net (Simenstad et al. 1991). The two sides were pulled at the same rate of speed so that the collection bag remained in the center of the net and parallel to shore as it was pulled into shore.

All fish, and most macro invertebrates, were identified to species and the first thirty of each species length was recorded (in mm) with the balance of the fish being counted. All salmonids were anaesthetized with MS-222 and measured for fork length. Chinook and coho smolts were electronically scanned for coded wire tags and visually checked for an adipose fin clip, indicating hatchery origin, and most were weighed. Beginning in June, for 2002 only, Chinook were also examined using a black light to determine the color, if present, of fluorescent dye used in a Sinclair Inlet WDFW research project

(Fresh et al. 2004). Additional data collected at each station included water quality (dissolved oxygen, temperature, salinity, and secchi), habitat (beach slope, substrate type, and vegetation), tidal stage/elevation, and meteorological conditions (air temperature, cloud cover, wind, and wave height). All data was entered into a Microsoft Access database (ArcGIS geodatabase) maintained at the City of Bainbridge Island and Suquamish Tribe, QA/QCed, and queried to generate finished figures and tables.

Results. A total of 84,818 fish and invertebrates were recorded, with 57,303 of this total, or 68%, comprised of shiner perch. Figure 2 details the proportional CPUE for all species illustrating that most species were present in relatively low abundance or seasonally. A low abundance does not presume low significance however, as the relatively few Chinook observed are listed as "threatened" under the US Endangered Species Act. We have little, if any, knowledge of the ecological significance of many of sparsely observed individual species. A more complete analysis of all vertebrate and invertebrates will be documented in a full report, along with the entire dataset, that will be downloadable from the COBI website (www.ci.bainbridge-isl.wa.us\seine) in the near future.

Figure 2: Proportional CPUE by Species



Juvenile Chinook were most numerous around Bainbridge Island during part of the current US Army Corps of Engineers (COE) marine regulatory work window (July 2 – March 2) and WDFW marine regulatory work window (June 15 – March 14) as seen in Figure 3 and Table 2, Juvenile Chinook were observed outside these work windows in increasing number from April to June. The Chinook CPUE's are comparable to recent studies by WDFW in Sinclair Inlet (Fresh et al. 2004), Dyes Inlet (Suquamish Tribe 2003), and King County (Brennan et al. 2004). In the Sinclair and Dyes Inlet studies, juvenile Chinook generally left these inlets by July whereas King County observed a pattern similar to COBI of extended juvenile Chinook presence from spring through late fall. Chinook CPUE's in Sinclair Inlet were significantly greater at night than during the day. The Bainbridge data is for daylight observations only.

Figure 3: Chinook and Coho CPUE with Current Regulatory Work Windows.

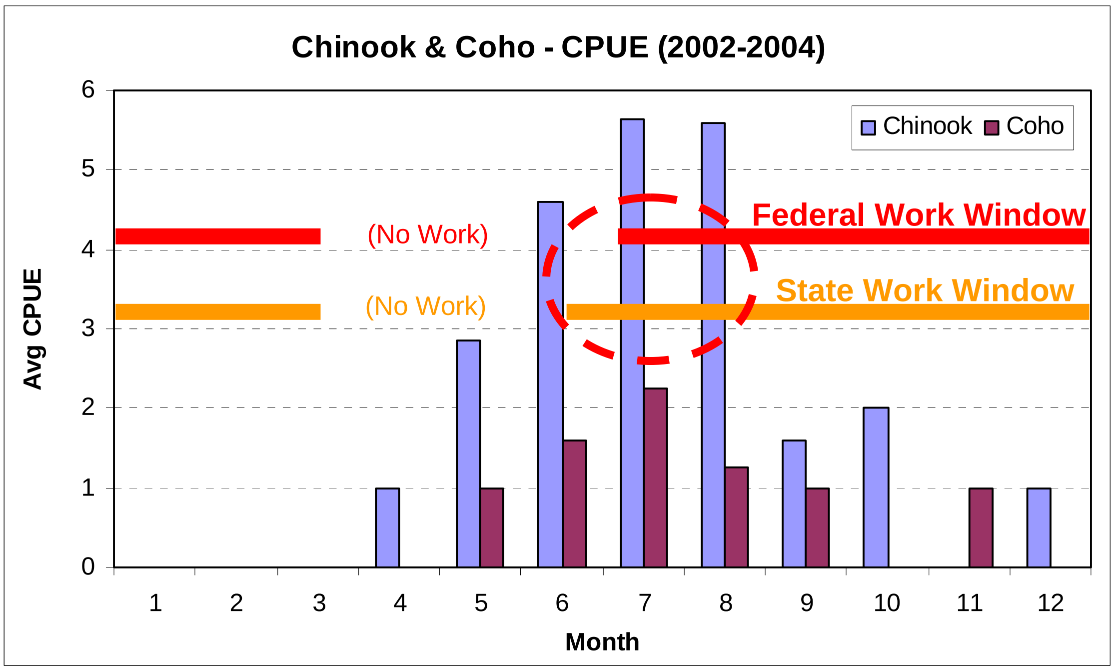


Table 2: Total Catch of Juvenile Salmonids and Forage Fish (2002-2004)

Month	Chinook	Coho	Chum	Pink	Herring	Surf Smelt	Sand Lance
1							
2				7			
3			593	174			3
4	1		1,734	771	2	58	117
5	20	1	2,136	567	3	123	22
6	69	8	32	7	192	133	5,153
7	107	18	6		27	94	320
8	84	5	10		15	123	313
9	8	1	5		3	9	12
10	6				8	151	720
11		1	1		31	279	2
12	1				3	22	
Total	296	34	4,517	1,526	284	992	6,662

The juvenile coho abundance, timing, and presence documented in Figure 3 and Table 2 was less than the observed juvenile Chinook data. Coho were also observed during regulatory work windows. Juvenile chum and pink salmon were present in much larger numbers than Chinook and coho as seen in Figure 4 and Table 2. Chum and pink salmon were observed around Bainbridge Island through September, with one individual captured in November, but except for March, the abundance was highest during closed Federal and State regulatory work windows. Pink salmon are most abundant in even years due to the much larger odd year adult spawning runs.

Figure 4: Chum and Pink CPUE with Current Regulatory Work Windows.

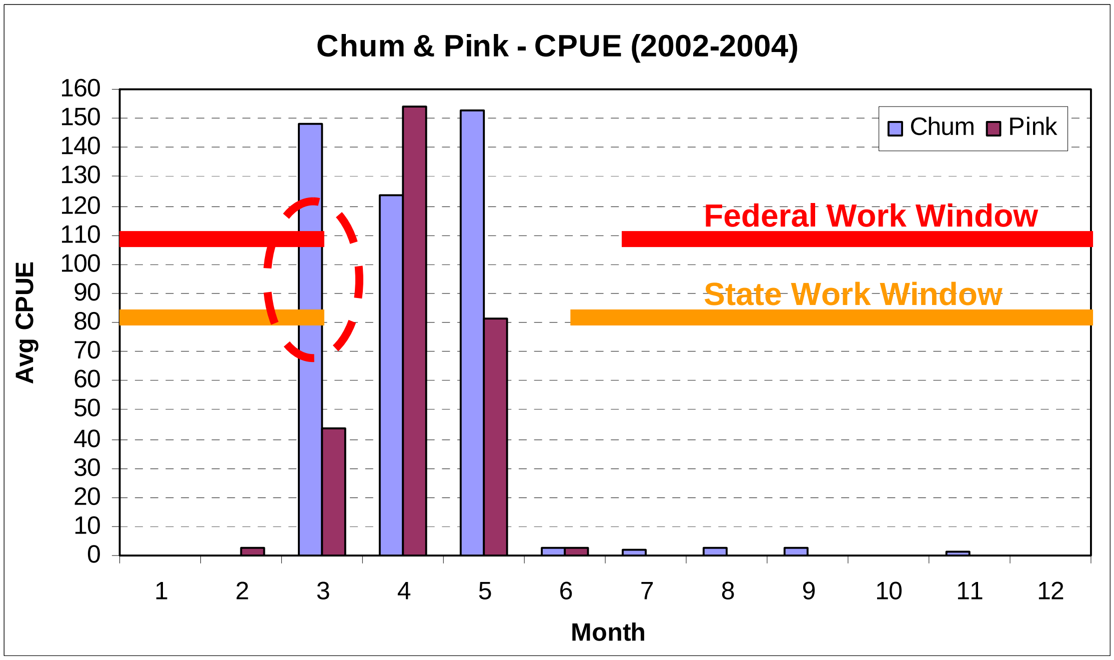
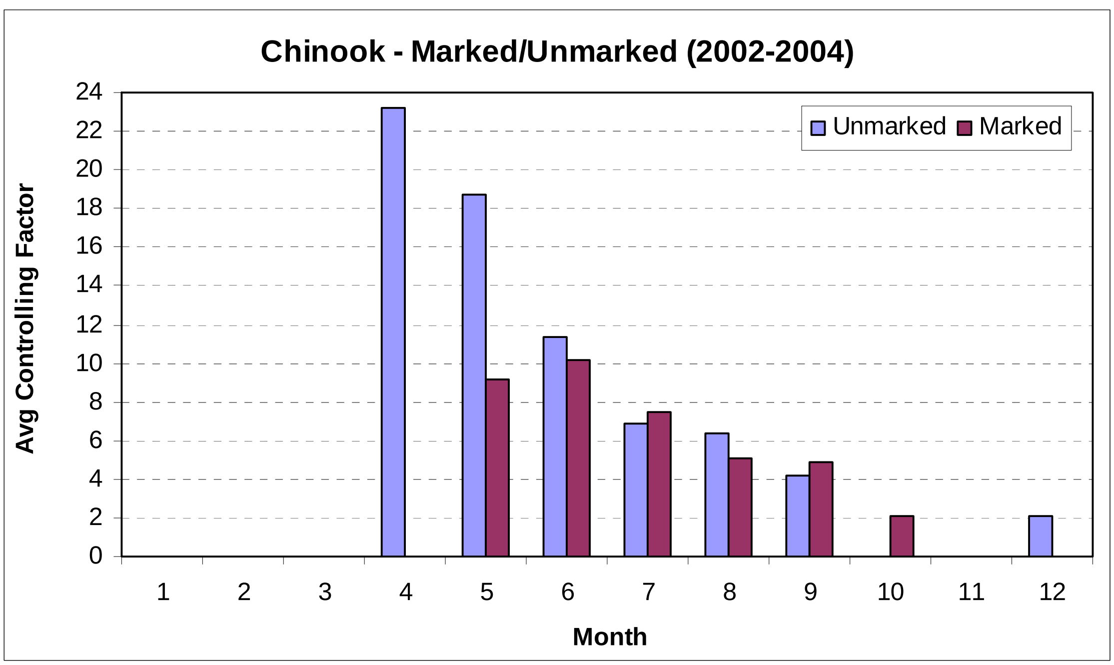


Figure 5: Condition Factor of Marked and Unmarked Chinook.



A large percentage of Puget Sound hatchery juvenile Chinook are “marked” by clipping their adipose fin. The Suquamish Tribe releases over 3 million Chinook into East Kitsap marine waters annually and uses this mark to identify hatchery Chinook from wild Chinook (the progeny of naturally spawning adult hatchery Chinook, or progeny of listed Chinook stocks) to help assess the impact of hatchery fish on natural fish in the estuary and nearshore. Figure 5 documents the observed differences in the condition factor (length divided by weight) between hatchery and wild juvenile Chinook collected in the Bainbridge nearshore sampling locations. The wild juvenile Chinook observed were present in April with a significantly higher condition factor than the hatchery Chinook, which are normally released in May. The condition factors of both hatchery and wild Chinook merge in June, and follow a similar pattern for the remainder of the year, suggesting that competition for prey resources may not be limiting

Table 3: Chinook CWT Origin (2002-2004)

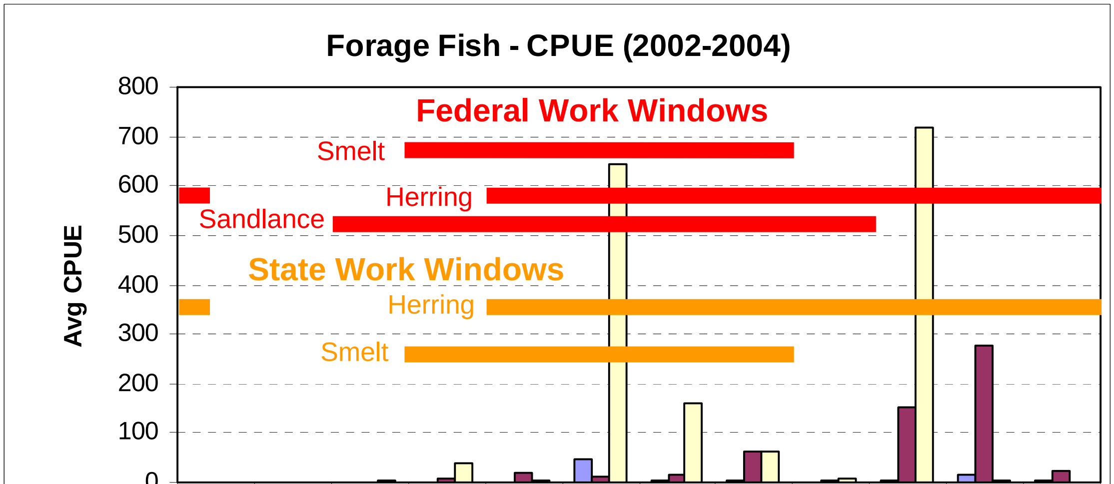
WRIA	Release Location	2002	2003	2004	**Total**
9	Big Soos (Green River)	5			**5**
10	Clarks Creek			1	**1**
15	Clear Creek			1	**1**
15	Gorst Creek	1	4	2	**7**
15	Grovers Creek		13	4	**17**
8	Issaquah Creek		2		**2**
15	Minter Creek			2	**2**
11	Nisqually River	1			**1**
10	Voight Creek			1	**1**
7	Wallace River			3	**3**
10	White River	1			**1**
	Total	**8**	**19**	**14**	**41**

The analysis of the CWT recoveries shown in Table 3 documents that juvenile hatchery Chinook salmon using Bainbridge Island nearshore originate from south, central, and north Puget Sound. This pattern is reflected in the King County, Sinclair, and Dyes studies. If juvenile hatchery Chinook migratory behavior is assumed to be surrogate for wild juvenile Chinook behavior, Bainbridge Island nearshore may be utilized by listed Puget Sound juvenile Chinook salmon from many rivers emptying into Puget Sound.

Forage fish are documented as important in the diet of salmon and utilize the nearshore for both reproduction and feeding. Figure 6 and Table 2 illustrate that forage fish utilize Bainbridge Island nearshore over much of the year and that their abundance is highly variable. Federal and State regulatory work windows vary by forage fish species but the Bainbridge Island data documents that the greatest abundance of forage fish was observed during these regulatory work windows.

Figure 7 documents the 2004 dissolved oxygen (DO) measurements at the four regular beach seine locations around Bainbridge Island. The lowest DO occurred in November and follows a pattern observed by the Puget Sound Ambient Monitoring Team. These observations were during cool weather and generally clear water conditions. Given the

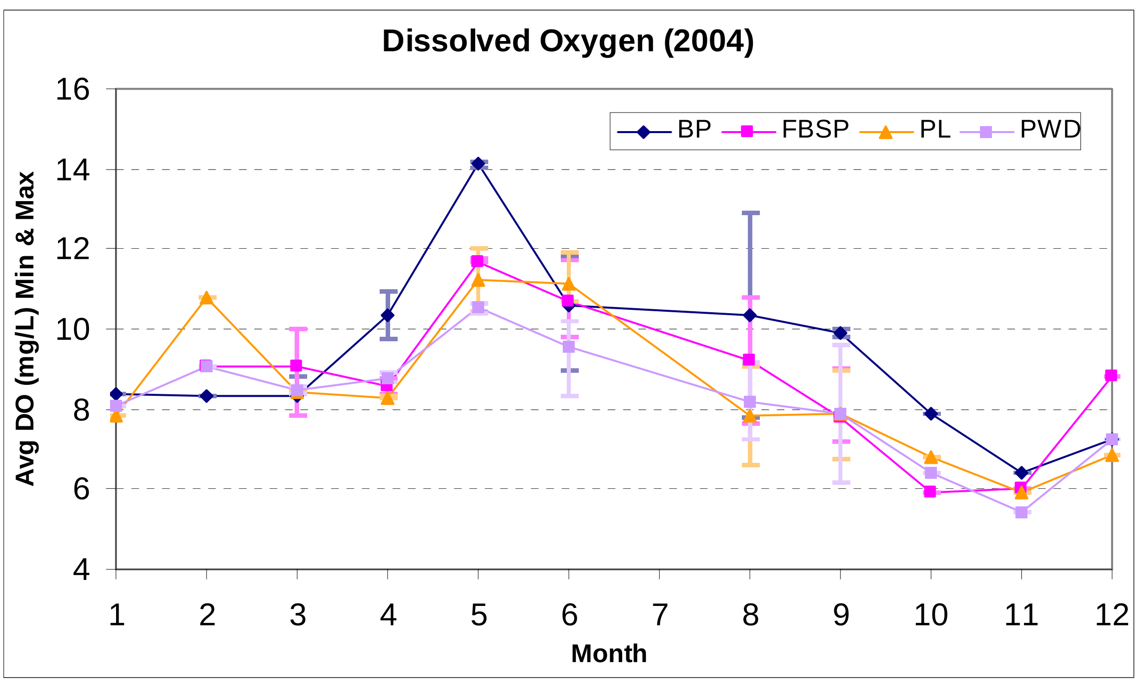
Figure 6: Forage Fish CPUE with Current Regulatory Work Windows.



Month	1	2	3	4	5	6	7	8	9	10	11	12
Herring	-	-	-	1	1	48	5	2	2	3	16	3
Surf Smelt	-	-	-	10	18	12	16	62	3	151	279	22
Sand Lance	-	-	3	39	3	644	160	63	6	720	2	-

low DO problems in Hood Canal, continued monitoring of Puget Sound DO levels would be important to insure nearshore habitat remains productive and can support the recovery of listed Puget Sound salmon stocks.

Figure 7: Dissolved Oxygen at Regular Sample Sites.



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