Protecting and Restoring the Waters of Sequim Bay

A Watershed-Based Plan Prepared in Compliance with
Section 319 of the Clean Water Act

Jamestown S'Klallam Tribe
Sequim, WA
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TABLE OF CONTENTS

Tables

Figures

1. PURPOSE AND SCOPE

The Jamestown S'Klallam Tribal reservation and community is located at the south end of Sequim Bay, on the northern Olympic Peninsula of Washington State, approximately 70 miles northwest of the city of Seattle. The Sequim Bay watershed is one of two primary focus watersheds for the Jamestown S'Klallam Tribe in its efforts to protect and restore treaty resources. The watershed has provided abundant resources from its land, forests, rivers, tidelands and marine waters, enabling Tribal citizens to harvest fish and shellfish from Sequim Bay for ceremonial, subsistence and commercial purposes.

The reservation land is approximately 20 acres and is the location of critical Tribal facilities: administrative center, library, health and human services facility, dental clinic, casino and gas station complex with a market and deli. Waters originating in the upper headwaters and tributaries to the Bay, as well as estuarine/ marine waters of the Bay and the Strait of Juan de Fuca, affect these Tribal lands and waters and are the subject of this plan.

The purpose of this plan is to characterize the Sequim Bay watershed area and describe the causes and sources of non-point source pollution. It describes watershed area goals along with management measures (if established) for protecting water quality and restoring impaired waterbodies. The plan has been developed with the intent of complying with the guidelines associated with Section 319 of the Clean Water Act as administered by the Environmental Protection Agency (EPA) (http://www.epa.gov/owow/nps/cwact.html).

Watershed planning in the Sequim Bay basin has been limited. In 1987 Clallam County was awarded a grant from Washington State Department of Ecology (DOE) to collect baseline data and assess the need for a comprehensive plan. This grant segued into a second grant from DOE in 1988 that was dedicated to coordinating a local planning effort to develop a comprehensive Sequim Bay Watershed plan. The plan was finalized and presented to DOE in 1989. At that time, there were no other sub-area or watershed management plans for the Sequim Bay area. Since then, Sequim Bay has been included within the *Elwha-Dungeness Watershed Plan: Water Resource Inventory Area 18 (WRIA 18) and Sequim Bay in West WRIA 17*, which was finalized and approved in 2005. The Elwha-Dungeness plan focuses on water quantity, a mandated component, and provides less attention to water quality, including nonpoint source pollution.

The area covered by this plan (Figure 1 and Figure 2) includes the Sequim Bay watershed and the westerly adjacent watershed of Bell Creek. All of Sequim Bay, its tributaries and Bell Creek, are closely related to the Dungeness hydrologically, geologically, and biologically. The Dungeness is the Jamestown S'Klallam Tribe's ancestral watershed and is the subject of a Clean Water Act 319-guided watershed-based plan, *Protecting and Restoring the Waters of the Dungeness (2007).* The plan was the first tribal watershed-based plan in the country to be certified by the EPA.

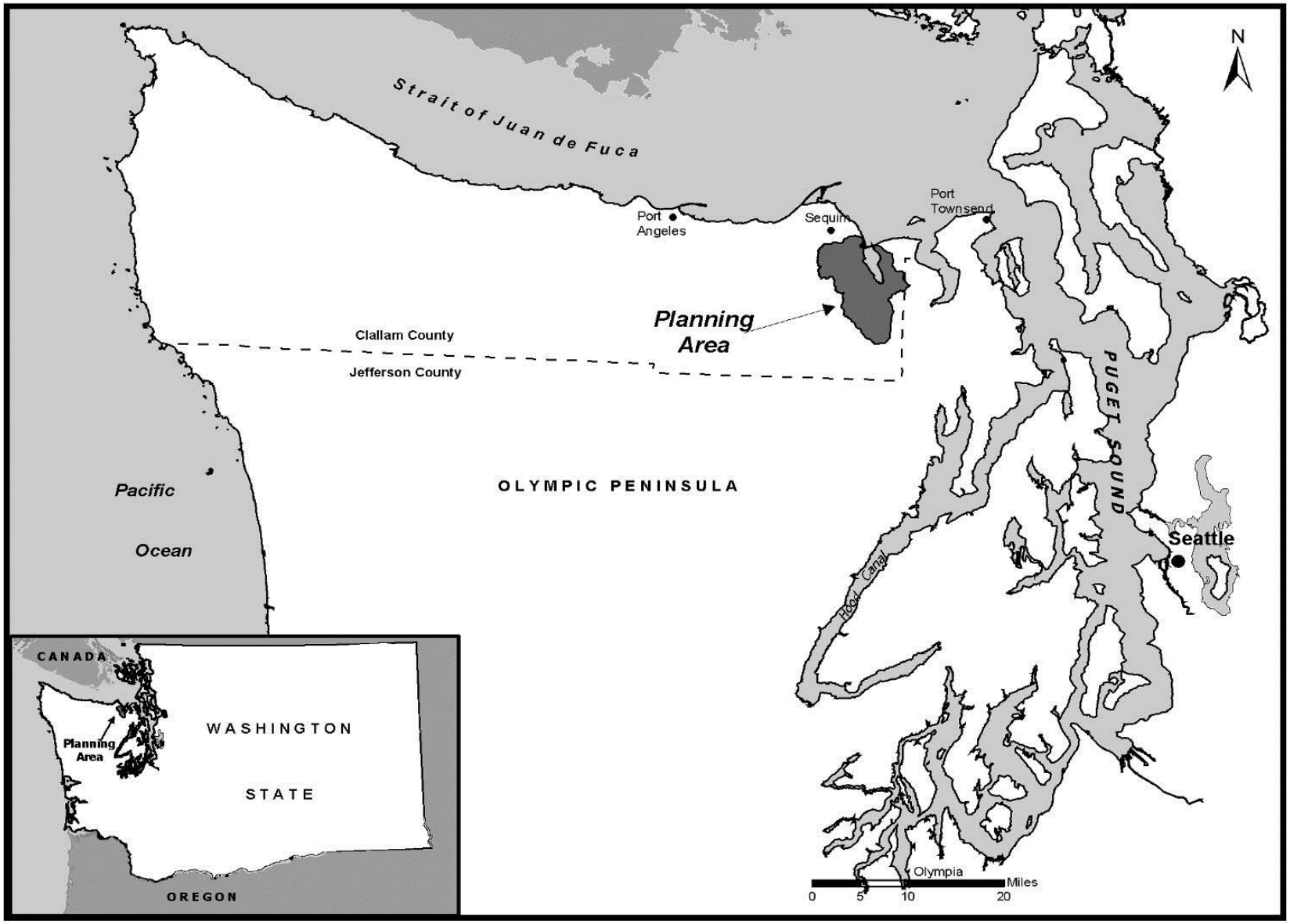
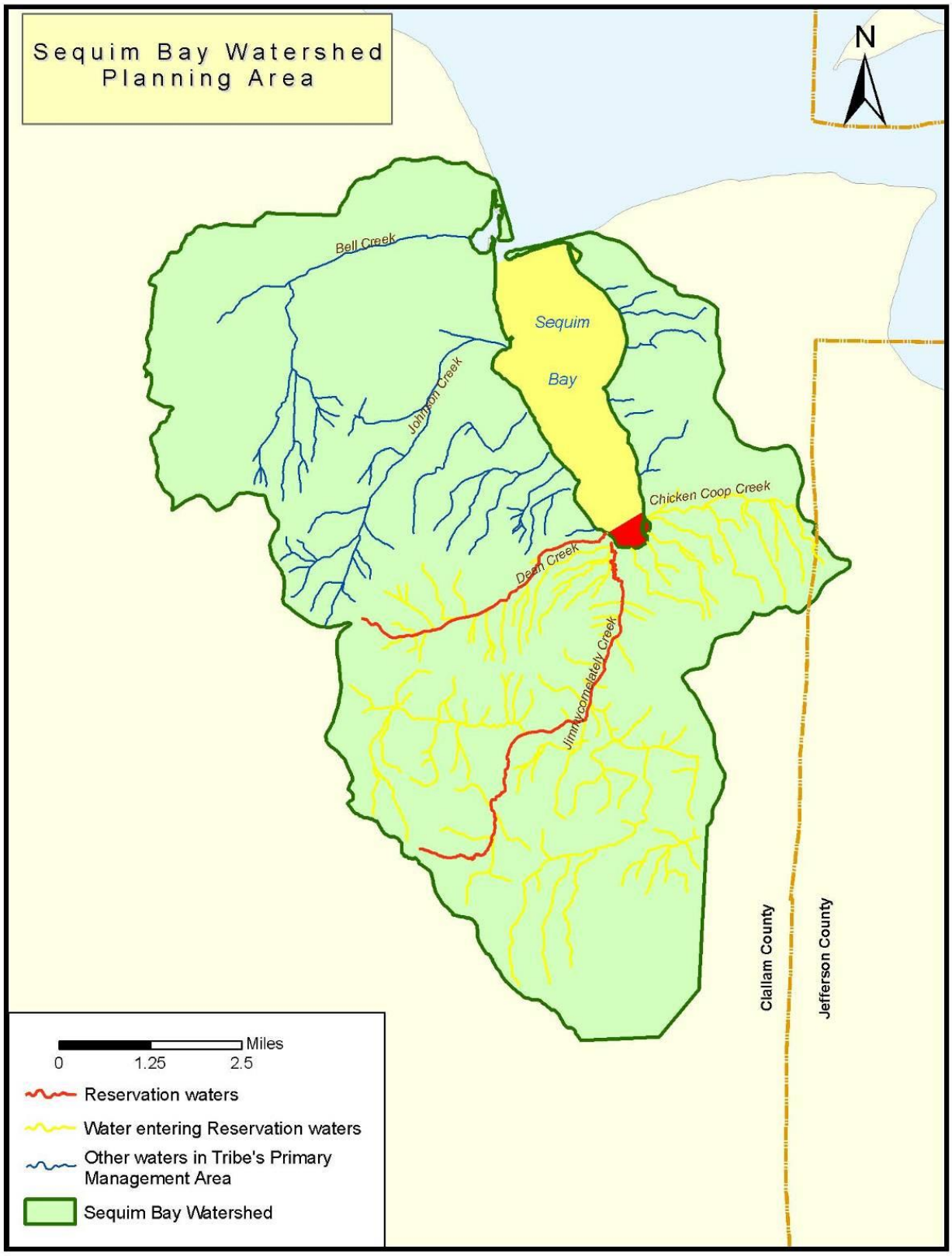


Figure 1.1: General location of the Sequim Bay watershed, Washington State.

Figure 1.2: Sequim Bay Watershed Planning Area Boundary.



2. OVERVIEW OF THE SEQUIM BAY WATERSHED

The Sequim Bay watershed is located in Clallam County on the Olympic Peninsula in northwest Washington State. The watershed drains an area of approximately 35,813 acres, from its highest point at Mt. Zion (4,273') in Olympic National Forest, north to the Strait of Juan de Fuca. Sequim Bay watershed is bounded on the east by Discovery Bay watershed and on the west by Dungeness watershed.

Jimmycomelately Creek is Sequim Bay's primary subbasin. Other significant subbasins draining to Sequim Bay include Johnson, Dean, and Chicken Coop creeks. Bell Creek drains into Washington Harbor. A series of smaller unnamed creeks between Johnson and Dean Creeks also provide runoff to the western shore of Sequim Bay (Parametrix 2000). Topography is steep in the upper, forested portions of the watershed with more gentle and flatter slopes toward Sequim Bay. In addition to the subwatershed drainages listed above, water used for domestic and farmland irrigation enters Sequim Bay from the Dungeness River through irrigation tailwaters in Bell and Johnson Creeks and one ditch north of John Wayne Marina.

Characteristics of the Sequim Bay Watershed, including climate, geology, hydrology, soils, biotic communities and land use, are described in the Elwha-Dungeness plan (Entrix 2005). Excerpts from that plan, provided below and slightly modified in some instances, are intended as an introduction to the Sequim Bay watershed and its key terrestrial, aquatic and human communities.

2.1 Climate

The Sequim Bay climate is mild with cool winters and warm summers, reflecting the moderating influence of winds from the Pacific Ocean. The watershed lies in the rain shadow of the Olympic Mountains. The location of Sequim Bay exposes it to marine air masses that have been conditioned for extended periods over open ocean. Precipitation averages 28 inches over the Sequim Bay watershed and varies from 35 inches in the upper watershed (Mt. Zion) to 15 inches at the lower elevations to less than 10 inches at Sequim Bay (Entrix 2005). Winter precipitation is primarily rain up to 1,500 feet elevation, with mixed rain and snow between 1,500 and 2,500 feet, and primarily snow above 2,500 feet. Most precipitation falls in the winter.

2.2 Geology

Geological processes affecting WRIA 17 area are described in the *Salmon and Steelhead Habitat Limiting Factors Report for WRIA 17* (Correa, 2002):

> The retreat of the huge and heavy ice sheets of the Cordilleran glaciations carved the inland waterways of Puget Sound, including those along east Jefferson County and Hood Canal. There is evidence that the termination of the latest glacial episode affecting WRIA 17, the Vashon, was rapid, with the ice sheet thinning, floating, and breaking up in the eastern Straits, as the temperature rose. As the ice lobe retreated northwards and approached the Strait, there was an isolated drainage route connecting Dabob Bay with Discovery Bay via the Leland-Snow Creek valleys. This glacial history had important consequences for the evolution of stream drainages, headwater wetland formation, and fish colonization/

movement among basins. Another such example in WRIA 17 with wetlands offering fish easy transit routes could be evidenced in a possible Ludlow-East Fork Chimacum link (Ted Labbe, personal communication, 2002). The sea-level rise was accordingly rapid and coastal lowlands freed from glacial ice were submerged under marine waters. The rebound of the earth's crust was more gradual, returning to equilibrium level about 5,000 years ago. At Port Townsend, the rise of the earth's surface has been estimated at nearly 500 feet since the Vashon ice disappeared. The coastal bluffs have formed in the time since the last glaciation, by gradual erosion of the coastline from a combination of wave action and wind erosion.

2.3 Soils

The soil types for the Sequim Bay watershed have been mapped and are presented in the Clallam County soil survey. There is a wide variety of relief and drainage. Generally, the soils support current land uses with some limitations because of wetness, steep slopes and depth to compact glacial till.

2.4 Surface Water

Jimmycomelately Creek is the most significant stream in the Sequim Bay watershed. Other significant streams include Johnson, Dean, and Chicken Coop creeks. Periodic streamflow data has been collected on Jimmycomelately and Johnson creeks; little data exists for the other streams. In general, low summer flows are characteristic in the Sequim Bay watershed. Summer storms must produce in excess of 1 inch of rainfall to show up as runoff in area streams. The rain shadow effect of the Olympic Mountains lessens the impact of major storms to the Sequim Bay area. Average monthly precipitation for Sequim is about one inch from May through August (Orsborn and Orsborn 1999). Low stream flows in fall 2002 created passage problems for salmon returning to spawn in Jimmycomelately Creek.

2.5 Stormwater Runoff and Flood Hazard

Flooding is rarely a problem where good forest cover is maintained over the watershed. However, Jimmycomelately (JCL) Creek experienced annual flooding in the past, especially in the 1980s and 1990s; flooding in JCL basin helped drive the restoration/ realignment of the creek (discussed later in this plan). Dean Creek also floods regularly and has a long history of being dredged because of its steep drainage area and loose soils. Dean Creek flooding was also addressed as part of the overall Jimmycomelately Creek- Lower Sequim Bay Estuary Restoration. Orsborn and Orsborn (1999) estimated floods for five drainages in the Blyn Basin, including Dean, No-Name West, Jimmycomelately, No Name East, and Chicken Coop creeks. Although some streamflow data were available, it was not possible to correlate these sites with USGS gage data for a reference creek. The peak 100-year floods range from 29 cfs for No-Name East to 800 cfs for Jimmycomelately Creek; the 2-year floods range from 7 cfs for No-Name East to 185 cfs for Jimmycomelately Creek. Potential problems summarized by Orsborn and Orsborn in these drainages included erosion, gravel and silt accumulation, land development patterns, and a raised streambed in Jimmycomelately Creek downstream of the Old Blyn Highway.

2.6 Soil Erosion and Sediment Load

Sequim Bay has an accelerated sedimentation rate, which appears to be originating from the Johnson Creek watershed. The Tribe continues to monitor impacts from the sediment load from a mass wasting event in 1996 in Johnson Creek. Sediment serves as a transport mechanism for bacterial contaminants. Bacteria and viruses adhere to the sediment particles and are deposited in the estuary, concentrating the bacterial contamination. Sediment, with its direct association with nutrients and organic matter, can reduce the capability of the freshwater and marine environments to produce shellfish and anadromous fish. Low dissolved oxygen levels interfere with survival rates. Silt deposited in stream beds can interfere with spawning, egg development and juvenile survival of anadromous fish. Deposition in estuaries interferes with respiration and feeding of shellfish.

From 2000 until 2005, the development of an off-road vehicle park on Burnt Hill (which drains to both Sequim Bay and the Dungeness Bay) was under consideration by the Washington Department of Natural Resources (DNR). Because of the potential for increased sediment input coming from the steep slopes of Burnt Hill as a result of off road vehicle use, the Tribe monitored this proposal. The specific concerns are that considerable restoration work is occurring and will continue to occur in an attempt to restore the summer chum salmon habitat in these watersheds and their associated sub-drainages (DRMT 2002). For now, the proposal has been withdrawn, partly because of resistance from the Tribe and watershed partners.

2.7 Land Cover and Use

The Sequim Bay watershed is 72 percent forestland (encompassing 25,866 acres), including commercial timber and small private woodlots. Commercial timberland, (owned by federal, state, and private forest industry) amounts to 18,776 acres out of the total forestland. Most of the commercial forestland is controlled by the U.S. Forest Service and State of Washington DNR. Although most of the timberland is public some is private and, as happened to 175 acres in 2009, can be rezoned from commercial timberland to mixed use, thereby increasing the number of residences that can be built in the watershed.

Rural/agricultural land use (22 percent) is split evenly between rural residential (11 percent) and agricultural land (11 percent). The rural residential category includes areas developed at a density of one residential unit per 1.5 to 5 acres. The area classed as agricultural land includes about 40 small farms and nine commercial farms. Commercial farms are defined as those operations producing a significant annual income (over $1,000). The agricultural area is used principally for hay and pasture, but there is an increasing amount of revenue-producing cropland. Small farms range in size from 8 to 20 acres with 5 to 10 cows or horses. Commercial operations average 72 acres in size with 30 to 40 head of livestock.

The village of Blyn on the shoreline at the head of Sequim Bay is the home of Jamestown S'Klallam Tribe's reservation. The Tribe's administrative campus and associated buildings are located on the shoreline here, together with commercial enterprises including a casino and gas station with a deli and market.

3. WATERSHED PLANNING HISTORY AND PREVIOUS PLANS

The history of watershed planning in the Sequim Bay watershed can be summarized by the documents that have evolved through the various planning efforts. These plans and processes are organized chronologically below.

Sequim Bay Watershed Management Plan

The *Sequim Bay Watershed Management Plan* was developed in 1989 (revised in 1991) by a committee of local citizens, the Sequim Bay Watershed Management Committee (SBW Management Committee), appointed by the Clallam County Board of Commissioners to carry out planning under an "early action" shellfish protection grant from Ecology. It framed water quality as a quality of life issue and was based on these shared concerns and values, as stated in the Plan:

- Recognize the importance of water quality and shellfish, not only for their economic and resource values but also for their irreplaceable contribution to quality of life.
- Articulate the desire to proactively protect these values.
- Address increased threats to public health and wildlife, and the prospect of shellfish closures.
- Stimulate widespread community support for stewardship and water quality protection.

The Sequim Bay Watershed Management Plan (SBWMC 1989) was developed through a collaborative, diverse, citizen-based and consensus-driven process that set the stage for years to come in East WRIA 18 watershed planning. The process eventually led to development of the Dungeness-Quilcene Plan in 1994, formation of the Dungeness River Management Team (DRMT), and this watershed plan. The 1989 Management Plan anticipates not only many of the issues that continue to require attention today in East WRIA 18, but also the priorities and approaches to watershed planning and management that have become widely used standards in attempts to protect watersheds, deal with nonpoint pollution sources, restore habitats, and recover fish populations.

Water quality in the watershed at the time of the *Sequim Bay Watershed Management Plan* was reported to be generally good (rated by the State as Class AA). The Management Plan focused on nonpoint sources of pollution stemming from animal waste directly entering waterways, lack of adequate riparian buffers, failing or poorly maintained septic systems, marine and land misuse, poor water conservation, and improper use or disposal of hazardous products. Among the resources identified as threatened by these sources were recreational and commercial shellfish beds, fisheries, property values, tourism, and both surface and groundwater, including potable drinking water supplies. The objectives section of the report is a pivotal part of the plan, comprising priority management policies and specific recommended actions toward improving water quality and protecting water quality resources of the Sequim Bay watershed.

Jimmycomelately Planning, Implementation and Monitoring (1997 – 2012)

In the 1990's, Jamestown S'Klallam Tribe, Clallam Conservation District, WA Department of Fish and Wildlife, and Clallam County began to address the problems of declining fish populations and increased flooding of the south Sequim Bay estuary and Jimmycomelately Creek. Extensive partnerships were created, detailed planning was initiated, funds were awarded

and the project was implemented. The essential elements of the project were to: restore the river and estuarine habitat of Jimmycomelately and south Sequim Bay for fish and wildlife in perpetuity; reduce flood hazards to homes, roads and utilities; monitoring and evaluation of the project; and involvement of all stakeholders. Publications prepared as part of the Jimmycomelately project include: *A Preliminary Plan for Restoring Jimmycomelately Creek and the Lower Sequim Bay Estuary* (Shreffler 2000), *Jimmycomelately Creek- Lower Sequim Bay Estuary Restoration Project: Phase 1 Monitoring Plan: Jimmycomelately Creek Realignment* (Shreffler 2001), *The Undevelopement of Jimmycomelately and Estuary* (Jamestown S'Klallam Tribe 2003), *Jimmycomelately Creek- Lower Sequim Bay Estuary Restoration Project: Conceptual Plan for Restoring the Lower Sequim Bay* (Shreffler 2003), *Jimmycomelately Creek- Lower Sequim Bay Estuary Restoration Project: Channel Design for Realignment of the Jimmycomelately Creek Channel* (Shreffler, Rot, Geiger and Gibboney, 2003), *Jimmycomelately Creek- Lower Sequim Bay Estuary Restoration Project: Estuary Monitoring Plan* (Shreffler 2004), *Jimmcomelately Restoration Project Brochure* (Jamestown S'Klallam Tribe 2005), *Jimmycomelately Ecosystem Restoration – Lessons Learned Report* (Jamestown S'Klallam Tribe 2008), *Jimmycomelately Ecosystem Restoration Monitoring Report 2004-2011* (Shreffler, 2012).

The project included land acquisition, channel relocation and meandering (for two creeks), large wood placement, gravel placement, dike and road removal, bridge replacements, fill removal, logyard pier removal, low impact public access and educational activities, and monitoring. The project has been fully implemented and the project is being monitored by the Jamestown S'Klallam Tribe. In 2008, the Tribe published and distributed widely a report called *Jimmycomelately Ecosystem Restoration - Lessons Learned Report*. In 2012 the Tribe published *Jimmycomelately Ecosystem Restoration: Monitoring Report 2004-2011,* which details post project monitoring results and habitat gains (Shreffler, 2012).

Salmon and Steelhead Habitat Limiting Factors for Water Resource Inventory Area 17 Quilcene-Snow Basin

In 1998, the Salmon Recovery Act directed the Washington State Conservation Commission, in consultation with local governments and treaty tribes, to convene a technical advisory group to identify the limiting factors for salmonids. Limiting factors are defined as "conditions that limit the ability of habitat to fully sustain populations of salmon." The Habitat Limiting Factors for WRIA 17 (Correa, 2002) compiled the best available information on the current distribution and condition of salmonid stocks. The report systematically goes through the water reach by reach in both freshwater and marine shoreline and identifies benefits of specific habitat protection and restoration efforts.

Bell Creek Wetland / Watershed Protection Project: Habitat Inventory Summary (1999)

Much of Bell Creek has been altered due to the growing Sequim community. In 1999, the Tribe chose to compile all of the information known about the sub-basin and inventory the basic habitat features of Bell Creek itself. A further goal of the report is to identify priority wetlands and creek restoration sites.

Floods in the lower Sequim Bay Tributaries

Homes, roads and utilities in the area of south Sequim Bay have a history of flooding from Jimmycomelately, Dean and some other small drainages. The Jamestown S'Klallam Tribe investigated conditions in the late 1990s and estimated how the flood levels would increase due to future development. Flood levels were identified for each of the south Sequim Bay tributaries and recommendations were presented to alleviate current conditions (Orsborne and Orsborne, 1999). Recommendations were presented so that future development would not aggravate flooding. The large scale Jimmycomelately restoration project was designed and implemented to handle 100 year floods and permit Highway 101 to remain open during these events. The restoration of Dean Creek as part of the larger Jimmycomelately project also was designed and implemented to alleviate flooding problem caused by aggradation and undersized culverts (Shreffler, 2012).

Jamestown S'Klallam Tribe Comprehensive Plan: 2005-2015 (2008, last update)

Historically, Jamestown S'Klallam Tribe has been dependent on the wise use and proper management of its natural resources. Today, that dependency and care in management continues even as we increase our economic development. In modern times the relationship between the Jamestown S'Klallam Tribe and our natural resources has been framed by a treaty with the United States. In 1855 the Jamestown Tribe ceded millions of acres of land to the government while reserving rights to the natural resources on that land and in local waters, including surface and ground water resources. Jamestown S'Klallam Tribe maintained the right to fish, shellfish, hunt and gather. But that right is empty if there are no fish to catch, no clams to dig, no elk to hunt, or no berries to gather. Our greatest natural resource concern is that the environment these natural resources live in and the habitat that supports healthy fish and wildlife populations be protected.

> *"If threatened with harm, the environment must be protected and kept in a highly productive state. If damaged, the habitat must be restored so that fish and wildlife may prosper. If natural resources are in decline, they must be improved so that future populations may thrive."*

It is the mission of the Natural Resources Department of the Jamestown S'Klallam Tribe to protect natural resources treaty rights for the benefit of its citizens and future descendants. When we have healthy, sustainable resources we have harvest opportunities (Jamestown S'Klallam Tribal Comprehensive Plan 2005-2015).

4. CAUSES AND SOURCES OF NON-POINT POLLUTION

Several waterbodies in the Sequim Bay watershed are present on the Department of Ecology's 303(d) list (2008) of impaired waters (Category 5) due to nonpoint source pollution (Table 1). The Tribe has particular concerns about the watershed's health, as lower Jimmycomelately Creek flows through the Tribe's reservation into Sequim Bay, which is also adjacent to Tribal Trust and reservation lands. Jimmycomelately Creek and Sequim Bay, both 303d-listed for low dissolved oxygen levels, among other impairments, are an integral part of the local salmon and clean water recovery efforts in the watershed and have been the focus of comprehensive planning. Additionally, Bell Creek is listed for bioassessment impairments, fecal coliform, dissolved oxygen and temperature. Johnson Creek is listed for pH and fecal coliform. Sequim Bay has listed habitat impairment due to macroalgae ulvoid mats in the Washington Harbor area (the 303(d) listing specifically sites human causes).

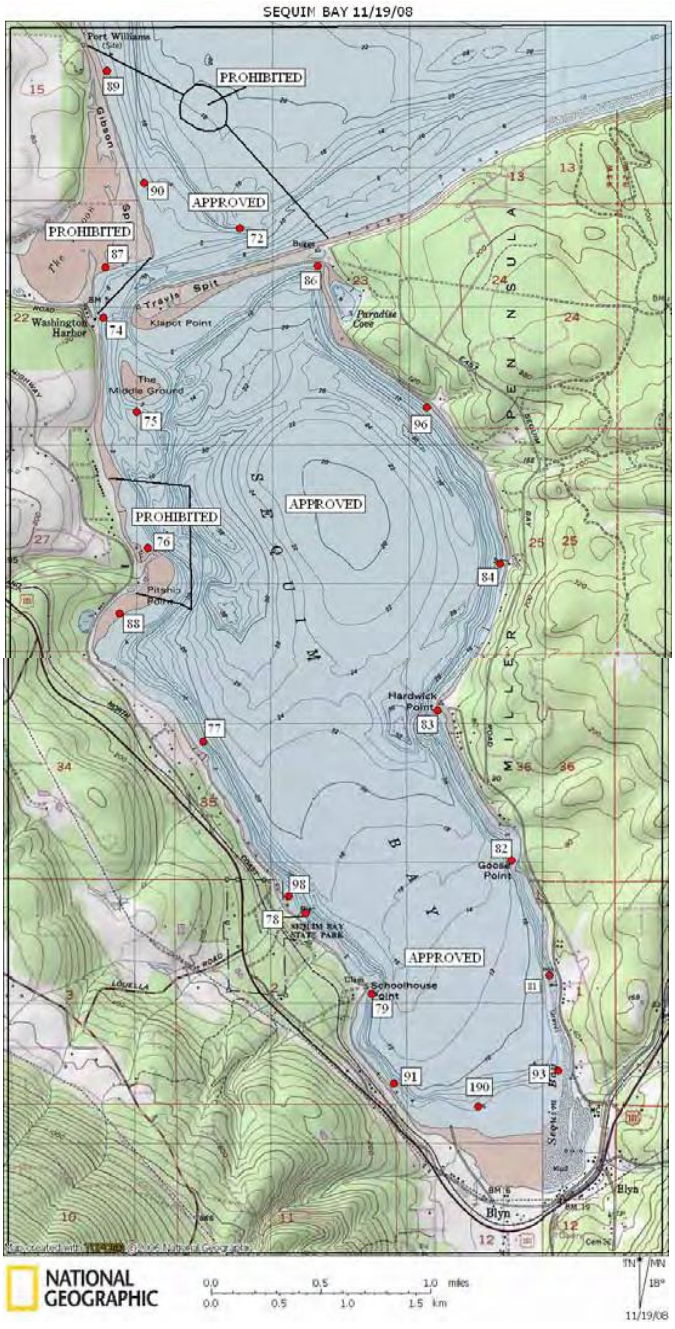
Table 4.1: Summary of WA State's Water Quality Assessment 2012 303(d) List (Category 5) for the Sequim Bay Watershed (from WA Department of Ecology website, 2012)

Waterbody Name	Pollution Parameter
Fresh Waterbodies	
Bell Creek	Bioassessment impairments Fecal coliform Bacteria
Johnson Creek	Fecal Coliform Bacteria
Jimmycomelately Creek	Dissolved Oxygen Fecal Coliform Bacteria
Marine Waterbody	
Sequim Bay	Dissolved Oxygen Fecal Coliform Bacteria

4.1 Marine Waters of Sequim Bay

The Washington State Department of Health (DOH) monitors marine water quality (temperature, salinity, fecal coliform bacteria) at 21 stations within the bay (Figure 4.2). The entire bay meets the National Shellfish Sanitation Program water quality standard (fecal coliform geometric mean not greater than 14 fecal coliform organisms/100ml and an estimate of the 90th percentile not greater than 43 fecal coliform organisms/100ml). However, there are two prohibited areas surrounding the John Wayne Marina (Station 76) and the City of Sequim secondary wastewater outfall (Station 87).

Figure 4.1: Sequim Bay monitoring stations and shellfish growing area classifications (DOH).



In addition to the low dissolved oxygen observed in the middle of Sequim Bay (303d listing), tidelands at the south shore of the bay are affected. Shreffler Environmental reports the south of the bay is characterized by anoxic conditions that discolor clamshells and possibly limit productivity (Shreffler 2000). *Beggiatoa spp.* is an indicator of low dissolved oxygen and its presence was observed in 2008 (Figure 4.3), and to a lesser extent in 2009, at low tide at the head of the bay in proximity of the old logyard. The *Beggiatoa spp*. often occurs in association with wood debris because the microbial decomposition activity of the wood depletes the water column's oxygen. In 2008 the Tribe took several substrate cores (approximately 3' deep) to determine if there was substantial underground woodwaste and if remedial activity was necessary. The cores showed limited pockets of woodwaste, therefore the Tribe has chosen to monitor the *Beggiatoa spp.* occurrence before undertaking remedial action.

Figure 4.2: *Beggiatoa spp* observed October 28, 2008.

Over the past few decades, the occurrence of harmful algal blooms (HABs) in general, has increased in frequency and in geographic distribution in Puget Sound and the Pacific Northwest. Causes include both natural and human-induced environmental factors. These increased outbreaks pose a greater risk to and have impaired ecosystem and human health, and have resulted in lost economic opportunities for both the shellfish industry and for Puget Sound Tribes. HABs have also negatively impacted Tribal uses of shellfish for subsistence, ceremonial and cultural purposes (Lefevre 2008). Five groups of shellfish toxins have been distinguished so far, including paralytic shellfish toxins causing paralytic shellfish poisoning (PSP), Amnesiac Shellfish Poisoning (ASP) and Diarrhetic Shellfish Poisoning (DSP).

NOAA Fisheries reports that PSP occurrences in Washington State were first documented in the Strait of Juan de Fuca. Monitoring by Washington Department of Health shows that Sequim Bay

has one of the two longest recorded histories of PSP in the state (Trainer, 2002 and 2003), and therefore in Puget Sound. In 2008, Jamestown S'Klallam Tribe monitored water for HABs as well as shellfish tissue for toxin levels to provide a better understanding of the dynamics between harmful algal bloom development and toxin levels in shellfish. The 2008 data collection showed few occurrences of HABs, and the Tribe sought funding to study the issue in future summer seasons. The Tribe again studied the HAB issue in 2010 and there were no instances of HABs in Sequim Bay that year. However, in the following two years the Tribe's shellfish harvest was severely impacted by HABs.

In 2011 Sequim Bay was the site of the first confirmed cases of Diarrhetic Shellfish Poisoning (DSP) in the United States. The Tribe is collaborating with NOAA and the Washington Department of Health to investigate the causes and drivers of these blooms and monitor to protect human health. The tribe studied nutrient levels in marine water in 2011. Results are shown in Table 4.2. Station 87 was at the entrance of Washington Harbor, station 98 was at Sequim Bay State Park and the other three stations were at the south end of the bay. Although marine water quality standards for nutrients have not been set for Washington State, these values exceeded standards set in other states (New Hampshire and Maryland) to protect seagrass. The highest values at all stations were observed in August.

Table 4.2. Mean and the Minimum and Maximum Values (in parentheses) of the Concentrations of Total Nitrogen, Total Phosphorous Measurements in Sequim Bay by Station.

Parameter	**87** n=9	**91** n=9	**93** n=9	**98** n=9	**190** n=9
TN (µg/L)	446.6 (379.4 – 516.0)	990.6 (412.0 – 5126.0)	587.1 (325.1 – 1295.8)	1694.8 (385.1 – 7280.0)	1134.2 (408.5 – 5702.6)
TP (µg/L)	71.0 (59.4 – 79.6)	166.0 (63.6 – 894.9)	92.2 (56.7 – 210.6)	203.0 (60.6 – 1222.6)	181.7 (58.0 – 949.8)
Chlorophyll (µg/L)	1.5 (0.1 – 3.3)	42.8 (0.4 – 345.6)	10.8 (0.3 – 71.7)	50.8 (0.8 – 419.4)	45.4 (0.4 – 354.2)

In 2012, in response to the DSP cases the previous year, the Tribe studied toxin uptake in shellfish, phytoplankton patterns and evaluated an ELISA based rapid testing method for DSP toxins. The study allowed us to gain a greater understanding of toxin uptake in different shellfish and the amount of toxigenic species present over the course of the growing season. In 2013 the Tribe is planning to continue monitoring to protect human health and study links between HABs and nutrient loading to the bay.

4.2 Sequim Bay Tributaries

Several relatively small streams flow into Sequim Bay. Jimmycomelately, Johnson, Bell and Chicken Coop Creeks are perennial streams whereas No Name, Dean, and Casino Creeks are intermittent.

Jimmycomelately Creek is on the 303d list for fecal coliform, dissolved oxygen, pH and bioassessment. As part of a massive restoration project beginning from 1998 to 2005, Jimmycomelately Creek, which had been straightened decades ago to create agricultural lands, was moved to a recreated meandering channel in the center of the valley. Tribal project monitoring has been an integral part of the restoration project. Tribal monitoring between 2004-2011 (via cross-section analysis) showed the new channel was downcutting, and additional

gravel was added to address this. Unfortunately, intergravel dissolved oxygen in Jimmycomelately is at lethal levels for early stages of salmonid life cycle, however, we are seeing somes of improvement. In 2008 the measured intergravel dissolved oxygen at a depth of 18 inches ranged from 0.8 to 4.0 mg/L. In 2012 the upper range extended to 14.6 mg/L. Gravel was installed in site specific locations before the improved measurements. However, measured lows still reached to lethal levels in 2012, with a low of 1.0 mg/L. Despite this, and with help by a broodstock hatchery program, annual summer chum returns to Jimmycomelately have grown from a low of seven fish in 1999 to annual returns between 2000-4000 fish. Full monitoring results can be read in the 2012 Jimmycomelately Monitoring Report 2004-2011 by the Jamestown S'Klallam Tribe (Shreffler, 2012).

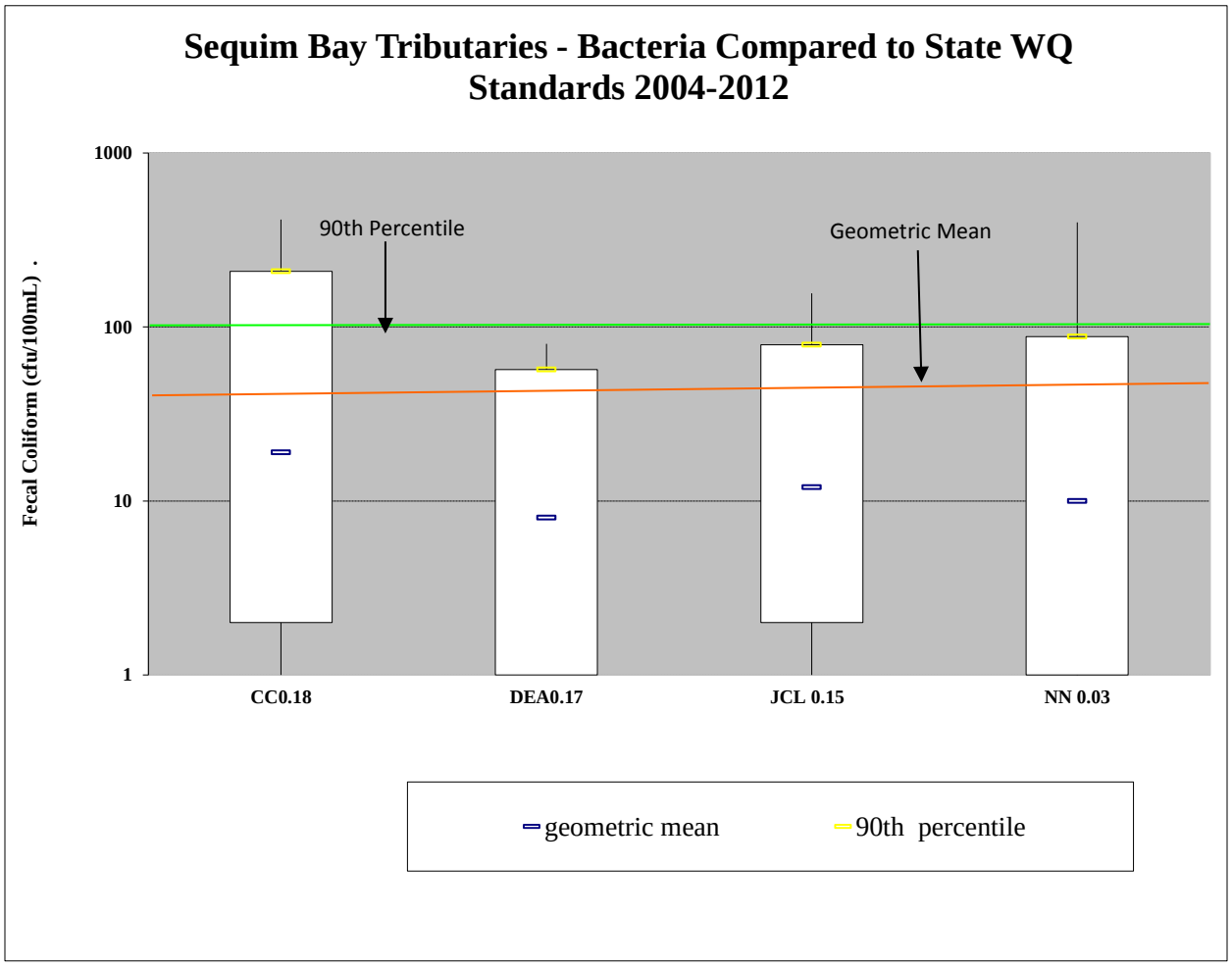
Quarterly monitoring results from 2006-2012 for dissolved oxygen, temperature, pH, conductivity, and salinity are reported for each of the Sequim Bay tributaries in Table 4.3. Per Washington Department of Ecology guidelines, each of these creeks shall be protected for the designated uses of: core summer salmonid habitat; and extraordinary primary contact recreation because they are tributaries to designated extraordinary quality marine waters (Sequim Bay). In 2012 and 2013 the tribe is investigating nutrient inputs into Sequim Bay from multiple small drainages including Dean Creek, No Name, Casino, Chicken Coop, the unnamed creek at Sequim Bay State Park and several small storm drainages around the tribal campus.

Table 4.3: Water Chemistry Descriptive Statistics for south Sequim Bay Tributaries 2006 -2012

Parameter	Max. Value	Min. Value	Mean	Sample Count	Standard Met?
Chicken Coop Creek RM 0.18					
Temperature C	13.7	3.9	7.8	22	Yes
DO mg/L	13.8	8.5	11.4	21	No
pH	8.1	7.4	7.8	17	Yes
Turbidity	312	1.0	44.6	14	No
Dean Creek RM 0.17					
Temperature C	13.5	3.1	6.8	16	Yes
DO mg/L	13.8	9.3	11.7	16	No
pH	8.3	7.6	7.9	15	Yes
Turbidity	118.0	7.7	35.4	10	No
Jimmycomelately Creek RM 0.15					
Temperature C	15.0	2.9	8.5	22	Yes
DO mg/L	13.7	7.8	11.1	21	No
pH	8.1	7.4	7.8	19	Yes
Turbidity	88.1	0.8	16.5	15	No
No Name Creek RM 0.17					
Temperature C	14.5	4.4	8.4	22	Yes
DO mg/L	13.5	7.7	10.7	20	No
pH	8.2	7.1	7.7	18	Yes
Turbidity	48.2	5.3	21.0	13	Yes

Fecal coliform results for the 2004 through 2012 time period show that all sites are well within the state water quality standard for the geometric mean of 50 cfu/100 mL. Although all sites meet the state geometric mean standard, Chicken Coop Creek failed to meet the 90th percentile criteria of 100 cfu/100 mL Figure 4.4 shows the results compared to State Water Quality Standards.

Figure 4.3: Bacteria Compared to State Water Quality Standards for south Sequim Bay Tributaries (2004-2012)
(CC = Chicken Coop Creek; DEA= Dean Creek; JCL = Jimmycomelately Creek; NN = No Name Creek)



Results shown below in Table 4.4 for Bell and Johnson Creeks is drawn shows that there are concerns about fecal coliform pollution in these with Bell in particular not meeting water quality standards in 2007. As discussed later in Chapter 11 there is a need for consistent funding to monitor water quality in these creeks.

Table 4.4. Fecal coliform results (cfu/100 ml) for Bell Creek and Johnson Creek

Site and Monitoring Period	Sample Size	Geometric Mean	WQ Criterion Geometric Mean	Meets criterion?	90th Percentile	Maximum	# of samples >100 cfu/100 ml
Bell RM 0.8							
Sept. 2004-Jun. 2005	10	11	50	Yes	53	55	0 of 10
All 2006	8	16	50	Yes	91	102	1 of 8
All 2007	10	20	50	Yes	132	244	1 of 10
2008 and 2010	5	14	50	Yes	106	138	1 of 5
Bell RM 0.16							
Oct. 2004-Jul. 2005	10	36	50	Yes	245	116	3 of 10
All 2006	12	29	50	Yes	449	792	4 of 12
All 2007	12	136	50	No	928	4000	7 of 12
2008 and 2010	5	21	50	Yes	215	164	1 of 5
Johnson RM 0.1							
Sept. 2004-Jul. 2005	11	15	50	Yes	101	122	2 of 11
All 2006	12	11	50	Yes	63	59	0 of 12
All 2007	12	14	50	Yes	93	250	2 of 12
2008 and 2010	5	16	50	Yes	186	90	0 of 5

4.3 Forestry

Many upland portions of the Sequim Bay watershed are in Federal jurisdiction, either in Olympic National Forest or Olympic National Park. Private commercial forestry ownership and Washington DNR ownership also exist within the Sequim Bay drainage. Figure 4.4 presents the forest lands of Sequim Bay watershed. The Sequim Bay watershed is 72 percent forestland (encompassing 25,866 acres), including commercial timber and small private woodlots. Commercial timberland, owned by federal, state, and private forest industry, totals 18,776 acres. Most of the commercial forestland is controlled by the U.S. Forest Service and State of Washington DNR. In 2009 eight parcels in 175 acres were rezoned from commercial Forestry to Mixed Commercial Forestry which could allow for increased residential development.

Forestry subcategories which could impact water resources include harvest on slopes, harvest in riparian areas, and road construction/ maintenance.

A complete analysis of sedimentation and road impacts to aquatic resources and water quality has not been conducted for the Sequim Bay forest acreage under private, state and federal management. Temperature and sedimentation effects are considered to be severe for Jimmycomelately, Chicken Coop Creek, No Name Creek, and Dean Creek (Jamestown

S'Klallam Tribe Assessment Report 2013- draft). Private land managers are subject to Forest and Fish rules and road maintenance defined by the Road Maintenance and Abandonment Plan. State lands and roads are subject to Washington State's Habitat Conservation Plan prepared for listed salmonids, in this case Hood Canal summer chum. Basin-wide sediment yields are high, with natural values associated with a legacy of unstable soils and landforms from glacial movement (FEMAT, 1993). Field reconnaissance is needed to ascertain what extent human activities have accelerated slides, erosion and channel instability. Figure 4.5 shows the forest lands superimposed upon light detection and ranging data (LIDAR) to demonstrate the significant topographic relief under forest management.

Figure 4.4: Federal, State and Commercial forest lands in Sequim Bay watershed

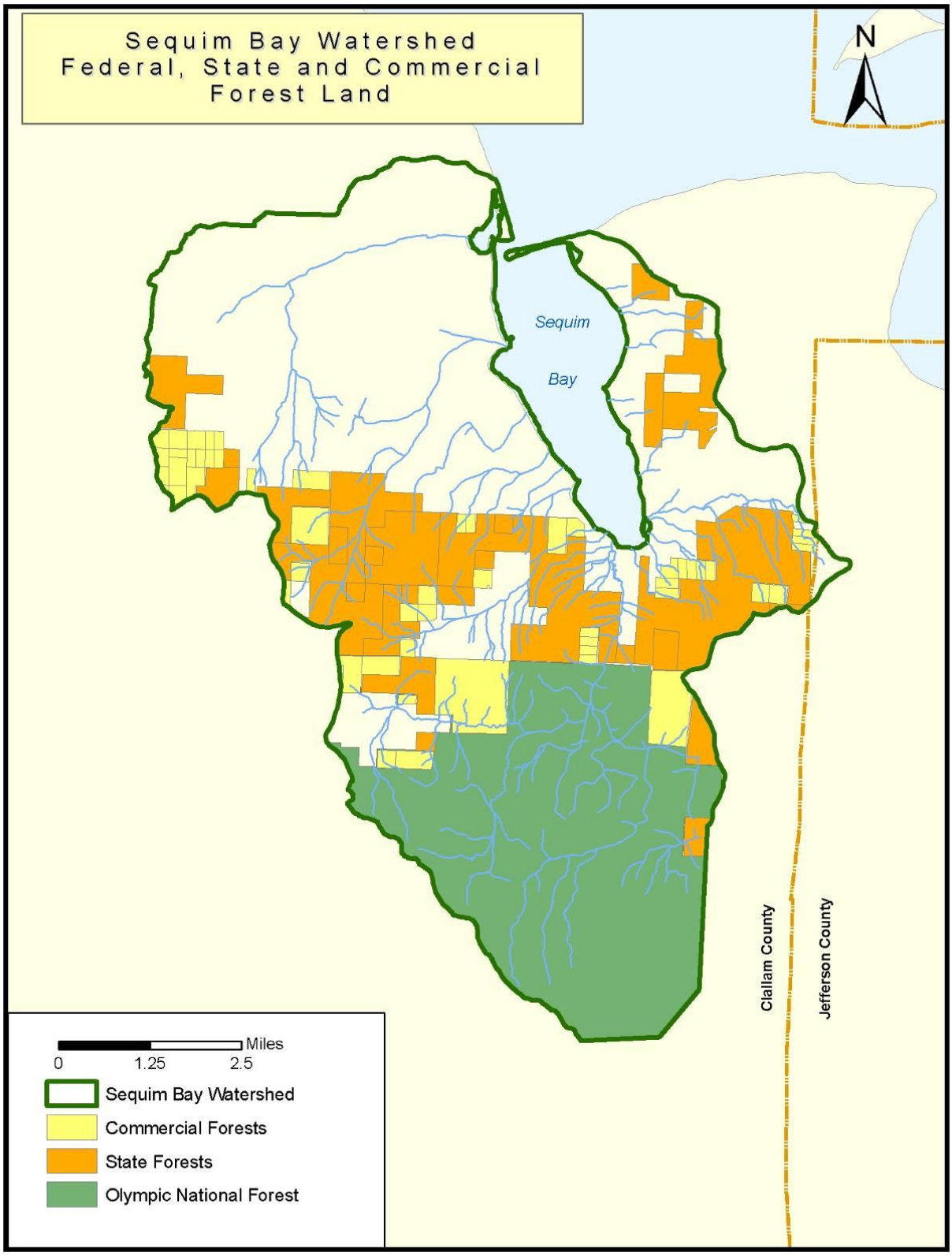
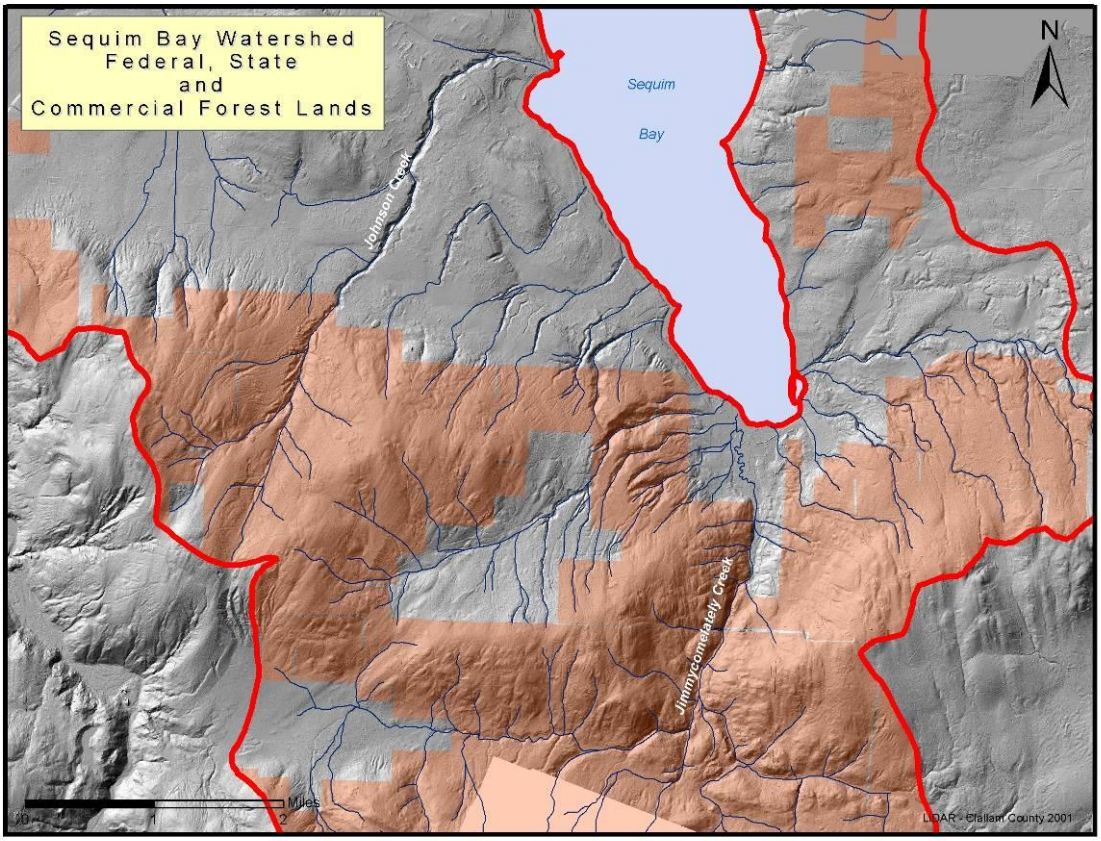


Figure 4.5: Forest lands superimposed on LIDAR



4.4 Agriculture

Agriculture in the Sequim-Dungeness Valley began in the middle of the 19th century. Early settlers built an extensive irrigation system of main canals and secondary ditches. The Bell Creek basin receives irrigation waters which are drawn from the Dungeness. Tailwaters from this irrigation water may impact Bell Creek. For further information on the topic of irrigation impacts, please reference the EPA-approved Dungeness watershed-based plan: *Protecting and Restoring the Waters of the Dungeness (2007)*:
http://www.jamestowntribe.org/programs/nrs/319C_Plan_173107.pdf

Agriculture of the Sequim Bay basin is primarily on the west side of the bay, within the Bell and Johnson Creek drainages. It is comprised of a few remaining commercial farms including one commercial dairy farm, and smaller "hobby" farms. Other agricultural lands have been converted to residential development. There are four hobby farms in proximity to Bell Creek which are suspected to affect water quality by: possible increase temperatures because of denuded vegetation, sedimentation due to poor pasture management, and possible bacterial contamination due to livestock access and or stormwater conveying bacteria from animal waste to Bell Creek (Clean Water Work Group notes, J. Coyle, Clallam Conservation District August 2008). Johnson Creek does not have any farms of medium or high potential to impact surface water quality (Clallam Conservation District, 2006 Farm Inventory).

The irrigation ditches have been a conduit for the transfer of bacteria and other contaminants into Bell Creek (Clean Water Work Group notes, S. Geither, 2005-2006). It is suspected that the irrigation ditch system co-mingles bacteria, pesticides, and sediment with Bell Creek waters that are transported to Sequim Bay. The commercial dairy farm in the lower Bell Creek watershed maintains a conservation plan with the Clallam Conservation District and has been intentional about managing their land to reduce possible water quality impacts. Recently they converted from restricted access stream watering (Bell Creek) to depending entirely upon tank watering.

Agriculture subcategories which could impact water resources:
Irrigated crop production - Potential causes and sources of pollutants from irrigated crop production include pesticide, herbicide, and fertilizer application. Bell Creek monitoring data suggest that nutrient sources are a problem, but a full assessment is needed.

Animal operations – In 2006, Clallam Conservation District conducted a farm inventory. The primary objective of the inventory was to rate livestock-keeping operations in terms of need for technical assistance to address potential water quality concerns. Any property keeping livestock was designated as a "farm". Farms were rated as high priority, "if livestock had access to waterways and/or if observed farm management practices clearly appeared to impact nearby waterways. For example, a farm was considered high priority if livestock manure was piled near a stream and it was apparent that the pile posed a pollution risk. If livestock had access to a waterway the farm was automatically designated as high priority unless it was apparent the effect was negligible" (Clallam County Conservation District, 2006). The Conservation District maintains a detailed map of the farms where technical assistance is needed to implement solutions such as rotating, composting, fencing, watering stations and other best management practices. The data below (Table 4.3) are for the farms identified as high priority located within the Sequim Bay drainages.

Table 4.5 Farm Acreage (Clallam Conservation District, 2006)

	Farmland (acres)	No. of high priority farms
Sequim Bay watershed	3,240 (total)	7 (total = 242 acres)
Bell Creek Sub-watershed	1,920	0
Johnson Creek Sub-watershed	840	4
Chicken Coop Creek Sub-watershed	480	3

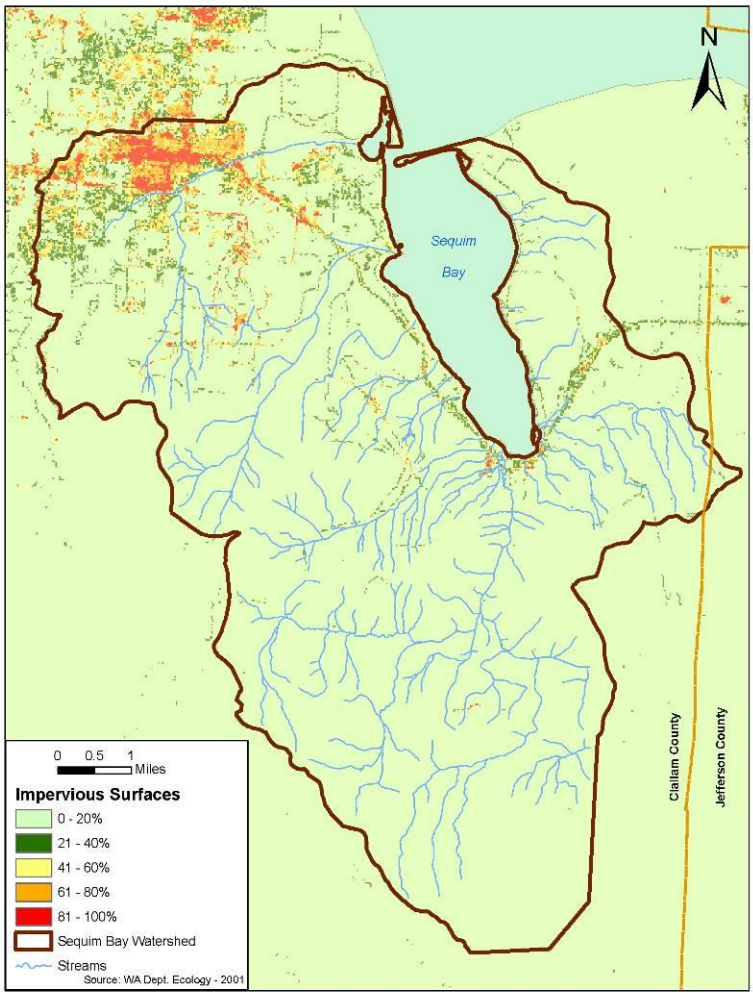
4.5 Aquaculture

Aquaculture in Sequim Bay is limited to shellfish cultivation and harvest along the marine shorelines of the bay. These activities are not identified as a cause of pollution to marine waters, however they are highly dependent on water quality in upland and marine areas in order to produce shellfish that meet state and federal health certification standards. Species cultivated include Pacific oysters, Olympia oysters, manila clams, and geoducks. These species supplement native littlenecks, horse clams and other species harvested for non-native recreational and tribal commercial, ceremonial and subsistence harvest. Protection of human health from the consumption of shellfish contaminated with fecal coliform is a high priority and consistent goal.

4.6 Hydromodification/ Habitat Alteration

The Sequim Bay watershed has been significantly altered by human development and has experienced significant problems as a result. Much of the watershed has intact forest cover (approximately 70%), without significant impervious surfaces (Figure 9) and approximately 60 miles of unpaved forest roads. About 5% of the watershed is urban, including industrial, commercial and residential, in the immediate and surrounding area of the City of Sequim. The City of Sequim has a sewer system, treatment system creating Class A reclaimed water (discharging in Sequim Bay watershed; with some plans to reuse more of the reclaimed water in both Dungeness and Sequim Bay basins), and a water system drawn from the Dungeness River (basin west of the Sequim Bay watershed).

Figure 4.6: Impervious surfaces in Sequim Bay Watershed



Flooding associated with urbanization and stormwater runoff has been a chronic issue in the Bell Creek watershed since the development of Bell Hill (S. Geither, Clean Water Work Group notes, 2005). Bell Creek has overflowed its banks on multiple occasions and flooded portions of downtown, especially eastern Washington Street and large low parking areas (e.g., QFC and

Senior Center) (Streamkeepers stormwater reconnaissance meetings October 2008). Stormwater monitoring results from 2008 and 2009 events in the Bell Creek basin reveal high suspended sediments and metals (R. Knapp, preliminary analysis, Clallam County Stormwater Study, 2009). Clallam County formed a stormwater advisory group to develop a draft Comprehensive Stormwater Management Plan (2011), a Stormwater Outreach Plan (2011), and ultimately both Clearing/Grading and Stormwater Ordinances. The draft Comprehensive Stormwater Management Plan and Outreach Plan are currently (2013) under revision by Clallam County.

The Jimmycomelately Creek watershed, an area of approximately 15.4 square miles, has less urbanization than Bell Creek, but still is an example of human degradation of the natural ecosystem, and also subject to flooding. Development of south Sequim Bay began in the late 18th century with logging, roads and development, railroad construction, dredging, wetland draining, filling and diking. Jimmycomelately Creek was relocated, channelized, straightened, and constricted by roads and fill to facilitate farming and the settlement of the community of Blyn. Wetlands were converted for an old shingle mill and a log yard that was in operation until the late 1990's. In addition, native vegetation was removed, and non-native vegetation became established on the fill and dikes. The history of degradation and fragmentation of the JCL watershed is described in greater detail in A Preliminary Plan for Restoring Jimmycomelately Creek and the Lower Sequim Bay Estuary (Shreffler 2000), which is downloadable from the Tribe's Natural Resources Program website:
http://www.jamestowntribe.org/jstweb_2007/programs/nrs/nrs_main.htm

The large-scale Jimmycomelately/Sequim Bay Estuary restoration project was implemented from 1998 to 2005. The Tribe coordinated this combined effort of 21 local, state, federal and private organizations which acquired land and restored it to a natural state by decommissioning buildings and removing a log yard (including removal of creosoted pilings through EPA's Brownfields program) and RV Park. The project also removed two roads, dikes, and wetland fill, and restored the JCL creek channel to its historic location, re-meandered smaller creeks and re-established natural estuarine wetland elevations and native vegetation in order to restore water quality and biological functions. Figures 4.8 and 4.9 show before and after conditions of lower Jimmycomelately and the south shore of Sequim Bay. In addition to the enhancement of the natural resources, the restoration project also resolved the flooding to Highway 101 and Blyn from JCL creek.

Development supporting the Jamestown S'Klallam Tribal administrative campus affects the hydrology of No Name Creek, located along the eastern edge of the tribal campus. Stormwater monitoring conducted in 2008/2009 revealed that suspended solids are high, as well as copper and zinc in No Name Creek. Tribal business development affects the hydrology of Casino Creek, Dean Creek and Jimmycomelately Creek. No work has been done to evaluate flow modifications related to the development.

Figure 4.7: Before restoration of Jimmycomelately Creek and South Sequim Bay

Figure 4.8: After restoration of Jimmycomelately/ Dean Creeks and South Sequim Bay

4.7 Shoreline modification

Shoreline armoring has occurred along portions of Sequim Bay and is in conjunction with private property bank protection or Bay access, Sequim Bay State Park facilities, John Wayne Marina and West Sequim Bay Road. The WRIA 17 Limiting Factors Analysis describes that a significant portion of the shoreline has been armored between Dean Creek and Pitship Point (2002). The Tribe performed a shoreline reconnaissance in 2006 and Figure 10 indicates points of observed shoreline alterations. Figures 11 and 12 provide examples of shoreline alterations observed.

Figure 4.9: Bank Armoring Reconnaissance Of Sequim Bay

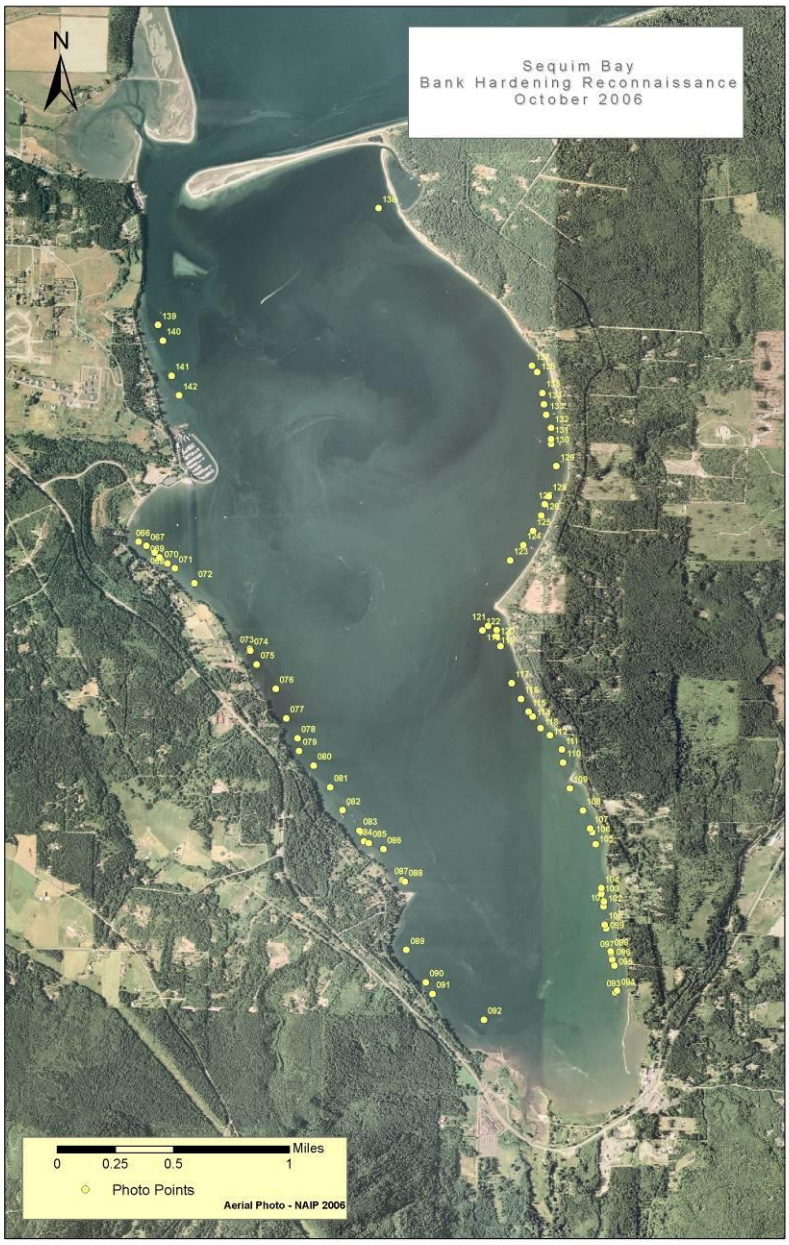


Figure 4.10: Sequim Bay Bank Hardening, Example 1

Figure 4.11: Sequim Bay Bank Hardening, Example 2

4.8 Marinas and Recreational Boating

The John Wayne Marina was constructed in 1985 on 22 acres of land originally owned by the John Wayne family. The land was donated to the Port of Port Angeles, which maintains the site as a moorage and vessel storage station with boat launching, fuel, pump-out, and restaurant and restroom facilities. The marina currently provides 300 moorage slips, one pump-out/dump station, and two portable toilets for moorage tenants, as well as guest and transient vessel owners. The "rules and regulations" for the marina explicitly direct marina users about permissible activities related to sewage discharge, garbage and oil disposal and fueling.

4.9 Roads, Highways and Bridges

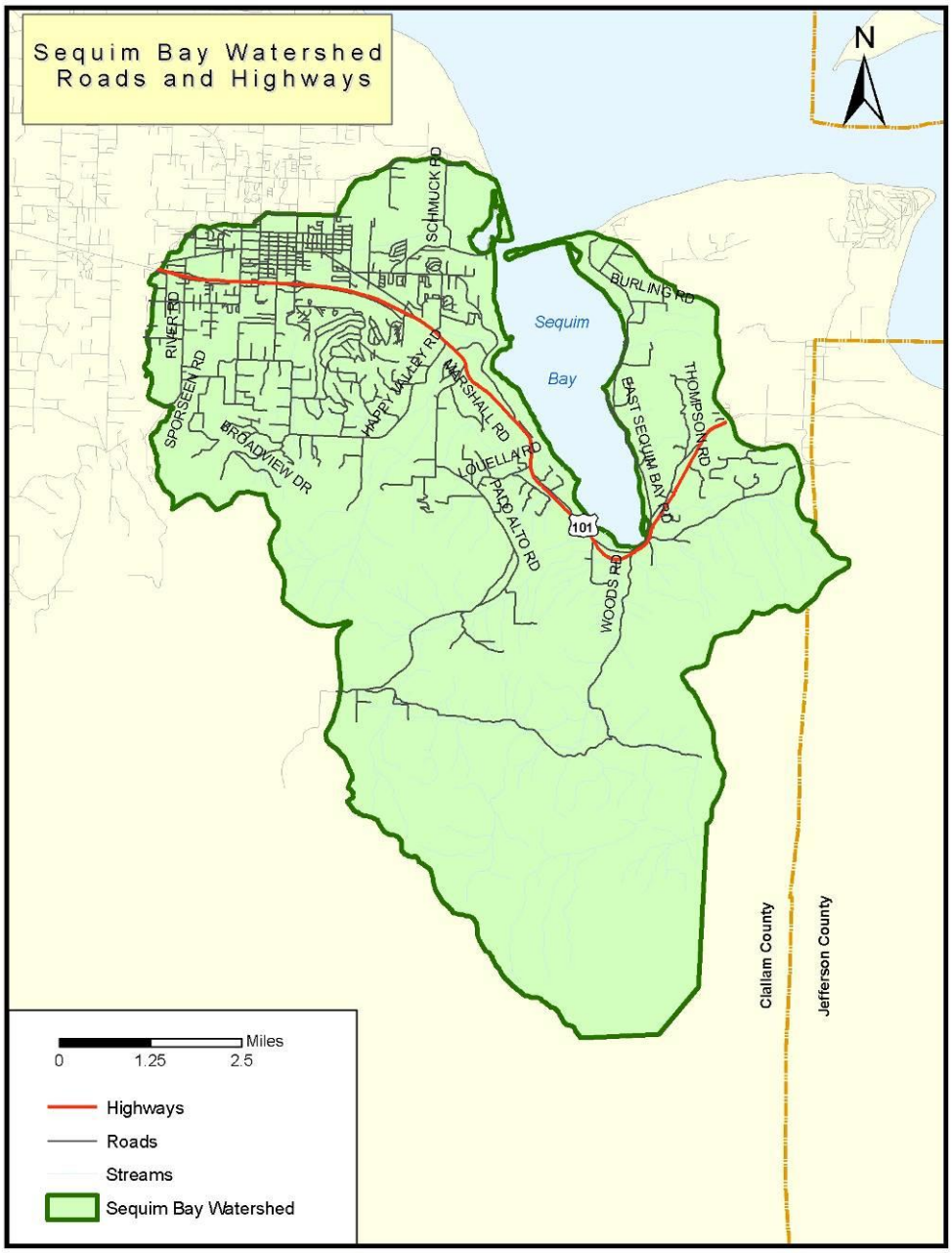
Highway 101 spans each of the tributaries (Bell Creek, Johnson Creek, Dean Creek, Jimmycomelately Creek, Chicken Coop Creek) to Sequim Bay. The original Jimmycomelately Highway 101 bridge constricted the active channel, reduced sediment transport, and compounded local flooding. It was replaced by a longer span in 2004 as part of the overall JCL restoration project. The current 110-foot span is deemed adequate for river processes and fish passage.

The Highway 101 culvert for Chicken Coop Creek is considered a partial barrier for migrating fish during low flows and is on the list for replacement by Washington Department of Transportation. The undersized partial barrier will be replaced with a 16-foot wide bottomless culvert. Johnson Creek is in a steep wooded ravine at the Highway 101 crossing location. This culvert is not considered a fish barrier as fish are observed on both sides (WRIA 18 Watershed Plan, 2005). Bell Creek passes under Highway 101 through a bottomless concrete culvert which does not affect fish passage.

The Bell Creek sub-watershed is highly urbanized with a large network of paved roads supporting residential and commercial uses. Stormwater from the Bell Hill development created high flows and bank overflowing in 1996, 1997 and 2003 (Clean Water Work Group Notes, 2005). Dean Creek, Casino Creek, Jimmycomelately Creek and No Name Creek are mostly forested sub-watersheds, with development near the mouths of the creeks. Highway 101 and small paved or dirt roads provide access to the Tribal administrative and business developments and private residences.

The network of roads and associated stormwater runoff has the potential to impact the water quality of Sequim Bay and its tributaries. Figure 4.13 shows the main roads overlaid on the watershed map.

Figure 4.12: Paved roads (2008) in Sequim Bay Watershed

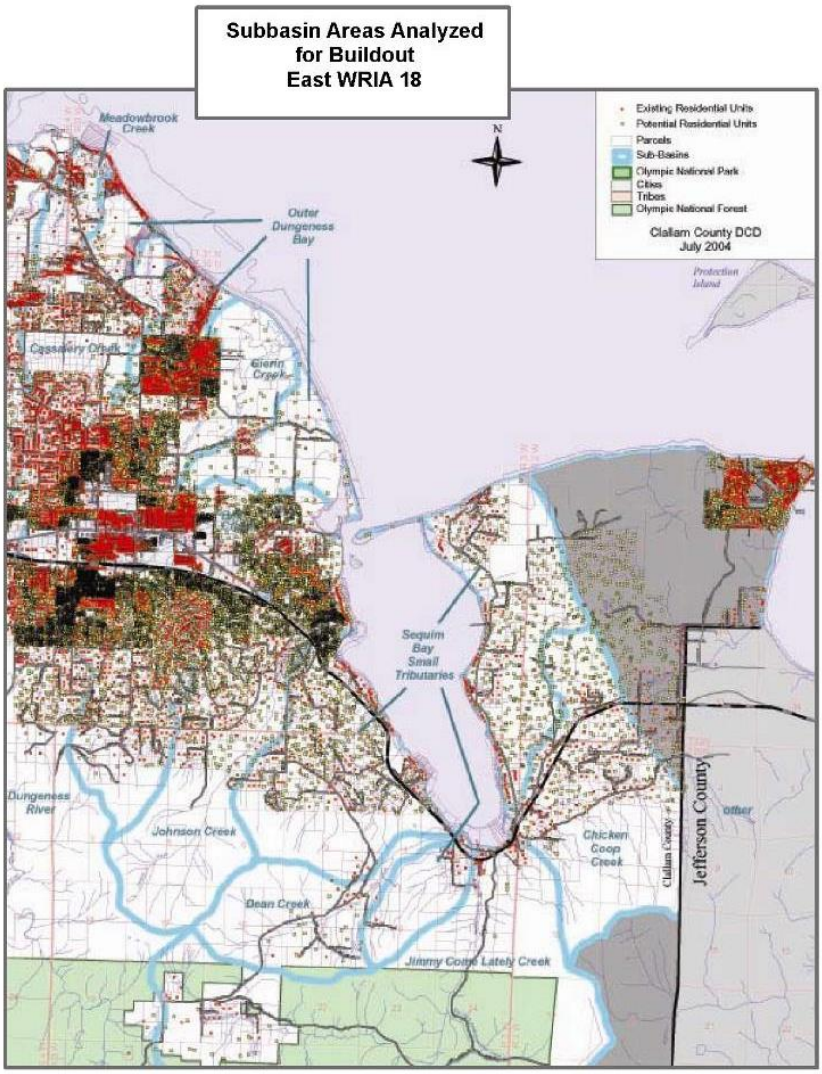


4.10 Urbanization and Land Management

Estimates of the growth rate in eastern Clallam County vary from 1.62 to 2.8% per year (Entrix, 2005). The Sequim Bay watershed's growth rate has not been assessed independently of eastern Clallam County. However, it is suspected that the growth rate is lower, though there is still pressure for land conversion from forested to private residential use. According to a use and build out estimate analysis conducted by Clallam County in 2004, Bell Creek subwatershed which includes the City of Sequim is already developed at planned capacity for much of its area, and Johnson Creek presents the most opportunity for growth. Jimmycomelately would also

present opportunity for growth in the buildout estimate if forest land conversions were accepted in the buildout scenario model. The buildout assumes state and federal ownership and management objectives would remain unchanged. In the buildout map below (Figure 4.13), red dots represent existing units and brown dots represent potential residential units under current zoning.

Figure 4.13: Buildout Potential (2004)



4.11 Municipal and Residential Development

Residential and commercial growth affects water resources in several ways. Growth creates demand for additional water supplies, increases the need for wastewater treatment and adds impervious surfaces. There is a corresponding increase in runoff of nonpoint source pollutants from roads and parking lots, lawn and landscaping maintenance, and domestic pet waste.

4.12 Wastewater Treatment

Wastewater treatment for the City of Sequim is a tertiary treatment and wastewater re-use facility located in the Bell Creek watershed. Wastewater treatment for the Jamestown S'Klallam Tribal administrative campus, Longhouse Market and Sequim Fire District Blyn Station is a small membrane bioreactor (MBR) treatment plant which treats approximately 3,500 gallons/day. The Seven Cedars Casino has an on-site septic system. Between 2000 – 2002 the Environmental Protection Agency's Underground Injection Control Program for Indian Tribes reviewed the casino treatment and disposal system. The EPA review concluded that the drainfield for the large capacity system was not functioning properly, resulting in occasional effluent surfacing. However, no significant impact to surrounding groundwater was found. The EPA review did not include an evaluation on whether the system was impacting marine waters. The Tribe continues to be concerned about this possibility because the bay suffers from low dissolved oxygen (303d listing) and increased nutrient loading would exacerbate the existing problems. Furthermore, there is some evidence that harmful algal blooms may be increased with nutrient loading and Sequim Bay has suffered from multiple species of algal blooms and been subject to shellfish closures due to biotoxins related to the algae. Eventually, the Tribe intends to replace the upgraded LOSS for the Seven Cedars Casino with a connection to the City of Sequim sewer system and treatment plant as part of a future business expansion. This expansion includes developing a conference center and hotel.

Homes sited outside of the City of Sequim and urban growth area limits are dependent upon individual on-site septic systems. Individual septic systems require appropriate design, installation and homeowner maintenance to avoid emitting bacterial and viral contaminants into surface and ground water. In 2008, Clallam County revised their code specific to on-site septic system operations and maintenance to meet new Washington State rule requirements. The code requires minimum inspections for systems depending upon the type of system and location. All systems within the Sequim Bay watershed will be on the most stringent schedule and will require a professional inspection because the entire watershed is designated as part of the Marine Recovery Area. More information about the code and the enforcement component can be found at the County's website under Clallam County On-Site System Management Program.

4.13 Individual Landowner Land Management

As the area around Sequim is a national retirement destination there has been a conversion of large acreage agricultural and forest lots to smaller lot residential development. One result of this is increasing numbers of individual landowners who are unfamiliar with proper stewardship techniques for the region. Impacts resulting from yards and small farms and woodlots include excessive water consumption for landscaping, nutrient loading from fertilizer and manure, pesticide/herbicide use, clearing of riparian vegetation, introduction or proliferation of invasive ornamental plants, and blockage of fish passage. Clallam Conservation District has developed programs to provide individual technical assistance to the owners of woodlots, small farms and urbanized lands to develop stewardship plans, conserve water, restrict animal access to waterways, and preserve open space and farm lands.

4.14 Domestic Pet Waste

In 2006 the Jamestown S'Klallam Tribe, working with ten volunteers, instituted a program to observe pet waste amounts at Port Williams Beach, draining to Sequim Bay (as well as several other sites outside of Sequim Bay watershed). The observations suggest that pet waste is a

likely contributor to bacterial pollution. The Port Williams beach site on Sequim Bay frequently had the highest number of waste observations (up to 44). Jamestown S'Klallam Tribe installed a pet waste station at Port Williams Beach in 2007 which was maintained by Clallam County Parks Department. However, after constant nuisance issues (excess overflowing garbage) that could not be resolved through an informational campaign (poster at station and note cards on windshields), the County decommissioned the site in July 2009. County Beachwatcher data (Beachwatcher data August 2009) showed a corresponding increase in bacteria counts after the station was removed, further confirming the suggestion that pet waste contributes to bacterial contamination. Jamestown would like to develop a program with volunteers to help monitor the pet waste station so that Clallam County would reconsider installation and maintenance at Port Williams beach.

5. WATERSHED GOALS

Goals for the Sequim Bay watershed have been developed by each of the agencies and governmental entities that are involved in management of watershed resources. Washington Department of Ecology has designated uses for each of the waterbodies of Sequim Bay watershed and has established criteria for the protection of the designated uses. It is a goal of all of the water resource partners to meet the established use designation criteria. Designated uses for Sequim Bay and its tributaries are listed in Table 5.1. Table 5.2 lists the parameters to be measured to determine support of the designated uses.

Table 5.1: Designated Uses for Sequim Bay Tributaries as Established for Water Quality Standard Purposes (WA Department of Ecology)

Waterbody	Aquatic Life Use	Core Summer Habitat	Recreation Use	Salmonid Spawning	Salmonid Migration	Salmonid Rearing
Chicken Coop Creek	X	X	X	X	X	X
Jimmycomelatley Creek	X	X	X	X	X	X
No Name Creek	X	X	X			
Dean Creek	X	X	X		X	X
Johnson Creek	X	X	X		X	X
Bell Creek	X	X	X		X	X

Table 5.2: Parameters to be measured to determine meeting of goal

Designated Use or Tribal Goal	Parameters to be Measured to Determine Support of Use or Goal
Recreation	Fecal coliform and eterococci, nitrogen, phosphorus, pH
Aquatic life	DO, temperature, pH, turbidity, macroinvertabrates, habitat, nitrogen
Salmonid Spawning	DO, seasonal temp.criteria, pH, turbidity, macroinvertabrates, habitat, nitrogen
Salmonid Migration	Smolt trap data collection and minnow trap data collection
Salmonid Rearing	Seining, minnow trap data collection, snorkel surveys

Long-standing watershed goals have been developed by the Jamestown S'Klallam Tribe and the Dungeness River Management Team (DRMT). Cooperative efforts to protect and restore the watershed, exemplified by the Jimmycomelately/Sequim Bay estuary project, has resulted in substantial convergence of these broad watershed goals between the tribal community and other partners. Taken together the established and adopted goals of the Tribe and DRMT embody the cooperative nature of tackling the NPS pollution problems in Sequim Bay.

5.1 Natural Resources and Planning Goals from the Jamestown S'Klallam Tribal Comprehensive Plan:

- Protect, restore and enhance the ecosystems which have historically supported populations of fish and wildlife for countless tribal generations
- Provide the necessary planning strategies and tools to meet the challenges of future growth.

Sub-Goals and Long Range Plans
(relevant to Non-Point Source Pollution):

Water Quality:

- Implement completed nonpoint watershed plans
- Monitor and document water quality to protect fish and wildlife habitat and shellfish beds
- Ensure that shellfish resources meet requirements for health certification or safe subsistence harvest.
- Monitor and protect drinking water

Water Quantity:

- Protect in-stream flows for fish
- Encourage water conservation by local irrigators and other entities
- Implement the Dungeness-Quilcene Water Resource Management Plan

Restoration and Habitat Protection:

- Restore fish and shellfish resources to sustainable, and ultimately harvestable, levels
- Complete comprehensive recovery plans for all threatened stocks of fish in the Dungeness River and eastern Strait of Juan de Fuca tributaries
- Implement cooperative projects with local, state and federal agencies to restore ESA listed and other threatened stocks
- Review timber harvest, gravel extraction, shoreline activities and other construction conducted in the Tribe's primary area.
- Implement an ecosystem restoration initiative for the Dungeness Watershed in cooperation with federal, state and local agencies and in compliance with the Federal Northwest Forest Plan. The initiative includes components covering channel stabilization, habitat recovery, riparian re-vegetation and critical stock protection and restoration.

Land Management and Future Growth:

- Institute strategies for developing Tribal lands, identifying potential development problems and opportunities.
- Establish methods for Tribal compliance with land use planning policies as lands are developed for programs, services, and business opportunities.

Environmental Education:

- Make presentations to inform the public and promote ecosystem protection Conduct special education projects
- Contract with Conservation Districts, Clallam County and others to work with farmers and landowners on water conservation and water quality
- Operate the natural history interpretive center on the Dungeness River

5.2 Goals of the Dungeness River Management Team that apply to Sequim Bay

The DRMT will strive to:

1. Support actions designed to reduce the risk of loss of life and property from flooding while encouraging measures that improve ecosystem functions.
2. Coordinate efforts to enhance water quality and quantity in the Dungeness River Watershed Planning Area* to support all beneficial uses, including an adequate supply of clean water for current and future human needs and a higher productive capacity of fish and wildlife habitats.
3. Encourage cooperation, coordination and effective watershed management within the community and at all levels of government. Emphasize protection of ground and surface water quality and quantity.
4. Exchange information about relevant studies, issues and projects occurring in the Dungeness River Watershed Planning Area*.
5. Promote public participation and education about the watershed, and provide a forum to inform the public and help resolve conflict.
6. Encourage development of a community stewardship ethic.
7. Support, promote, and facilitate implementation of relevant management plans and strategies developed for the Dungeness River Watershed Planning Area* and endorsed by the DRMT.

*The Dungeness River Watershed Planning Area includes the Sequim Bay Watershed.

6. NON POINT SOURCE MANAGEMENT MEASURES

6.1 Introduction

Management measures that address non-point source (NPS) causes and sources for the Sequim Bay watershed were first documented in the 1989 (revised 1991) *Sequim Bay Watershed Management Plan* as broad priority management policies with specific recommended actions, at least some of which are relevant today. Other existing plans and reports, some broad-based and some focused on specific areas, such as the Jimmycomelately sub-basin, include some NPS measures that address causes and sources of NPS pollution within the watershed. The existing plans and reports were prepared over the years by federal, tribal, state and local governments in partnership with involved citizens and private organizations. Additionally Quality Assurance Project Plans are prepared for discreet and ongoing monitoring including the Tribe's recent effort to gain a better understanding of nutrient inputs within the watershed, a subject which has only recently been receiving more attention.

In this section, the key initiatives that address non-point source pollution and other regional watershed issues are organized around the following priority areas for the Tribe:

- **Water quality for marine waters and fresh waters:** plans and reports, including the Clean Water Strategy and Detailed Implementation Plan for addressing bacteria pollution in Dungeness Bay and Watershed, associated TMDL analyses, and potential future clean-up plans, related to nutrient monitoring findings or the recent (December 2012) Washington Department of Ecology 303d-listing of Sequim Bay for bacteria;
- **Water conservation:** plans targeting the recovery of instream flows to levels that will protect and enhance stream temperature and salmon productivity;
- **Salmon recovery:** action plans to protect and restore habitat and critical stocks. These have been developed locally and submitted as part of the regional recovery plans for Puget Sound salmon and bull trout;
- **Regional land and watershed management:** plans including the 2005 WRIA 18 watershed plan, applicable portions of the Federal Northwest Forest Plan, and other regulations and best management practices to promote stewardship on federal, state and private lands;
- **Tribal land and water management:** property specific plans for land and water management;
- **Environmental education:** strategies as described in Section 7.

In many instances, Dungeness Watershed planning has incorporated planning for the Sequim Bay Watershed due to the watersheds' shared connection with the Strait of Juan de Fuca, and also to shared impacts from the Sequim-Dungeness Water Users Association (A hydrologic connection exists between the Dungeness River and Johnson and Bell Creeks/Sequim Bay via the Highland Irrigation District's irrigation system). The Dungeness River Management Team's geographic focus area is bounded on the West by Bagley Creek and on the East by Chicken Coop Creek (the eastern-most named creek draining to Sequim Bay). The WRIA 18 Watershed Plan for the Elwha and Dungeness watersheds incorporates recommendations for Sequim Bay and its drainages, even though they are a part of WRIA 17. The Jamestown S'Klallam Tribe has the only reservation lands in WRIA 17 and requested that these areas be incorporated into WRIA

18 watershed planning and development of the Elwha-Dungeness Watershed Plan. Both Clallam County's Clean Water District and Marine Recovery Area also adopted these boundaries.
As such, each discrete NPS pollutant sub-category for Sequim Bay is addressed in a number of plans related to the Dungeness or Bay. Table 6-1 provides a summary of the NPS categories and sub-categories, and the key planning documents describing measures to address each pollutant source.

Table 6-1: Summary of Management Measures by NPS Categories/Sub-Categories

NPS Category	Sub-category	Key Planning and Management Documents	Description of Measures
Forestry	Harvest Management	Federal Forest Plan; USFS Watershed Analysis; USFS Sedimentation Analysis; WDNR HCP, WA Forest Practices	Federal Lands: ongoing Watershed Improvement Needs (WIN) inventory of measures to address sedimentation from erosion and road maintenance, and road decommissioning.
	Road Construction & Maintenance		State and Private Lands: Harvest Mgt measures subject to Habitat Conservation Plans, regulations of the WA Forest Practices Board, and the Washington Timber Fish and Wildlife Agreement.
Agriculture	Irrigated Crop Production	CCD Best Management Practices; Clallam County Critical Areas Ordinance, CIDMP (Comprehensive Irrigation Management Plan); Tribe and State shellfish management documents	Clallam Conservation District (CCD) annual operation plan for outreach and implementation of best management practices for pasture management and animal operations. Irrigation ditch water quality improvements; bacterial source identification. Clallam County Critical Areas Ordinance for stream buffers. CIDMP includes pollutant reduction measure for irrigation system (Highland Irrigation District includes irrigation laterals from Dungeness River that enter Sequim Bay).
	Animal Operations		
	Aquaculture		Aquaculture practices relating to water quality are regulated by WA Dept of Health, the National Shellfish Sanitation Program, and Tribal ordinances.
Hydromodification & Habitat Alteration (freshwater, estuarine, and marine waters)	Flow Regulation & Modification	WRIA 18 Watershed Plan	WRIA 18 plan provides water budget for entire region, including Sequim Bay drainages, and comprehensive water use management recommendations.
	Groundwater Withdrawal	Blyn, WA Groundwater Resource Development Report; WRIA 18 Watershed Plan	Recommendations include: additional study and modeling of groundwater resources, measurement of groundwater use, conservation measures, and wellhead protection.
	Channel Modification	Salmon recovery plans and North Olympic Peninsula Lead Entity for Salmon Recovery three-year action plan; habitat restoration plans (such as Jimmycomelately Creek and Estuary Restoration Plan)	Measures to improve channel function and riparian productivity, conservation easements, flood plain restoration, LWD placement, replacement of shoreline armoring, etc. Shoreline Master Program regulates shoreline development.
	Estuary/Nearshore/Marine	Salmon Recovery Notebook; Jimmycomelately Creek and Estuary Restoration Plan; Sequim Bay Drift Cell Protection Plan (in process by JS'KT); Shoreline Master Program	Flood plain restoration; upland sediment source controls; monitoring and maintenance of saltmarsh habitat and conservation easements; removal of shoreline armoring; trend analysis of circulation; monitoring of algal blooms; revegetation; drift cell protection strategies; Shoreline Master Program regulates shoreline development.
Marinas & Recreational Boating	Vessel discharge and shoreline dredging	Shoreline Management Program; WA Department of Health	County shorelines management measures; info and outreach to vessel owners; pump-out stations.

Roads, Highways & Bridges	Construction		WA DOT stormwater general permit; WA DOT culvert prioritization list; WA DOE stormwater manual		Recommendations regarding culvert replacement and channel function, bridge lengthening or removal, construction monitoring.
	Runoff		WA DOT stormwater general permit; Sequim-Dungeness Groundwater Protection Strategy; WRIA 18 Plan; Clallam County Celaring and Grading Ordinance (in process); Clallam County Stormwater Ordinance (in process)		Research on contaminants in streams and groundwater; waste disposal; use of LID measures to treat runoff.
Urbanization	Municipal & Residential Development		Sequim & Clallam Comp Plans; WRIA 18 Plan; Tribal Comp Plan		Designation of critical areas, and areas for forest and agricultural land retention; City and County ordinances; development of Tribal ordinances.
	Wastewater Treatment		City of Sequim Wastewater Re-use Plan; City of Sequim Sewer System Master Plan; Tribal MBR O&M plan; County Environmental Health code		Waste water reuse; County septics O&M program (septic installation and inspection, identification of septics of concern and remediation, landowner education), construction of community wastewater systems.
	Golf Courses		None currently in area. One proposed.		Recommended development of BMPs for golf course design and operation related to water quality and quantity.
	Impervious Surfaces & Stormwater Runoff		WRIA 18 Plan, Clallam Comprehensive Stormwater Strategy (underway, anticipated by 2013)		Recommendations for use of low impact development techniques; adoption of a County stormwater ordinance; use of updated state stormwater manual.
	Landowner Management		WRIA 18 Plan; Clallam Conservation District 5 year Plan		Outreach and technical assistance to individual landowners by CCD and Tribe; short courses at River Center.
	Domestic Pet Waste		Clean Water Work Group Notes; Jamestown S'Klallam Tribe pet waste observations		Public outreach and education program, installation of pet waste stations, signage.
Wetland- Riparian (including freshwater, estuarine, and marine shorelines)	Wetlands		Clallam Critical Areas Component of Comp Plan		Maintain wetland inventory and regulatory protection.
	Riparian Vegetation		County noxious weed mgt plan; Salmon recovery plans; WRIA 18 plan; JCL Monitoring Plan.		Recommendations for re-vegetation of shoreline and flood plain areas; removal of invasive species; outreach and technical assistance to individual landowners, short courses at River Center. JCL plan includes a riparian monitoring element.

	Drainage & Fill		Clallam Co. ordinance (drafted never approved/ up for redo by 2013)		Adoption of Clearing and Grading Ordinance by Clallam County.
	Estuarine/nearshore/Marine		Clallam Critical Areas Component of Comp Plan; Shoreline Management Program		Shoreline protection; soft armoring; recommendations for re-vegetation of shoreline; public outreach and technical assistance to individual landowners, short courses at River Center.
			Northwest Straits Commission/Clallam County Marine Resource Committee		Marine debris removal; removal of creosote logs and structures; public outreach on nearshore functions and water quality
Other	Salmon Recovery		WRIA 18 Limiting Factors Analysis; WRIA 17 Limiting Factors Analysis; NOPLE Three-year work plan		Includes ranked salmonid habitat restoration actions for Bell Creek, Washington Harbor (WRIA 18), and Sequim Bay sub-basin and other Sequim Bay creeks (e.g., Jimmycomelately Creek, Johnson Creek) (WRIA 17).
	Land Use		Sequim Bay Land Use Inventory (in process by JS'KT); Sequim Bay Nutrient Reduction Plan (in process by JS'KT)		Inventory of land uses in Sequim Bay area; Source identification of nutrient contribution to Sequim Bay; strategy for reducing nutrients to Sequim Bay.

6.2 Water Quality Clean-up Plans to Protect and Restore Marine and Fresh Waters

The Sequim-Dungeness Clean Water District was formed by the Board of Clallam County Commissioners in 2001 in response to water quality violations of federal and state bacterial standards in the lower Dungeness River, the Matriotti Creek tributary, adjacent creeks, and Dungeness Bay affecting shellfish harvest. A Clean Water Strategy and Detailed Implementation Plan (DIP) (2004) were developed by the Clean Water Work Group, comprised of the US Fish and Wildlife Service, Jamestown S'Klallam Tribe, Washington Departments of Ecology and Health, Puget Sound Action Team, Clallam County, Clallam Conservation District, the Sequim-Dungeness Agricultural Water Users Association and private citizens. They were published by the Washington Department of Ecology to implement the two TMDL studies of the lower watershed and Dungeness Bay. Actions of the work group are coordinated with the Dungeness River Management Team, and the work group serves as the DRMT water quality sub-committee, as well as reporting to the Clallam County Board of Health. While the TMDLs and Clean-Up Plan exclude the Sequim Bay Watershed, the Clean Water District shares the same geographic focus area as the DRMT, which does include the Sequim Bay watershed.

The Clean Water Strategy and DIP for the Dungeness contain an action plan specifying recommended actions, priorities, status, agency roles and responsibilities and cost estimates. The approach includes continued investigation of pollution sources, on-site septic investigation and outreach, on-site septic system repair and replacement, farm planning with the use of best management practices, stormwater management, proper disposal of pet waste, modification of irrigation ditches to promote water conservation/quality, and overall outreach and education in the region. These are summarized in table 6-2 below. While some of the identified actions are specific to areas draining directly to Dungeness Bay (rather than Sequim Bay), many of the identified actions and all of the general strategies are still relevant to the Sequim Bay watershed.

Table 6-2: SUMMARY OF NPS MANAGEMENT MEASURES IN THE CLEAN WATER STRATEGY AND DETAILED IMPLEMENTATION PLAN (adapted from Streeter and Hempleman, 2004)	
General Strategies	***Identified Actions***
Strategies to Address Human Waste	
Expansion of septics operation and maintenance programs	Assessment and monitoring
	Inspect septics of concern
	Followup repair, replacement
Reduce commercial development use of septic systems in proximity to Sequim Bay.	Connect Seven Cedars casino to City of Sequim sewer and wastewater treatment.
	Connect Longhouse Market to City of Sequim sewer and wastewater treatment.
Landowner Education	Septics 101 class on basic septic system maintenance.
	Canvas of West Sequim Bay Rd residents to discuss nitrogen removal systems.
	Talks and displays at River Center, displays at area festivals and events
Stormwater Management	
	Capital facilities, retrofits, standards for new development, and basic BMPs based on soil characteristics, topography, and development patterns.
Low Impact Development	CCD stormwater management manual for small-scale development (rural residential) in progress. The manual includes a series of pre-engineered stormwater management practices for builders, developers and citizens which can be installed without the aid of an engineer.
	The North Peninsula Builders Association has developed a Built Green Checklist
	Landowner education.
Agriculture and livestock waste	
Treatment of irrigation ditch tailwaters	Pilot projects completed, biofiltration, constructed wetlands. Marine Drive specifically identified for treatment.
Ditch piping	Reduction of bacterial contamination through piping of open ditches, based on priorities identified in CCD monitoring
Individual conservation plans and BMPs	CCD activities based on 2006 farm inventory.
Outreach and education	Workshops and presentations
	Brochures such as "Living on a Ditch"
	web page information
Enforcement	WA Dept of Ecology per MOU with Clallam County and Clallam Conservation District
Domestic animals and pet waste	
Public outreach	Waste disposal information via brochures, advertisements and presentations; signage
Installation of pet waste stations	Areas of high pet use adjacent to surface waters
Cleanup	Coordination of volunteer cleanup crews
Regulatory and Policy Approaches	
Stormwater ordinance or designation of stormwater sensitive areas	Revisions to draft; proceed to adoption (Clallam County)
Critical Areas	Update maps and regulatory constraints per Federal ESA listings and WA Legislature action

Review development regulations	Encourage use of LID, remove disincentives.
Establish Tribal regulations	Adopt ordinances to regulate activities on Tribal reservation/trust lands
Research and Monitoring	
Freshwater	Develop overall freshwater monitoring for wet season/storm events for streams, ditches
	Continued fresh water monitoring
	BMP effectiveness monitoring
	Data analysis of monitoring
	Microbial source identification
	Streamkeeper voluntary monitoring program
Marine and estuarine areas	Continued marine monitoring; emphasis on biotoxins
	Beach and Beachwatcher voluntary monitoring programs
	Microbial source identification
	Additional research on Sequim Bay (basic ecological studies, nutrients, circulation, fecal coliform assessment in water and sediment, wildlife usage)
	Monitoring of Washington Harbor Restoration Project (completed 2013)
	Implement marine shoreline soft armoring techniques
General	Analysis of impervious surfaces
	GIS analysis, map fecal nutrient and temporal trends
Education and Outreach	
General outreach	Public workshops
	Newspaper reports
	Continuation of school age water quality classes and field trips
	Displays and activities in booths, fairs and festivals

Some implementation actions have occurred in each of the strategies outlined above, but major areas remain unfunded. Previous funding from the EPA under the 319 program has enabled the Tribe to conduct marine and fresh water studies, participate in the development of the Clean Water Strategy/DIP, provide targeted public education, and implement water quality improvement projects on Tribal lands. From 2004-8 the Jamestown S'Klallam Tribe, Battelle Marine Science Laboratory, Clallam County, and the Clallam Conservation District carried out the scope of work under an EPA-funded Targeted Watershed Initiative in the Dungeness Watershed. Key elements of the project include:

- a Microbial Source Tracking study (MST), to more precisely define pollutant sources;
- innovative Best Management Practice (BMP) demonstrations (and market-based incentives for BMP implementation) related to water quality treatment, stormwater management, and septic maintenance; and,
- an Effectiveness Study, to compare cost/benefit and effectiveness of the MST Study and BMP demonstrations
- Public outreach and education

All members of the Clean Water Work Group are involved in public outreach efforts. The Clallam Conservation District has taken a major role in the implementation of several action items within the Clean Water Strategy relevant to landowner education and technical assistance.

Information about water quality protection measures for the Dungeness irrigation system, which impacts Sequim Bay via the Highland Irrigation District's tailwater locations, is closely linked to Dungeness River water conservation and is described in the following section.

6.3 Water Conservation

The Tribe's Administration Department maintains the Water and Wastewater Utility Program, which includes the Blyn Community Water System; supplying water to the Jamestown S'Klallam Tribal Operations in Blyn, as well as some Tribal rental homes and private residences. The Utility provides water conservation tips to its customers via Consumer Confidence Reports, as well as Tribal and Employee Newsletters. The Tribe does not have a Tribal Water Conservation Plan, but one is needed to address the various types of properties under Tribal ownership (golf course, Casino, administrative offices, dental and health clinics, gas station/deli, and other enterprises, as well as residences).

6.4 Salmon Recovery Planning

The Jamestown S'Klallam Tribe is one of the three S'Klallam tribes that are successors in interest to the Treaty of Point-No-Point in 1855 that reserved the opportunity for hunting, gathering and fishing at usual and accustomed stations in the ceded territory. All three S'Klallam tribes retain treaty fishing rights in Dungeness and Sequim Bays, however the Jamestown S'Klallam Tribe has primary tribal management authority of the area under the terms of the Point No Point Treaty Council Compact.

Kathy Duncan, Tribal Elder, is quoted in the Jimmycomelately Creek and Estuary Restoration Plan (Shreffler, 2000)."Sequim Bay is in the heart of the traditional hunting, fishing, shellfishing, and gathering areas for the S'Klallam People. Washington Harbor, at the mouth of Sequim Bay, was the site of a large S'Klallam village, until the late 1800s when the village moved to Jamestown near Dungeness Bay. The Washington Harbor S'Klallams would follow the salmon runs, moving to fishing areas from Dungeness, Sequim, and Discovery Bays all the way into Hood Canal".

Jimmycomelately Creek is the largest stream in the Sequim Bay Watershed. Anadromous fish species in the creek include summer chum salmon, coho salmon, winter steelhead, and sea-run cutthroat trout. Hood Canal summer chum salmon were listed as threatened under the Endangered Species Act in March 1999. The Jimmycomelately Restoration Project has been completed and summer chum have returned from as few as 7 adult fish returning in 1999 to over 4,000 in 2011. Project details and results are presented in the Jimmycomelately Ecosystem Restoration Monitoring Report 2004-2011 (Jamestown S'Klallam Tribe, 2012): http://www.jamestowntribe.org/programs/nrs/jcl-prelim_final.pdf.
Jamestown Tribe has initiated another large scale salmon-recovery, ecosystem restoration project within Sequim Bay. It is the removal of more than 600 linear feet of road causeway which bisects Washington Harbor. The causeway housed the City of Sequim's sewer outfall. A new line has been installed below estuary grade preparing the way to remove the causeway (expected in summer 2013).

Additionally, the WRIA 18 Plan, which the Tribe approved as a member of the Dungeness River Management Team, contains "desired conditions and outcomes" as well as recommendations for

water quality and habitat for Sequim Bay, Sequim Bay Marine Shoreline Waters, and each of the drainages to Sequim Bay: http://www.clallam.net/environment/elwhadungenesswria.html.

6.5 Regional Land and Water Management Plans and Initiatives

The upper Sequim Bay watershed falls within Olympic National Forest and is federally owned and managed by USDA/Forest Service (the upper Dungeness watershed is also a part of Olympic National Park). Management on the Olympic National Forest is guided and directed by the 1990 Land and Resource Management Plan as amended by the 1994 Northwest Forest Plan: http://www.reo.gov/general/aboutnwfp.htm. These plans comprise a comprehensive ecosystem management strategy that strives to maintain both a sustainable economy and environment through the use of several land allocations with different management emphases toward these ends. The three types of allocations found on the Olympic National Forest include:

- **Late Successional Reserves** are areas designed to serve as habitat for late-successional and old growth related species including the northern spotted owl.
- **Adaptive Management Areas** are designed to develop and test innovative approaches for integrating economic and ecological goals.
- **Riparian Reserves** are areas designed to protect the health of aquatic systems and their dependent species, and to provide incidental benefits to upland species.

In addition to these land allocations, the Aquatic Conservation Strategy of the Northwest Forest Plan plays an integral role to aid the recovery of fish habitat, riparian habitat, and water quality on the Olympic National Forest

State and Commercial Forest Lands

State trust forest lands are managed under the Policy for Sustainable Forests, replacing the 1992 Forest Resource Plan in 2006; the Habitat Conservation Plan (1997) covering riparian species; and, the State Forest Practices Code: http://www.dnr.wa.gov/BusinessPermits/Topics/ForestPracticesRules/Pages/fp_rules.aspx. Washington Department of Natural Resources (WDNR) forest practices follow rules promulgated under the Forest and Fish Act and Timber-Fish-Wildlife (TFW) guidance.

Privately owned forest lands are managed under the WA Forest and Fish Act and updated forest practices rules to address water quality and riparian-dependent species habitat. On a site-specific basis, these rules consider risks associated with hydrologic changes (e.g. peak flows), wetlands, unstable land forms and cumulative timber harvest effects. The updated rules have been adopted as a Programmatic Habitat Conservation Plan under Endangered Species Act provisions and approved by NOAA Fisheries and the US Fish and Wildlife Service. The HCP is a 50-year agreement signed in 2006 which applies to 60,000 miles of Washington streams running through 9.3 million acres of forest land that provide habitat for more than 70 aquatic species, including salmon, many of them threatened or endangered. It covers 13 populations of salmon and steelhead.

Additional recommendations for state and commercial forest lands are included in the WRIA 18 plan to address issues such as:

- Improvement of forest practices to address long-term cumulative effects

- Reduction of impacts to watershed resources when forest lands are converted to residential use
- Reduction of sediment delivery to natural levels to the extent feasible
- Sediment pulses are avoided to prevent impacts to sensitive species and life stages
- Planning for road maintenance and abandonment as part of forest practices
- Off road vehicle use management to protect natural drainage, slopes, water quality and to minimize noise and disturbance of wildlife or habitat
- Need for technical assistance for small forest landowners

Local Land and Water Management Measures

The WRIA 18 plan contains a watershed characterization for the Elwha, Dungeness, independent drainages in east Clallam County, as well as Sequim Bay and its drainages along with regional and sub-basin recommendations. These detailed recommendations are organized around eight categories: water quantity, water quality, habitat, instream flows, stormwater, land use and management, education and outreach, and watershed management. Please refer to the Plan for additional information: http://www.clallam.net/environment/elwhadungenesswria.html.

Due to the urbanizing nature of eastern Clallam County, a number of specific local measures have recently been emphasized by the Clallam Conservation District, Clallam County, Jamestown S'Klallam Tribe, WDFW and other watershed partners to address stormwater, animal management, yard/landscape management, noxious weed control, and other issues:

- Best management practices for **animal management and individual property management** have been developed by the Clallam Conservation District and the District provides outreach and technical assistance subject to funding.
- **Stormwater management** in eastern Clallam County has been the subject of several activities to try to upgrade present development standards. Although the Washington Department of Ecology has developed 2005 and 2012 standards, Clallam County is currently operating out of the old, outdated Department of Ecology stormwater manual, dated 1992. A comprehensive stormwater plan was drafted by the County in 2011 (http://www.clallam.net/realestate/assets/applets/Clallam_CSWMP_Draft_for_Public_Review_4_15_11.pdf), but it has not been adopted; the plan is undergoing further review and is expected to be adopted, along with a stormwater and clearing/grading ordinance, in 2013. In 2007, Clallam Conservation District completed an EPA-funded project to prepare a set of engineered standardized LID designs for small scale development that can be submitted with permit applications and building plans to encourage the use of LID best management practices. The North Peninsula Builders Association has also developed a Built Green Checklist incorporating LID. Several pilot LID projects have been constructed by the Conservation District and the Tribe. LID designs have been incorporated into parking areas at some tribal facilities, and the retrofit or new design of stormwater management will be needed for existing and planned tribal facilities. A Tribal ordinance addressing stormwater is also needed.
- Clallam County operates a **Noxious Weed Control** Board to oversee inspection, notification, outreach and weed removal activities throughout the county. Major invasive species in the Dungeness area have included Scotch Broom, Robert's geranium, knotweed and butterfly bush. Knotweed and butterfly bush, which are escaped ornamentals used in landscaping,

have been particularly difficult to eradicate. A vigorous program was implemented by the County, Conservation District, Jamestown S'Klallam Tribe and other partners in an effort to halt the spread of these species. Eradication is extremely labor intensive and expensive -- knotweed for example is only effectively removed if individual stems are injected with an approved herbicide. As of 2012, knotweed is considered "controlled" (very few occurrences) in the Dungeness River. Outreach to raise the awareness that butterfly bush is an invasive plant was funded by an EPA grant in 2005, along with a demonstration project to remove approximately 4-6 acres in the Dungeness channel migration zone. Research on the impact of butterfly bush, knotweed, and other alien species to proper successional growth in forested areas remains an unmet need. In Jimmycomelately Creek, the entire restoration reach is monitored and treated for invasive species throughout each year. Invasives of concern on the site include: reed canary grass, blackberry, thistles, and Herb Robert.

6.6 Tribal Land and Water Management

The Jamestown band of S'Klallams were signatories to the Point No Point Treaty in 1855. In order to avoid being sent to a reservation 90 miles away, the Jamestown S'Klallam purchased land near the Dungeness River and settled on it, establishing their own unique community. Their refusal to move to a distant reservation eventually caused the band to lose Federal recognition, which was regained in 1981 following a lengthy petition process. The Tribe then purchased properties on Sequim Bay to create a reservation with an administrative facility and community center that was generally accessible for groups of Tribal citizens who lived in Port Angeles, Sequim, the original Jamestown site on Dungeness Bay, and Port Townsend. Funds limited the amount of land purchased to 11 acres.

Since that modest beginning, the Tribe's social, health, economic and natural resource programs, as well as its land-base, have grown significantly. Tribal holdings now exceed 1,137 acres, noncontiguous parcels scattered across watersheds within the Tribe's Usual and Accustomed (U&A) treaty fishing area. These properties have been purchased by the Tribe and converted, piece by piece, into trust land. As of January 1, 2013 a total of 13.5 acres are in Reservation status, 266 acres are in Trust status, and the balance is in fee-to- trust or fee-simple status.

The Tribe's ability to properly address water quality impacts and problems is challenged by the dispersed nature of its land holdings and the diversity of the numerous watersheds in which they occur. The Tribe's Non-Point-Source Management Plan and Non-Point- Source Assessment were updated in 2003 and 2009, respectively, addressing Tribal non-point source management measures across all reservation waters, waters entering reservation waters and non-reservation waters. Related to the Non-Point-Source Management Plan (NPS Plan) is a document (currently under review) that updates the Tribe's Environmental Program Goals. The NPS plan is closely integrated with the Clean Water Strategy for the Dungeness Bay and Watershed TMDLs and other plans developed and implemented in conjunction with watershed partners.

Governmental services

The Tribe has jurisdiction for regulating development and management of reservation and trust lands to ensure compliance with all Federal statutes. In the past, the Tribe has frequently mirrored county standards for its developments, and identified a federal agency to complete the NEPA process, usually the federal agency contributing funding to the project. In 2007, the Tribe

developed a comprehensive environmental ordinance specific to Tribal properties. As the Tribe's trust land base grows, and some developments are conducted without federal financing, it will continue to be necessary for the Tribe to update or develop ordinances, policies and procedures to implement their jurisdictional responsibilities.

Since regaining federal recognition in 1981, the Jamestown S'Klallam Tribe has had considerable success in building a land and facilities base for tribal citizens, along with a host of programs for natural resource management, social and health services, and business development. Overall tribal goals reflect the drive toward increasing self-sufficiency and reduction of dependence on federal programs and services, while at the same time building and maintaining community partnerships.

7. INFORMATION AND EDUCATION

7.1 Coordination of Public Information and Education

The Jamestown S'Klallam Tribe conducts much of its education and outreach programs through the Dungeness River Audubon Center as described below. The Tribe also maintains a number of natural resource education programs for Tribal children, prepares displays for community events describing Tribal natural resource projects and programs, provides talks and presentations to conferences and workshops, provides in-class activities for local school groups, and leads field trips for school and other interested groups. The Tribe frequently assists other community organizations such as the Marine Resource Committee, Clallam Conservation District, Clallam County, WSU Cooperative Extension, Peninsula College and others with delivery of their educational programs. Educational outreach is an important management tool for the Tribe where waters entering the reservation are not under Tribal jurisdiction.

The Dungeness River Audubon Center, situated on Jamestown S'Klallam Tribe Trust property, and jointly operated by the Tribe and the local Audubon society (Olympic Peninsula Audubon Society), provides an important site for environmental education and outdoor experiences. While much of the educational content provided by the River Center focuses on issues related to the Dungeness Watershed, many of the issues are also relevant to the Sequim Bay Watershed. The River Center sponsors numerous water quality programs with area school groups, and regular events to educate the public about water quality, quantity, salmon and wildlife habitat and related aspects of the watershed. High school and college students conduct research through two scholarship programs. The River Center also provides meeting space for a wide variety of local and state entities working on solutions to watershed problems. Permanent and rotating displays addressing ecology, water quality and habitat issues reside on the Center grounds and within the Center itself. River Center programs provide detailed learning opportunities about the physical characteristics, wildlife, and human use of the area watersheds, including:

- Middle school and elementary school watershed education programs;
- Annual events and festivals focusing on the environment of the Dungeness Watershed/ Salmon Recovery and Water Quality/ Cultural Heritage
- Adult education classes and presentations;
- Field trip opportunities for pre-K through college classes and retiree groups;
- Pre-K through college classroom visits by River Center instructors and docents
- Interpretive facilities, exhibits, and signs, both within the River Center and throughout Railroad Bridge Park on interpretive trails;
- Internships for high school and community college students;
- Docent and volunteer opportunities for all ages; and,
- Speaker programs covering natural resources, natural history and human history.

Along with the Tribe, Clallam County, and the Dungeness River Audubon Center, numerous other governmental and non-governmental organizations provide education and outreach related to marine and fresh water quality and habitat in the Sequim Bay Watershed Area. Some of the major organizations involved in public education and outreach include the following:

The Dungeness River Management Team (DRMT) is approaching its 25th anniversary (summer, 2013). The DRMT management area extends from Sequim Bay west to Morse Creek,

and includes the drainages to Sequim Bay. The longstanding watershed council serves as a clearinghouse for coordinating information and education efforts for participating governments, organizations, and the public at large. Continuation of a central watershed council to coordinate information with open, regular public meetings has been a recommendation in every major watershed plan in the area. Open meetings are held monthly and announced on the DRMT's website and in the Sequim Gazette newspaper. The Jamestown S'Klallam Tribe has been a principal facilitator of the group since its inception in the late 1980s, and it maintains the DRMT website, which was recently upgraded (October 2012). The DRMT also works with the following standing committees and organizations to coordinate watershed information:

The Clean Water Work Group (CWWG), a subcommittee of the DRMT, meets quarterly and consists of a consortium of participating governments, shellfish growers, scientists, volunteer organizations, private citizens and tideland owners. The Tribe has been a principal facilitator of the group since 2005. The CWWG is working with Clallam County and WA DOH to develop and implement a Pollution Identification and Correction (PIC) Program. The boundaries of the PIC program will extend from Sequim Bay watershed east to Morse Creek.

The Clallam County Marine Resource Committee is a governmental and citizen committee appointed by the County to oversee projects and information related to the nearshore and marine waters of Clallam County. The MRC has provided public information on several projects including forage fish surveys, derelict gear, marine debris, and other subjects related to marine water quality and habitat.

The Clallam Conservation District provides public outreach relating to best management practices for forest, farm and urban land owners. This includes talks, tours, newsletters and publications on a wide variety of water-quality related topics such as pasture management, manure management and the use of native plants. The District also conducted a farm inventory (2006) in Clallam County to rate livestock-keeping operations in terms of need for technical assistance to address potential water quality concerns within the Dungeness and Sequim Bay watersheds. Additionally, the Conservation District retains engineering and technical staff for the layout and design of specific restoration, animal management, and related projects and structures. The District also works closely with school groups.

Streamkeepers is a cadre of volunteer water quality and habitat monitors, sponsored and coordinated by Clallam County (Roads Department). Streamkeepers has a technical advisory group of data users who cooperate on data collection needs. Streamkeepers provides training to the volunteers, circulates its data widely, and maintains a newsletter and communicates frequently on water quality and habitat-related issues to an extensive email-based communication network.

Beachwatchers: Washington State University Cooperative Extension has been able to sponsor a Clallam County Beachwatcher program in the past to train and deploy volunteer marine and nearshore stewards, and provide outreach to their neighbors and the general public. Currently (December 2013), this program is unfunded.

7.2 Public Information and Involvement Methods

The Elwha-Dungeness (WRIA 18) Watershed Plan (inclusive of the Sequim Bay portion of WRIA 17) provided a comprehensive list of the public involvement techniques that have been used and/or are recommended as follows:

- Establish and maintain a central clearinghouse for watershed information;
- Continue to develop and implement school curricula for watershed health;
- Conduct small demonstration projects for water quality protection, water conservation, habitat restoration, etc.;
- Provide outreach and one-on-one technical assistance for landowners through the WSU Cooperative Extension Service (yard and garden management), Clallam Conservation District (forest, agriculture and animal waste management), Clallam County Department of Health (septic installation and maintenance), Sequim-Dungeness Water Users Association (conservation), and Jamestown S'Klallam Tribe and Washington Department of Fish and Wildlife (water quality and habitat restoration);
- Continue and expand volunteer programs such as the Streamkeepers, Beachwatchers and Salmon volunteers to involve greater numbers of people in monitoring and restoring watershed health;
- Publicize the benefits of conservation easements by the North Olympic Land Trust and other organizations;
- Promote the formation of neighborhood and sub-basin groups;
- Conduct seminars to provide information on local natural resources and ecological processes such as shellfish, fisheries and wildlife;
- Expand interpretive information along the Olympic Discovery Trail; promote trail and recreation programs that are compatible with watershed health;
- Conduct homeowner seminars covering topics such as wells and septic maintenance, pasture management, native landscaping, pesticide and herbicide use, and water conservation;
- Provide training to realtors, well drillers, septic installers and other professional organizations;
- Periodically prepare publications on the status of watershed resources, such as brochures, booklets, newsletters, fact sheets, newspaper articles and posters;
- Prepare an annual milestones report of the DRMT;
- Provide direct mailings to watershed residents; and,
- Conduct creative activities to celebrate the watershed including fairs and stream festivals, entries in the irrigation festival parade, and theatrical productions.

Additionally, the Tribe is currently working on a Public Outreach Needs Assessment which will more precisely define our targeted audiences for outreach and focus our messages, desired behavioral changes, and obstacles to achieving those changes. Through this process we hope to not only develop a project which will affect behavior change but also develop a repeatable process, using the logic model process form the NOAA coastal services center as a starting point, for deciding and developing effective outreach projects.

8. COST ESTIMATES AND SOURCES OF FUNDING

8.1 Cost Estimates of Identified NPS Management Measures

The cost estimates for implementing NPS management measures (Table8.1) come from a variety of sources, and contain a mix of short term and long term management actions. Each of the Jamestown Tribal natural resources sub-goals from the Tribal Comprehensive Plan -- water quality, water quantity, habitat, land management, and environmental education -- entail tribal staffing needs to participate in planning forums, design and implement projects, monitor results, and inform the tribal community and general public. Protection and restoration of tribal reservation and trust lands and waters will also require significant funding from other watershed partners. Table 8.1contains the funding estimates for protecting and restoring the Sequim Bay watershed area as such estimates are available. These are broken out for each Tribal sub-goal, and divided into Tribal programs and programs identified for cooperating watershed partners.

8.2 Current and Future Needs

Governments at all levels are struggling to meet their financial obligations for the protection and restoration of the environment. Tribal governments are no exception and face particular challenges. Small tribes like the Jamestown S'Klallam are immensely affected by activities occurring off the reservation over which they have little or no control, but must monitor and respond as these actions directly affect reservation lands and waters. Additionally, the Tribe has few revenue sources of their own that can be dedicated to environmental management and NPS remediation. Although Tribal fishers are taxed on their commercial fishing activities, few Tribal fishermen are presently engaged in commercial fishing due to the poor status of most fisheries resources, and these funds are already dedicated to management, enforcement and legal expenses associated with the exercise of tribal treaty fishing rights. Other revenue sources support social services such as education and elders' programs to meet the needs of Tribal citizens. Table 8.1 provides many long term estimates that would enable major steps in addressing NPS pollution in the watershed. Only a small short-term fraction of the needed funding is in hand for the implementation of the Salmon Recovery Plans. Other areas of need which are not in one of the existing plans, and where detailed cost estimates are not available include:

• Each newly purchased Tribal property requires professional assessments for wetland delineation, water supply capability, critical aquifer recharge, stormwater management, wastewater disposal, noxious weed removal, and re-vegetation. EPA Brownfields grants cover some assessments of hazardous waste and underground storage tanks, but these funds are granted only on an annual basis. Hazardous waste assessments may reveal needed actions, but these have not been estimated as they are action specific and highly variable.

• Retrofitting of existing tribal properties to ameliorate NPS causes and sources is needed, as well as the development and implementation of best management practices.

• Land acquisition, based on market and funding availability. Acquisition is necessary where other management measures are insufficient to protect and restore habitat and water quality;such as the setback of dikes, removal of structures and septic systems, and re-vegetation on river and marine shorelines.

• Integration of Tribal enforcement with NPS management to enhance program

effectiveness. Tribal enforcement programs are presently limited to fisheries management, and current funding levels are inadequate for existing responsibilities, let alone expanded services.
• Identification of solutions to legal and structural barriers to water conservation.
• Additional assessments of salmon productivity to determine if recovery efforts are working.
• Long term and stable funding for the operation of Environmental Education programs and the Dungeness River Audubon Center.
• The growing threat to species and habitat posed by the rapid proliferation of invasive vegetation and alien aquatic species.
• Assessment of the potential loss of tribal trust resources from climate change.

9. WATERSHED MILESTONES AND SCHEDULE FOR IMPLEMENTATION

On a watershed basis, the progress for implementing NPS management measures will depend on the concerted effort of all watershed partners. The Jamestown S'Klallam Tribe and other partners have made substantial commitments of staff, funding and other resources for the past decade to protect and restore watershed health. These commitments are largely completed with the full implementation of the Jimmycomelately/ Sequim Bay project. The Tribe and its partners remain committed to evaluating project success and responding to identified needs as resources allow. Further, ongoing projects, such as water quality improvement and protection, and habitat protection are expected to continue to over the long term subject to available funding.

Table 9.1 describes in detail the milestones for implementation (outputs) as well as the criteria for evaluating success (outcomes). The table is organized around the Tribal natural resource sub-goals, and briefly summarized below.

Water Quality: Milestones include the number and location of septic systems upgraded or redesigned, stormwater management systems upgraded and designed, research projects completed, and the number of people reached through outreach efforts such as publications and classes.

Water Quantity: An instream flow rule for the Bell Creek sub-basin went into effect on January 2, 2013 as part of the larger rule for the Dungeness River Basin. This rule will prohibit new surface water withdrawals and set up mitigation for new groundwater withdrawals in the Bell Creek watershed. For the remainder of the sub-basins in Sequim Bay, Ecology is expected to write an instream flow rule but a schedule has not been set.

Habitat Protection and Salmon Recovery: A short term and long term list of measures and milestones have been submitted to the National Marine Fisheries Service covering land acquisition, floodplain restoration, re-vegetation, and sediment control and are outlined in Table 9.1.

Management of Tribal Lands and Waters: Milestones are tied to achieving goals set by the North Olympic Peninsula Lead Entity for salmon recovery and the upgrading of tribal social and business facilities to protect water quality and conserve water.

Education and Outreach: Continued support operations of the Dungeness River Center for education and communication of watershed, community and school organizations. A Near term milestone will be to complete the outreach needs assessment and implement projects originating from this process.

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Table 9.1

TRIBAL PRIORITY	NPS MANAGEMENT STRATEGY	MILESTONES FOR IMPLEMENTATION	TIMING	KEY PARTNERS	MEASUREABLE OUTPUTS	MEASURABLE CRITERIA FOR EVALUATING PROGRESS (Outcomes)
HIGH	**Human Waste Management**	Support County programs for septic O&M, septic inspection and remediation	ongoing	County	# septic systems pumped	Sequim Bay DOH shellfish areas continue to meet APPROVED criteria
					database tracking of septic O&M	
					# systems inspected and repaired	
					# classes Septics 101	
MEDIUM	**Stormwater management**	Reduce stormwater impacts	1.5 yrs	County, Tribe	County approval of Comprehensive Stormwater Strategy; Development of Stormwater ordinance; clearing and grading ordinance; County Roads Dept install LID in roadside ditches	No increase in metals or hydrocarbons for baseline streams. Hydrology impacts reduced.
			5 yrs	Tribe	Retrofit tribal facilities	
		Raise public awareness	5 yrs	volunteers	Signage program at stormwater drains	
		Increase use of LID methods	5 yrs	Tribe, County, CCD	County approval of LID techniques	
MEDIUM	**Animal Waste Management**	Implement pet waste program	1 yr	Tribe, EPA, volunteers	mailings and posters distributed	Reductions in fecal coliform loading to Sequim Bay (as measured by quarterly SK and JSKT monitoring)
			2 yrs	County parks	install pet waste stations	
HIGH	**Monitoring**	Shellfish sampling	ongoing	Tribe, DOH	bi-weekly for intertidal harvest during PSP season; weekly for geoduck harvest	Safe consumption of shellfish by tribal citizens and general public
		Marine waters	ongoing	Tribe, DOH	Monthly sampling	Continued achievement of certified shellfish beds

						standards
HIGH		Toxic Phytoplankton	Ongoing	Tribe, NOAA	Weekly Summer/ biweekly winter	Safe consumption of shellfish by tribal citizens and general public. Understanding of DSP problem.
		Freshwater	ongoing	Streamkeeper Baywatchers, Tribe, County	monthly sampling; quarterly for some parameters	Safe wading/swimming for tribal citizens and general public; attain temperature/DO targets for fish bearing streams
		Complete annual data analysis	annual	Clean Water Work Group	Annual review of results	Adaptive mgt of strategies based on results.
		Achieve capacity to monitor all nine parameters required under CWA Section 106		Tribe	trained staff, all equipment available, funding for staff, materials, transportation, lab costs	Attain water quality standards for all nine parameters
ACTIVITY DEPENDENT: **HAB RESEARCH IS HIGH** **EVERYTHING ELSE MEDIUM**	**Research**	Evaluate harmful algal blooms and shellfish tissue correlation	1 yr	Tribe, NOAA	Identify relationship between harmful algal blooms in water column and shellfish tissue (not understood to date)	Adaptive mgt of strategies based on results.
		Evaluate Sequim Bay for nutrients and wildlife contribution	5 yrs	Tribe, Ecology, DOE, WDFW	to be developed	Adaptive mgt. based on results.
		Evaluate culture methods for oysters, clams etc	ongoing	Tribe, volunteers	Shellfish gardens completed	Adaptive mgt. based on results.
		GIS analysis and remote sensing	ongoing	Tribe, CCD, County	annual airphotos, updated maps	
		Evaluate effectiveness of BMPs	ongoing	Tribe, County, CCD	progress reports	Adjustment of BMPs to achieve water quality standards

MEDIUM	**Regulatory**	Upgrade city and county ordinances	1 to 5 years	County, Ecology	Adopt stormwater ordinance	Improved water quality (bacteria, nutrients, chemicals)
				MRC, City	Designate nearshore critical areas	Revisions to CAO and SMP
				County, Tribe, CCD	Identify barriers to improved water quality in ordinances	Updated ordinances leading to improved water quality
		Develop/update Tribal ordinances	1 to 5 years	Tribe	Improve jurisdictional control over tribal waters	Updated/new ordinances leading to improved water quality
TRIBAL PRIORITY	**NPS MANAGEMENT STRATEGY**	**MILESTONES FOR IMPLEMENTATION**	**TIMING**	**KEY PARTNERS**	**MEASUREABLE OUTPUTS**	**MEASURABLE CRITERIA FOR EVALUATING PROGRESS (Outcomes)**
LOW	**Education and Outreach**	Public workshops on water quality issues	annual	County, CCD, River Center, Tribe	# Workshops conducted; # individuals attending	Behavior change leading to improved water quality; participant feedback
MEDIUM		Prepare written material for public outreach	annual	County, CCD, Tribe	Newspaper articles and mailings; annual milestones report of DRMT; # publications distributed	Understanding of project work leading to community support.
HIGH		Booths, fairs and festivals	annual	all partners	Dungeness River Festival; other festivals; attendance and participation	Behavior change leading to improved water quality; participant feedback
HIGH		Design and implementation of interpretive displays	5 years	River Center	Permanent displays at River Center	Understanding of project work leading to community support, and behavioral changes leading to improved water quality.

LOW		Information for recreational boaters	1-5 years	WDFW, County parks, Tribe	Interpretive signs and brochures for boaters at launch sites.	Behavior change or continued stewardship by vessel owners.
HIGH		In-class and in-field school programs	on-going	River Center; Tribe; CCD; County	# of students reached;# of accompanying adults reached	Evaluate student understanding of watershed processes and impacts from actions; participant feedback; teacher feedback.

TRIBAL PRIORITY	NPS MANAGEMENT STRATEGY	MILESTONES FOR IMPLEMENTATION	TIMING	KEY PARTNERS	MEASUREABLE OUTPUTS	MEASURABLE CRITERIA FOR EVALUATING PROGRESS (Outcomes)
MEDIUM	**Domestic Water Supplies - Conservation and Efficiency**	Identify options for Tribal administrative and business and public domestic water supply	3 yrs	County, Ecology	State water rule for WRIA 17 and County ordinance for conservation	Revised building and land use requirements to promote water quality and Conservation and efficiency measures in place.
LOW		Residential and business conservation	ongoing	Sequim, County, PUD	New construction and retrofits for water conservation (interior and outside)	
LOW		Water re-use	Ongoing (Sequim) 5yrs Tribe	Sequim, Tribe	Use of treated wastewater for additional uses.	Expanded use of waste water leading to reduced reliance on new surface and ground water sources.
HIGH	**Protection of Instream Flows**	Conduct aquifer/ JCL and Chicken Coop Creek hydraulic continuity study	2 yrs	Tribe, Ecology, USGS	Complete hydraulic study	Improved estimates of the relationship of flow and salmon habitat and well use
MEDIUM		Conservation outreach and education	ongoing	Ecology, County, Tribe, WUA, PUD, CCD	# presentations; publications; demonstration projects	Improved individual stewardship for water conservation on farms and residences.
LOW	**Restoration of Functional Riparian and**	Riparian reforestation	1-10 yrs	CCD, Tribe, WDFW	Acres revegetated	Increase in # acres properly functioning riparian and flood

	Riverine Habitat					plain habitat.
HIGH		Noxious weed removal	1-3 yrs	County, Tribe, CCD,	Acres treated	
TRIBAL PRIORITY	**NPS MANAGEMENT STRATEGY**	**MILESTONES FOR IMPLEMENTATION**	**TIMING**	**KEY PARTNERS**	**MEASUREABLE OUTPUTS**	**MEASURABLE CRITERIA FOR EVALUATING PROGRESS (Outcomes)**
LOW	**Large Woody Debris Placement**	LWD placement for channel stabilization (Jimmycomelately)	1-3 yrs	Tribe	River miles of LWD placed	
HIGH	**Nearshore Habitat Protection and Restoration**	Removal of shoreline armoring	2-10 yrs		Length of armoring removed	Improved marine water circulation for water quality protection and nearshore habitat.
HIGH		Review of Shoreline Master Program update	Ongoing	County, Ecology	Comments	
HIGH	**Barrier Removal**	Culvert upgrades / replacement	1-5 yrs	USFS/ DOT/ DNR/ Tribe	Hwy 101 Culvert for DOT (Chicken Coop Creek); E Sequim Bay Rd culvert barrier replacement if Tribe sponsors a new traffic interchange; forest roads as identified	# stream miles opened Reduced sediment input
HIGH		Improve irrigation diversion structures	1-5 yrs	WUA	upgrade irrigation outtakes	Improved fish passage
LOW	**Sediment management and source control**	Remediation of mass-wasting and road sedimentation in upper watershed (Johnson Creek)	1-5 yrs	USFS	implementation of remaining sites on Watershed Needs Inventory	Improved turbidity and TSS in Johnson Creek
HIGH		Upgrade construction practices	5 yrs	County	Clearing and Grading Ordinance	Prevent turbidity exceedences during construction activity

HIGH	**Management of Tribal properties**	Protect and restore habitat on designated conservation properties	ongoing	Tribe	Tribal properties retain habitat values and species diversity	Increase acreage in protected status
HIGH					Acquire additional habitat parcels	
TRIBAL PRIORITY		**MILESTONES FOR IMPLEMENTATION**	**TIMING**	**KEY PARTNERS**	**MEASUREABLE OUTPUTS**	**MEASURABLE CRITERIA FOR EVALUATING PROGRESS (Outcomes)**
HIGH	**NPS MANAGEMENT STRATEGY**	Tribal social & economic development properties	1-5 yrs	Tribe	Specific standards supporting Jamestown S'Klallam Tribe's Tribal Environmental Policy Act	Tribal properties meet current standards for water quality, BMPs and stormwater by 2012
MEDIUM					Implement LID on tribal properties	

10. CRITERIA FOR EVALUATING PROGRESS

Criteria for evaluating progress are also summarized in Table 8.1 and are organized by Tribal sub-goal as follows:

Water Quality: It is the goal of the Jamestown S'Klallam Tribe and the Clean Water Work Group to meet all water quality standards by 2015 and maintain them thereafter. This will require tremendous resources, which are currently not in hand. It is the Tribe's goal to assure supportive water quality for all life cycles of salmonids and to assure safe shellfish consumption.

Water Quantity: It is the goal of the Jamestown S'Klallam Tribe and Dungeness River Management Team to meet all minimum instream flows set for Bell Creek. It is a long term goal to set and met minimum instream flows for the other drainages in Sequim Bay through the rulemaking process. Until that time it is a goal of the Jamestown Tribe to have any water groundwater withdrawals in the Blyn area have a de minimis impact on surface water flows.

Salmon Recovery: The primary goal in terms of salmon recovery in the Sequim Bay watershed is to maintain the current success of the effort to recover ESA listed summer chum in Jimmycomelately Creek, as well as protect and improve ESA listed steelhead habitat. Other criteria include the removal of blocking culverts that impact salmonids. Quantitative targets and ranges for other salmon species in the Sequim Bay watershed have not been determined due to lack of information and are a future research need.

Tribal Land and Water Management:
Criteria for Tribal properties that are designated for conservation purposes can be measured in total acreage acquired or restored. Additionally, monitoring of water quality and habitat parameters on these properties will indicate the effectiveness of the Tribe's management. Tribal properties that are designated for development for social service facilities and businesses can be evaluated on the basis of whether best management practices are developed or implemented.

Education and Outreach:
In keeping with the Tribe's philosophy of working with watershed partners, the Tribe has focused education and outreach around the Dungeness River Audubon Center facilities and activities. The River Center partners are striving to make River Center programs and facilities financially self-sustaining. The Tribe will also continue to provide education and outreach directly where appropriate. Criteria for measuring progress in education and outreach include number and age of people reached, range of subjects covered, and ultimately the degree of behavior change within the watershed, as measured by responses to polls and questionnaires, and actual improvements in water quality and habitat.

The Jamestown S'Klallam Tribe has a current comprehensive plan which projects needs and activities from 2005 through 2015. When the Tribe renews its comprehensive plan there will be an opportunity to adjust program goals. Further, each year the Tribe develops an annual plan to identify specific objectives of the year. This is an opportunity to respond to new information and adjust priorities and recommendations.

11. MONITORING AND ADAPTIVE MANAGEMENT

Monitoring in the Sequim Bay watershed consists of an integrated strategy of "implementation monitoring" of progress and "effectiveness monitoring" of whether quantitative goals have been achieved. Monitoring and adaptive management are coordinated through the Clean Water Work Group which is a technical workgroup of the Dungeness River Management Team.

The Clean Water Work Group allows the various entities involved in monitoring such as Clallam County Washington Department of Health, Clallam Conservation District, Clallam County Streamkeeper and the Tribe to coordinate their actions and share their results. The Clean Water Work Group meets quarterly and regularly reviews water quality results of monitoring in the Sequim Bay Watershed. It can also help review and refine sampling plans so that monitoring is more effective and does not duplicate others. Through this review process of data the Tribe and its partners identify management actions to protect water quality (such as where to focus efforts to find failing septic systems) and where and how to focus monitoring efforts. Current and near term projects are outlined in Table 10.1.

Table 11.1 Ongoing and Expected Future Water Quality Monitoring Efforts

Site Name	Location	Entity	Sampling Frequency	Parameters
Chicken Coop Creek	50yds upstream of Old Blyn HWY	JSKT	Quarterly since 11/2004 Ongoing	DO, SpC, Salinity, Turbidity, pH, Temp, fecal coliform Nutrients
			Monthly August 2012- July 2014	Total P, Total N, Nitrite, Nitrate, Silicate, Ammonium, Temp, SpC, pH, Flow
Jimmycomelately Creek	At Ecology gage upstream of HWY 101	JSKT	Quarterly since 11/2004 Ongoing	DO, SpC, Salinity, Turbidity, pH, Temp, fecal coliform Nutrients
Jimmycomelately Creek	9 sites between RM .12 and .68	JSKT	Monthly October through March 2012, 2013, expected 2015	Intra-gravel Dissolved Oxygen
No Name Creek	30 yds upstream of mouth	JSKT	Quarterly since 11/2004 Ongoing	DO, SpC, Salinity, Turbidity, pH, Temp, fecal coliform Nutrients
Dean Creek	Downstream of 15yds HWY 101	JSKT	Quarterly since 11/2004 Ongoing	DO, SpC, Salinity, Turbidity, pH, Temp, fecal coliform

			Monthly August 2012- July 2013	Total P, Total N, Nitrite, Nitrate, Silicate, Ammonium, Temp, SpC, pH, Flow
State Park Creek	Near mouth	JSKT	Monthly August 2012- July 2013; discontinued 2014	Total P, Total N, Nitrite, Nitrate, Silicate, Ammonium, Temp, SpC, pH, Flow (when possible)
Bell Creek	Mile 0.2 and Mile 4.2	County	No sampling 2012 1year planned 2013-2014	DO, SpC, Salinity, Turbidity, pH, Temp, fecal coliform
Johnson Creek			No Ongoing monitoring, last monitored 2011	
Blyn	Four small storm drainages near tribal campus and casino in Blyn	JSKT	Quarterly since 2004	Total P, Total N, Nitrite, Nitrate, Silicate, Ammonium, Temp, SpC, pH, Flow (when possible)
Sequim Bay	Twenty one sites shown in figure 4.2	WDOH	Bimonthly	Fecal coliform, Temp, Salinity
Sequim Bay-Soundtoxins	Sequim Bay State Park	JSKT/ NOAA	Weekly summer, biweekly winter	Phytoplankton (toxigenic species enumerated, Temp, Chlorophyll, Particulate shellfish toxins, Nitrate, Nitrate, Phosphorus
Sequim Bay-Diarrhetic Shellfish/ Nutrient study	Sequim Bay State Park, South end of Bay	JSKT	Weekly: May-October 2013	Phytoplankton (toxigenic species enumerated), Temp, Chlorophyll, Particulate shellfish toxins, Nitrate, Nitrate, Phosphorus, Urea, DO, Shellfish tissue

In 2013 the Tribe's priorities for water quality monitoring revolve around understanding nutrient inputs into Sequim Bay and examining the links between nutrients and harmful algal blooms. We have an ongoing yearlong study to measure inputs into Sequim Bay from numerous small drainages along the south end of the bay, Chicken Coop Creek, Dean Creek and State Park Creek (we already have a good estimate of how big of a contribution Jimmycomelately Creek is making from the ongoing monitoring that is conducted). The 2013 marine water study will sample nutrients, phytoplankton and shellfish at two sites to gain a greater understanding in the response of the phytoplankton assemblage to nutrients, as well as the relationship between the concentration of toxigenic phytoplankton species in the water column and the concentration of toxin in various species of shellfish. The Tribe is partnering with NOAA and WDOH on this study. Quarterly monitoring will also continue of selected freshwater sites as outlined in the Table 10.1. The Tribes decision to monitor nutrients and HABs is a result of using an adaptive management process that took into account data showed elevated nutrients in freshwater and marine waters as well as a 2005 study linking high nutrients levels to a toxic phytoplankton bloom (Trainer et. al. 2007).

Washington State Department of Health is responsible for the certification of the shellfish beds in Sequim Bay. It is expected that the sites shown in figure 4.2 will continue to be monitored. If water quality results do not meet federal standards, the DOH will respond with a shellfish area downgrade and develop a management plan. The Clean Water Work Group would assist Clallam County in developing a mandated response and recovery plan to improve conditions.

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