Section 3
Baseline Conditions

3.1 Water Quality

3.1.1 Water Quality Regulatory Framework

Surface water quality is regulated under the federal Clean Water Act 33 U.S.C. 1251. The purpose of the Clean Water Act (CWA) is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The CWA is administered by the U.S. Environmental Protection Agency (USEPA), although the USEPA has authority to delegate its responsibility to individual states. In Washington State, the USEPA has delegated some of its CWA authority to the Washington State Department of Ecology (Ecology). Ecology regulates water quality under Chapter 90.48 RCW, the Water Pollution Control Act, and under Chapter 173-201A WAC, the Water Quality Standards for Surface Waters of the State of Washington.

The process that Ecology follows to regulate surface water quality includes setting water quality standards, monitoring for compliance to those standards, and developing compliance strategies if the standards are not met. Ecology has set standards for eight indicators of water quality: (1) temperature, (2) dissolved oxygen, (3) turbidity, (4) total dissolved gas, (5) pH, (6) fecal coliform, (7) toxic, radioactive, and deleterious materials, and (8) aesthetic values. The standards are both numeric and narrative and are established to protect the designated uses, such as fish and shellfish, and recreational uses, for each water body. Additionally, the surface water quality standards include an anti-degradation policy which states that waters should not be degraded to the point that designated uses are impaired.

The surface water bodies in the Planning Area are classified as Class A (excellent) quality waters under WAC 173-201A-030 and WAC 173-201A-120, which were adopted in 1997. The WAC requires that this class of waters meet or exceed the requirements for all or substantially all characteristic uses, including:

- Water supply (domestic, industrial, agricultural)
- Stock watering
- Fish and shellfish (migration, rearing, spawning, harvesting)
- Wildlife habitat
- Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment)
- Commerce and navigation

Table 3-1 summarizes the water quality standards applicable to this CIDMP. The watercourses within the Planning Area are subject to Class A Fresh Water standards; the marine waters adjoining the Planning Area are subject to Class A Marine Water standards.

Table 3-1. Washington State Surface Water Quality Standards[1]

Parameter	Criteria	Class A Standards	
		Fresh Water	Marine Water
Fecal Coliform	Shall not exceed a geometric mean value of (colonies/100 mL):	100	14
	Shall not have more than 10% of samples exceeding (colonies/100mL):	200	43
Dissolved Oxygen	Shall exceed (mg/L):	8.0	6.0
Temperature	Shall not exceed a 7-day average maximum (°C):	17.5	16.0
	When natural conditions exceed this value, no temperature increases will be allowed which will raise the receiving water temperature by more than (°C):	0.3	0.3
pH	Shall be within the range of (pH Units):	6.5-8.5	7.0-8.5
	Human-caused variation shall be within the range of (pH Units):	0.5	0.5
Turbidity	When background turbidity is 50 nephelometric turbidity units (NTU) or less, shall not exceed background turbidity by more than (NTU):	5	5
	When background turbidity is more than 50 NTU, shall not increase more than (percent):	10%	10%
Total Dissolved Gas	Shall not exceed 110 percent of saturation at any point of sample collection.		
Toxic, Radioactive, or Deleterious Material	Toxic, radioactive or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health (see WAC 173-201A-040 and 173-201A-050).		
Aesthetic Values	Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the sense of sight, smell, touch, or taste.		

Source: WAC 173-201A-030

[1] Ecology is currently revising the State's water quality standards. The 1997 version of the water quality standards apply to this project until the USEPA approves the revised standards.

3.1.2 Washington State Water Quality Assessment

Ecology assesses state water bodies every 2 years to determine if water quality standards are being met. Ecology classifies each water body within a system of five categories and publishes the results in a report called the Water Quality Assessment. The 2004 Statewide Water Quality Assessment includes five categories of water bodies:

- **Category 5** - Polluted waters that require establishing a Total Maximum Daily Load (TMDL), which sets the maximum level of pollutant loading at which the water body will meet standards.
- **Category 4** - Polluted waters that do not require a TMDL:
  - Category 4a - Has a TMDL
  - Category 4b - Has a pollution control plan
  - Category 4c - Impaired by a non-pollutant (i.e., fish passage, instream flow, etc.)
- **Category 3** – No data submitted

- **Category 2** - Waters of concern
- **Category 1** - Meets tested standards for clean waters

The compliance strategy for point source pollution (contaminants entering a water body from discrete sources) is accomplished by requiring discharge permits that limit pollutant loading under the National Pollutant Discharge Elimination System (NPDES) program. The compliance strategy for non-point source pollution (contaminants entering from non-discrete sources) is largely accomplished by voluntary Best Management Practices (BMPs), although mandatory enforcement is possible in some cases.

Non-point source pollution is the main category of pollutant loading in the Planning Area. Agricultural non-point pollution is addressed primarily by BMPs, although state laws exist for regulation of livestock and dairy farms, Certified Animal Feeding Operations, and pesticide use. Dairy farms are required to create waste management plans with technical assistance provided by conservation districts. Pesticide use is regulated by the Washington State Department of Agriculture (WSDA). Water bodies are also protected from agricultural non-point pollution under Skagit County's Critical Areas Ordinance (Skagit County Code 14.24.120). These measures include restrictions on cattle access to streams, ditch maintenance, soil erosion, and manure management.

Ecology's 2004 Water Quality Assessment analyzed 170 data sets for water bodies within the Planning Area. Over half of the data sets (61 percent) met water quality standards (Category 1), approximately one-third (28 percent) did not (Category 4 and 5), and the remaining data sets were inconclusive (Category 2).

The results of the 2004 Water Quality Assessment pertaining to the Planning Area are summarized in Table 3-2 and Exhibit 3-1. Category 5 listings are shown in Table 3-2, and all categories are shown in Exhibit 3-1 for illustrative purposes. In Table 3-2, a water body may appear several times since it may be tested for several parameters; similarly, different sections of the water body may be listed for the same parameter.

Water bodies within the Planning Area that do not meet water quality standards include: Browns Slough (fecal coliform); Carpenter Creek (temperature); Edison Slough (temperature, dissolved oxygen); Big Indian Slough (fecal coliform, dissolved oxygen); Joe Leary Slough (fecal coliform, dissolved oxygen); Noname Slough (fecal coliform, dissolved oxygen); Samish Bay (fecal coliform); Samish River (turbidity, fecal coliform); Skagit Bay (fecal coliform); Skagit River (PCBs); Swinomish Channel (organics); an unnamed creek (temperature, dissolved oxygen); an unnamed slough (fecal coliform, dissolved oxygen); and Wiley Slough (fecal coliform).

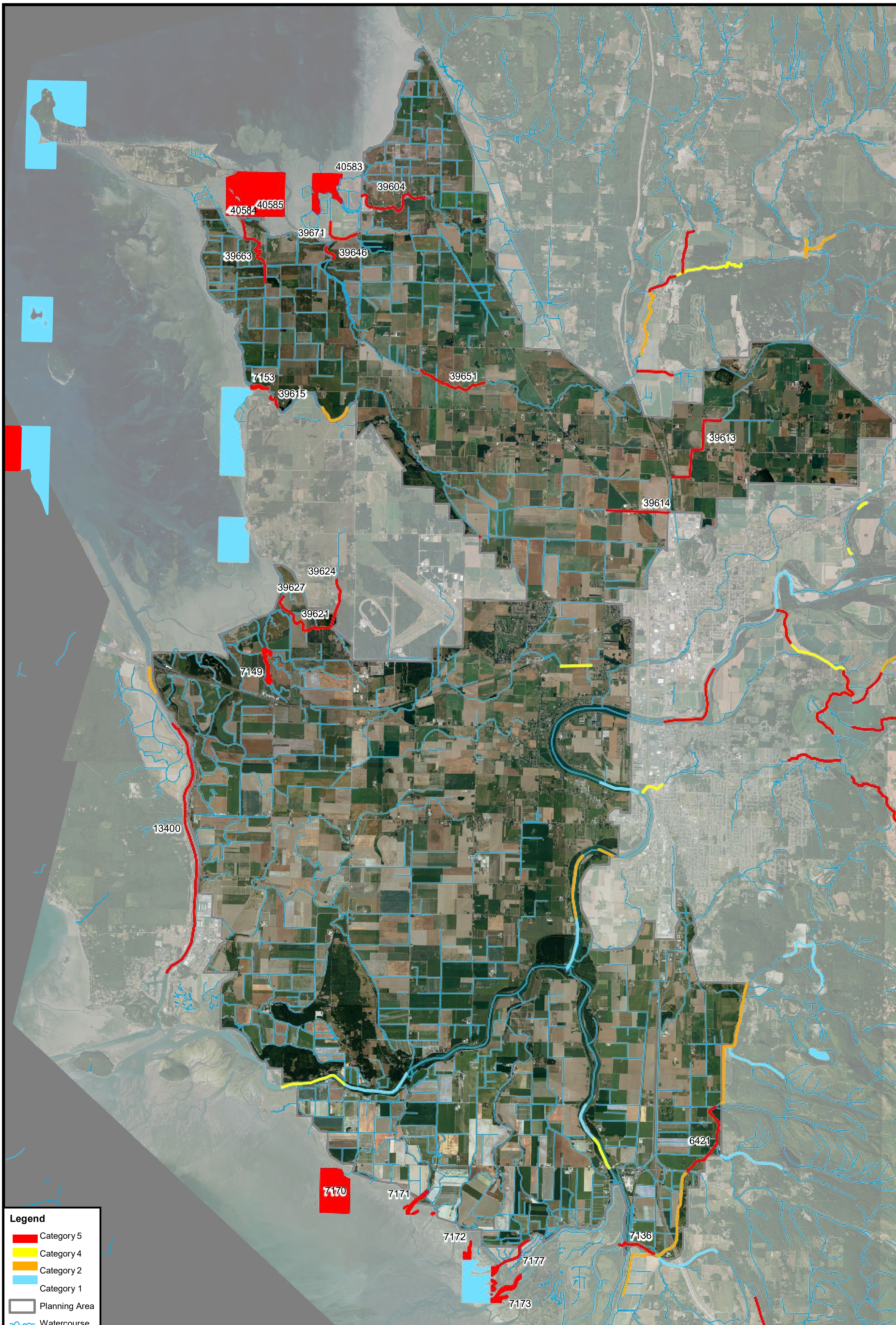
Table 3-2. Category 5 Water Bodies in the Planning Area

Water body	Parameter	Basis for Listing[1]	Listing ID
Browns Slough	Fecal Coliform	Skagit River System Cooperative data (submitted by Bob La Rock on 9-20-93) show that the percentile criteria are exceeded out of 6 samples at station BRWU during 1992.	7133
Carpenter Creek	Temperature	Ecology unpublished data from the Skagit TMDL Study shows a 7-day mean of daily maximum values of 22.4 for week ending 14 July 2001 at station 03C01 (Carpenter Creek nr mouth). Pickett (1997) station Skagit34 (Carpenter/Fisher Creeks).	6422
Carpenter Creek	Temperature	Ecology unpublished data from the Skagit TMDL Study shows a 7-day mean of daily maximum values of 22 for week ending 15 August 2001 at station 03C02 (Carpenter Creek at SR 534).	6421
Edison Slough	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, 2001, and 2002.	39605
Edison Slough	Temperature	Skagit Stream Team unpublished data show excursions beyond the criterion in 2000, 2001, and 2002.	39606
Indian (Big) Slough	Dissolved oxygen	Bulthuis, 1993: review shows multiple excursions beyond the criterion during 1987, 1988, and 1991. Cassidy and McKeen, 1986: multiple excursions beyond the criterion during 1985 and 1986.	7150
Indian (Big) Slough	Fecal Coliform	Bulthuis, 1993: exceeds geometric mean criterion in 1986.	7149
Joe Leary Slough	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, 2001, and 2002.	39611
Joe Leary Slough	Fecal Coliform	Skagit Stream Team unpublished data show the geometric mean criterion was exceeded in 1999, 2000, and 2002.	39608
Joe Leary Slough	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, 2001, and 2002.	39612
Joe Leary Slough	Fecal Coliform	Skagit Stream Team unpublished data show the geometric mean criterion was exceeded in 2000.	39609
Joe Leary Slough	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, 2001, and 2002.	39610
Joe Leary Slough	Fecal Coliform	Skagit Stream Team unpublished data show the geometric mean criterion was exceeded in 1999, 2000, and 2002.	39607
Joe Leary Slough	Fecal Coliform	Bulthuis, 1993: exceeds geometric mean criterion in 1986. Bulthuis, 1997: samples from multiple locations showed high levels of fecal coliform on 12/5/96. Bulthuis, 1996: samples from multiple locations showed high levels of fecal coliform on 10/29/xx.	7153
No Name Slough	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, and 2002.	39620
No Name Slough	Fecal Coliform	Skagit Stream Team unpublished data show the geometric mean criterion was exceeded in 1999, 2000, 2001, and 2002.	39616
No Name Slough	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, and 2002. Giles and Bulthuis, 1996: numerous excursions beyond the criterion during 1996.	39621
No Name Slough	Fecal Coliform	Skagit Stream Team unpublished data show the geometric mean criterion was not exceeded in samples collected from 1999-2002. Giles and Bulthuis, 1996. 4 samples collected showed some high levels in 1996. Bulthuis, 1993: exceeds geometric mean criteria.	7158
No Name Slough	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, and 2001.	39623

Water body	Parameter	Basis for Listing[1]	Listing ID
Samish Bay	Fecal Coliform	Department of Health Prohibited Commercial Shellfish Area at Samish Bay based partially on data from station 13 that exceed the criterion (from the Annual Growing Area Review ending December 1996).	40584
Samish Bay	Fecal Coliform	Department of Health Prohibited Commercial Shellfish Area at Samish Bay based partially on data from station 19 that exceed the criterion (from the Annual Growing Area Review ending December 1996).	40585
Samish Bay	Fecal Coliform	Department of Health Prohibited Commercial Shellfish Area at Samish Bay based partially on data from station 18 that exceed the criterion (from the Annual Growing Area Review ending December 1996).	40583
Samish River	Fecal Coliform	Hallock (2001): Ecology Ambient Monitoring Station 03B045 (Samish River near mouth) shows a geometric mean of 89 does not exceed the criterion and that 0% of the samples does not exceed the percentile criterion from 2 samples collected during 1994.	16413
Samish River	Turbidity	Hallock (2002): shows 5 excursions beyond the criterion out of 12 samples collected between 1992 and 2001 derived by the difference between the upstream station 03B080 (Samish River near Prairie) and the downstream station 03B045 (Samish River near mouth).	15910
Samish River	Fecal Coliform	Skagit Stream Team unpublished data show the geometric mean criterion was exceeded in 2000 and 2001.	39646
Skagit Bay	Fecal Coliform	Skagit River System Cooperative data (submitted by Bob La Rock on 9-20-93) show both criteria are exceeded out of 6 samples at station HALD during 1992.	7170
Skagit Bay	Fecal Coliform	Skagit River System Cooperative data (submitted by Bob La Rock on 9-20-93) show both criteria are exceeded out of 6 samples at station BRWD during 1992.	7171
Skagit Bay	Fecal Coliform	Skagit River System Cooperative data (submitted by Bob La Rock on 9-20-93) show both criteria are exceeded out of 6 samples at station DRYD during 1992.	7172
Skagit Bay	Fecal Coliform	Skagit River System Cooperative data (submitted by Bob La Rock on 9-20-93) show both criteria are exceeded out of 6 samples at station WILD during 1992.	7173
Skagit River	Total PCBs	Washington Department of Fish and Wildlife PSAMP database shows the National Toxic Rule Criterion was exceeded in a composite of 4 muscle samples collected in 2000 from coho salmon (*Oncorhynchus kisutch*) from station SKAGIT. Tissue samples are from anadromous or nonresident fish and do not include information on the likely source of the toxic pollutant as it relates to the water body segment.	35570
Swinomish Channel	Benzo(A) Anthracene	Johnson, 2000: shows the National Toxic Rule criterion was exceeded in a composite of 20 oyster soft-parts on 6/1/99.	12367
Swinomish Channel	Chrysene	Johnson, 2000: shows the National Toxic Rule criterion was exceeded in a composite of 20 oyster soft-parts on 6/1/99.	12371
Unnamed Creek	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, 2001 and 2002.	39666
Unnamed Creek	Temperature	Skagit Stream Team unpublished data show excursions beyond the criterion in 2000, 2001, and 2002.	39669
Unnamed Slough	Dissolved oxygen	Skagit Stream Team unpublished data show excursions beyond the criterion in 1999, 2000, 2001, and 2002.	39673
Unnamed Slough	Fecal Coliform	Skagit Stream Team unpublished data show the geometric mean criterion was exceeded in 1999, 2000, and 2002.	39671
Wiley Slough	Fecal Coliform	Skagit River System Cooperative data (submitted by Bob La Rock on 9-20-93) show the percentile criteria are exceeded out of 6 samples at station WILU during 1992.	7177

Source: Ecology, 2005c

[1]References included in Table 3-2 are cited on Ecology's Web site and are not included in the References section of this CIDMP document.



Printing Date: October 10, 2006 | File: exhibit_3-1.mxd | Source: Ecology, 2005c

Exhibit 3-1
2004 Washington State Water Quality Assessment

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association

3.1.3 Water Quality Monitoring

This section describes ongoing water quality monitoring activities in the Planning Area. An overview of monitoring activities is presented in Table 3-3. Watercourses are organized using the watercourse classification system developed for the Drainage and Fish Initiative (see Section 1.2.2). Results of the monitoring activities listed in Table 3-3 are described below.

Table 3-3. Water Quality Monitoring in the Planning Area and Adjoining Marine Waters

Water Body[1]	Parameter	Ecology[3]	Skagit County	Padilla Bay Reserve	Skagit Conservation District	Dept. of Health	Dept of Agriculture[4]
Natural Watercourses							
Skagit River	Fecal Coliform		X				
	Temperature		X				
	Dissolved Oxygen		X				
Samish River	Fecal Coliform	X	X		X		
	Temperature	X	X		X		
	Dissolved Oxygen	X	X		X		
	Other[2]	X	X				X
Managed Watercourses with Headwaters							
Fisher Creek	Fecal Coliform		X				
	Temperature		X				
	Dissolved Oxygen		X				
No Name Slough	Fecal Coliform		X		X		
	Temperature		X		X		
	Dissolved Oxygen		X		X		
	Other[2]		X		X		
Big Indian Slough	Fecal Coliform		X				
	Temperature		X				
	Dissolved Oxygen		X				
	Other[2]						X
Big Ditch	Other[2]						X
Hill Ditch	Fecal Coliform		X				
	Temperature		X				
	Dissolved Oxygen		X				
Maddox Slough/Big Ditch	Fecal Coliform		X				
	Temperature		X				
	Dissolved Oxygen		X				
Managed Watercourses without Headwaters							
Edison Slough	Fecal Coliform	X	X				
	Temperature	X	X				
	Dissolved Oxygen	X	X				
	Other[2]	X	X				

Water Body[1]	Parameter	Ecology[3]	Skagit County	Padilla Bay Reserve	Skagit Conservation District	Dept. of Health	Dept of Agriculture[4]
Joe Leary Slough	Fecal Coliform		X		X		
	Temperature		X		X		
	Dissolved Oxygen		X		X		
	Other[2]		X	X	X		
Wiley Slough	Fecal Coliform		X				
	Temperature		X				
	Dissolved Oxygen		X				
Alice Bay Pump Station	Fecal Coliform	X	X		X		
	Temperature	X	X		X		
	Dissolved Oxygen	X	X		X		
	Other[2]	X	X		X		
Sullivan Slough at La Conner / Whitney Road	Fecal Coliform		X				
	Temperature		X				
	Dissolved Oxygen		X				
Ditch near Edison Slough	Fecal Coliform	X	X				
	Temperature	X	X				
	Dissolved Oxygen	X	X				
	Other[2]	X	X				
Brown's Slough	Other[2]						X
Tide gate / pump station near Samish Bay	Fecal Coliform	X	X				
	Temperature	X	X				
	Dissolved Oxygen	X	X				
	Other[2]	X	X				
Marine Waters							
Swinomish Channel	Fecal Coliform		X				
	Temperature		X				
	Dissolved Oxygen		X				
Samish Bay	Fecal Coliform					X	
	Temperature					X	
	Dissolved Oxygen						
	Other[2]					X	
Padilla Bay	Fecal Coliform			X		X	
	Temperature			X		X	
	Dissolved Oxygen			X			
	Other[2]			X		X	
Skagit Bay	Fecal Coliform					X	
	Temperature					X	
	Other[2]					X	

Sources: Skagit County Public Works Department, 2003; Skagit County Public Works Department, 2004; Skagit Conservation District, 2004; DOH, 2005.

[1] Water bodies may be sampled at several locations.

[2] Other parameters may include turbidity, pH, conductivity, salinity, nitrates/nitrites, ammonia, total suspended solids, streamflow, and others.

[3] Ecology began collecting data in 2006 as part of the Samish Watershed TMDL. See Section 3.1.4.

[4] The Washington State Department of Agriculture began collecting data in 2006 as part of a pesticide study. See Section 3.1.5.

Natural Watercourses

Water quality in the Skagit River within the Planning Area is relatively high. Only one segment of the Skagit River that lies within the Planning Area is listed as requiring a TMDL (for total polychlorinated biphenyls [PCBs]) (see Table 3-2). Skagit County monitors the Skagit River for fecal coliform, temperature, and dissolved oxygen (Skagit County Public Works Department, 2004). Data collected from October 2003 to September 2004 indicate that the sampled Skagit River sites met water quality standards for fecal coliform and dissolved oxygen. Temperature data indicate that the state temperature standard was exceeded in the Skagit River in some weeks during July and August 2004, with a maximum daily temperature of 20.9°C recorded at Fir Island Road. However, it is likely that these high temperature readings were inaccurate because the data collection equipment was out of the water during periods of low flow.

Fecal coliform is the main water quality concern in the Samish River based on results of Ecology's 2004 Water Quality Assessment (see Table 3-2). Ecology is in the process of planning a TMDL study to address this problem (see Section 3.1.4). Data collected by Skagit County and the Skagit Conservation District also indicate that the criteria for fecal coliform are not consistently met in the Samish River (Skagit County Public Works Department, 2003; Skagit Conservation District, 2004). Skagit County data indicate that the temperature criteria were exceeded during July and August, and the dissolved oxygen standard was not met for 2 weeks in May 2004 at the sampled location (near Thomas Road).

Managed Watercourses with and without Headwaters

Skagit County monitors Fisher Creek for temperature, dissolved oxygen, and fecal coliform (Skagit County Public Works Department, 2004). Skagit County data show that temperature and dissolved oxygen levels in Fisher Creek consistently met state standards. Fecal coliform levels in Fisher Creek exceeded the state standard, with 27 percent of samples exceeding 200 coliform units per milliliter (cfu/mL).

Six sloughs in the Planning Area are identified in the 2004 Water Quality Assessment (see Table 3-2) as not meeting water quality standards for fecal coliform, temperature, dissolved oxygen, or a combination thereof. Skagit County and the Skagit Conservation District monitor water quality at various locations in these and other sloughs in the Planning Area (Skagit County Public Works Department, 2004; Skagit Conservation District, 2004). None of the sloughs sampled by Skagit County between October 2004 and September 2005 consistently met standards for temperature, dissolved oxygen, or fecal coliform.

Marine Waters

Fecal coliform, and its effect on shellfish production, is the primary water quality concern in Skagit, Padilla, and Samish Bays. Several locations in Samish and Skagit Bays are listed as Category 5 for fecal coliform (see Table 3-2). The Washington State Department of Health (DOH) monitors fecal coliform and temperature at multiple locations in the bays. Samples are collected monthly from several sites in Samish and Skagit Bays. Data collected between January 2002 and July 2005 were reviewed for the purpose of this analysis. During that time period, the fecal coliform standard was not met at 6 of the 20 locations sampled in Samish Bay, and 2 of the 12 locations sampled in Skagit Bay.

The is a concern with regard to natural background temperature conditions in the marine waters adjoining the Planning Area, which may result in seasonal temperature fluctuations that exceed water quality criteria. This phenomenon is not well documented, but may warrant consideration as future monitoring activities are planned. None of the marine waters adjoining the Planning Area have been listed as impaired in the 303(d) list with regard to temperature.

3.1.4 Samish Watershed Fecal Coliform TMDL

Ecology recently announced that a fecal coliform TMDL is being developed for the Samish Watershed (Lawrence, 2005). The goal of the TMDL is to quantify loadings of fecal coliform to Samish Bay in an effort to protect and restore shellfish beds for harvest. Water quality monitoring for the TMDL began in 2006 and will continue for approximately 1 year. The monitoring results will be used to set the maximum level of fecal coliform loading at which Samish Bay will meet standards for fecal coliform. Ecology will prepare a cleanup plan to achieve those standards.

As part of the TMDL study, Ecology will quantify the major sources of fecal coliform to the Samish River and Samish Bay. Five districts included in this CIDMP are located all or in part within the Samish Watershed: Districts 5, 8, 14, 16, and 25. Thus, a portion of the Planning Area is located within the Samish TMDL study area.

WWAA and Ecology are working together to integrate the Samish TMDL and this CIDMP. As discussed in Section 1, Ecology has provided guidance on this integration, which indicates that the CIDMP may be considered part of the implementation plan for the TMDL for those waters and parameters affected by irrigation district operations. Integration of these processes could provide multiple benefits to both Ecology and the drainage/irrigation districts. Ecology hopes to improve communication with landowners, gain access and support for monitoring activities within the drainage system, and learn more about drainage system infrastructure and operation and maintenance practices.

By cooperating with Ecology, the districts will have an ongoing role in and understanding of the TMDL process, and will gain valuable water quality and quantity data, which will better inform the CIDMP process and provide a stronger basis for Ecology to provide assurances under the CWA. In addition to fecal coliform data, Ecology will collect data for several other conventional parameters, including flow, temperature, dissolved oxygen, conductivity, pH, salinity, and turbidity. This will be very helpful to the CIDMP process, both in terms of water quality and habitat issues. Furthermore, the BMPs and other measures developed as part of the TMDL may be applied in other districts as part of the CIDMP action plan in an effort to gain assurances for those districts.

3.1.5 Pesticides

Agricultural pesticide use is regulated by WSDA. Little is known about the use of pesticides in the Skagit Basin, or throughout the state.

A review was conducted of pesticide monitoring data collected by WSDA between May 1995 and October 2004 (WSDA, 2005). The data included monitoring for 21 pesticides measured from 211 groundwater, marine sediment, and fish tissue samples. Eighty-four percent of the samples were collected from fish tissues, and most of the fish were collected in marine waters.

Pesticides were not detected in 98 percent of the samples (206 of 211 samples collected). Four of the remaining samples, collected in groundwater, were found to contain the pesticides bromacil, prometon, or atrazine. One fish tissue sample contained the pesticide endosulfan-I. The concentrations of pesticides detected in these five samples were well below their respective criteria (see WAC 173-201A-050).

In February 2006, WSDA launched a statewide pesticide study which targets surface waters in the Skagit Basin. This study will include sampling for 87 pesticides in stream locations with salmonid presence on the Samish River, Big Indian Slough, Browns Slough, and Big Ditch. The WSDA study will provide a better understanding of the presence of pesticides in the Skagit Basin.

3.2 Covered Species and Habitat Types

3.2.1 Species Proposed for Coverage

In developing this CIDMP, the TAT and WWAA considered a wide range of protected and sensitive species that occur in Skagit County and within the irrigation districts' boundaries (see Section 1). Per the TAT's recommendation, the overall list of species was narrowed to a project-area-specific species list (Table 3-4), and the effects of agricultural activities will be evaluated in regard to these species. While some of the species presented in Table 3-4 are not listed under the Endangered Species Act (ESA), these species share similar life histories or habitats and will benefit from conservation measures designed to minimize impacts to listed species; therefore, these species are also discussed within this CIDMP document.

Of the protected species, bald eagles, bull trout, and Chinook salmon are known to occur within, or are directly associated with certain waterways in the Planning Area. Actions associated with agricultural practices are most likely to affect these species. Additional salmonid species including coho salmon, steelhead trout, and coastal cutthroat trout share similar habitats in the Planning Area and could also be impacted by agricultural activities. The lamprey species (Pacific and River) are included here due to their potential presence within the Planning Area and concerns about lamprey population abundance. The potential is limited for impacting marine mammals through the direct effects of agricultural activities that take place within the Planning Area, but marine mammals may be impacted through indirect effects in adjoining areas.

3.2.2 Habitat Types in the Planning Area

A variety of freshwater and marine habitats, including estuarine and nearshore habitats, occur within the Planning Area and adjoining lands. The Planning Area encompasses portions of two major river systems, the Skagit and the Samish Rivers. Together these rivers form the Skagit Basin, which is the largest of the Puget Sound drainages in total land mass and drainage area (Phinney and Williams, 1975). The Planning Area includes the lower reaches of the Skagit River from approximately River Mile (RM) 15.5 downstream to the bifurcation into the North Fork (NF) and South Fork (SF). The NF from the bifurcation to approximately RM 1.8, and portions of the SF downstream to approximately RM 2.8, are within the Planning Area. For the Samish River, the Planning Area boundary is approximately from RM 5.2 to the estuary.

In addition to these two major river systems, there are a number of small, independent drainages within the Planning Area, including Joe Leary Slough, Indian Slough, No Name Slough, Telegraph Sough, Sullivan Slough, and others. There are a limited number of tributary streams that occur within this area (see Table 1-2).

Many artificial watercourses occur within the Planning Area. These watercourses are not considered habitat for the species covered within this CIDMP because they are wholly man-made for the purpose of conveying local surface or subsurface water from an area to improve soil conditions for agriculture. These watercourses are typically seasonal and do not have the characteristics required to support native cold water fishes (WDFW, 2005).

Table 3-4. Covered Species and Species of Concern

Common Name	Scientific Name	Federal Status
Birds		
Bald eagle	*Haliaeetus leucocephalus*	FT
Marbled murrelet (designated critical habitat)	*Brachyramphus marmoratus*	FT
Fishes		
Bull trout (designated critical habitat)	*Salvelinus confluentus*	FT
Chinook salmon (Puget Sound ESU; designated critical habitat)	*Oncorhynchus tshawytscha*	FT
Steelhead trout	*Oncorhynchus mykiss*	PT; Listing under review
Coho salmon	*Oncorhynchus kisutch*	SoC
Coastal cutthroat trout	*Oncorhynchus clarki clarki*	SoC
Pink salmon	*Oncorhynchus gorbuscha*	none
Chum salmon	*Oncorhynchus keta*	none
Sockeye salmon	*Oncorhynchus nerka*	none
River lamprey	*Lampetra ayresi*	SoC
Pacific lamprey	*Lampetra tridentata*	SoC
Mammals		
Humpback whales	*Megaptera novaeangliae*	FE
Steller sea lion	*Eumetopias jubatus*	FT
Southern resident killer whales	*Orcinus orca*	FE; Depleted under the Marine Mammal Protection Act

FE = Federally Endangered; FT = Federally Threatened; FC = Federal Candidate; PT = Proposed Threatened; SoC = Species of Concern

Estuaries and Nearshore Habitat

The estuarine areas of Padilla Bay, Skagit Bay, Samish Bay, and the Swinomish Channel occur immediately adjacent to the Planning Area boundary and may be indirectly affected by agricultural actions. An estuarine habitat is defined as a body of water adjacent to fresh water where salt water mixes with fresh water. The upland boundary of estuary habitat can generally be delineated by the dikes at maximum high tide occurrence. Following the convention set forth in the House Bill 1418 Report (Smith and Manary, 2005), the upper extent of the estuarine habitat is equivalent to a 13-foot tide. For the Skagit River, the upper extent of estuarine habitat occurs at the confluence of the North and South Forks.

Estuaries provide a critical transition area between fresh and salt water for anadromous fish species; physiological transitions occur within the estuary. Estuaries serve many functions in the life histories of salmonids by providing habitat for smoltification, rearing, migration, and refuge. Estuaries also contribute greatly to ecological processes such as detritus cycling (Smith and Manary, 2005). Detritus, generated through the decay of plant material, provides a major source of food for small invertebrates. These invertebrates can be a primary food source for many juvenile salmonids and forage fish species (Smith and Manary, 2005).

Nearshore habitat is defined as a marine area distant from major freshwater sources. It serves as the interface between marine and terrestrial habitats (Smith and Manary, 2005). The nearshore habitat adjacent to the Planning Area occurs in Padilla and Samish Bays. These areas provide important habitat for salmonids, and are also vital as spawning and rearing areas for forage fish species: herring (*Clupea pallasi*), surf smelt (*Hypomesus pretiosus*), sand lance (*Ammodytes hexapterus*), and anchovy (*Engraulis mordax mordax*) (Smith, 2003). Forage fish are an important and abundant fish species, and as the name implies, they are a critical part of the prey base for a large variety of other marine organisms. Forage fish are harvested by recreational and commercial fisheries and are utilized for tribal subsistence (WDFW, 2005b).

The nearshore habitat type provides migration corridors, rearing and refuge habitat, and detritus input for many aquatic species. Aquatic vegetation along the shoreline consists of eelgrass (Exhibit 3-2); nonfloating kelp; floating kelp; and sargassum, a non-native brown algae. Eelgrass communities are of importance because they provide several benefits for salmonids, including rearing habitat, food, protection from predators, and shoreline stabilization.

Shoreline modifications affecting estuarine and nearshore habitats have occurred in areas adjacent to the Planning Area. Exhibits 3-3 and 3-4 present the condition of the shoreline area in Water Resource Inventory Area (WRIA) 3 and specifically in Skagit Bay.

Riparian areas include the land adjacent to streams, rivers, and nearshore environments that interacts with the aquatic environment. Vegetation within these areas provides a transition between the aquatic habitat and terrestrial habitat (Exhibit 3-5). Riparian vegetation provides shade, nutrients, bank stability, and large woody debris to the aquatic system.

The Skagit Delta supports large concentrations of wintering waterfowl, shorebirds, and raptors. A significant portion of an entire trumpeter swan population winters in this area, as well as the entire population of gray-bellied brant, a subpopulation of brant geese. Additionally, thousands of snow geese utilize fields in the area.

Upland Habitat

The western slope of the Cascade Mountains has unique vegetation communities classified as the Pacific Northwest Coastal Forest Zone. Among other species, a typical plant community in this zone contains grand fir (*Abies grandis*), red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), and willows (*Salix spp.*) along streams and rivers (Whitney, 1989). Common shrubs and herbs in these areas include vine maple (*Acer circinatum*), salmonberry (*Rubus spectabilis*), sword fern (*Polystichum munitum*) (Whitney, 1983; Johnson and O’Neil, 2001), salal (*Gaultheria shallon*), huckleberry (*Vaccinium parvifolium*), twinflower (*Linnaea borealis*), and oceanspray (*Holodiscus discolor*) (Franklin and Dyrness, 1988; USFS, 1983).

The variety of landforms, plant communities, and habitat resources in the Skagit Basin, as in most of Puget Sound lowland forest communities, has led to the development of a diverse wildlife community (Whitney, 1983). Riparian habitats and the river itself dominate the environment of the Skagit Basin and attract a wide variety of water-oriented wildlife. Raptors such as osprey (*Pandion haliaetus*) and bald eagles (*Haliaeetus leucocephalus*) are attracted to plentiful fish stocks as prey. Waterfowl, including mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), gulls (*Larus spp.*), common loon (*Gavia immer*), western harlequins (*Histrionicus histrionicus pacifica*), hooded and common mergansers (*Mergus spp.*), and goldeneye (*Bucephala clangula*) are known to nest along the Skagit River (Whitney, 1983; Udvardy, 1986).

Wetlands

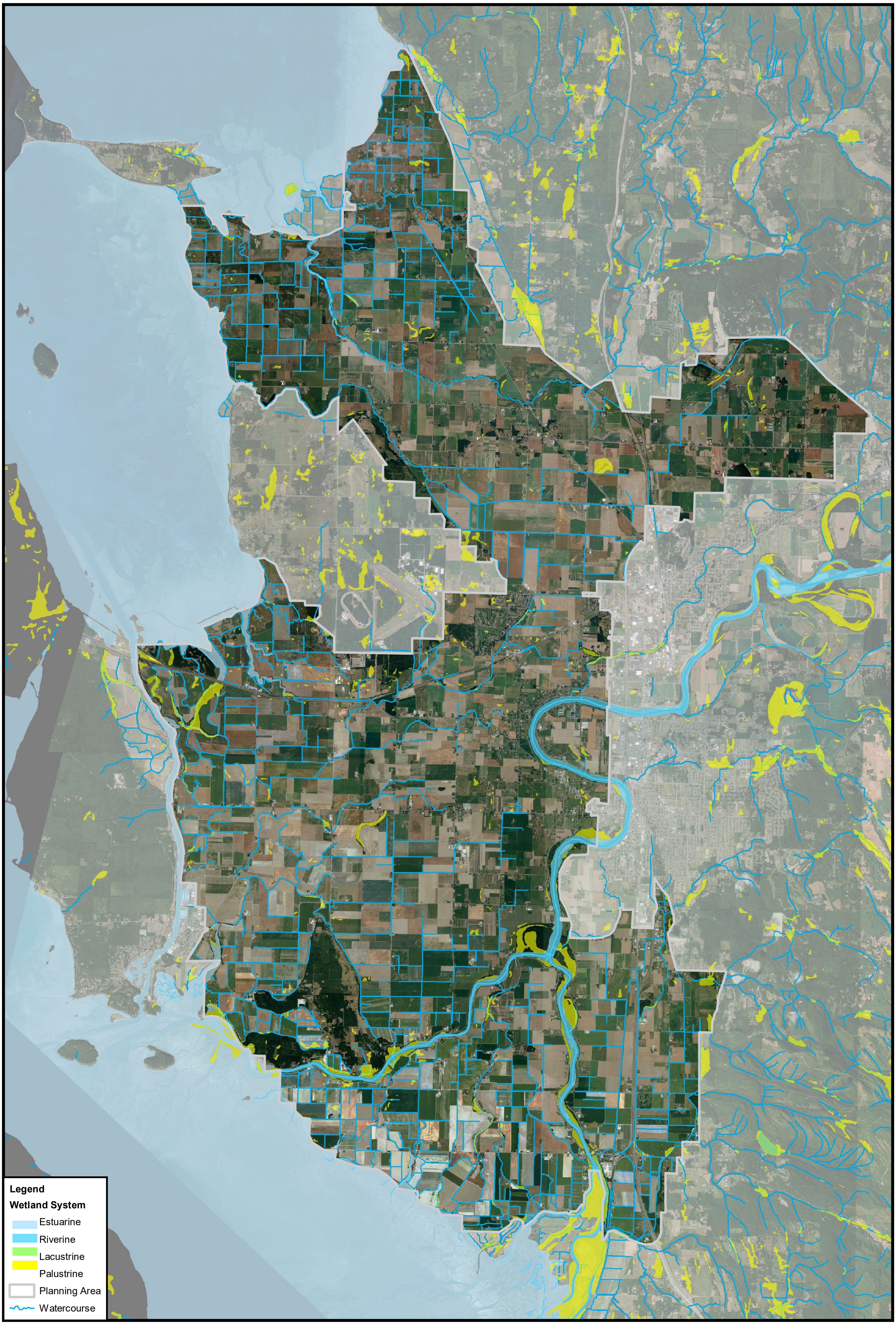
Wetlands within the study area include estuarine, riverine, and palustrine habitats. These wetlands, though significantly modified from historic conditions, play vital ecological roles in supporting regional ecosystems. Wetlands of the Skagit River Delta are considered critically important habitat and are thought to support over 30,000 Wrangle Island snow geese and hundreds of thousands of waterfowl during wintering and migration. The vegetated estuary and mudflats are particularly important for these resources; however, agricultural lands and palustrine wetlands are also heavily used by waterfowl, resident mammals, and migratory songbirds.

Estuarine wetlands occur within tidal areas and outside of tidal gates within the planning area. These wetlands provide the previously mentioned food chain support functions, supply important structural habitat within the nearshore ecosystem, and they buffer shoreline areas from wave and tidal erosion.

Riverine wetlands occur along perennial watercourses within the Planning Area. These wetlands can provide important habitat for aquatic species that use the rivers, and can regulate stream flow or provide floodplains. Riverine wetlands also tend to provide cover and resting habitat within the riparian corridor and are often heavily used by wildlife.

Palustrine wetlands are freshwater wetlands that are supported through groundwater interactions or by surface waters. These wetlands can provide emergent, scrub-shrub, or forested wetland habitat, depending to a large degree on the water regime. Groundwater-fed palustrine wetlands within the Planning Area, when isolated by agricultural land use, often provide nutrient sinks for fertilizers and other field runoff.

Palustrine wetlands that are supported by surface water, such as depressions or swales, are also important for water quality treatment functions. These wetlands occur within the Planning Area in association with drainage ditches, perennial streams, or isolated ponds.



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October 2006

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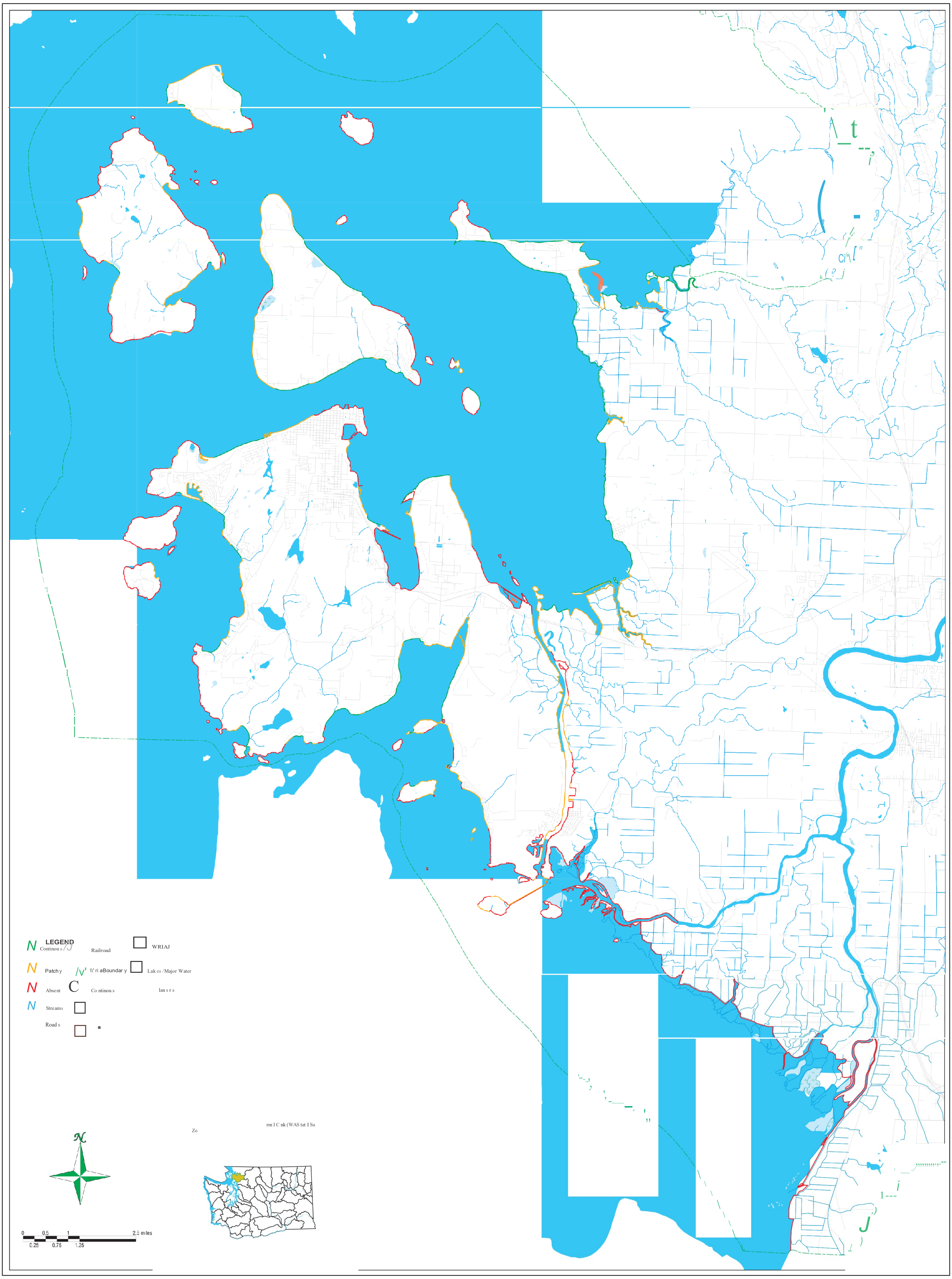
Exhibit 3-2
Wetlands In Planning Area

Skagit Basin CIDMP
Western Washington Agricultural Association



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WRIAJ
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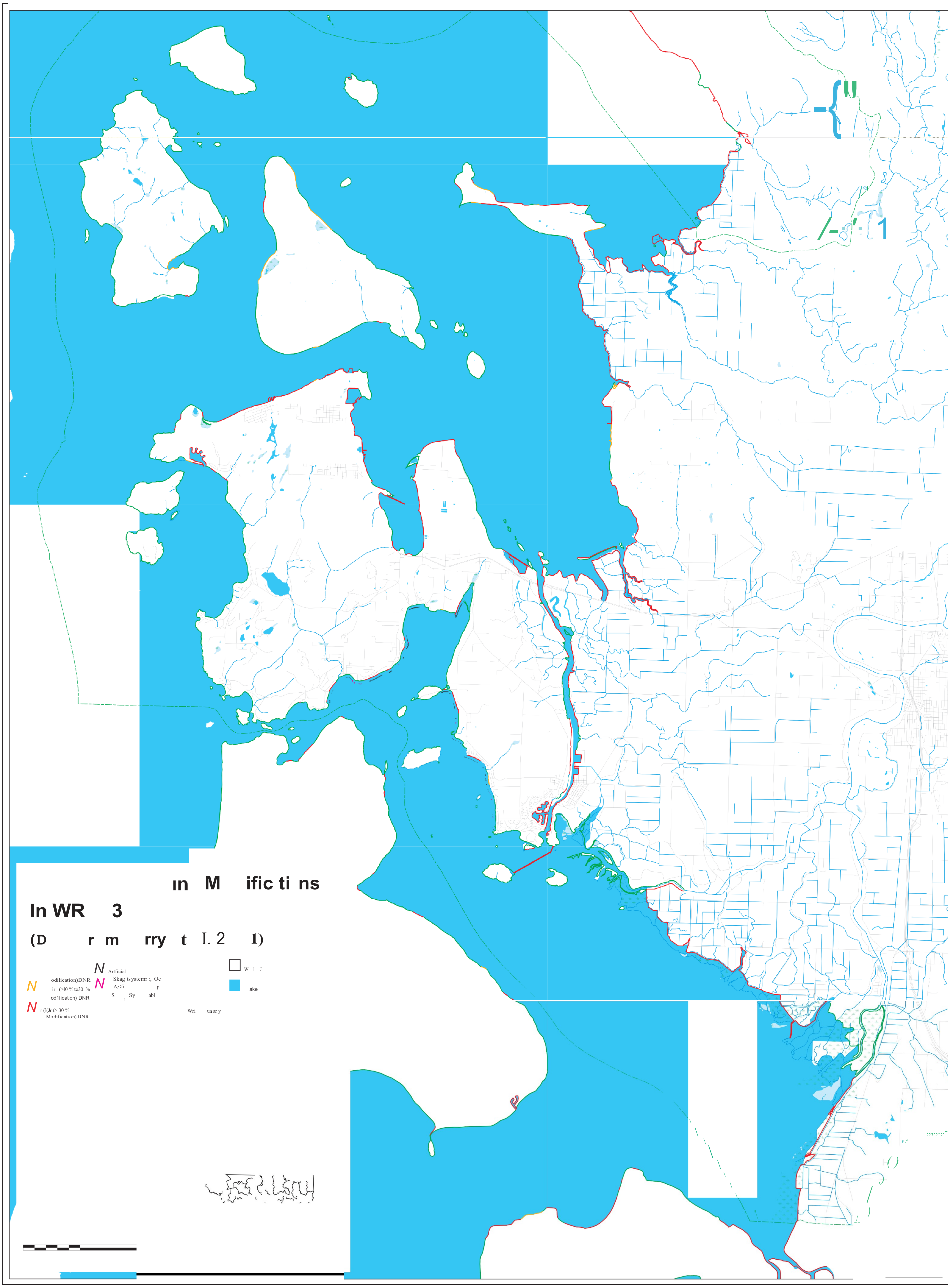

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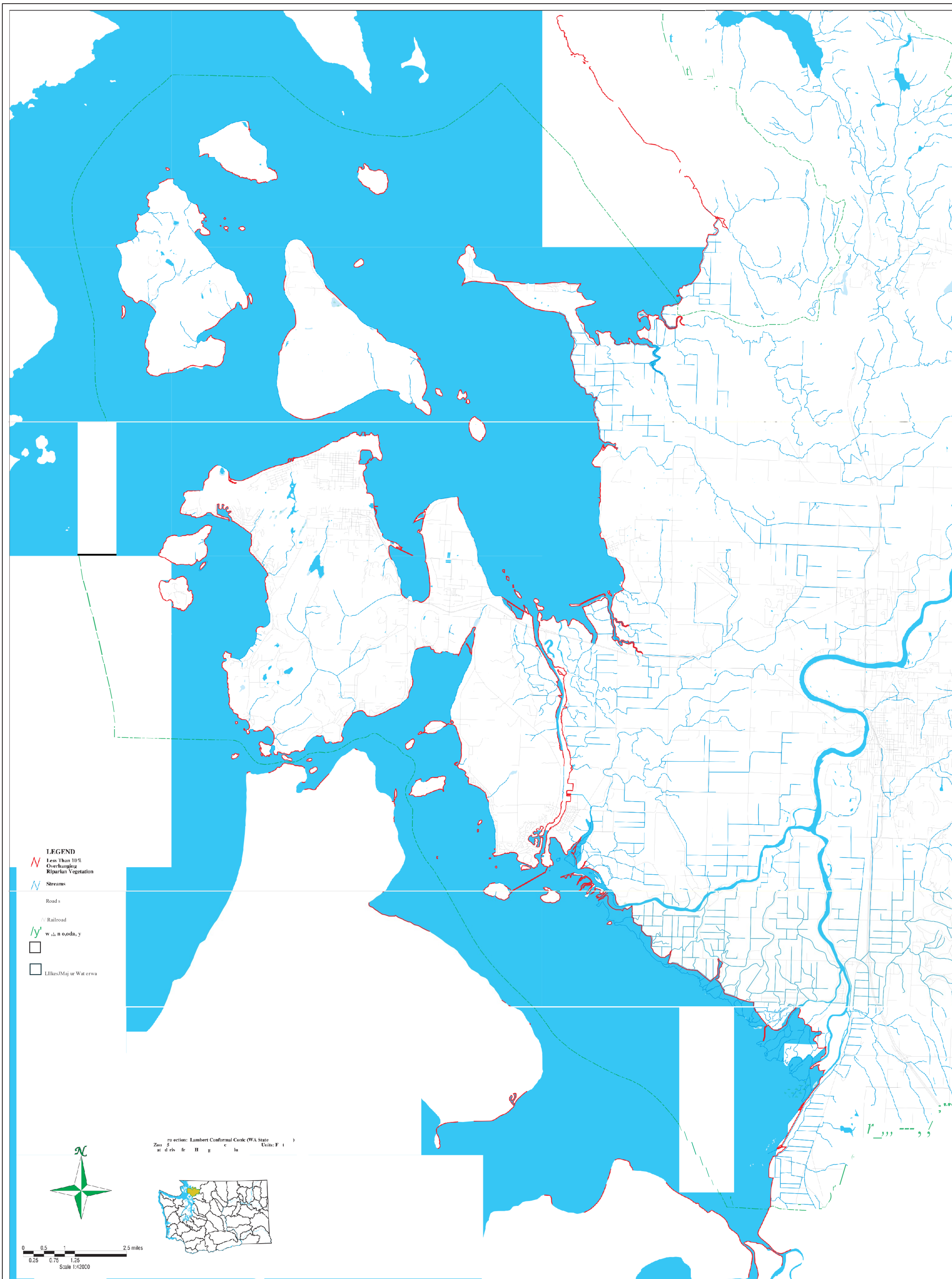
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3.2.3 Specific Watercourse Conditions within the Planning Area

(Source: Smith 2003, except where noted)

Skagit River

The lower Skagit sub-basin contains the most highly degraded freshwater salmonid habitat in the Skagit Basin. While the lower Skagit River has extensive floodplain areas (an estimated 108 square miles), floodplain degradation has been abundant, especially due to the construction of dikes and installation of riprap. An estimated 62 percent of the Skagit River channel length from Sedro-Woolley to the mouth of the river has been hydromodified, and only 10 percent of this length includes split channels or island habitat. Floodplain habitat is an essential type of habitat for salmonid production, and is of particular importance to coho salmon.

Water quality within the lower Skagit River has been degraded by various types of land use and development. Elevated levels of nutrients and chronic levels of lead and copper have been documented in the lower main stem Skagit River. Sources for these contaminants are presumably from urban and highway runoff, wastewater treatment, failing septic systems, and agriculture/livestock. Warm water temperatures (18°C) have been noted at River Miles (RMs) 2.2 and 4.0 in the Skagit River.

In 2003, the Washington State Conservation Commission and other cooperators reviewed salmon and steelhead habitat conditions within WRIA 3 and 4 to determine the limiting factors within these watersheds. The “Limiting Factors” report describes data gaps for the following data: sediment sources; large, woody debris (LWD); pool habitat; sediment quality; and low flow impacts or conditions.

South Fork Skagit River

Lead and copper were found in the Skagit River near Blakes Resort and Conway; copper levels were found to exceed water quality criteria near RM 10. The significance of these findings is unknown (see the following discussion of the Skagit River estuary).

North Fork Skagit River

Moderately impaired flow conditions dominate the North Fork Skagit River (see the following discussion of the Skagit River estuary).

Samish River

The Samish Watershed is a relatively small drainage with approximately 29 miles of low-gradient main stem habitat, and with additional tributaries which also provide accessible low-gradient habitat (USFWS, 2004a). The main stem is predominantly a continuous, slow moving, moderately deep watercourse that is 30 to 40 feet wide (LLTK, 2003). Tidal influence extends upstream to RM 4, where the channel bottom is mostly sand and silt (LLTK, 2003). This is a productive river system supporting coho, chum, and Chinook salmon and steelhead and cutthroat trout, which provide a forage base for anadromous bull trout. The Samish River enters Puget Sound at Samish Bay, between Bellingham Bay to the north and Padilla Bay to the south (USFWS, 2004a).

Much of the lower Samish River is constrained by dikes, resulting in a loss of estuarine and freshwater habitat (USFWS, 2004a). Continuous dikes confine the river up to RM 5 (LLTK, 2003). Intermittent diking occurs between RM 5 and RM 12. Most banks are cleared and steep-sloped, having been stabilized by riprap or artificial sloping (LLTK, 2003).

The floodplain loss is an important impact to coho salmon. The loss in the Samish River has not been quantified or assessed. The Samish River is described as generally having “poor” riparian conditions due to conversion to non-forest land uses (USFWS, 2004a). Except for immediate stream bank cover, adjacent land is cleared for grazing or annual crops. Construction of summer homes is beginning along the upper tributary reaches (LLTK, 2003).

Water quality is “poor”, with warm water temperatures, increased nitrogen, phosphorus, and turbidity throughout the Samish River. The overall sediment supply rates are estimated as high.

The “Limiting Factors” report describes data gaps for the following data: large, woody debris (LWD); pool habitat; and sediment quality.

Carpenter Creek/Hill Ditch

The headwaters of Carpenter Creek are located in the upper elevations of Devils Mountain and are surrounded by private timberland, rural residential development, and hobby farms (Tetra Tech, 2002). Historically, it appears that Carpenter Creek continued west from the base of the slope into a large wetland area, which ultimately drained via several small sloughs into the South Fork Skagit River (Tetra Tech, 2002). Carpenter Creek/Hill Ditch is typically a constructed trapezoidal channel constrained by levees, roads, agricultural land, and residential homes. It parallels the base of the hillslope throughout most of this reach. The creek alternately runs through the center of agricultural fields and along the hill on the left bank as Hill Ditch. There is a complete lack of riparian trees and shrubs in the agricultural fields. These areas are primarily dominated by reed canary grass and Himalayan blackberries on the ditch slopes. Where the creek is adjacent to the foothills, the left bank has better riparian cover comprised of sparse young conifer and deciduous trees (Tetra Tech, 2002). Between 1910 and 1945, Carpenter Creek was rerouted from its confluence with the Skagit River at Conway to its present location at Fisher Slough, approximately 1.2 miles south of Conway (TNC, 2005).

Four small tributaries enter the creek through this reach: Sandy, Johnson, Bulson, and one unnamed creek. Except for Bulson Creek, these tributaries are relatively short, arising in wetlands on top of the hill and quickly falling to the valley floor. Historically, these creeks also continued westward through a large wetland area before draining into the South Fork Skagit River. Because Carpenter Creek/Hill Ditch has been relocated and channelized at the base of the hillside, significant deltas have built up at the confluence of each creek. These deltas cause flooding problems or other maintenance problems for roads and bridges adjacent to the channel (Tetra Tech, 2002).

Much of the water in the lower reaches of Carpenter Creek/Hill Ditch is slow moving and highly turbid (Tetra Tech, 2002). Excess sedimentation has been reported for Carpenter Creek/Hill Ditch, with sedimentation rates estimated at 150 to 199 percent above natural rates. High- and medium-priority fish passage blockages exist in the creek. A large increase in non-forest riparian land use has occurred along Carpenter Creek, resulting in a complete loss of riparian function and contributing to increased water temperatures. Very warm temperatures (23°C) are reported near RM 3. Low dissolved oxygen levels (4.4 mg/L) have also been documented in Carpenter Creek (RM 3). Carpenter Creek has also shown elevated phosphorus (157 µg/L) during low flow spot checks in 1992. Lead and copper were also detected in Carpenter Creek. The significance of these findings is unknown. Water quality data collected by Ecology at Cedardale Road Bridge from 1999 to 2000 showed low dissolved oxygen, increased turbidity, and high fecal coliform counts. Dissolved oxygen ranged between 3.5 and 7.0 mg/L for the months from November 1999 to June 2000. Turbidity ranged from 5.1 to 7.3 nephelometric turbidity units (NTUs) during measurements taken in February, March, and April 2000. Fecal coliform counts of 130 and 150 were collected in June and August 2000, respectively.

Johnson Creek

Johnson Creek is a small tributary to Carpenter Creek/Hill Ditch. This tributary is relatively short, arising in wetlands on top of the hill and quickly falling to the valley floor. Historically, this creek continued westward through a large wetland area before draining into the South Fork Skagit River.

Bulson Creek

The Bulson Creek sub-basin is drained by three distinct forks: the north, middle and south forks. Only a short reach of Bulson Creek (downstream from the confluence with the north and middle forks) is within the Planning Area. The northern fork of Bulson Creek flows through low and high density housing and forested areas, and spills over a 100-foot-high waterfall prior to entering the south fork. The middle fork of Bulson Creek winds through extensive scrub-shrub and forested wetlands along the south side of State Route (SR) 534 before entering the south fork of Bulson Creek north of English Road. The south fork works its way north through an area of small “hobby” livestock farms and emergent and forested wetlands. After joining with the middle fork of Bulson Creek, the stream crosses SR 534 in a large fishway project created by WDFW. The stream continues north with good overall riparian habitat, where it is joined by the northern section of Bulson Creek and enters Hill Ditch.

Fisher Creek (Big and Little) and Fisher Slough

The Planning Area is bordered on the south by Fisher Slough. Fisher Slough receives flow from three tributaries: Carpenter, Big Fisher, and Little Fisher Creeks. The confluence of the tributaries and Fisher Slough is confined by dikes, is subject to increased sedimentation, has an elevated streambed that increases flooding on farm land, and is subject to high storm flow energies that scour the instream habitat and threaten dike integrity. Fisher Slough is straightened and constrained by dikes, with limited channel habitat and tidal wetland (TNC, 2005). A small amount of forest/scrub-shrub wetland is present. Approximately 8 percent of the channel edge has riparian forest. The mouth of Fisher Slough has a floodgate that is seasonally operated to restrict Skagit River storm flow while allowing relatively natural tidal flow.

The headwaters of the Big Fisher sub-basin begin in Snohomish County on the forested ridge approximately 1 mile southwest of Lake McMurray. Big Fisher Creek is composed of a north fork, which begins in forested lands, and a south fork, which begins as a wetland in northern Snohomish County. Both tributaries travel through beef cattle pastureland and open pasturelands. In the late 1990s, Skagit County constructed a fishway in Big Fisher Creek to provide fish access upstream of the Starbird Road culvert.

From the fishway, Big Fisher Creek continues northwest through a partially forested riparian area along a cleared natural gas pipeline right-of-way. From this point on, Big Fisher Creek enters a heavily forested gorge and runs about 1 mile before re-emerging under Cedardale Road in a large fishway and flowing under I-5. It then flattens out for its final reach past a junkyard, under Franklin Road, and through forested bottomlands to its confluence with Hill Ditch at Fisher Slough Bridge.

The headwaters of Little Fisher Creek begin in a wetland area and the creek is composed of east and west forks. The east fork travels through a forested area for approximately 1 mile, where it passes along a low-density housing area. The east fork then travels under a number of roadways and continues northwest through an area zoned Rural Reserve with ample riparian forest habitat, crosses Clarence Land, and eventually crosses Franklin Road. Downstream, the east fork passes through pasturelands, where it is joined by the west fork of Little Fisher Creek and flows into the Hill Ditch system and Fisher Slough.

The west fork of Little Fisher Creek begins in a seasonal wetland and travels through a number of road crossings. The stream continues through a forested area to a pond impounded by a small concrete dam. Below the dam, the creek flows under County Line Road/332 Street NW, then flows through a small wood-weir fishway and winds into a small, forested valley, where it is joined by the east fork of Little Fisher Creek. It then flows northwest through a cattle pasture where it runs along a dike to the Hill Ditch system/Fisher Slough.

Swede Creek

Warm water temperatures have been documented in Swede Creek. Water temperatures were monitored for 45 days in June and July 2002. During this period, 23 days had peak water temperatures in the “poor” category and 17 days had peak water temperatures in the “fair” category; the warmest temperature was 18.9^{o}C. The latter half of August 2001 was also monitored, with 9 out of 17 days in the “poor” category and 9 days in the “fair” category. Swede Creek also has high-priority fish passage blockages.

Parson Creek

In 1999, Skagit County Surface Water Management implemented a fish passage project on Parson Creek.

Maddox Creek

Historically, coho salmon were seen above Blackburn Road, although recent anecdotal information suggests that adult coho salmon have not been seen in many years above that point. Resident cutthroat trout still occur in both the left and right bank tributaries of Maddox Creek. Much of the lower Maddox system is used as agricultural land. Ditches have replaced the original system and this reach is referred to as the ”Big Ditch”. The lower reach of Maddox Creek was relocated from its historic channel on the east side of I-5 to the west side of I-5. The creek in this area is a man-made channel that flows through commercial developments and along the county road. The substrate in this reach is composed of fine-grained material, silts, and quarry spawls (WDFW, 2005).

Flowers Creek

Flowers Creek is a tributary to Maddox Creek. The lower section of Flowers Creek (confluence to 300 feet upstream) is bordered on both sides by pasturelands and the channel has been straightened. Riparian vegetation in this stream reach is absent. Upstream, the creek channel flows through pastureland, commercial development, and wetlands. The upper area of Flowers Creek increases in gradient and flows through a wooded draw. This area may provide spawning habitat for coho salmon or cutthroat trout in addition to rearing and migration habitat, whereas the lower areas of the creek provide only limited rearing and migration habitats (WDFW, 2005). Riparian vegetation is absent in this reach.

Martha Washington Creek

Martha Washington Creek is highly channelized and serves as little more than a conduit for stormwater. Although good quality surface water enters the water body from its headwater ravine above I-5, it is likely that dense reed canary grass contributes to poor flow and biological oxygen demand, and results in depleted dissolved oxygen and increased water temperature. Limited riparian vegetation is present. Spawning of cutthroat trout is documented in the creek, and coho salmon may also utilize this watercourse for spawning if appropriate substrate is present (WDFW, 2005).

Thomas Creek

Thomas Creek is a tributary to the Samish River. Thomas Creek is highly channelized with high banks and is reported to have been diked and moved to its present location in the 1930s.

Fornsby Creek

The Swinomish Indian Tribal Community has initiated a restoration project, the Fornsby Creek SRT Project, to accomplish restoration of former estuarine habitat adjacent to the Swinomish Channel on the Swinomish Indian Reservation. The project will re-open more than 5 miles of estuarine-riparian channel to fish and improve more than 70 acres of associated aquatic habitat by replacing existing impassible tide gates with self-regulating tide gates (SRTs), improving the channel quality behind the new tide gates, and installing vegetated buffers adjacent to the channels (Mitchell et al., 2005).

Skagit River Estuary

The Skagit River estuarine delta extends from the mouths of the North and South Fork Skagit Rivers upstream to their confluence, although tidal influence reaches as far upstream as Sedro Woolley. Recent estimates indicate that total estuarine/riverine tidal habitat now covers 6,316 acres, with 2,508 acres of estuarine emergent marsh; 2,471 acres of emergent/forested transition; and 1,337 acres of forested riverine/tidal zone. The channel area is estimated at 1,436 acres of main stem channel; 215 acres of subsidiary channels; 59 acres of large blind channels; and a maximum of 232 acres of small blind channels. A 72-percent loss of total estuarine delta habitat has been estimated for the Skagit Basin from the river mouth to Sedro Woolley. The highest percentage loss is riverine tidal habitat, which has been reduced by about 84 percent. Estuarine forested transition habitat and estuarine emergent marsh habitat have also shown dramatic losses of 66 percent and 68 percent, respectively.

Currently, there is a fringe of marsh habitat seaward of the dikes in the north Skagit Delta and an area of marsh along the South Fork Skagit River mouth. Riparian conditions along the sloughs and streams within the Skagit Delta are rated “poor”. Nearly all of the riparian areas along the Fir Island sloughs and 90 percent along the Skagit Flats streams and sloughs have been converted to a non-forest use. A non-forest land use results in a loss of riparian function, and likely affects the water temperatures that are found in many of these streams.

Padilla Bay

Padilla Bay was established as a National Estuarine Research Reserve in 1980. This is the only estuarine reserve in Washington State. The 11,000 acres in the reserve are managed by Ecology. Currently, Padilla Bay is a shallow bay with exposed mudflats on out-going tides. Sloughs deliver fresh water to the bay, and these sloughs have numerous water quality problems. The land use in the Padilla Bay Watershed is mostly agriculture (65 percent). Two concerns are sediment toxicity and the potential for eutrophication. The potential for eutrophication is of concern due to increased nutrient flow to Padilla Bay from the sloughs. The presence of contaminated sediments is documented in Padilla Bay. The inner bay has elevated phenols and has failed three different toxicity tests, while the outer bay has elevated phenols and phthalates, but did not fail any toxicity tests.

A significant loss of both estuarine and freshwater wetland habitat has occurred in the Padilla Bay Watershed. Diking, draining, and filling have removed nearly all of the salt marsh. Only a fringe of salt marsh remains. An estimated 454 wetlands have been identified in the Padilla Bay Watershed, but most of these no longer have contact with streams that either provide or directly connect to salmonid habitat. A coarse estimation of shoreline modifications indicates that most of the east and south sides of Padilla Bay have extensive modifications. Landfill (dikes) comprises the greatest number of feet of shoreline modifications, with riprap as the second greatest. Several sections of the Padilla Bay shoreline also have less than 10 percent overhanging riparian vegetation.

Padilla Bay has one of the largest intertidal eelgrass beds in the western United States, and it is believed that Padilla Bay eelgrass beds may have increased in area due to the diversion of fresh water (Skagit River) away from the bay.

Skagit Bay

Skagit Bay is one of the most important areas for salmonids because of its proximity to the Skagit River. Significant numbers of eelgrass beds are located in Skagit Bay, and these are recommended for protection because of their importance to salmonid production. Much of the east Skagit Bay shoreline has less than 10 percent overhanging riparian vegetation. Water quality in Skagit Bay appears to be good.

Samish Bay

The Samish Bay Delta has been constrained by dikes to support agricultural activity and flood control. Dikes exist along the lower 5.5 miles of the Samish River including the estuary (tidal influence extends to about RM 4). The diking has isolated former salmonid habitat. The primary shoreline modifications are riprap followed by landfill (dikes). Drainage and stormwater discharge is passed to Samish Bay via tide gates and pumps. Contaminated sediments also occur within the bay. Two of three sites sampled in Samish Bay had either elevated phenols or failed bioassay tests.

Eelgrass beds are known in Samish Bay, but some of those beds are routinely plowed for Pacific oyster cultivation.

Swinomish Channel

The Swinomish Channel is greatly impacted by shoreline modifications. Most of the segments along the channel have been altered by riprap, landfill (dikes), or bulkheads. A lack of riparian vegetation occurs and much of the Swinomish Channel has less than 10 percent overhanging riparian vegetation.

A proposed project to improve the hydraulic connection between the North Fork Skagit River and the Swinomish Channel would involve removing a portion of the existing jetty. This would improve fish passage and encourage more utilization of estuarine habitat in Padilla Bay by juvenile Chinook salmon. This project is included in the Skagit Chinook Recovery Plan (SRSC and WDFW, 2005).

Patchy eelgrass beds have been documented in the channel, particularly on the west bank.

No Name Slough

It is likely that this slough has always been the outlet for a small creek feeding into it from the adjacent hillslope (Bay View Ridge). There is a tide gate and pump station located at the mouth of the slough at Padilla Bay, which is crossed by a dike (Tetra Tech, 2002). These discharge water on low tides and store water on high tides, creating a more distinct boundary between fresh water and salt water (Smith, 2003). There is some brackish water influence for a short distance upstream of the dike, although the fresh water is primarily backed up during high tides. Fish can access the slough during low and medium tides, but not while water is being pumped out. Adult coho salmon have been observed spawning in the slough (Tetra Tech, 2002). Riparian vegetation west of Bayview-Edison Road is limited to less than 25 feet in most locations and is comprised of shrubs and herbs, with no mature trees. The east side runs through agricultural land as well and has limited riparian habitat, primarily comprised of non-native vegetation such as reed canary grass and blackberries (Tetra Tech, 2002).

The slough is listed for low dissolved oxygen with recorded violations during high flow conditions.

Dry Slough

Dry Slough has been identified as the remnant of the Middle Fork of the Skagit River and is thought to have functioned as a major distributary channel. The upstream end begins near the North Fork Skagit River (isolated by a levee) and runs through Fir Island and then through a tide gate at a second levee along Skagit Bay near the mouth of the slough. Dry Slough has two tide gates which allow only freshwater outflow to Skagit Bay. From the North Fork Skagit River to the Skagit Bay levee, Dry Slough is primarily a cattail wetland that appears to be significantly higher in elevation than either of the Skagit River forks, with very few areas of standing water. Many locations have little to no riparian buffer and are located directly adjacent to agricultural fields. Organic enriched mud and silt are the dominant substrate types for this slough, and surrounding soils are primarily silt loam and fine sandy loams. Water is relatively clear, but many aquatic macrophytes are seasonally present. Agricultural land and residential homes surround the entire length of the slough. A minimum of 10 road crossings are present, which are fish passage barriers (Tetra Tech, 2002).

Browns Slough

This slough is a former distributary channel of the Skagit River within the tidal zone of Skagit Bay. Browns Slough and Hall Slough were formerly connected, but are now physically separated by farmland; however, some amount of water from Hall Slough eventually discharges into Browns Slough. There is a tide gate beneath Fir Island Road which allows only freshwater flow downstream. Approximately 1,000 feet downstream of Fir Island Road is a cross levee constructed after the 1990 floods, and a water control gate is present beneath this levee. The opening allows tidal exchange up to Fir Island Road, and allows freshwater flow toward Skagit Bay during high flow events. Adjacent land uses are agricultural fields on both banks and residences at Fir Island Road. There are approximately six culverts or other crossings along the slough's entire length and a levee cuts off the slough near the North Fork Skagit River (Tetra Tech, 2002). The left bank levee has a long portion of riprap placed during construction of the cross levee.

This slough is used by juvenile salmonids for rearing, both upstream and downstream of the cross levee, and has been monitored by the Skagit Co-op. Salmon are not present upstream of the tide gate at Fir Island Road. The water is visually stagnant and very turbid even though fresh water is discharged through the tide gate during low tide. Investigations by the Skagit Co-op found water quality to be generally acceptable, although temperatures frequently exceeded state water quality standards (more than 19°C) in spite of the tidal influence. An additional agricultural ditch drains into the slough upstream of the cross levee from the right bank via a tide gate. Very few pieces of LWD are present in the channel or marsh areas upstream of the cross levee (Tetra Tech, 2002). Vegetation varies from salt marsh to brackish/freshwater marsh and there is a very limited riparian zone. There is no buffer along the right bank. A narrow riparian zone exists along the left bank levee (Tetra Tech, 2002).

High pH readings (9.2 to 9.4) have been documented in Browns Slough, with higher pH samples toward the bay.

Higgins Slough

No information was available to describe the condition of Higgins Slough.

Sullivan Slough

Historically, Sullivan Slough was a large tidal channel from Skagit Bay with several branches that also drained a large wetland area to the west of the North Fork of the Skagit River. The slough exists in its historic alignment from Skagit Bay up to the Chilberg Road crossing, and then exists as agricultural ditches and a constructed spur channel with an outlet to the Swinomish Channel. Tidal influence extends up to Chilberg Road on the main channel, while on the spur channel, tidal influence ends at the first road crossing (approximately 500 feet). South of Chilberg Road, Sullivan Slough is comprised of a braided channel system, which runs through an approximately 500-foot-wide brackish and salt marsh habitat constrained on both sides by levees and surrounded by agricultural land. The area is a mosaic of salt and freshwater, riparian, and upland habitats. A narrow riparian zone has become established on the levees. The diversity of vegetation is high and generally dominated by native species, and communities transition from riparian to brackish marsh to saltwater marsh habitat. Since the construction of the jetty between the Swinomish Channel and the North Fork Skagit River, Sullivan Slough has apparently been filling in with sediment (Tetra Tech, 2002). As delta accretion continues, much of what was formerly intertidal mudflat or shallow subtidal habitat is now transitioning to vegetated salt marsh. Numerous pieces of LWD are present, many of them fallen cottonwoods from the adjacent riparian zone (Tetra Tech, 2002).

Joe Leary Slough

Historically, this slough was one of two major drainage channels for the large Olympia Marsh wetland complex (the other major drainage was the Samish River). It may also have periodically been a flood channel for the Skagit River. Currently, tidal influence extends up to a levee crossing with tide gates about 500 feet downstream of Bayview-Edison Road. At the levee crossing there are 12 culverts with tide gates that only allow freshwater outflow (Tetra Tech, 2002).

Joe Leary Slough is the largest watercourse in the Padilla Bay Watershed. This slough flows through tilled cropland, and many of its tributaries are ditches that drain farmland. The lower reaches are constrained by dikes, and the slough has tide gates with a storage channel behind the gates. Water quality is reported to be of concern. The slough is on the 303(d) List for warm water temperatures and low dissolved oxygen levels. The dissolved oxygen levels have been consistently below the state standard in both high and low flow conditions. In addition, nutrient (nitrogen and phosphorus) levels are high during low flow conditions, while ammonia levels are elevated in high flows. Elevated suspended sediments are reported in winter and early spring with the worst areas coming from farmland without crop cover and where V-ditches drain fields. The turbidity standard of 5 NTU was greatly exceeded with a range of 23 to 99 NTU, with the mean turbidity in Joe Leary Slough higher than in other Puget Sound streams. In the 1993 monitoring, exceedances of metals occurred during high flows. In the late 1980s, elevated polycyclic aromatic hydrocarbon (PAH) levels were measured in sediments at the mouth of Joe Leary Slough. The water in Joe Leary Slough often appears rust colored; this condition is unique to this watercourse and is likely caused by suspended or dissolved constituents such as iron or manganese, or naturally occurring organic components such as tannins or lignins.

Joe Leary Slough has degraded riparian conditions. There is very little riparian vegetation; a small forested patch exists on the left bank just upstream of the Bayview- Edison Road crossing (Tetra Tech, 2002).

Edison Slough

Edison Slough was once the North Fork Samish River, but construction of dikes has disconnected it from the Samish River (Phinney and Williams, 1975). It is now used for irrigation water with a tide gate controlling saltwater intrusion. There is a self regulating tide gate (SRT) at the tide gate complex at the Town of Edison that allows tidal inundation upstream of the tide gate complex. Skagit County is currently upgrading the design of this tide gate.

Edison Slough is also part of the extensive floodplain area of the lower Samish River. Much of this habitat has been developed into farms and residences. Extensive diking exists along the lower 1.3 miles of Edison Slough. The shoreline near Edison Slough has extensive (greater than 30 percent by miles) shoreline modifications. The primary shoreline modifications near the Samish River Delta are riprap followed by landfill (dikes).

Gages Slough

Gages Slough is a former meander channel of the Skagit River. Currently, Gages Slough is entirely isolated from the Skagit River by levees and gated culverts. There is no connection at the downstream end of Gages Slough to the river, but a pump station is present to facilitate freshwater outflow (Tetra Tech, 2002).

Gages Slough has experienced warm water temperatures (18°C), low dissolved oxygen levels (1.3 and 5.1 mg/L), and elevated phosphorus levels. Lead, copper, and zinc have also been detected in levels above standard criteria in Gages Slough. Impaired or moderately impaired flow conditions are also reported.

Keekealia Slough

Limited information concerning this watercourse is available. Keekealia Slough is a dead-end watercourse with uncertain fish presence or utilization.

Big Indian Slough (also known as Indian Slough)

Indian Slough is a former blind tidal channel from Padilla Bay that also drained localized runoff from the surrounding wetlands. There are two branches of Indian Slough: Big Indian and Little Indian Slough (south and north branches, respectively). Currently, Indian Slough is tidal-influenced up to Bayview-Edison Road on both branches. Tide gates are present at the Bayview-Edison Road crossings, which prevent tidal inundation upstream. Impoundment of freshwater outflow does occur during high tides. A pump station is present at the Big Indian Slough crossing (Tetra Tech, 2002).

West of Bayview-Edison Road the slough has a fine silty mud substrate. Marsh and channel width varies from approximately 70 to 100 feet. West of the road the slough has good channel sinuosity, although further meandering is constrained by levees. East of Bayview-Edison Road, the channel becomes trapezoidal in shape, with no tidal influence or riparian habitat present. Levees are present along Big Indian Slough upstream of Bayview-Edison Road to the railroad crossing, where it then turns into a narrow ditch at the railroad and runs east-west immediately adjacent to the railroad line (Tetra Tech, 2002).

Big Indian Slough is the second largest watercourse draining into Padilla Bay, and has one of the most degraded riparian conditions within the Padilla Bay drainages. Elevated water temperatures and low dissolved oxygen levels have been reported. The low dissolved oxygen levels have been recorded during storm events as well as during some low flows. Levels of metals were generally good in 1993, but turbidity was very high, ranging from 15 to 65 NTU.

Little Indian Slough

Little Indian Slough is more tightly confined by levees. East of Bayview-Edison Road the slough becomes trapezoidal in shape, with no tidal influence or riparian habitat present. Little Indian Slough has no levees east of the road, although it is highly channelized and has steep slopes (Tetra Tech, 2002).

Wiley Slough

Wiley Slough is located in the southern portion of the Skagit River Delta along the northern bank of Freshwater Slough. A major portion of this slough and surrounding lands under the ownership of WDFW are the subjects of a restoration project. The project area originally had an extensive and complex network of tidal slough channels. To a lesser extent, relic channels remain today. The area has been disconnected from tidal exchange with Freshwater Slough and Skagit Bay for approximately 45 years (since the dikes were constructed sometime between 1956 and 1965). This has precluded the accumulation of suspended sediments delivered from the neighboring tidal mudflats and Freshwater Slough, and has limited the accumulation of fine sediments and organic materials associated with tidal marsh vegetation (Hinton et al., 2005).

As recently as 1956, the levee system was expanded to isolate the Wiley Slough project area from the key processes of riverine and tidal flooding, thereby altering hydrology, sediment transport and storage, detritus accumulation, vegetative growth, and use by aquatic species. This isolation occurred after transfer of the property from the USFWS to the State Department of Game (Hinton et al., 2005). The loss of riverine and tidal flooding had a crucial effect on the formation and maintenance of a variety of estuarine habitat conditions. For example, construction of the Wiley Slough levee has resulted in direct loss of about 16 acres of tidal channel habitat and approximately 160 acres of intertidal marsh habitat. There have been additional off-site impacts because of dike construction: 20 acres of intertidal channel habitat have been lost seaward of the dikes due to sediment deposition resulting from loss of tidal prism landward of the dikes (Hood, 2004).

The management directive for these lands was that they were to be used for the benefit of waterfowl. Early land managers chose to convert this site for active management of cereal grains to attract and hold waterfowl for increased hunting opportunities. To allow the production of cereal grains, the site had to first be drained and converted to tillable soil. As with most of Fir Island, this conversion required construction of a levee to protect the site from tidal influence. This conversion appears to have started with construction of a central “training dike” along Wiley Slough proper. This spur dike was primarily intended to improve agricultural drainage for existing farmlands to the north, and may have been necessary to address drainage infrastructure requirements prior to the extension of the levee system to include the Wiley Slough site. Levee construction resulted in the enclosure and isolation from tidal influence of 160 acres of tidal marsh and 16.3 acres of tidal channel, and in elimination of channel usage by juvenile salmon. Inside the dikes, the smaller tidal channels were entirely filled in, plowed over, and assimilated into agricultural fields. The larger tidal channels, including Wiley Slough, have accumulated sediments from farmland erosion and become narrower and shallower than they were historically (Hinton et al., 2005). Tidal channels seaward of the dikes were also impacted by dike construction. Net channel loss outside the Wiley Slough dikes has amounted to 20.5 acres since dike construction. This is due to sediment accumulation in the tidal channels, which lost flushing volume as a result of upstream diking (Hood, 2004).

Current data indicate that juvenile Chinook, coho, and chum utilize the Wiley Slough area (Hinton et al., 2005). Salmonids are almost completely absent above the Wiley Slough tide gate, while juvenile salmon were found just downstream of the tide gate and in adjacent sloughs. Species richness below the tide gate and in the vicinity around Wiley Slough is approximately 10 to 12 species, including salmonids, smelt, sculpin, flatfish, and others (Hinton et al., 2005). Upstream of the tide gate in Wiley Slough only stickleback and one Chinook salmon and one coho salmon were captured in recent surveys (Hinton et al., 2005).

The foremost goal of the Wiley Slough restoration project is to restore natural processes, conditions, functions, and biological responses to the project area (approximately 175 acres) by removing dikes to restore riverine and tidal flooding to the project area. Restoration of natural estuarine processes will result in the restoration of estuarine habitat for a wide variety of fish, wildlife, and other organisms (Hinton et al., 2005).

Steamboat Slough

Steamboat Slough is mostly constrained by dikes.

Hall Slough

Although historically Hall and Browns Sloughs were connected, they are now separated by a strip of agricultural land. The downstream area is a tidal salt marsh slough constrained on both sides by levees. A levee crosses the slough immediately downstream of Maupin Road. A tide gate, designed to allow only freshwater outflow, is present beneath this levee,. However, the tide gate is reported as inoperable due to silt accumulation on the saltwater side of the gate, as well as a large log jam (Tetra Tech, 2002). Given the interconnectivity of the interior drainage ditches, the water eventually flows to Browns Slough for discharge to Skagit Bay. There is also a pump station at Maupin Road, which can be activated to pump fresh water out from behind the gate to handle excessive flows. In Hall Slough, the estuarine scrub-shrub has been extremely impacted, with an estimated 93 percent lost (Tetra Tech, 2002).

Telegraph Slough

Telegraph Slough is part of a historically large blind channel system (including Blind Slough and lower Higgins Slough) from Padilla Bay that may have occasionally received flood overflows from the Skagit River, and also received drainage from freshwater wetlands. Currently, this system has some connectivity with the Swinomish Channel, but not from Padilla Bay. Levees are present on the left and right banks throughout much of the system, but are old and generally overgrown with shrubs and trees. Fully functional tide gates are present at the confluence of the slough with the Swinomish Channel (Tetra Tech, 2002).

A tidal channel is present throughout Telegraph Slough, ending in high salt marsh immediately south of Highway 20. The slough is a mosaic of upland, riparian, and marsh habitats. In the lower marsh areas, braided channels of silt/mud substrate are present, and become more defined and larger with less vegetation as they near the Swinomish Channel. The water that does not drain entirely out of the slough is highly turbid with extensive algae growth on the surface (Tetra Tech, 2002).

Big Ditch

See Maddox Creek. The Big Ditch drainage system was created between 1910 and 1945. The drainage watercourse is at a lower elevation than Fisher Slough, and as a result, it is routed underneath the slough in a siphon culvert. Big Ditch continues south from this siphon culvert for approximately 4 miles before entering Skagit Bay (TNC, 2005).

Kayton Slough

This watercourse is the portion of Big Ditch from the culvert under Conway Road to the pump station north and west of the Town of Conway (WDFW, 2005). This slough is bordered by agricultural land on the north and residential and commercial development on the south. The channel has been straightened and riparian vegetation is absent. Limited rearing may occur within this watercourse.

Davis Slough

No information was available to describe the condition of Davis Slough.

Teal Slough

The lower portion of Teal Slough is cut off by dikes and no longer drains to Skagit Bay (Kuntz et al., 2003). Juvenile Chinook salmon use of the Teal Slough marsh has been documented (Hinton et al., 2005).

Dodge Slough

No information was available to describe the condition of Dodge Slough.

Britt Slough

Britt Slough is a former freshwater channel that has been significantly changed by disconnection from the main stem and through residential development (Tetra Tech, 2002). Currently, the upstream end of the slough has been filled in and is now the location of a wastewater treatment plant for the City of Mount Vernon. Over 20 habitat breaks occur within the slough where road crossings or driveways have been built. Many of these crossings have small culverts, sized to contain only localized runoff; it is likely that these culverts would be fish passage barriers if fish were allowed to access the slough. At the downstream end, the slough is crossed by a levee running parallel to the main stem Skagit River. Beneath this levee are culverts controlled with flap gates, which open with sufficient hydraulic pressure and allow flood flows to drain into the river. A pump station is also present that pumps water downstream when it reaches a specified elevation (Tetra Tech, 2002).

3.2.4 Summary of Watercourse Conditions within WRIA 3

A set of habitat condition rating standards were developed in the “Limiting Factors” analysis utilizing several tribal, state, and federal documents. These ratings are intended as a coarse screening to identify the most significant habitat limiting factors within WRIA 3 (Smith, 2003). Where data were lacking, the professional judgment of the Technical Advisory Team (TAT) members was relied upon. Habitat conditions are presented in Tables 3-5 and 3-7 for watercourses within or adjacent to the Planning Area. These represent generalized conditions within the watercourse, and it is likely that there are reaches of the watercourse that are in better or worse condition than the ratings suggest (Smith, 2003). Criteria utilized for the rating standards are presented in Tables 3-6 and 3-8, estuarine/nearshore and fresh water, respectively. For parameters where insufficient data or knowledge about the condition was found, the rating is left blank.

Table 3-5. Summary of Estuarine and Nearshore Conditions in WRIA 3

	Hydromodifications	Water Quality/Sediment Contamination	Wetland/Habitat Loss	Riparian and Instream Habitat
ESTUARIES				
Skagit Delta/Estuary	Poor	Poor in SF Skagit	Poor	Poor
Carpenter Creek	Poor	Poor	DG	Poor
Skagit Bay Sloughs	Poor	Poor	Poor	Poor
Padilla Bay Sloughs	Poor	Poor	Likely Poor	Poor
Samish Estuary	Poor	DG	Poor	DG
Edison Slough	Poor	DG	Poor	DG
NEARSHORE AREAS				
Skagit Bay East	Poor	Good	Poor	NA
Skagit Bay West	Good	Poor	Good	NA
Swinomish Channel	Poor	Poor (DG)	Poor	NA
Padilla Bay East	Poor	Poor (DG)	Poor	NA
Samish Bay	Poor	Poor (DG)	Poor	NA

Adapted from Smith, 2003.

DG= Data Gap; When a DG accompanies a rating of good, fair, or poor, it means that the rating is provisional and additional assessments are needed. NA=Not Applicable

Table 3-6. Criteria for Rating Estuarine Habitat Conditions

Impact	Poor	Fair	Good
Hydromodifications	30% or greater modified shoreline length.	10-30% modified shoreline length.	Less than 10% modified shoreline length.
Water Quality/ Sediment Contamination	Any exceedance above standard of a parameter known to directly impact salmonids.	An exceedance above standard of a parameter that impairs water quality, but not known to directly impact salmonids.	No exceedances of known standards.
Wetland/Habitat Loss	30% or greater loss of habitat.	10-30% loss.	Less than 10% loss.
Riparian and Instream Habitat	See Table 3-8 for criteria.	See Table 3-8 for criteria.	See Table 3-8 for criteria.

Adapted from Smith, 2003.

Table 3-7. Summary of WRIA 3 Freshwater Limiting Factors Results

	Lower Skagit River	Samish River
Fish Passage		DG
Floodplain Conditions	Poor	Poor in lower
Sediment: gravel quantity		Poor
Sediment: gravel quality	DG	DG
Road Density	See tribs	Fair
Current Instream LWD (quantity)	DG (likely poor)	DG
Riparian		Poor
Water Quality	Poor	Poor
Water Quantity		DG

Adapted from Smith, 2003.

DG= Data Gap; When a DG accompanies a rating of good, fair, or poor, it means that the rating is provisional and additional assessments are needed.

Table 3-8. Criteria for Rating Limiting Factors Conditions - Summary of WRIA 3 Freshwater Limiting Factors Results

Impact	Poor	Fair	Good
Fish Passage	>20%	10-20%	<10%
Floodplain Conditions	Connectivity: >50% Loss of habitat: >66%	Connectivity: 10-50% Loss of habitat: 33-66%	Connectivity: <10% Loss of habitat: <33%
Sediment: gravel quantity (sediment supply)	$m^3/km^2/yr$: > 100 or exceeds natural rate	----	< 100 or exceeds natural rate
Sediment: gravel quality	Fines <0.85mm in spawning gravel: >17%	11-17%	≤11%
Road Density	mi/mi^2: >3 with many valley bottom roads	2-3 with some valley bottom roads	<2 with no valley bottom roads
Current Instream LWD (quantity)	Pieces per meter channel length: <0.2	0.2-0.4	>0.4
Riparian (Type 1-3 and untyped salmonid streams)	Riparian buffer width: <75' or <50% site potential tree height (whichever is greater) OR Riparian compositions: <30% conifer, unless hardwoods, shrubs were dominant historically.	Riparian buffer width: 75' -150' or 50-100% of site potential tree height (whichever is greater) AND Riparian compositions: ≥30% conifer of any age unless hardwoods were dominant historically	Riparian buffer width: >150' or site potential tree height (whichever is greater) AND Riparian compositions: ≥70% conifer unless hardwoods were dominant historically
Water Quality	Temperature: >15.6°C (spawning), >17.8°C (migration and rearing) Dissolved Oxygen: <6 mg/L	Temperature:14-15.6°C (spawning), 14-17.8°C (migration and rearing) Dissolved Oxygen: 6-8 mg/L	Temperature: 10-14°C Dissolved Oxygen: >8 mg/L
Water Quantity (Flow)	% impervious surface: >10%	3-10%	≤3%

Adapted from Smith, 2003.

3.2.5 Summary of Fish Species Presence and Habitat Use Type within Planning Area Watercourses

Fish species' use of watercourses within the Planning Area is presented in Table 3-9. Presence within watercourses was determined from the WDFW StreamNet database, Geographic Information System (GIS) data provided by WDFW, Critical Habitat designations, and Salmonid Stock Inventory reports prepared by WDFW. Fish habitat use type for watercourses within the Planning Area is summarized in Table 3-10. These data are provided by WDFW and are from documented observations, or, the species are presumed to occur based on knowledge of the specific watercourse. Critical habitat maps for bull trout and Chinook salmon are shown in Exhibits 3-9 and 3-11, respectively.

Table 3-9. Water Bodies within the Planning Area and Fish Species Presence

Mgt./ jurisdiction	Watercourse	FC	SC	SuC	CO	SSH	WSH	BT	CCT	PINK	CHUM	SOCK	Critical Habitat
Fed/St/Co	Skagit River	X	X	X	X	X	X	X	X	X	X	X	CHN/BT
Fed/St/Co	1223755483878	X	X	X	X	X					X		CHN
Fed/St/Co	South Fork Skagit River	X	X	X	X	X	X	X	X	X	X	X	CHN/BT
Fed/St/Co	North Fork Skagit River	X	X	X	X	X	X	X	X	X	X	X	CHN/BT
Fed/St/Co	1224144483655	X			X		X		X	X	X		CHN
Fed/St/Co	1224261483579						X		X		X		
Fed/St/Co	Samish River	X			X		X	X	X		X	X	BT
Fed/St/Co	1224414485339				X				X				
DK3	Johnson Creek				X				X				
DK3	Bulson Creek				X				X				
D17	Swede Creek	X			X		X						
D17	Parson Creek				X		X						
DK3	Carpenter Creek	X			X	X	X	X	X				CHN
DK3	1223046483813				X				X				
DK3	1223045483814				X				X				
DK3	Fisher Creek/Slough	X			X	X	X		X		X		
D17	Maddox Creek				X				X				
D17	Flowers Creek				X				X				
D17	Martha Washington Creek				X				X				
D14	Thomas Creek	X			X		X		X		X		
Swinomish Tribe	Fornsby Creek	X	X	X				X	X		X		
D19/D12	Telegraph Slough	X	X	X				X	X		X		
Fed/St/Co	Steamboat Slough	X				X	X				X		CHN

Mgt./ jurisdiction	Watercourse	FC	SC	SuC	CO	SSH	WSH	BT	CCT	PINK	CHUM	SOCK	Critical Habitat
County	Edison Slough	X	X		X				X		X		
D14	Joe Leary Slough	X	X		X			X	X		X		
D14	1224158485015								X				
D14	1224261485093								X				
D12	No Name Slough				X				X				
D19	Higgins Slough				X								
D12/D19	Big Indian Slough	X			X				X				
D17	Big Ditch	X	X		X			X	X		X		
DK3	Hill Ditch	X	X		X	X	X	X	X		X	X	CHN
?	Unnamed 1224929484398	X			X								
?	Unnamed 1223170485270				X				X				
D22	Dry Slough	X	X		X			X	X	X	X	X	
D22	Browns Slough	X	X		X			X		X	X	X	CHN
D15	Sullivan Slough	X			X			X		X	X		CHN
D22	Keekealia Slough												
D22	Wiley Slough				X			X					
D22	Hall Slough	X			X					X	X		CHN
D12	Little Indian Slough	X			X			X	X	X	X		
D22	Davis Slough												
D22	Teal Slough												
LD22	Dodge Slough												
D17	Britt Slough	X											CHN
D17	Kayton Slough	X	X		X			X	X		X		
Fed/St/Co	Swinomish Channel	X	X	X	X	X	X	X		X	X	X	
Fed/St/Co	Padilla Bay	X	X	X	X	X	X	X		X	X	X	
Fed/St/Co	Skagit Bay	X	X	X	X	X	X	X		X	X	X	
Fed/St/Co	Samish Bay	X	X	X	X	X	X	X		X	X	X	

Sources: WDFW, 2005d; Williams, 2005; FR, 2005a; TAT, 2005

FC = fall Chinook, SC = spring Chinook, SuC = summer Chinook, CO = coho, SSH = summer steelhead, WSH = winter steelhead, BT = bull trout, CCT = coastal cutthroat trout, PINK = pink salmon, CHUM = chum salmon, SOCK = sockeye salmon, CHN = Chinook

Table 3-10. Water Bodies within the Planning Area and Fish Habitat Use Type

Watercourse	Presence/ Migration	Spawning	Rearing	Examples of Funded and Proposed Restoration Activities
Skagit River	X		X	
1223755483878	X		X	
South Fork Skagit River	X		X	Salmon Recovery Funding Board project: Skagit County Dike District #3 – South Fork levee setback: Acquisition and restoration of 37 acres of off-channel/wetland and riparian habitat adjacent to main stem Skagit River near Conway.
North Fork Skagit River	X		X	Proposed levee setback - Skagit Chinook Recovery Plan.
1224144483655	X			
1224261483579	X			
Samish River	X		X	
1224414485339	X			
Johnson Creek	X	X	X	
Bulson Creek	X			
Swede Creek	X		X	
Parson Creek	X		X	Fish passage project funded by Family Forest Fish Passage Program through the Skagit Fisheries Enhancement Group (SFEG).
Carpenter Creek	X	X	X	
1223046483813	X			
1223045483814	X			
Fisher Creeks/Fisher Slough	X	X	X	TNC project: Fisher Slough and Little Fisher Creek – levee setback, improve flood storage, increase juvenile fish habitat and restore tidal functions.
Maddox Creek	X	X		Riparian Pilot Project and proposed Maddox Creek Relocation – Drainage and Fish Initiative. The City of Mount Vernon and Skagit County are removing a 400-foot-long culvert with grant assistance from Ecology's Centennial Clean Water Funds.
Flowers Creek	X	X	X	Riparian Pilot Project – Drainage and Fish Initiative.
Martha Washington Creek	X	X		
Thomas Creek	X	X	X	
Fornsby Creek	X		X	Salmon Recovery Funding Board project: Swinomish Tribal Community Fornsby Creek SRT Project – reconnect 5 miles of habitat to Swinomish Channel and restore riparian vegetation to 1.3 miles of habitat.
Telegraph Slough	X		X	Proposed delta restoration - Skagit Chinook Recovery Plan.
Steamboat Slough	X			
Edison Slough	X	X	X	

Watercourse	Presence/ Migration	Spawning	Rearing	Examples of Funded and Proposed Restoration Activities
Joe Leary Slough	X		X	
1224158485015	X			
1224261485093	X			
No Name Slough	X	X	X	Proposed channel widening, wetland creation and riparian buffer enhancement – Drainage and Fish Initiative.
Higgins Slough	X		X	
Big Indian Slough	X	X	X	
Big Ditch	X		X	
Hill Ditch	X		X	
Unnamed - 1224929484398	X			
Unnamed - 1223170485270	X		X	
Dry Slough	X		X	Proposed delta restoration - Skagit Chinook Recovery Plan and HB 1418 Report.
Browns Slough	X		X	Proposed delta restoration - HB 1418 Report.
Sullivan Slough	X		X	
Keekealia Slough				
Wiley Slough	X		X	Salmon Recovery Funding Board project: WDFW and Skagit Watershed Council – restoration of tidal and riverine processes on WDFW lands.
Hall Slough	X		X	Proposed delta restoration - HB 1418 Report (low priority).
Little Indian Slough	X		X	
Davis Slough	X			
Teal Slough				No documented fish presence – possible presence intertidal.
Dodge Slough				No documented fish presence – possible presence intertidal. Proposed delta restoration - HB 1418 Report.
Britt Slough	X			
Kayton Slough	X			
Swinomish Channel	X		X	
Padilla Bay	X		X	
Skagit Bay	X		X	
Samish Bay	X		X	

Sources: WDFW, 2005a; WDFW, 2005d; TAT, 2005

3.2.6 Biological Information for Covered Species - Life Histories, Distribution and Critical Habitat

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was listed as threatened in Washington on February 14, 1978. On July 6, 1999, the USFWS proposed to delist the bald eagle (USFWS, 1999). A final determination on the proposal has not been made to date. Delisting, if determined to be appropriate, would occur in conjunction with a minimum 5-year monitoring period to ensure that recovery goals continue to be met and that relisting is not warranted.

The Skagit River is one of the key wintering areas for bald eagles in the Pacific Northwest and in Washington State. As many as 500 eagles are found on the upper reaches of the Skagit River (Stalmaster, 1989). Eagles are attracted to the river because of the spawned carcasses of chum salmon (*Oncorhynchus keta*) and coho salmon (*Oncorhynchus kisutch*) deposited in the backwaters and on the riverbanks. Wintering eagles are found on the river from late October through March (Watson and Pierce, 1998). The Skagit River's salmon populations provide an important prey cushion during a time of reduced foraging opportunities in mid-to-late winter (Watson and Pierce, 2001). The health and abundance of these fish populations has a direct correlation to the wellbeing of bald eagles.

Wintering areas are defined as sites where the presence during winter of five or more eagles has been documented (USFWS, 1997). The wintering period for bald eagles is from November 1 to March 1. Wintering populations tend to congregate around food sources such as spawning salmon or large concentrations of waterfowl. Wintering eagles may roost communally at night near major foraging areas, and roost trees may be used in successive years (Idaho State University, 2002). Night roosts are selected in uneven-aged, multi-layered forests to provide protection from weather, and are typically in stands having trees of larger diameter (older) than those trees typical of the surrounding area (Rodrick and Milner, 1991). Eagles require perch trees for day use.

Wintering adult eagles on the Skagit River, and presumably throughout western Washington, comprise a population that is distinct from breeding eagles in western Washington. Results from 2 years of monitoring indicated that eagles telemetered on the Skagit River originated north of the 49th parallel from broadly distributed breeding populations in British Columbia, Alaska, the Northwest Territories, and the Yukon Territory. No telemetered individuals were from breeding populations in the contiguous United States (Watson and Pierce, 1998).

On the Skagit River, the spring departure migration generally occurs from the end of January to the third week in April (Watson and Pierce, 2001). During spring migration, eagles travel an average of 700 miles in 21 days to reach breeding territories (Stitson et al., 2001).

In Washington, nesting territories are adjacent to either reservoirs or large rivers. Nesting bald eagles begin courtship and nest building activities in January, with eaglets hatching in mid-April or early May. Eagles will occupy a site until the young are fully fledged in mid-August. Nest trees are chosen for location and structure. The nests must be sufficiently close to water and reliable food sources. Nest trees are usually dominant or co-dominant in the overstory and may have a broken or dead top with a limb structure to support the nest. Nests are typically within 20 feet of the top of the tree, where stout branches create flight windows for the bird's large wingspan. A nesting territory may contain more than one nest, and is also likely to have additional snags and trees with exposed lateral limbs or dead tops that are used as perches, roosts, and defense stations (Rodrick and Milner, 1991). Eagles breeding in western Washington migrate northward for several weeks in the summer and fall, and return to southern breeding areas by early November, when winter migrants begin to arrive on the Skagit River (Watson and Pierce, 1998).

Eagles are present in and utilize agricultural lands within the Planning Area. Eagles are highly adaptable to and compatible with farming, and farms can provide nesting and foraging areas with no conflict with most farming activities (Stofel, 2005). Bald eagles are frequently observed within the Planning Area, such as the one observed on April 13, 2005 during a site tour (Exhibit 3-7).

Exhibit 3-7. A Bald Eagle Observed During a Site Tour of the Planning Area

It is likely that this individual was feeding when observed. Review of the Priority Habitat and Species data indicates that 20 nest locations are present within the Planning Area. Of these nests, observations indicate that 14 have been utilized within the last 5 years. All nest sites are considered viable by WDFW, and in general are considered part of viable territories (Stofel, 2005).

Pesticides

Pesticides can affect bald eagles through environmental contamination resulting in bio-accumulation and through in-direct poisoning. Secondary poisoning of raptors can occur through the use of bait for predator or rodent control. Most cases of bald eagle poisonings have been traced to illegal or careless pesticide applications. Organophosphorous and carbamate compounds have generally replaced organochlorine pesticides, which were more persistent in the environment. However, under some conditions or uses, pesticides can still kill eagles. Eagle deaths have been reported from the use of organophosphorous and carbamate pesticides including famphur, carbofuran, fenthion, aldicarb, phorate, terbufos, parathion, and coumaphos (Franson et al., 1995).

Marbled Murrelet

In North America, the marbled murrelet ranges along the Pacific coast from Alaska and south to California (Marshall, 1990).

Marbled murrelets are semi-colonial seabirds and are dependent for breeding and rearing habitat upon old-growth forests, or forests with an older tree component (Ralph et al., 1995). These stands are characterized as old-growth and late-successional coniferous forests, being of large size (greater than 32 inches in diameter at breast height) and multi-storied with a moderate to high canopy closure. The trees must have large, near-horizontal branches for egg-laying platforms, which are usually located higher up in the canopy. Breeding occurs from late spring to fall.

A breeding pair will produce only one egg that incubates for approximately 30 days. The pair will incubate the egg in 24-hour shifts, rotating each evening (Marshall, 1990). The young remain until they are capable of flying to the sea. Marbled murrelets usually move to other areas to search for food when not breeding (Ralph et al., 1995). Primary food sources include forage fish (smelt and sand lance) (Ralph et al., 1995) and invertebrates (Marshall, 1990).

Marbled murrelets do not use farms for any of the stages of their lives, but farms can affect murrelets if runoff into salt water reduces forage by negatively affecting eelgrass beds and beaches. Murrelets feed on small fish (sand lance and herring) and on plankton (adults may feed primarily on plankton) (Stofel, 2005).

Review of the Priority Habitat and Species mapping data provided by WDFW indicates that the nearest detection location is approximately 3 miles from the Planning Area's northeastern boundary. With inclusion of the adjacent buffer (0.75 mile to the detection site), the outer margin of the buffer section is within approximately 1.5 miles of the northeastern Planning Area boundary. Review of the USFWS on-line critical habitat mapper indicates that the nearest designated critical habitat area is approximately 12.6 miles from the eastern Planning Area boundary.

Coastal – Puget Sound Bull Trout

Bull trout were historically distributed throughout Washington State and especially in the northern Puget Sound rivers including the Nooksack, Skagit, Stillaguamish, and Snohomish River basins (Mongillo, 1993). In the Planning Area, bull trout are presently known to occur in the Skagit and Samish River systems (Exhibit 3-8). They are also present in the estuary and nearshore areas, because segments of the populations demonstrate an amphidromous life history (that is, fishes that regularly migrate between fresh water and the salt water [in both directions], but not for the purpose of breeding). The Swinomish Channel is documented as a corridor for bull trout migration and rearing (Beamer, 2004).

The Skagit River supports the largest natural population of bull trout/Dolly Varden in Puget Sound. Bull trout/Dolly Varden spawn in most, if not all, of the accessible upriver areas in the drainage. Anadromous, fluvial, adfluvial, and resident fish all exist in the watershed and, in many cases, overlap geographically. All stock and populations are native and are maintained by wild production (WDFW 1998; 2004). Three distinct stocks within the Skagit River Basin are currently identified: lower Skagit River and tributaries, upper Skagit River, and Baker Lake (WDFW, 2004). The lower Skagit River population has recently been determined to be bull trout based on genetic analysis (WDFW, 2004). Goetz et al. (2004) identified over 19 local populations in the lower Skagit River area, representing over 40 percent of the local populations in the Puget Sound basin. In 2001, it was thought that the lower Skagit River supported a spawning population of migratory bull trout that numbered in the thousands, likely making it the largest population in Washington. Based on recent tag recapture efforts, this number has been reviewed and is thought to be in the tens of thousands rather than in the thousands (Goetz et al., 2004). In the 1998 and 2004 WDFW Salmonid Stock Inventory, the lower Skagit stock is described as healthy (WDFW, 1998; 2004).

Life histories of the stocks in the Skagit River are complex in the areas accessible to anadromous and non-anadromous fish. Spawning occurs in the upriver areas as water temperatures decrease to around 8°C. In many cases, fluvial, anadromous, and resident adults spawn in the same areas. After spawning, resident adults remain in the area, while fluvial adults move throughout the upper river area and remain in pools during the winter, spring, and early summer. They return to their spawning staging areas in late summer. Anadromous adults, after spawning, begin the downriver migration from late fall through the winter and enter the estuary area in the spring. They remain in the estuary until early to mid-summer and begin the upriver spawning run again (WDFW, 1998).

A significant portion of the migratory fish in the basin exhibit an anadromous life history and use the estuarine and nearshore marine areas in Skagit Bay and Port Susan. The anadromous fish are typically found in nearshore marine waters from the early spring through the late fall. The maintenance of marine nearshore and estuary habitat is key to supporting this life history form. The anadromous fish forage primarily on salmon smolts and marine forage fish (i.e., surf smelt, sand lance, and herring) while in the estuary and nearshore marine waters. Surf smelt, sand lance, and herring become more and more important as forage as the summer growing season progresses. Protecting the spawning beaches for these forage fish in Skagit Bay and Port Susan is key to maintaining the current abundance of the anadromous life history form. While the anadromous fish are in the river, either as post-spawn adults or overwintering sub-adults, they rely on much the same forage base as the fluvial fish (USFWS, 2004a).

In the Skagit River, juvenile and sub-adult bull trout migrate downstream between April and July (98 percent of all migrants) at 2 or 3 years of age, although the range of seasonal timing of entry extends from mid-February to early September. The peak of the migration occurs in May (59 percent) and June (25 percent) (Goetz et al., 2004).

Within Skagit Bay, bull trout are essentially present year-round. Peak abundance usually occurs in May or June; however, in recent years (coinciding with higher overall abundance) there appears to be a bi-modal distribution where significant numbers of bull trout are present in Skagit Bay during the fall months. Bull trout are more consistently associated with spit habitat throughout the year than any other habitat type, with stable bluffs a strong secondary habitat feature. Bull trout are found occupying coastal lagoon habitat in July (Goetz et al., 2004).

No spawning is documented within the Planning Area (WDFW, 1998).

The Samish River contains important foraging, migration, and overwintering habitat necessary for bull trout recovery (USFWS, 2004a). The Samish River habitat is especially important to bull trout populations that occur in the Nooksack and Skagit River systems (USFWS, 2004a). Adult and sub-adult bull trout have been caught on the main stem of the Samish River upstream of the confluence with Friday Creek, as well as in the lower river; however, it is likely that potential use extends to the uppermost reaches of anadromous salmon use. These are likely anadromous bull trout from the Nooksack and Skagit core areas due to their close proximity (USFWS, 2004a).

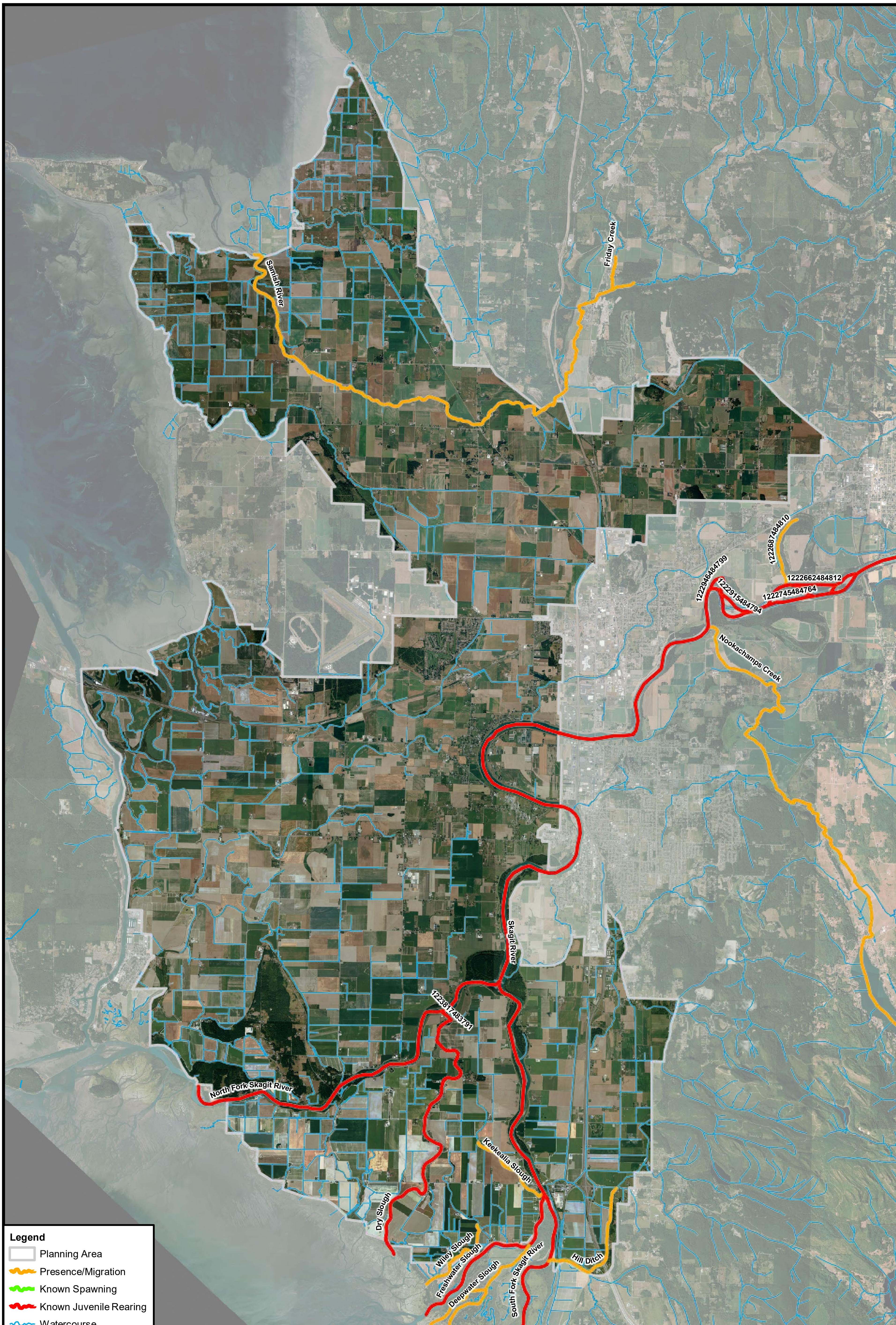
Critical Habitat

Critical habitat for the Coastal-Puget Sound bull trout population was designated in September 2005 (Federal Register / Vol. 70, No. 185 / Monday, September 26, 2005). Within the Planning Area this is identified as Unit 28 – Puget Sound. Critical habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line. In areas where ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years in the annual flood series.

Critical habitat also includes the inshore extent for marine nearshore areas (the mean higher high water [MHHW] line), including tidally influenced freshwater heads of estuaries. This refers to the average of all the higher high-water heights of the two daily tidal levels. Adjacent shoreline riparian areas, bluffs, and uplands are not designated as critical habitat. For marine nearshore areas, critical habitat extends offshore to a depth of 33 feet relative to the mean lower low-water line (MLLW) (average of all the lower low-water heights of the two daily tidal levels). This area between MHHW and minus 10 MLLW is considered the habitat most consistently used by bull trout in marine waters based on known use, forage fish availability, and ongoing migration studies, and captures geological and ecological processes important to maintaining these habitats. This area contains essential foraging habitat and migration corridors such as estuaries, bays, inlets, shallow subtidal areas, and intertidal flats (Federal Register / Vol. 70, No. 185 / Monday, September 26, 2005).

For the Planning Area and adjoining marine waters, critical habitat includes the Skagit River, North Fork Skagit River, South Fork Skagit River, Samish River, and the eastern shoreline of Puget Sound (Exhibit 3-9).

Primary constituent elements (PCEs) for bull trout have been identified within the designated critical habitat areas. The PCEs are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. The PCEs address water temperature, stream channel complexity, substrate, presence of a natural hydrograph, high quality and cold natural water sources (e.g., springs, seeps), migratory corridors, food base, and water supply quantity and quality (Federal Register / Vol. 70, No. 185 / Monday, September 26, 2005).



Printing Date: October 10, 2006 | File: exhibit_3-8.mxd | Source: WDFW, 2005d

Exhibit 3-8

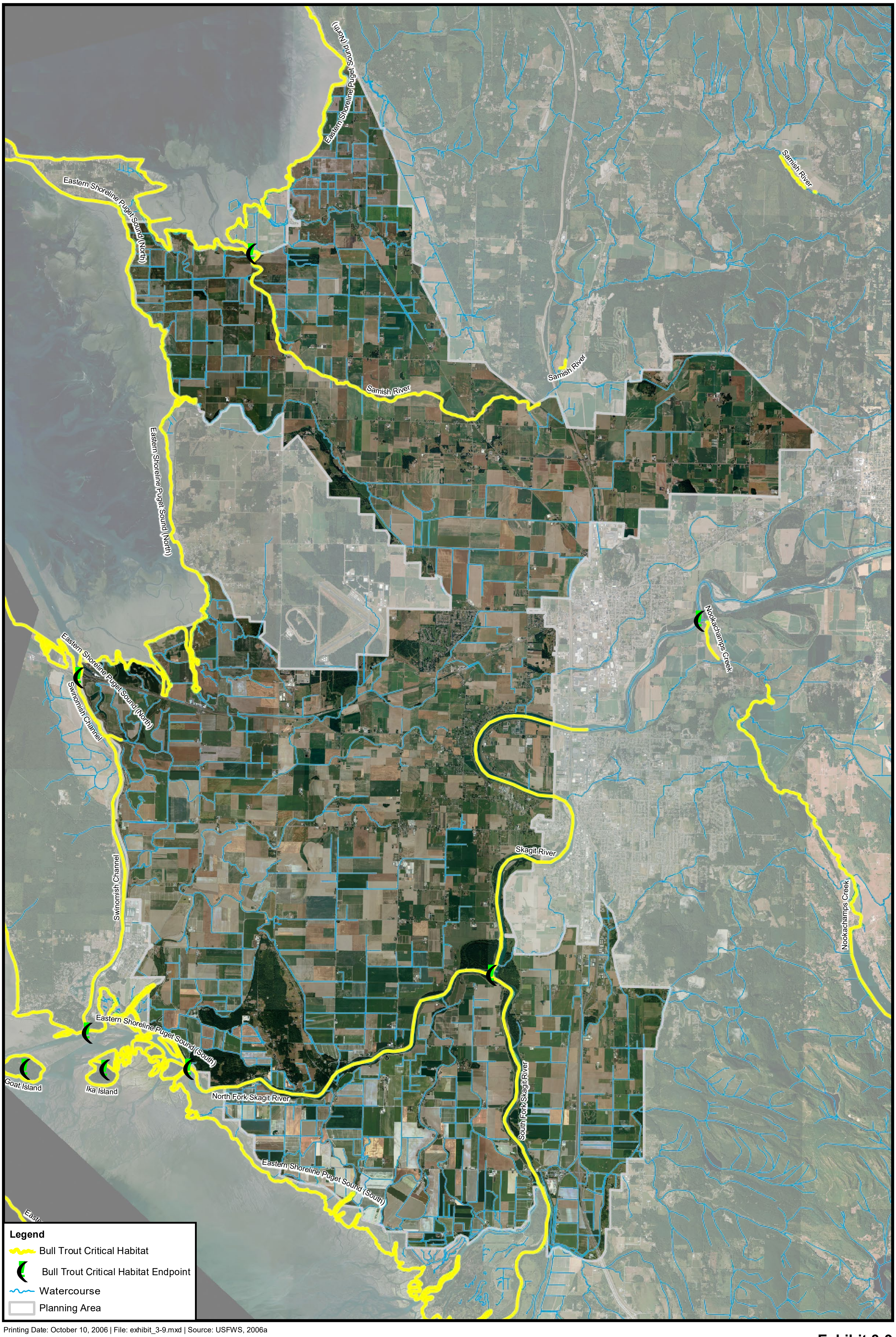
Dolly Varden/Bull Trout Distribution In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association



Printing Date: October 10, 2006 | File: exhibit_3-9.mxd | Source: USFWS, 2006a

Exhibit 3-9

Designated Critical Habitat for Puget Sound Bull Trout In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP

Western Washington Agricultural Association

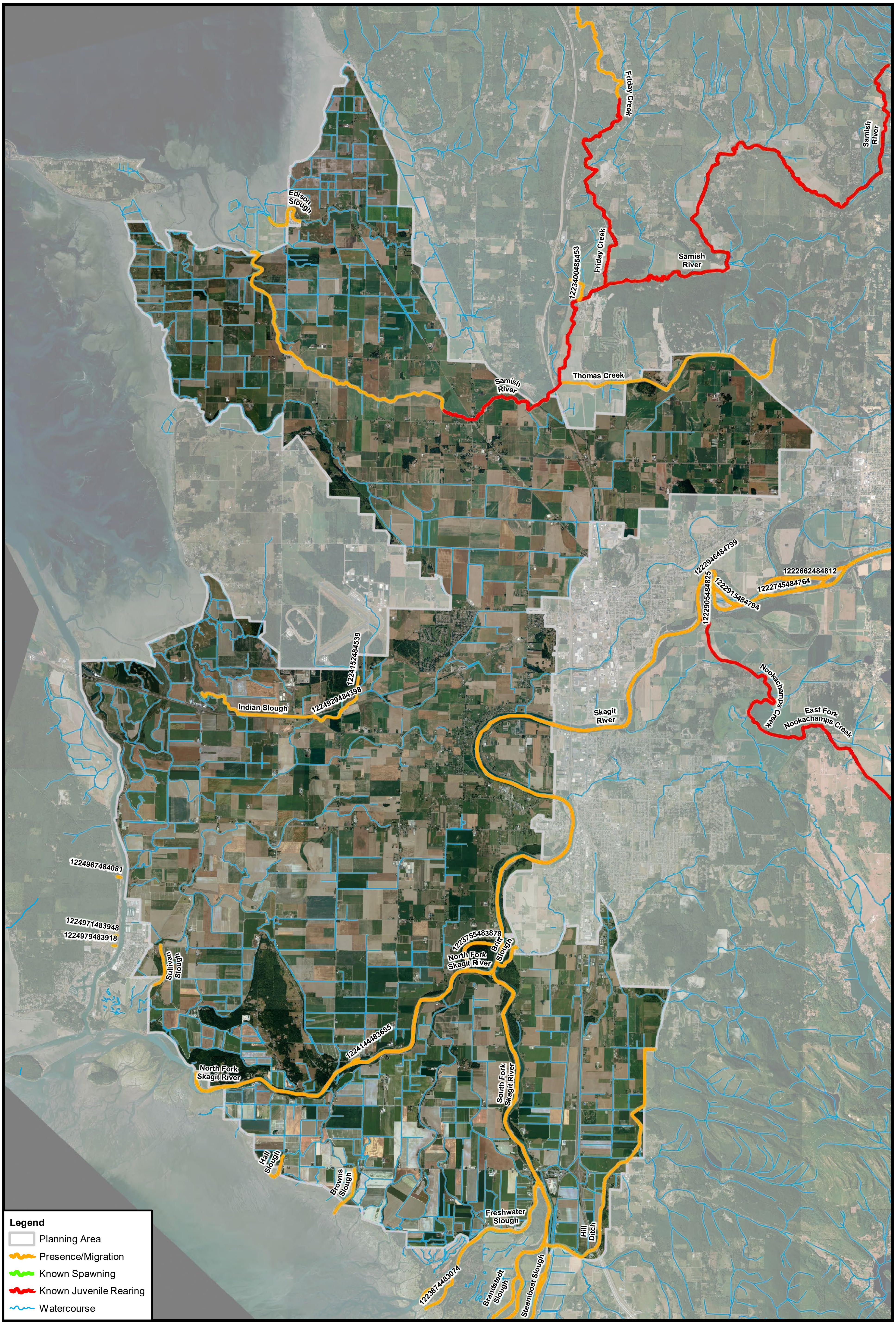
Chinook Salmon

The Puget Sound Chinook Evolutionarily Significant Unit (ESU) was listed as threatened on March 24, 1999 by NOAA Fisheries and the threatened status was reconfirmed on June 28, 2005 (FR, 2005b). Fall, spring, and summer Chinook salmon (*Oncorhynchus tshawytscha*) occur within the Skagit River system, and fall Chinook occur within the Samish River. There are six different Chinook salmon populations recognized in the Skagit Basin. These six populations are: lower Skagit, upper Skagit, lower Sauk, upper Sauk, Suiattle, and upper Cascade populations (Smith, 2003). Within the Planning Area, Chinook occur throughout numerous watercourses (Exhibit 3-10).

Chinook populations within the Skagit River have been in long-term decline. Catch data from the terminal area have shown a declining trend since 1935 (SRSC and WDFW, 2005). Of the six Chinook populations in the Skagit River, all but the Suiattle are listed as depressed in the 2002 WDFW Salmonid Stock Inventory (SaSI). The Suiattle population was listed as healthy. In the Samish River system, the Chinook population is a non-native stock, and the population status is described as unknown in the 2002 SaSI report.

Two distinct life history strategies occur within these populations: stream type and ocean type. Stream types reside longer in fresh water and migrate seaward as yearlings or older. Ocean types migrate to sea as sub-yearlings, typically within the first 3 months after emergence. A detailed description of Skagit River Chinook life histories is presented in the *Skagit Chinook Recovery Plan* (SRSC and WDFW, 2005, Section 4.3). All six wild Skagit Chinook salmon stocks include delta rearing life history strategies in their populations. Juvenile Chinook utilize the deltas (estuaries) adjacent to Skagit, Samish, and Padilla Bays to varying degrees, depending on their specific life history type and “sub” type. For example, a portion of the ocean type Chinook are delta rearing migrants that utilize the tidal delta habitat for several weeks to several months before migrating to Skagit Bay (SRSC and WDFW, 2005), while the parr migrants travel downstream directly to Skagit Bay and do not rear in the delta habitat. The lack of estuary habitat in the Skagit Basin area has been identified as a limiting factor for Chinook salmon populations (Smith, 2003).

The loss of delta channel edge and blind channel habitats preferred by juvenile Chinook for rearing is limiting the Chinook population levels in number and size (SRSC and WDFW, 2005). Limitations in current delta habitat conditions are also displacing juvenile Chinook from delta habitat to Skagit Bay habitat, and forcing a change in their life history strategy from delta rearing to fry migrants. Literature shows that fry migrant survival is one order of magnitude lower than that of delta rearing individuals (SRSC and WDFW, 2005).



Printing Date: October 10, 2006 | File: exhibit_3-10.mxd | Source: WDFW, 2005d

Exhibit 3-10
Chinook Salmon Distribution In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association

Critical Habitat

Critical habitat for the Puget Sound Chinook salmon ESU was designated on September 2, 2005 (Federal Register / Vol. 70, No. 170). This designation specifically identified habitat within the Lower Skagit Sub-basin (Federal Register / Vol. 70, No. 170). Critical habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. As previously mentioned, bankfull elevation is the level at which water begins to leave the channel and move into the floodplain. It is reached at a discharge which generally has a recurrence interval of 1 to 2 years in the annual flood series (Federal Register / Vol. 70, No. 170). In estuarine and nearshore marine areas, critical habitat includes areas contiguous with the shoreline from the line of extreme high water out to a depth of no more than 30 meters relative to mean lower low water (FR, 2005a).

Critical habitat within the Planning Area is presented in Exhibit 3-11. The following list of Planning Area watercourses was determined by utilizing the NOAA Fisheries GIS mapping data and by referencing the Federal Register listing to the extent possible, as exact correlation to watercourses named in the Federal Register (Vol. 70, No. 170) does not occur, or could not be determined.

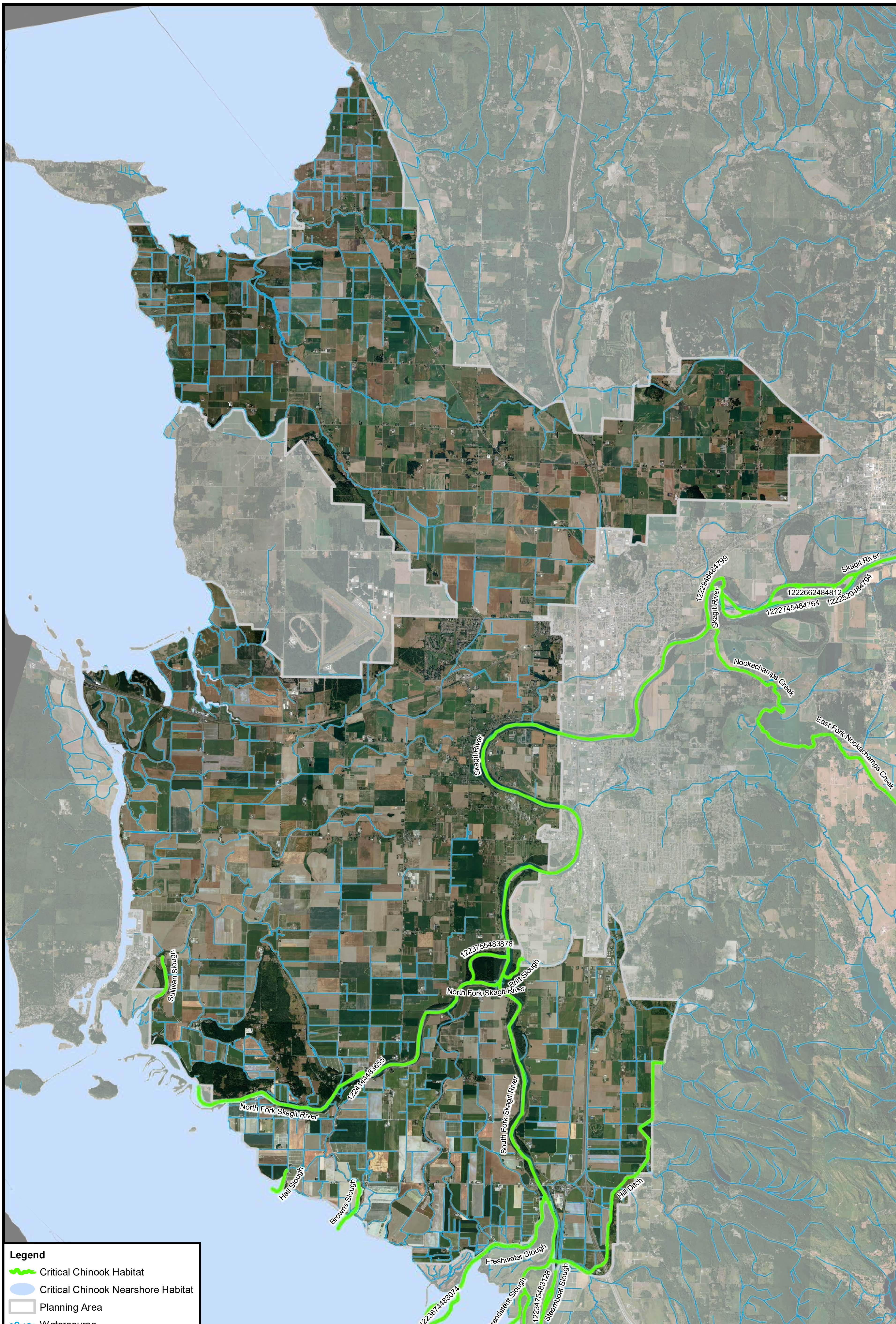
Within the Planning Area and extending into marine waters, critical habitat for the Puget Sound Chinook ESU includes the following watercourses:

- Skagit River – all segments within the Planning Area.
- North Fork Skagit River – from the Planning Area boundary upstream to the confluence with the Skagit River.
- South Fork Skagit River - from the Planning Area boundary upstream to the confluence with the Skagit River.
- Freshwater Slough - generally outside of the Planning Area, on the boundary of the Planning Area. Water return or drainage from within the Planning Area may enter this watercourse.
- Browns Slough – upstream to Fir Island Road crossing.
- Hall Slough – from the Planning Area boundary upstream to the terminus of designated habitat (location unspecified).
- Sullivan Slough – old channel (Unnamed [48.3831, –122.4842]).
- Hill Ditch – (Unnamed 48.3217, - 122.3439) - not specifically listed within the Federal Register, but depicted on maps and within GIS data available from NOAA Fisheries.
- Britt Slough – from the confluence with the Skagit River upstream to the Planning Area boundary.
- Unnamed 48.3878, – 122.3755 – watercourse from the Skagit River to the North Fork Skagit River (not specifically listed within the Federal Register, but depicted on maps and within GIS data available from NOAA Fisheries).

- Unnamed 48.3655, - 122.4144 – tributary to the North Fork Skagit River (not specifically listed within the Federal Register, but depicted on maps and within GIS data available from NOAA Fisheries).
- Steamboat Slough – mapping indicates that the upper extent of designated critical habitat is outside the Planning Area boundary. Water return or drainage from within the Planning Area may enter this watercourse.
- Nearshore marine habitat.

The entire watershed for the Samish River was excluded from the Critical Habitat designation for Puget Sound Chinook Salmon.

Primary constituent elements (PCEs) for Chinook salmon have been identified within the designated critical habitat areas. The PCEs are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. The PCEs cover freshwater spawning sites; freshwater rearing sites; freshwater migration corridors; estuarine areas for physiological transition and rearing and migration; nearshore marine areas; and offshore marine areas (Federal Register / Vol. 70, No. 170). PCEs within the Planning Area are depicted in Exhibit 3-12.



Printing Date: October 10, 2006 | File: exhibit_3-11.mxd | Source: NOAA Fisheries, 2006

Exhibit 3-11

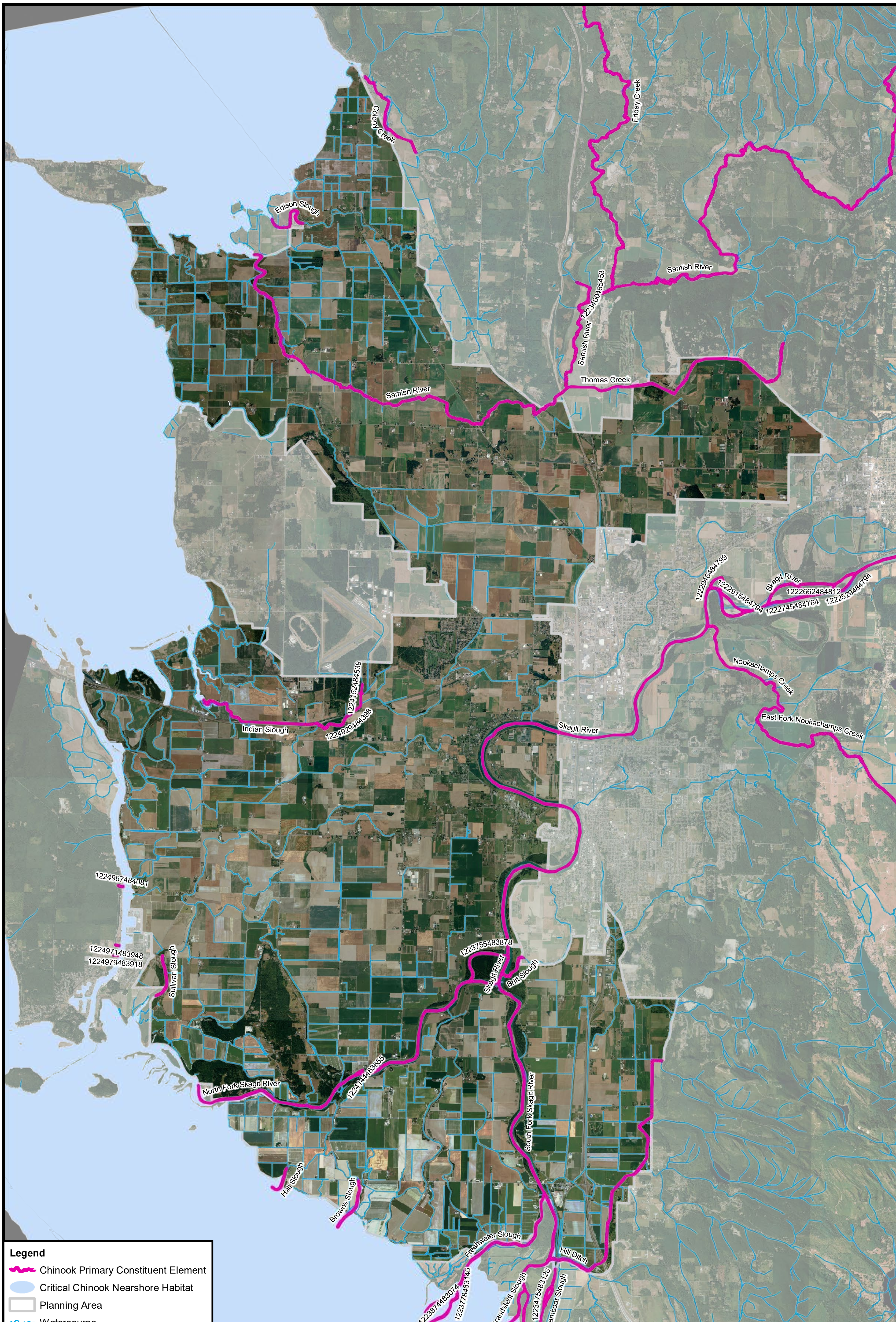
Critical Habitat for Puget Sound Chinook Salmon ESU - Lower Skagit Subbasin In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association



Printing Date: October 10, 2006 | File: exhibit_3-12.mxd | Source: NOAA Fisheries, 2006

0 2,000 4,000 8,000 12,000 16,000 Feet

Exhibit 3-12

Identified Primary Constituent Elements Habitat For The Puget Sound Chinook Salmon ESU

October 2006

HDR

Skagit Basin CIDMP
Western Washington Agricultural Association

Steelhead Trout

Winter and summer populations of steelhead trout occur within the Skagit River system. Six populations of steelhead are described in the Skagit Basin: three populations of winter steelhead and three populations of summer steelhead (WDFW, 2002). All of the winter steelhead populations are described as being native in origin with wild production. The Skagit main stem/tributaries winter steelhead population declined from a healthy status in 1992 to a depressed status in 2002.

The status of the Cascade and Sauk winter steelhead populations are unknown. The three summer steelhead populations in the Skagit Basin are classified as having an unknown status (WDFW, 2002). The three populations are greatly separated spatially in spawning distribution. One population spawns in Finney Creek, another in the upper Cascade River, and the third in the upper Sauk River. The Finney Creek and Sauk River summer steelheads are native in origin with wild production, while the Cascade River population has an unknown origin and wild production. All of these populations occur within WRIA 4, the Upper Skagit. Occurrence within the Planning Area is assumed to be limited to migration and rearing.

In the Samish River, one population of winter steelheads occurs. This population spawns throughout the Samish River and in Friday Creek and its tributaries. Spawning generally occurs from mid-February through early June. This is described as native stock with wild production (WDFW, 2002). The status of this stock is described as healthy. This population occurs within WRIA 3. Occurrence within the Planning Area is assumed to be for migration, rearing, and spawning (spawning information is based on WDFW's salmonscape/sasimap).

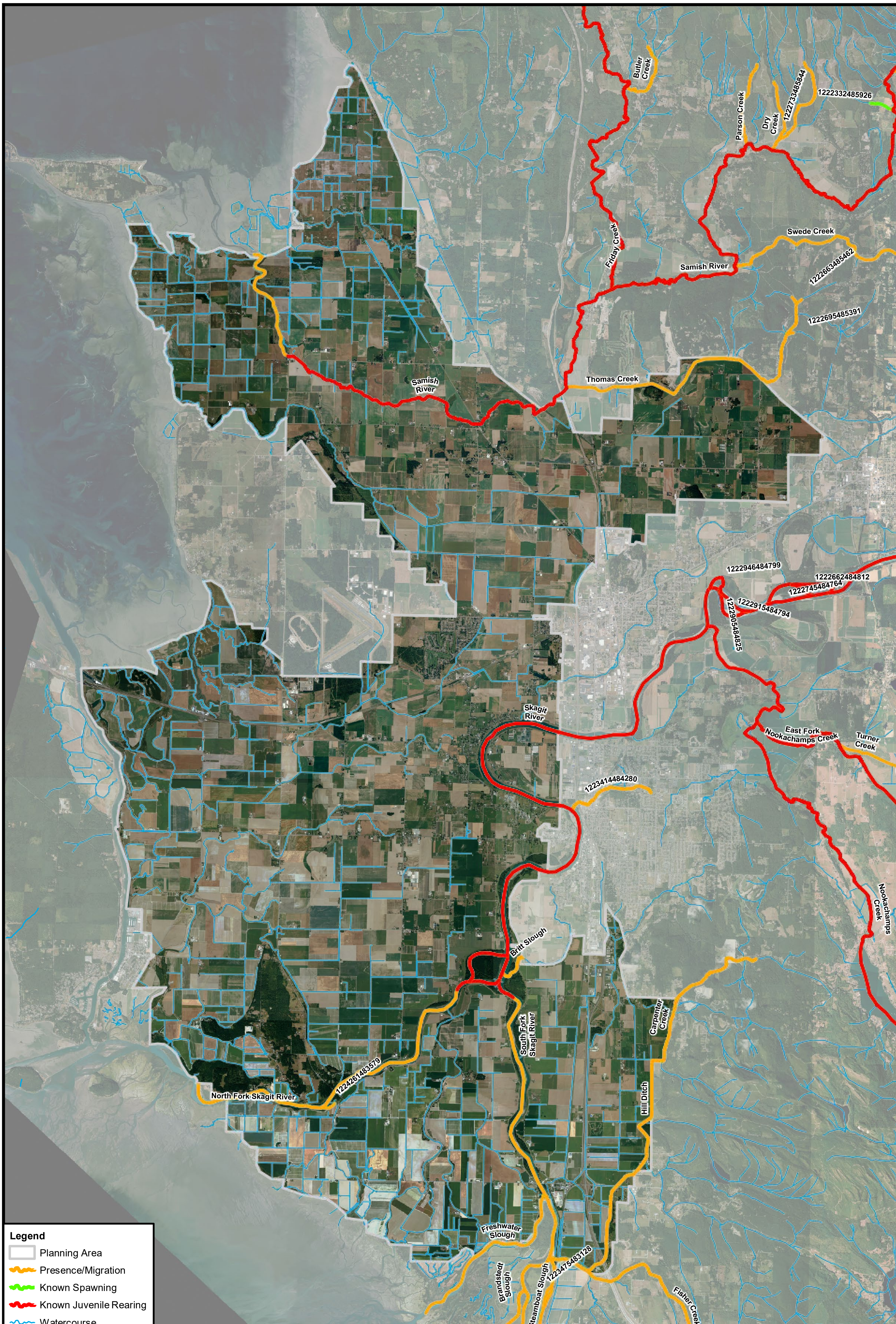
Steelhead trout distribution within the Planning Area is presented in Exhibit 3-13.

Coho Salmon

Two coho salmon populations occur in the Skagit Basin: one spawns in the Baker River (and tributaries) and the other spawns in accessible areas in the Skagit Basin (Smith, 2003). The Baker River coho are small in size, return to the river in September through October, and generally spawn in the beginning of January until early February (Smith, 2003). Baker River coho are a mixed-origin run. The Skagit coho population spawns from early October through mid-February, and is native in origin with a mix of hatchery and wild production (Smith, 2003). Both the Baker River and the Skagit coho populations are classified as healthy in the 2002 SaSI report (WDFW, 2002).

In the Samish Basin, coho salmon are the most abundant salmon. Samish coho are of mixed origin with wild production, and the coho population has been classified as healthy in the 2002 SaSI report (WDFW, 2002).

Coho salmon distribution within the Planning Area is presented in Exhibit 3-14.



Printing Date: October 10, 2006 | File: exhibit_3-13.mxd | Source: WDFW, 2005d

October 2006

HDR

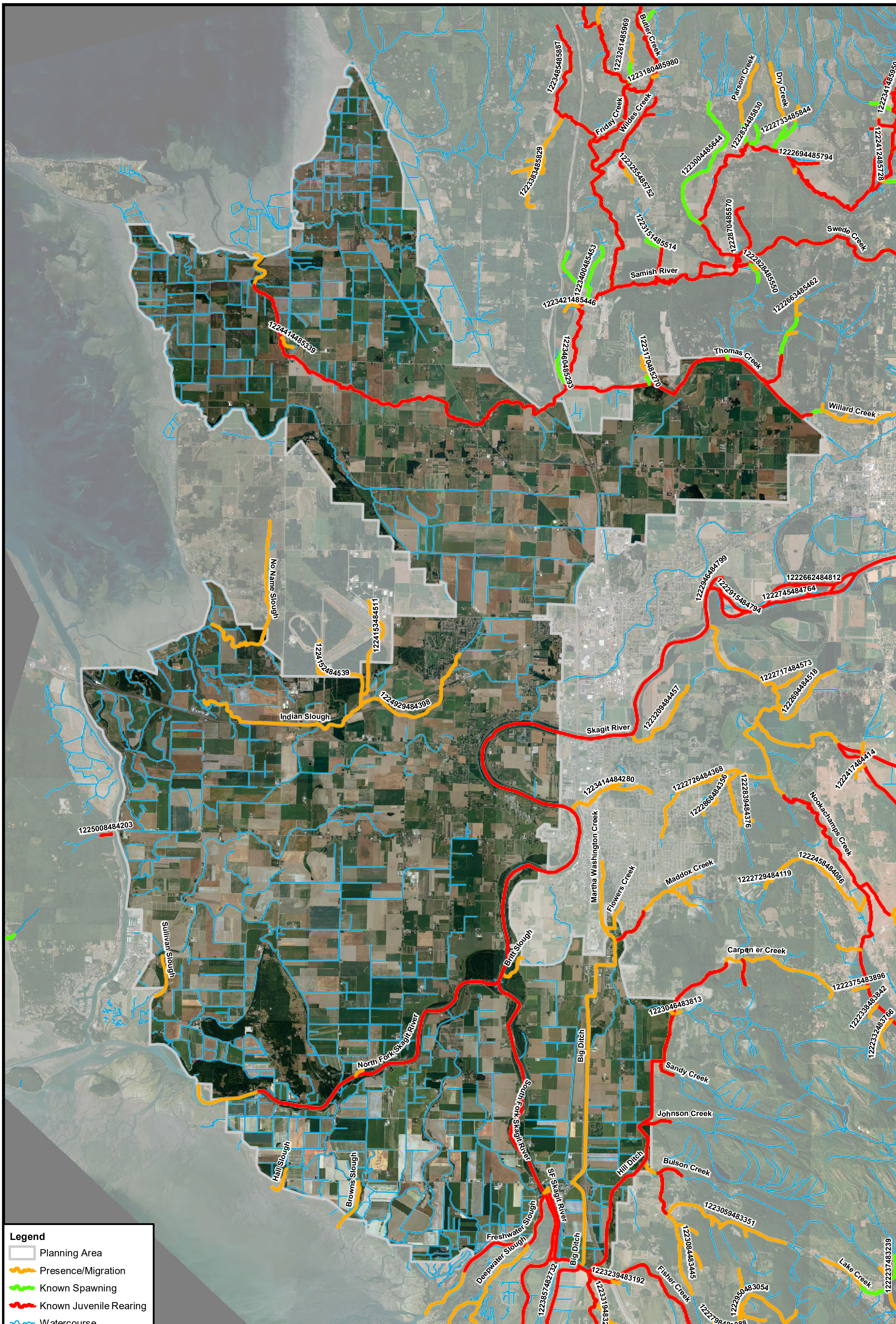
0 2,000 4,000 8,000 12,000 16,000 Feet

Exhibit 3-13

Steelhead Trout Distribution In Planning Area

Skagit Basin CIDMP

Western Washington Agricultural Association



Printing Date: October 10, 2006 | File: exhibit_3-14.mxd | Source: WDFW, 2005d

Exhibit 3-14
Coho Salmon Distribution In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association

Pink Salmon

The Skagit River pink salmon are a native stock with wild production and the population was rated healthy in 2002. The escapements of this stock have generally been increasing since the late 1960s, with substantial inter-annual variability (6-year cycles), which is characteristic of many Puget Sound pink stocks. Spawning takes place in the main stem Skagit River and in a number of tributaries outside the Planning Area. Spawning generally occurs from late August through October in odd-numbered years. No spawning is documented within the Skagit River Planning Area. Genetic analysis indicates that gene flow occurs at fairly high levels among pink salmon in the Skagit, Stillaguamish, and Snohomish (odd-year stock) basins (WDFW, 2002).

Pink salmon also occur in the Samish River.

Pink salmon distribution within the Planning Area is presented in Exhibit 3-15.

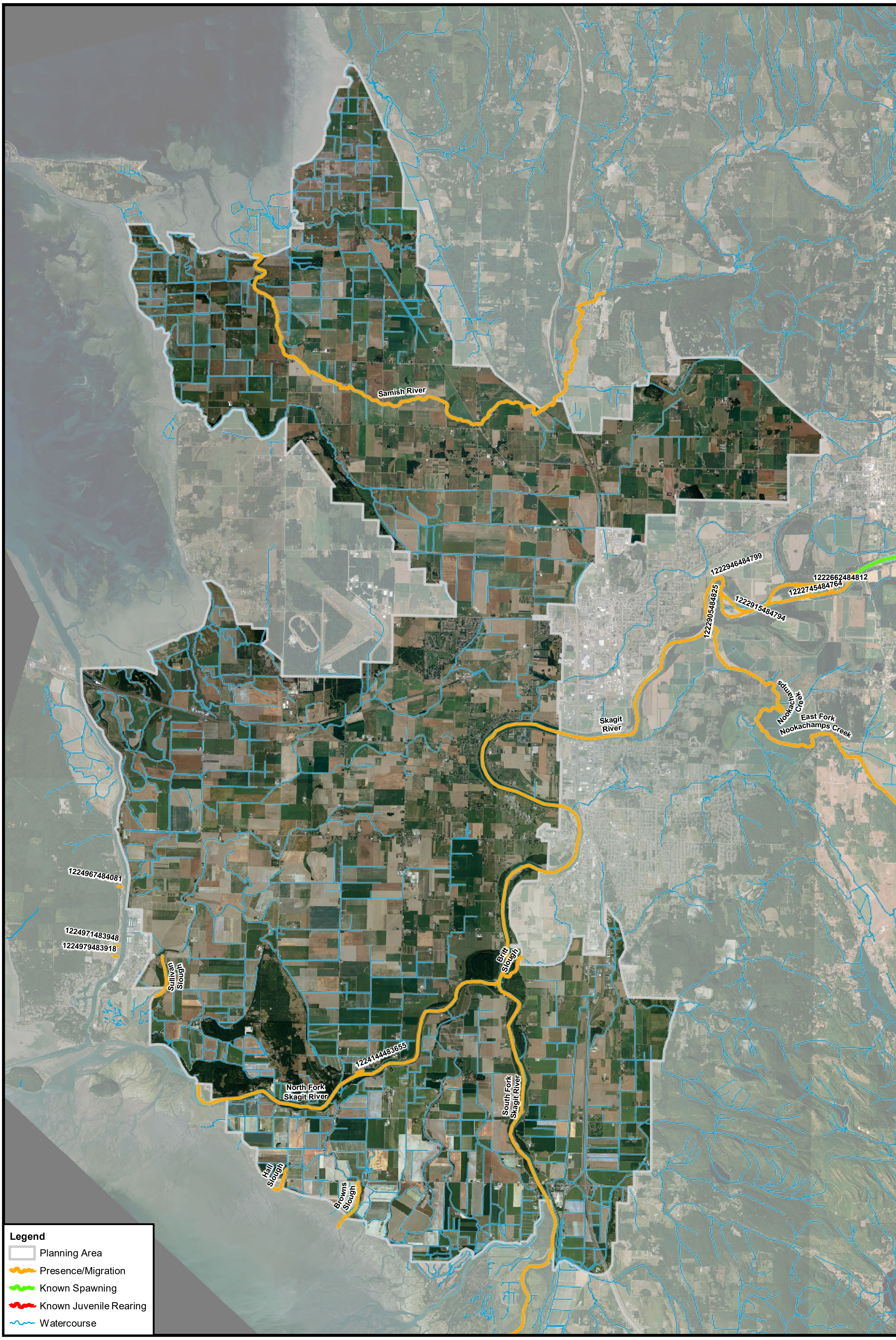
Chum Salmon

Lower Skagit Tributary fall chum were identified as a stock based on their distinct spawner distribution and spawning timing. This is a native stock with wild production. There are no adequate abundance trend data for Lower Skagit Tributary fall chum, so the status is unknown (WDFW, 2002). Most spawning takes place in Finney, O'Toole, Pressentin, Mill, and Turner Creeks, all upstream of the Planning Area. Spawning generally occurs from October through November. This is earlier than spawning in other Skagit fall chum stocks. Genetic analysis has shown Lower Skagit Tributary fall chum to be genetically distinct from all other Washington and Canadian chum stocks examined (WDFW, 2002).

The Mainstem Skagit fall chum stock has a long-term pattern of relatively stable, but inter-annually variable escapements. This is a native stock with wild production. Stock status was rated as healthy in 2002. Mainstem Skagit fall chum were identified as a stock based on their distinct spawner distribution, spawning timing, and genetic composition. Spawning takes place in the main stem Skagit River from RM 34 to 93. Spawning also occurs in larger tributaries such as the Cascade River, Nookachamps, Gilligan, Illabot, and Bacon Creeks, all upstream of the Planning Area. Spawning generally occurs from mid-November through December, which is later than spawning by the Lower Skagit Tributary fall chum stock. Genetic analysis has shown Mainstem Skagit fall chum to be genetically distinct from all other Washington chum and Canadian chum stocks examined (WDFW, 2002).

The Samish/Independent fall chum escapements for recent years have been in the normal range for this stock. Stock status was rated healthy in 2002. Samish/Independent fall chum were identified as a stock based on their distinct spawning distribution. This is a mixed stock with composite production. Hood Canal and Quilcene chum have been released into the Samish River. Other chum releases into the Samish River have included hatchery stocks from Grays Harbor and Garrison Springs (South Puget Sound). Most spawning takes place in the Samish River system and in Squalicum, Whatcom, Padden, Chuckanut, Oyster, Colony, and Whitehall Creeks. Spawning generally occurs from late October through early December. Genetic analysis has shown Samish/Independent fall chum to be genetically distinct from all other Washington and Canadian chum stocks examined (WDFW, 2002).

Chum salmon distribution within the Planning Area is presented in Exhibit 3-16.



Printing Date: October 10, 2006 | File: exhibit_3-15.mxd | Source: WDFW, 2005d

Exhibit 3-15

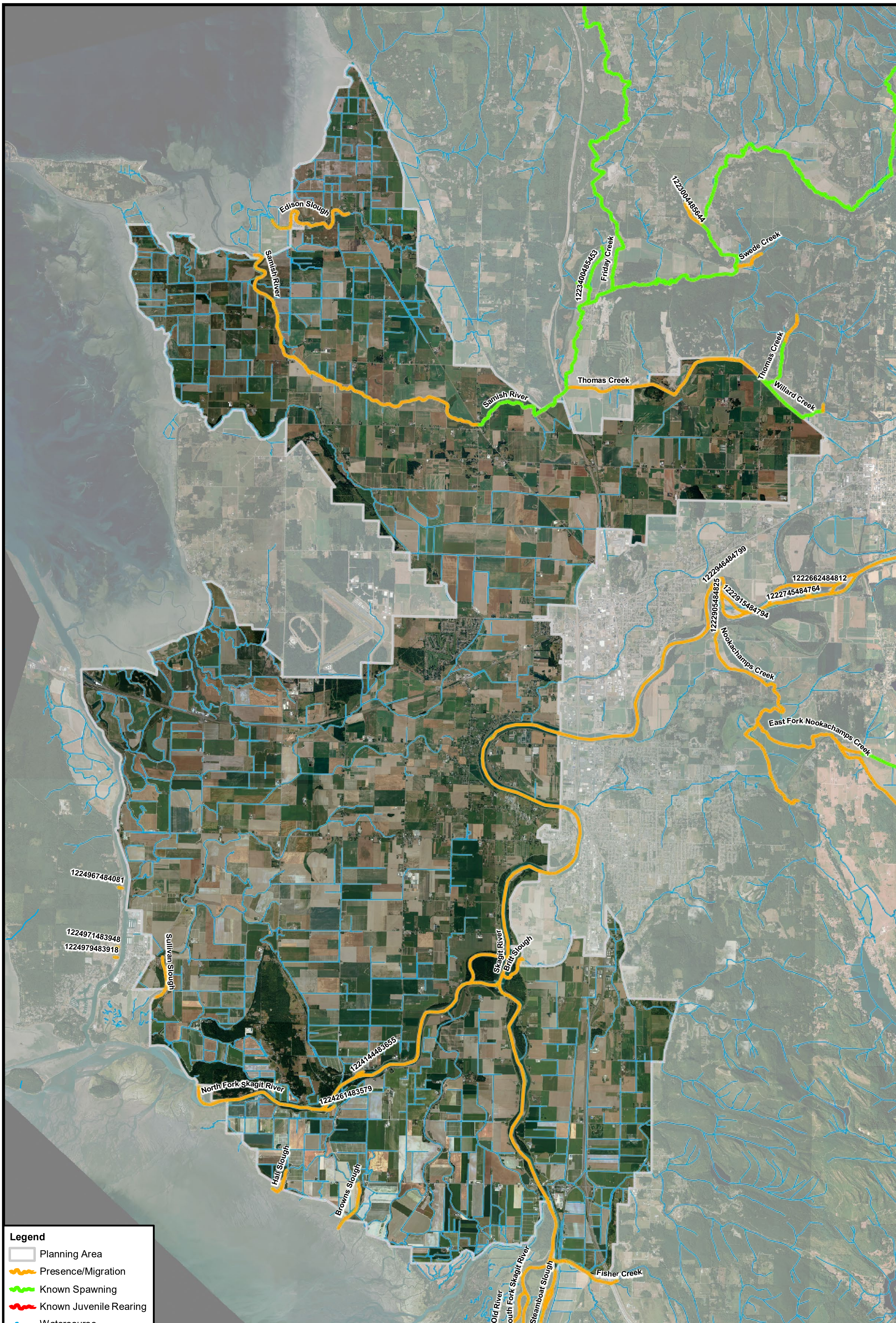
Pink Salmon Distribution In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association



Printing Date: October 10, 2006 | File: exhibit_3-16.mxd | Source: WDFW, 2005d

Exhibit 3-16
Chum Salmon Distribution In Planning Area

October 2006

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association

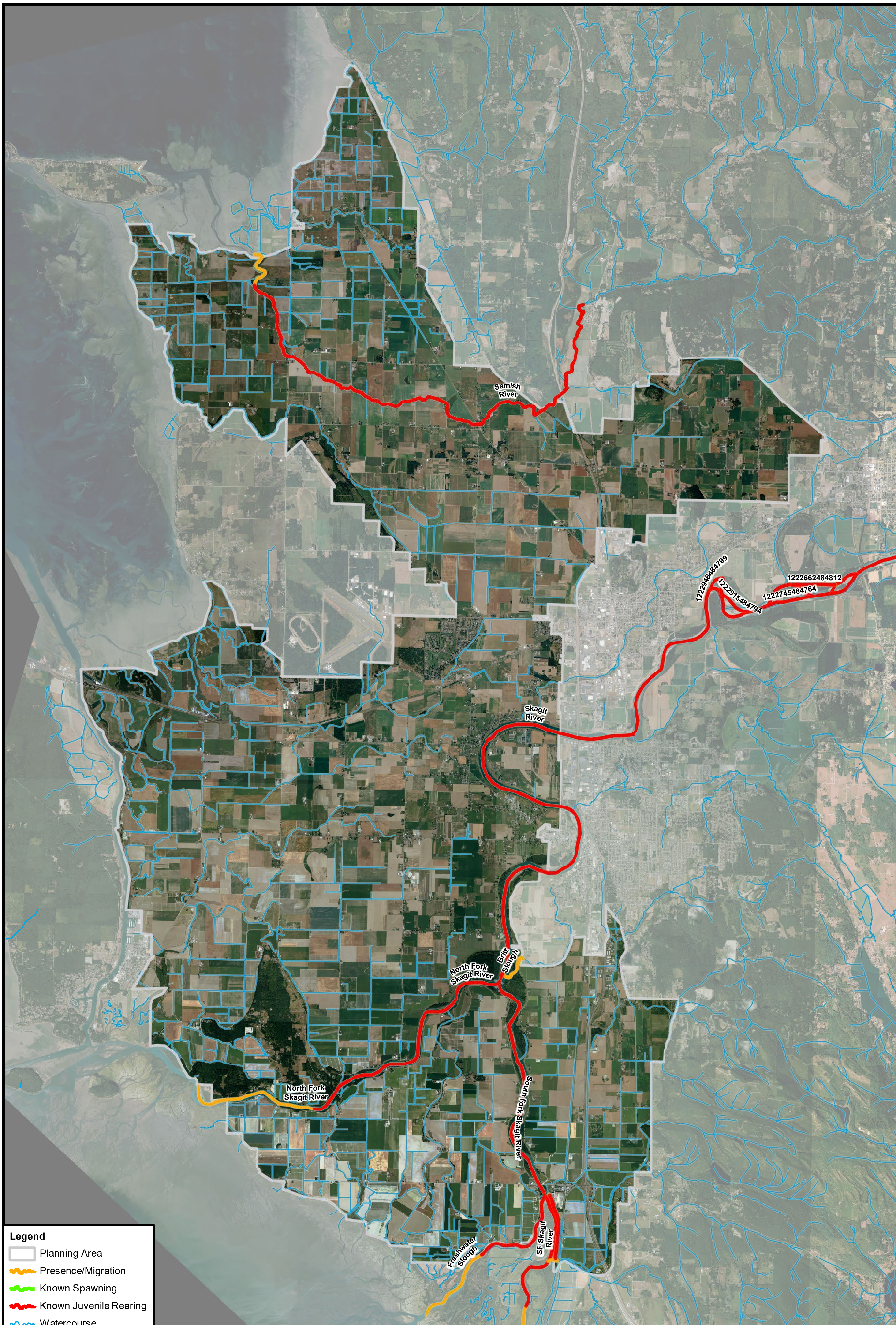
Sockeye Salmon

The Baker River sockeye salmon stock has shown a remarkable recovery from its critical status in 1992. Between 1979 and 1991, spawning escapements exceeded 1,000 fish in only 2 years and reached an all-time low of 99 spawners in 1985. Since 1992, escapements have ranged from 2,155 to 15,991. The escapement goal for Baker River sockeye is about 5,000 fish, but varies annually depending on the capacity of artificial spawning beaches and research needs. Based on spawner abundance, Baker River sockeye were rated healthy in 2002. Baker sockeye were identified as a stock based on their distinct spawning distribution and genetic differences.

This is a native stock with cultured production. Spawning of all or part of each year’s escapement takes place in artificial spawning beaches. Fry are transported to Baker Lake for rearing, then are trapped as smolts and trucked to the Baker River below the lower dam (WDFW, 2002).

Small groups of sockeye are occasionally observed spawning in Washington river systems that do not have suitable lakes. There are several locations in Puget Sound rivers where small numbers of sockeye are known to spawn on an annual basis. Recent genetic research by the National Marine Fisheries Service has shown that sockeye from the upper Skagit, Sauk, and Nooksack Rivers display no relationship to any known lake populations. However, they appear to be genetically similar to known sockeye populations in British Columbia, Alaska, and Russia that use off-channel river habitat (river type) or marine waters (sea type) instead of lakes for juvenile rearing. Although the rearing habitats of the Washington populations are in most cases unknown, these local sockeye populations are labeled as "river sockeye” for distinction from lake-based populations. Locations in Puget Sound drainages where sockeye are observed to spawn on a regular basis include the lower Samish River, the upper Skagit River near Newhalem, and the upper Sauk River (WDFW, 2005c).

Sockeye salmon distribution within the Planning Area is presented in Exhibit 3-17.



Printing Date: October 10, 2006 | File: exhibit_3-17.mxd | Source: WDFW, 2005d

Exhibit 3-17
Sockeye Salmon Distribution In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

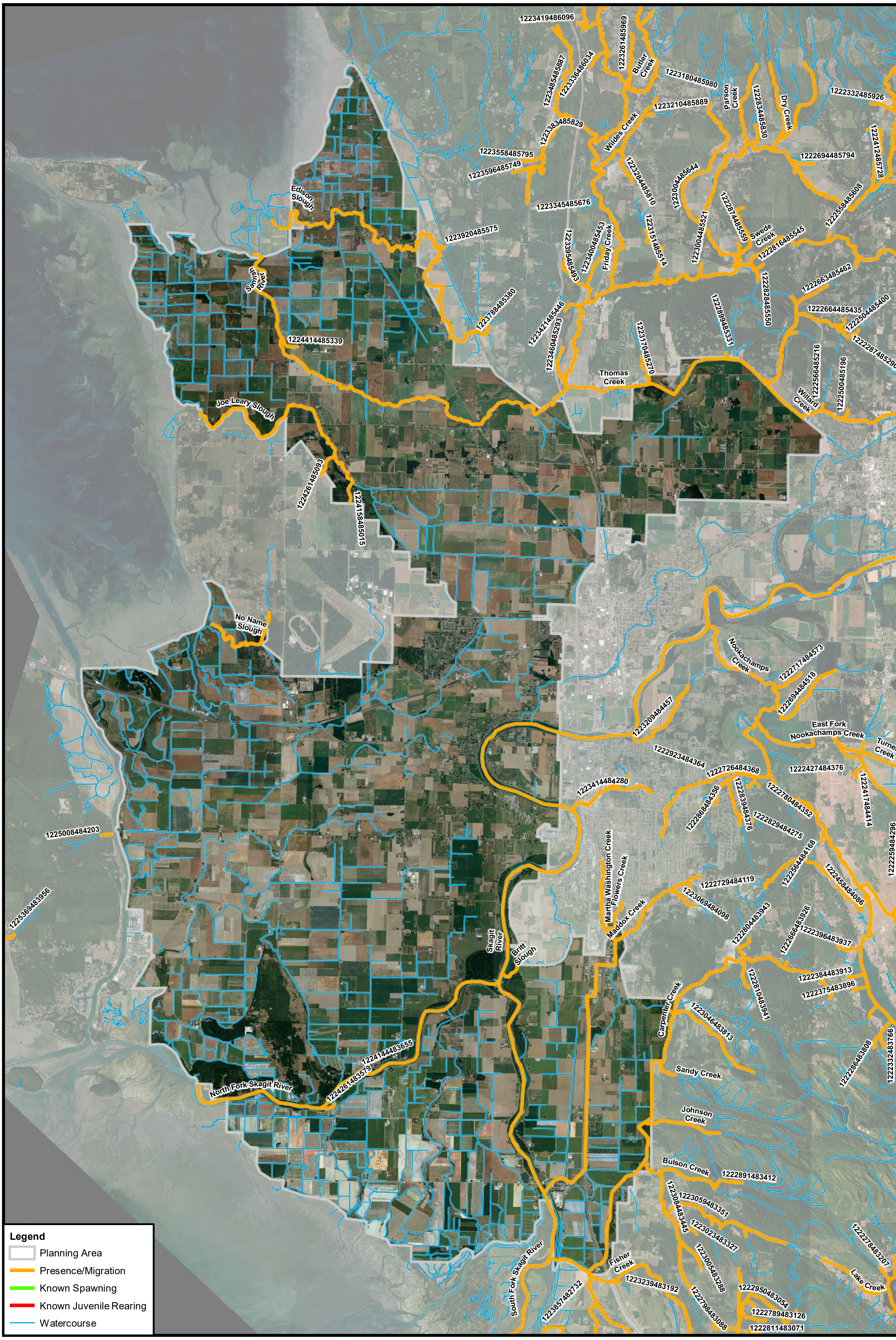
Skagit Basin CIDMP
Western Washington Agricultural Association

Coastal Cutthroat Trout

Skagit coastal cutthroat trout have been identified as a separate stock complex based on the geographic distribution of their spawning grounds. All life-history forms (anadromous, adfluvial, and resident) are found within the system. The anadromous form is found in most main stem and some tributary waters where passage to salt water is accessible. The anadromous form is an early-entry type, entering the mouth of Skagit River from July through November. Little is know about the saltwater movements of the anadromous form, but it is believed that they are distributed in Skagit Bay and in Swinomish Slough. Spawning occurs from January through April. The adfluvial form can be found in waters of Baker Lake and Lake Shannon, as well as in Ross Lake and its tributaries. Adfluvial fish spawn from June to mid-August while resident fish spawn from January through May. All forms are considered native in origin, and production is wild. Genetically, Skagit cutthroat are represented by collections from a number of tributaries, including Alder, Red Cabin, Walker, Wiseman, Bulson, Lake, and Parker Creeks. Each of these collections is genetically distinct from the others and from all other Washington cutthroat collections (WDFW, 2000). The status of Skagit coastal cutthroat is unknown (WDFW, 2000).

Samish coastal cutthroat have been identified as a separate stock complex based on the geographic distribution of their spawning grounds. Anadromous and resident life history forms are present in the Samish River drainage. Adfluvial forms are also thought to exist in the system, using Samish Lake for adult habitat. Anadromous cutthroat enter the river from August through October (early-entry migration timing) and spawn from January through April, while adfluvial and resident fish spawn from January through May. Samish cutthroat are considered to be native (WDFW, 2000). The status of Samish coastal cutthroat is unknown (WDFW, 2000).

Cutthroat trout distribution within the Planning Area is presented in Exhibit 3-18.



Printing Date: October 10, 2006 | File: exhibit_3-18.mxd | Source: WDFW, 2005d

Exhibit 3-18
Cutthroat Trout Distribution In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association

Lamprey

Lampreys belong to a primitive group of fishes that are eel-like in form but lack the jaws and paired fins. These species have a round sucker-like mouth (oral disc), no scales, and breathing holes instead of gills. Most lamprey species have a similar life cycle: all begin life in fresh water, but some are anadromous. In the beginning of their life cycle, the lamprey eggs hatch and the young ammocoetes (larvae) drift downstream to areas of low velocity and silt or sand substrate. They remain burrowed in the stream bottom, living as filter feeders for 2 to 7 years, filter-feeding on algae and detritus. Metamorphosis of ammocoetes to macropthalmia (juvenile phase) occurs gradually over several months as they develop eyes, teeth, and become free swimming (USFWS, 2004b).

Pacific and river lampreys are parasitic as adults and feed on a variety of marine and anadromous fish. After the adult feeding phase, both Pacific and river lampreys migrate to spawning areas and cease feeding. Their degree of fidelity to their natal streams is unknown. Adult lampreys spawn in gravel-bottomed streams at the upstream end of riffle habitat, typically above suitable ammocoete habitat (Moyle, 2002 in USFWS, 2004b). Both sexes construct the nests, often moving stones with their mouths. After the eggs are deposited and fertilized, the adults typically die within 3 to 36 days. Pacific and river lamprey ammocoetes are nearly indistinguishable from each other. Although there is some color differentiation between the species, this characteristic is not reliable (Kostow, 2002 in USFWS, 2004b).

Presence and habitat utilization for Pacific and river lampreys within the Planning Area is undetermined at this time. Further investigation is required.

Pacific Lamprey

(excerpt from USFWS, 2004b)

After spending 1 to 3 years in the marine environment, Pacific lampreys return to fresh water between February and June (Kostow 2002; Moyle 2002). They are thought to overwinter and remain in freshwater habitat for approximately 1 year before spawning. In fresh water they may shrink in size up to 20 percent (Beamish 1980). Pacific lampreys primarily migrate upstream at night and adult size at the time of migration ranges from about 15 to 24.5 in (38 to 62 cm). They spawn between March and July, depending upon location within their range (Beamish 1980). Fecundity is high but variable, with females producing between 20,000 and 200,000 eggs (Moyle 2002). After the eggs are fertilized and deposited in the nest, embryos hatch in approximately 19 days at 59° Fahrenheit (F) (15° Celsius (C)). Once the ammocoetes reach about 6 in (15 cm), they begin metamorphosis into macropthalmia (Moyle 2002; Wydoski and Whitney 2003).

River Lamprey

(excerpt from USFWS, 2004b)

The adult river lamprey has two teeth (cusps) and no posterior teeth on the oral disc (Wydoski and Whitney 2003). Adult river lampreys average between 7 and 12 in (18 and 30 cm) in length. They are dark on the back and sides with silvery yellow on the belly and dark pigmentation on the tail (Moyle 2002). River lampreys are associated with large river systems, and in some locations only in the lower portions of these large rivers. Little information is available on river lamprey life history. Metamorphosis from the ammocoete to macropthalmia life stage occurs between July and April (Kostow 2002; Moyle 2002). At this time, macropthalmia are thought to live deep in the river channel, which may explain why they are rarely observed (Kostow 2002). As adults, their oral disc develops just before they enter the ocean between May and July (Kostow 2002; Moyle 2002). During the approximately 10 weeks they are at sea in the parasitic phase, they remain close to shore, feeding primarily on smelt and herring near the surface (Kostow 2002). According to Moyle (2002), their life span is 6 to 7 years. River lampreys lay 11,400 to 37,300 eggs per adult female (Kostow 2002; Moyle 2002).

Humpback Whale

The humpback whale (*Megaptera novaeangliae*) is widely distributed throughout the world's oceans from the equator to the arctic ranges (Angliss and Lodge, 2003). Humpbacks were listed as endangered throughout their range on June 2, 1970 under the ESA, and consequently are considered depleted under the Marine Mammal Protection Act. The current population of these cetaceans is at a critical low. Humpback whales are the fourth most numerically depleted large cetacean worldwide. There are four recognized stocks (based on geographically distinct winter ranges) of humpback whales in the U.S.: the Gulf of Maine stock (previously known as the western North Atlantic stock), the eastern North Pacific stock (previously known as the California-Oregon-Washington stock), the central North Pacific stock, and the western North Pacific stock.

The current estimated abundance of humpback whales in the eastern North Pacific stock (California, Oregon, and Washington waters) is 1,314; the minimum population estimate is 681 animals. This stock appears to have decreased in abundance between 1998 and 1999, but the most recent estimate shows that this stock is increasing in abundance.

Humpback whales are seasonal migrants and spend the winters in the northern and southern hemispheres. Humpbacks follow predictable migratory routes and feed in the summers in higher near-polar latitudes. The winters are spent in the lower latitudes such as Mexico and Baja for breeding and calving.

Historic feeding ranges of the humpback whale in the North Pacific encompass the coastal and inland waters of the Pacific rim, from California, Oregon, Washington, to the Gulf of Alaska, the Aleutian Islands, the Bering Sea, and as far as Russia (Angliss and Lodge, 2003). Feeding requirements for the humpback can consist of a variety of krill, copepods, juvenile salmonids, arctic cod, walleye pollock, pollock, pteropods, and some cephalopods.

Humpback whales occur adjacent to human population centers and are affected by human activities in many parts of their range. There are a number of anthropogenic factors that may impede recovery. Factors applicable to this Planning Area and activities may include reduction of prey species, introduction and persistence of pollutants, and habitat degradation or loss associated with coastal development. These factors could affect individual reproductive success, alter survival rates, and limit availability of needed habitat.

Steller Sea Lion

The Steller sea lion (*Eumetopias jubatus*) was first listed on April 5, 1990, and is currently designated as Threatened. The Steller sea lion population is comprised of two stocks (Eastern U.S. and Western U.S.) separated geographically and genetically. Within the area covered by this listing (Eastern U.S. stock), this species is known to occur in Alaska, California, Oregon, and Washington, and in British Columbia, Canada. Critical habitat is designated for this entity, but none is designated in Washington.

The center of abundance for the Steller sea lion Eastern U.S. stock is the Gulf of Alaska and the Aleutian Islands, where they breed, pup, and seek refuge on the remote islands of the Alaska coastline. There are limited haul-outs and rookeries in Washington. These animals are opportunistic feeders and their diet may primarily consist of schooling demersal fish such as walleye pollock, Atka mackerel, herring, and capelin. Adult males and females reach maturity at different ages. Bulls mature between the ages of 3 to 8 years, whereas females begin reproducing at age 4. The pups are born from late May to early July and remain with their mothers until the beginning of foraging trips to sea.

Impacts to populations occur from a variety of sources, including incidental mortality in commercial fisheries (e.g., strandings from entanglement in fishing gear), illegal shooting, entanglement in garbage, reduction in prey base, contamination, disease, and loss of habitat.

Haul-out habitat information provided by WDFW from their Priority Habitats Species database indicates that the closest seal haul-outs (data not specific to species) occur approximately 0.5 miles from the Planning Area boundary. The majority of the haul-outs occur 1 mile or more from the Planning Area. It is assumed that the majority of the identified haul-out locations are for harbor seals (*Phoca vitulina*) rather than Steller sea lions, because the Steller sea lion occurs infrequently within Puget Sound.

Southern Resident Orca/Killer Whale

Killer whales (*Orcinus orca*) are the largest species in the *Delphinidae* family and the world's largest dolphin (NOAA Fisheries, 2005). These long-lived species are present in coastal waters and within Puget Sound (Ylitalo et al., 2001). The southern resident orcas consist of three pods, identified as J, K, and L pods (NOAA Fisheries, 2005). These pods reside for part of the year in the inland waterways of the Strait of Georgia, Strait of Juan de Fuca, and Puget Sound, especially during the spring, summer, and fall (NOAA Fisheries, 2005). This population, known as the Eastern North Pacific southern residents, is designated as a depleted stock under the Marine Mammal Protection Act (May 2003). This action has lead to the development of a conservation plan to address factors that may be causing the population's decline (NMFS, 2005).

The southern resident population occurs primarily in the Georgia Basin and Puget Sound from late spring to fall, when it typically comprises the majority of killer whales found in Washington (Exhibit 3-19). The population travels more extensively during other times of the year to sites as far north as the Queen Charlotte Islands in British Columbia and as far south as Monterey Bay in California. Southern resident population trends are unknown before 1960, when roughly 80 whales were present, but it is likely that numbers were at a depleted level due to indiscriminant shooting by fishermen. The population has been closely monitored since 1974, with exact numbers of animals and other demographic details learned through annual photo-identification surveys. Membership increased from 70 to 98 whales between 1974 and 1995, but this was followed by a rapid net loss of 18 animals, or 18 percent of the population from 1996 to 2001. J and K pods have generally maintained their numbers during the decline, equaling or exceeding their largest recorded sizes in 2003. However, L pod, which comprises about half of the southern resident population, has been in sharp decline since 1994 (Wiles, 2004).

Threats to the southern resident population in Washington include possible declines in their main prey, salmon, and the fact that the southern resident whales (and the transient population) are heavily contaminated with organochlorine pollutants, primarily PCBs and

DDT residues. Both populations are now considered among the most highly contaminated marine mammals in the world (Wiles, 2004).

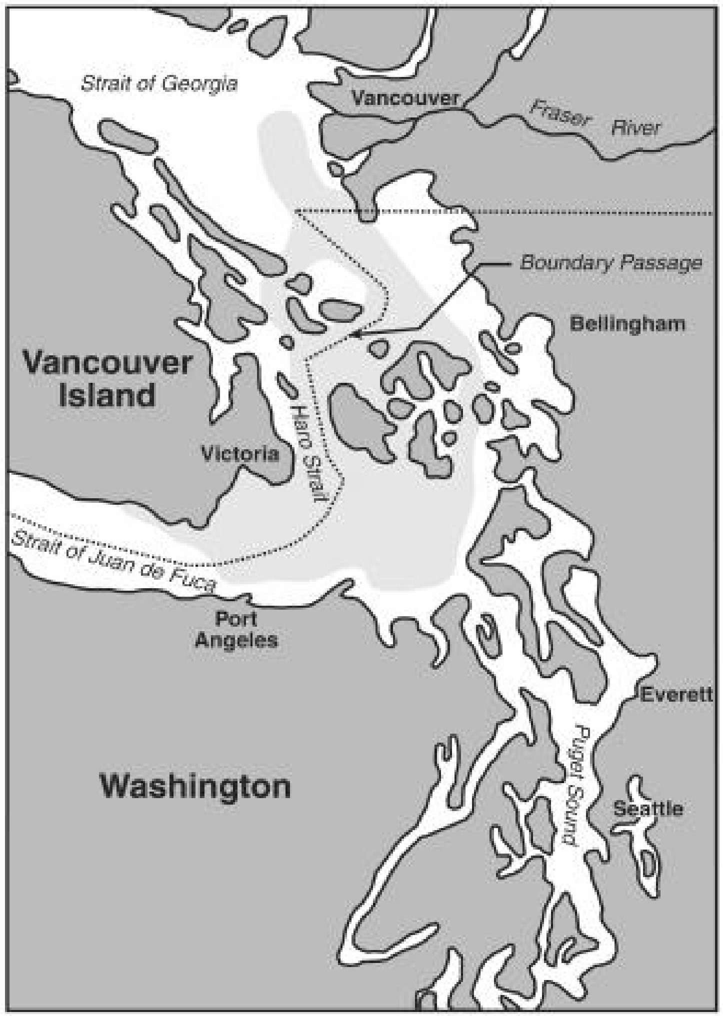


Exhibit 3-19. Primary Area of Occurrence of Southern Resident Killer Whales (light shading) (J, K, and L pods when present in the Georgia Basin and Puget Sound) (Source: Wiles, 2004)

Marine Mammals and Pesticides

Marine pollutants originate from a multitude of urban and non-urban activities including agricultural use of pesticides, and non-point source terrestrial runoff. During the past few decades, regulatory actions, improved waste handling, and ongoing cleanup efforts have led to marked improvements in regional water quality. Important actions taken include the cessation of polychlorinated biphenyl (PCB) production and dichlorodiphenyltrichloroethane (DDT) use in the 1970s (Wiles, 2004).

A primary factor in the decline of killer whales in the northeastern Pacific may be exposure to elevated levels of toxic chemical contaminants, especially organochlorine compounds (Wiles, 2004). Organochlorines comprise a diverse group of chemicals manufactured for industrial and agricultural purposes, such as PCBs and DDT, as well as unintentional byproducts of industrial and combustion processes, such as the dioxins (PCDDs) and furans (PCDFs). Many organochlorines are highly fat soluble (lipophilic) and have poor water solubility, which allows them to accumulate in the fatty tissues of animals (Wiles, 2004). Some are highly persistent in the environment and resistant to metabolic degradation. The toxicity of several organochlorines led to bans or restrictions, and most agriculture uses of DDT ended in the U.S. in 1972 (Wiles, 2004). Production of PCBs stopped in the U.S. in 1977 (Wiles, 2004). Environmental levels of many organochlorine residues (e.g., PCBs, dioxins, furans, organochlorine pesticides, and chlorophenols) have declined significantly (Wiles, 2004). Despite these improvements, the presence of some chemicals (e.g., PCBs and DDT) in coastal habitats and wildlife has stabilized since the early 1990s and is not expected to decline further for decades to come (Wiles, 2004).

PCBs, polycyclic aromatic hydrocarbons (PAHs), and a number of other pollutants appear to occur at substantially higher levels in Puget Sound than elsewhere in Washington and southern British Columbia, including the Strait of Georgia, based on studies of contaminant loads in harbor seals, herring, and mussels (Wiles, 2004). Recent analyses indicate that 1 percent of the marine sediments in Puget Sound are highly degraded by chemical contamination, whereas 57 percent show intermediate degrees of deterioration and 42 percent remain relatively clean (Wiles, 2004). Hot spots for contaminated sediments are centered near major urban areas where industrial and domestic activities are concentrated. Locations of particular concern include Bellingham Bay, Fidalgo Bay, Everett Harbor and Port Gardner, Elliott Bay, Commencement Bay, Sinclair Inlet and other sites near Bremerton, and Budd Inlet, but contamination can extend widely into even some rural bays (Wiles, 2004).

Species Presence Timing in Relation to Agricultural Activities

A timing table is presented in Table 3-11. This table presents general salmonid species presence timing within the lower main stem Skagit River, and also presents generalized time frames for agricultural operations that occur within the Planning Area. The timing of fish presence by life stages is also applicable to watercourses within the Planning Area that provide access to fish and contain the appropriate habitat to support that life stage.

Table 3-11. Summary of Species Presence Timing in Relation to Agricultural Activities

Species / Event	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Agricultural Operations												
Planting												
Weed/pest control												
Harvest												
Irrigation												
Cover Crop												
V-ditch placement												
Drainage Ditch cleaning												
• Artificial												
• Managed w/o headwaters												
• Managed w/ headwaters												
Hatchery Winter Steelhead												
Adult immigration/spawning												
Smolt emigration												
Skagit Mainstem/Tributaries Wild Winter Steelhead												
Adult immigration and holding												
Adult spawning												
Fry emergence												
Rearing												
Emigration												
Samish Winter Steelhead												
Spawning												
Lower Skagit Chinook												
Adult immigration, holding and spawning												
Emergence												
Rearing												
Juvenile emigration												
Samish Chinook (fall hatchery origin)												
Spawning												
Bull trout – Lower Skagit												
Adult immigration, holding and spawning												
Downstream post-spawners												
Rearing												
Juvenile emigration												
Marine Water												
Bull trout – Lower Nooksack stock - Samish												
Adult entry												
Spawning												
Skagit Chum												
Adult immigration and holding												
Adult spawning												
Emergence/immediate emigration												
Juvenile estuary holding												
Samish Chum - fall												
Spawning												

Species / Event	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Agricultural Operations												
Planting												
Weed/pest control												
Harvest												
Irrigation												
Cover Crop												
V-ditch placement												
Drainage Ditch cleaning												
• Artificial												
• Managed w/o headwaters												
• Managed w/ headwaters												
Skagit Coho												
Adult immigration and holding												
Adult spawning												
Emergence												
Juvenile rearing (subadults)												
Juvenile emigration												
Samish Coho												
Spawning												
Baker River Sockeye												
Adult immigration and holding												
Adult spawning												
Juvenile emigration												
Samish Sockeye												
Spawning												
Skagit Pink												
Adult immigration and holding												
Adult spawning												
Emergence/immediate emigration												
Juvenile estuary holding												
Cutthroat Trout												
Adult immigration and holding												
Adult spawning												
Juvenile emergence/emigration												

Source: WDFW a