Samish Bay Watershed
Fecal Coliform Bacteria
Total Maximum Daily Load

Volume 2 – TMDL and Water Quality Implementation Plan

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Cover photo: Samish River channel in Samish Bay at low tide, June 2006 (Ecology Shoreline Aerial Photo).

Project Codes

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Executive Summary

The Samish River and its tributaries, and some creeks and ditches that discharge directly to Samish Bay, have too much fecal coliform bacteria to meet state water quality standards. This bacteria pollution degrades the marine waters of the bay and limits the area open for safe commercial shellfish harvest and recreational uses. It also indicates there is a significant public health risk for fishers, hunters, recreators, and others using the freshwater tributaries to the bay.

In this Total Maximum Daily Load Volume 2 – TMDL and Implementation Plan, Washington Department of Ecology (Ecology) determined how much fecal coliform bacteria can be accepted by the freshwaters that discharge to Samish Bay without polluting it. The Implementation Plan lists the responsibilities of Samish residents, local and state government agencies, and organizations for getting the cleanup work done.

A total maximum daily load (TMDL) is an assessment required under the federal Clean Water Act for waters that do not meet state water quality standards. In Washington State, Ecology is the agency delegated by the U.S. Environmental Protection Agency to carry out the requirements of the Clean Water Act.

For the Samish TMDL, Ecology regularly monitored fecal coliform bacteria, streamflow and other parameters at 34 sites throughout the watershed in 2006-2007 (Ecology 2008). The agency determined that the Samish River discharged an annual average of 83 percent of the freshwater flow to the bay and 70 percent of the bacteria load. As the largest source of bacteria loading to the bay, the river is the single most important source to clean up, followed by the creeks and tidal sloughs that discharge directly to the bay and contribute the remaining 30 percent of the load. Ecology calculated that the bacteria load measured near the mouth of the Samish River needs to be reduced by 72 percent in order for Samish Bay to meet strict marine standards. Further up the mainstem Samish River, the required load reductions vary from 0 to 78 percent. Some tributaries need bacteria reduced by as much as 95 percent. For areas that discharge directly to the bay, the required reductions range from zero percent 79 percent.

The bacteria sources of greatest significance are onsite sewage systems, various categories of livestock, operations that spread manure, and possibly some pets. Waterfowl are known to congregate around the shores of Samish Bay during migration periods, particularly on fields used for hunting, but these congregations are not as frequent in the upriver portions of the watershed that contribute a significant part of the loading.

To reduce bacteria contributions from failing or poorly maintained onsite sewage systems, a new program by Skagit County Public Health will require inspections of all onsite systems in the watershed. The program will fully address this source of bacteria if the program is carried out completely. This includes sending notifications and reminders, and administering penalties for onsite owners who do not get inspections. Skagit County manages a loan program that can defray costs of septic repair or replacement.

For animal manure sources of bacteria, both current regulations and well-accepted best management practices, if fully addressed by dairies, beef cattle owners, owners of

noncommercial farms, and manure spreading operations (including poultry manure) will likely lead to water quality improvement. Dairy nutrient management plans (DNMPs) need to be reviewed and, if needed, updated to be sure plan elements, especially manure management, meet Natural Resource Conservation Standards. Commercial and noncommercial livestock farms need to follow all best management practices for manure management, and exclude livestock from streams and ditches using permanent fencing. Vegetated buffers may be needed, in addition to fencing, to provide extra protection where surface runoff could be a problem. Ecology will work with local agencies on public outreach, and will consider visits to noncommercial farms to provide information about Samish watershed water quality problems and manure best management practices.

Among Ecology's main recommendations:

- Ecology should increase its nonpoint inspection capability to better respond to complaints and ensure follow-up and water quality compliance.
- Skagit County applies for grant funding for a pollution identification and correction project, to provide additional characterization of sources and ensure corrective actions take place.
- Skagit County fully implements the data review, land use review and compliance process laid out in Skagit County Code 14.24.120, Critical Areas Ordinance for Areas of Ongoing Agriculture.
- In next update of SCC 14.24.120, Skagit County explicitly require livestock exclusion from surface waters that do not meet state water quality standards or that could be impaired by livestock access.
- Washington State Department of Agriculture (WSDA) continue its program of regular inspections of dairies and thoroughly evaluate practices, including manure spreading, that could result in discharges to surface waters in the Samish watershed.
- WSDA and Ecology work together on ways to communicate with managers/owners of manure spreading operations in Skagit and Whatcom Counties to ensure that poultry and other livestock manures do not pollute Samish basin waters.
- Agricultural sectors facing economic challenges in relation to excess manure production (poultry, dairy, and potentially other livestock managers) work together and with appropriate agencies to explore these economic challenges and evaluate potential regional solutions, including innovative and environmentally sustainable green technologies.

To ensure full implementation of this TMDL plan and to meet water quality standards by 2014, Ecology will lead a two-year adaptive management phase in which water quality monitoring results and implementation of best management practices are reviewed and shared with local agency partners and landowners. Continuation of work underway by our local agency partners – Skagit County Public Works; Skagit County Planning and Development Services; Skagit County Public Health; Skagit Conservation District; Skagit Conservation Education Alliance; Washington State Department of Agriculture; Washington State Department of Health and others, is critical to the success of this effort.

Figure 1. Samish Island Road between Padilla Bay (upper left) and Alice Bay *portion of Samish Bay (right) (Ecology Shoreline Aerial Photo Archive, 2006)***.**

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Why Ecology is Developing a Cleanup Plan for the Samish Watershed

The Samish River and its tributaries, as well as smaller creeks, ditches and tidal sloughs that drain to Samish Bay, are contaminated with fecal coliform bacteria (Figure 2). The area of the bay that can safely be harvested for shellfish is limited, and safe human recreational uses are also at risk.

Federal law requires that a water quality cleanup plan or total maximum daily load (TMDL) be developed when the state has determined that a stream, river, lake or marine water body is polluted. We make this determination by comparing local water quality monitoring data with standards set by the state for each type of pollutant. The TMDL study identifies the different types of sources of fecal coliform bacteria responsible for the pollution. The TMDL implementation plan provides a plan of activities that will help locate problem properties in the watershed and provide education, technical assistance, and if necessary, enforcement, to make sure the necessary water quality improvements are achieved.

The t*otal maximum daily load* is the maximum amount of a pollutant that a water body can accept before there is a loss of beneficial uses (e.g., swimming, boating, shellfish harvest). This document provides an estimate of the maximum amount of bacteria the Samish Bay watershed can accept and still meet standards. It also provides a cleanup or implementation plan with steps for residents and local agencies to undertake to get to clean water.

Figure 2. Fecal coliform bacteria, microscope view

Health risk from harmful bacteria and viruses

Bacteria levels for Washington waters are set to protect people who work and play in and on the water from waterborne illnesses, as well as protecting those who consume shellfish from marine waters. Fecal coliform bacteria are "indicator bacteria." Their presence indicates that other pathogenic, or disease-causing, bacteria and viruses may be in the water. We track indicator

bacteria rather than the pathogenic bacteria and viruses because the testing is easier and less expensive. Feces from mammals, including humans, and birds contain fecal coliform bacteria and may contain pathogens that make people sick. The state established maximum levels, or criteria, for fecal coliform bacteria in water. Below these levels, the bacteria and viruses that may cause serious gastrointestinal illness or other illness are typically rare.

Samish watershed pollution history

Fecal coliform pollution has been documented in the Samish watershed in numerous studies for more than two decades. In 1982, the Shellfish Sanitation Branch of the federal Food and Drug Administration monitored water quality in Samish Bay and its major freshwater sources. The study measured bacteria in marine water samples collected over ten days during the winter storm season to assess rainfall impacts, differentiate sources, and develop shellfish harvest management recommendations (U.S. Public Health Service Shellfish Sanitation Branch, 1983).

A 1997 U.S. Geological Survey analysis of nutrient loading from major rivers to Puget Sound singled out the Samish River as particularly high in nutrient loads compared with other rivers (Embrey and Inkpen, 1998). This study is of interest because failing onsite sewage systems and animal manures, which are potential sources of the high nutrients, are also sources of fecal coliform bacteria to waterways. The Samish yielded more nutrients than any other river in the study, including the Nooksack, Skagit, and Stillaguamish in tons of inorganic nitrogen and total phosphorus transported per square mile of watershed area. The authors suggested that animal manure and commercial fertilizers were principal sources of the nutrients, but they did not fully explain how they reached this conclusion.

On the Samish River, Ecology monitors water quality at station 03B050 at Old Highway 99 Bridge in Burlington. Water quality at this location met both parts of the standard for bacteria in only seven out of the past 20 years. However, the station shows an improving trend (Ecology 2008), and fecal coliform bacteria concentrations have met both parts of the standard in all but one year since 2003.

Despite this improvement in the river, recreational and commercial shellfish resources in Samish Bay continue to be impacted by ongoing pollution problems. Two outbreaks of gastrointestinal illness occurred among consumers of shellfish harvested from these waters, one in 1994 and another in 2003. After the 1994 illnesses, Skagit County Planning and Development Services worked with state and local agencies to conduct storm event monitoring in the lower Samish watershed as part of a shellfish closure response strategy (Palmer, Knable, and Pfaff, 1996). The study estimated stormflows and documented both high concentrations and high loads of bacteria to the bay from the Samish River and Friday Creek, and a smaller load from Thomas Creek. The county also conducted detailed monitoring of the Samish basin in 2000-2002 (Haley 2004).

In response to the 1994 illnesses, the Samish Watershed Plan (Samish Watershed Management Committee, 1995) was prepared as a Final Shellfish Closure Response Strategy. The plan outlined objectives for addressing nonpoint pollution problems. Local and state government efforts got results. In 1998, many individual septic systems in Blanchard were replaced or repaired, and a community treatment system and drainfield were installed in Edison. These

efforts resulted in a small area of the original 2700 acres of closed shellfish beds upgrading to "approved" and "conditionally approved."

In December 2003, Washington State Department of Health (DOH) again closed Samish Bay to commercial harvest for three weeks following an outbreak of Norovirus. Norovirus is considered a serious food poisoning illness which causes severe gastrointestinal symptoms. Twenty-one people who ate raw Samish Bay oysters in Seattle-area restaurants became ill. The closure cost the local industry tens of thousands of dollars and the layoff of several workers. This temporary closure, and a DOH alert that additional closures could follow if bacteria loading to the bay were not reduced, spurred local and state interest in developing a TMDL for bacteria in the Samish Bay watershed.

Monitoring for the current TMDL in 2006-2007, and by Skagit County Public Works and Skagit Stream Team, continued to show excessive bacteria in the freshwater discharges to Samish Bay. These bacteria loads continue to contaminate Samish Bay and affect shellfish harvest. For example, between April and December 2008, DOH enacted five temporary closures of the Samish shellfish beds for commercial harvest. All the temporary closures were in response to rain events accompanied by high fecal coliform counts in the Samish River.

Samish water bodies on the state list of impaired waters

The main beneficial uses to be protected by this TMDL are primary contact recreation and shellfish protection. Table 1 is a list of reaches of the Samish River, Samish Bay, Friday Creek, Thomas Creek, and an unnamed slough that do not meet fecal coliform standards and are listed on Washington's 2004 Water Quality Assessment [Clean Water Act Section 303(d) list]. These listings are addressed in the Samish Bay Watershed Fecal Coliform TMDL Study.

Table 2 contains additional 303(d) listings in the Samish Bay watershed that are not addressed by this report. This TMDL establishes load and wasteload allocations at 303(d)-listed sites in the watershed, and also at non-listed locations where exceedances of water quality criteria for bacteria were observed. Load allocations are not established for non-listed locations where this study's data indicate compliance with the water quality criteria or where other downstream sites provide adequate water quality monitoring coverage.

Table 1. Study area water bodies on Washington State's 2004 Water Quality Assessment, *which includes the 303(d) list, for fecal coliform bacteria***.**

Water Body	Waterbody ID	Listing ID	Latitude/Longitude or Section, Township, Range	Marine Grid Cell
Samish Bay	390KRD TMKY HEWJ	40585 40583 40584	48.565 122.475 48.565 122.455 48.565 122.485	48122F4G7 48122F4G5 48122F4G8
Samish River	NN50EA	16412	35N 04E 06	
Samish River	NN50EA	16413 16414 39646	35N 03E 15 36N 04E 24 35N 03E 99	
Friday Creek	NI79KV	16409	35N 04E 05	
Thomas Creek	IO78KZ	39658	35N 04E 18	
Edison Slough	TR24JW	39604	36N 03E 33	
unnamed slough	AU64DK	39671	35N 03E 05	

Table 2. Additional 303(d) listings not addressed by this report.

Water Body	Parameter	Medium	Waterbody ID	Listing ID	Section, Township, Range
Samish River	Turbidity	Water	NN50EA	15910	35N 03E 15
Samish River	Turbidity	Water	NN50EA	15911	35N 04E 06
Samish Lake	Total PCBs	Tissue	O54FYG	17366	37N 03E 26
Edison Slough	D.O.[1]	Water	TR24JW	39605	36N 03E 33
Unnamed slough	D.O.[1]	Water	SN87OD	39666	35N 03E 06
Unnamed slough	Temperature	Water	SN87OD	39669	35N 03E 06
Unnamed slough	D.O.[1]	Water	AU64DK	39673	35N 03E 05

[1] Dissolved Oxygen

Why are we doing this TMDL now?

Although Ecology is not a public health agency, it has responsibility under the state Water Pollution Control Act (RCW 90.48) and federal Clean Water Act to work to restore and protect state waters and ensure they are in clean and safe condition.

Reducing fecal coliform bacteria in the river, creeks, and sloughs draining to Samish Bay will help keep important commercial and recreational shellfish beds available and safe for harvest. Samish Bay shellfish are an important economic resource, with annual sales of oysters and clams totaling three to four million dollars. Samish Bay shellfish are also harvested recreationally.

Keeping the Samish watershed clean is important for local quality of life, recreation, aquatic life, tourism and even the health of our livestock and farm resources. Both residents and visitors will get the greatest enjoyment of Samish water resources if the waters are kept clean.

What is a Total Maximum Daily Load (TMDL)

Federal Clean Water Act requirements

The Clean Water Act established a process to identify and clean up polluted waters. Under the Clean Water Act, each state is required to have its own water quality standards designed to protect, restore, and preserve water quality. Water quality standards consist of designated uses for protection, such as cold water biota and drinking water supply, as well as criteria, usually numeric criteria, to achieve those uses.

Every two years, states are required to prepare a list of water bodies – lakes, rivers, streams, or marine waters – that do not meet water quality standards. This list is called the 303(d) list. To develop the list, Ecology compiles its own water quality data along with data submitted by local state and federal governments, tribes, industries, and citizen monitoring groups. All data are reviewed to ensure that they were collected using appropriate scientific methods before the data are used to develop the 303(d) list. The 303(d) list is part of the larger Water Quality Assessment.

The Water Quality Assessment is a list that tells a more complete story about the condition of Washington's water. This list divides water bodies into five categories:

Category 1 – Meets standards for parameter(s) for which it has been tested.

Category 2 – Waters of concern.

Category 3 – Waters with no data available.

Category 4 – Polluted waters that do not require a TMDL because:

- 4a. – Has a TMDL approved and it is being implemented.
- 4b. – Has a pollution control plan in place that should solve the problem.
- 4c. – Is impaired by a non-pollutant such as low water flow, dams, culverts.

Category 5 – Polluted waters that require a TMDL – the 303d list.

TMDL process overview

The Clean Water Act requires that a total maximum daily load (TMDL) be developed for each of the water bodies on the 303(d) list. The TMDL identifies pollution problems in the watershed and then specifies how much pollution needs to be reduced or eliminated to achieve clean water. Then Ecology works with the local community to develop an overall approach to control the pollution, called the implementation plan which includes a monitoring plan to assess effectiveness of the water quality improvement activities. This Samish Bay Watershed Volume 2 TMDL and *Implementation Plan* is to be submitted to EPA along with Volume 1 for approval. The plan identifies specific tasks, responsible parties and timelines for achieving clean water.

Elements required in a TMDL

The goal of a TMDL is to ensure the impaired water will attain water quality standards. A TMDL includes a written, quantitative assessment of water quality problems and of the pollutant sources that cause the problem. The TMDL determines the amount of a given pollutant that can be discharged to the water body and still meet standards (the loading capacity) and allocates that load among the various sources.

If the pollutant comes from a discrete source (referred to as a point source), such as a municipal or industrial facility's discharge pipe, that facility's share of the loading capacity is called a wasteload allocation. If it comes from a set of diffuse sources (referred to as a nonpoint source), such as general urban, residential, or farm runoff, the cumulative share is called a load allocation.

The TMDL must also consider seasonal variations, and include a margin of safety that takes into account any lack of knowledge about the causes of the water quality problem or its loading capacity. A reserve capacity for future loads from growth pressures is sometimes included as well. The sum of the wasteload and load allocations, the margin of safety and any reserve capacity must be equal to or less than the loading capacity.

Identification of the contaminant loading capacity for a water body is an important step in developing a TMDL. EPA defines the loading capacity as "the greatest amount of loading that a water body can receive without violating water quality standards" (EPA, 2001). The loading capacity provides a reference for calculating the amount of pollution reduction needed to bring a water body into compliance with standards. The portion of the receiving water's loading capacity assigned to a particular source is a load or wasteload allocation. By definition, a TMDL is the sum of the allocations, which must not exceed the loading capacity.

TMDL = Loading Capacity = sum of all Wasteload Allocations + sum of all Load Allocations + Margin of Safety

What part of the process are we in?

This report is a revision of the public review draft of the *Samish Bay Watershed Fecal Coliform Bacteria Volume 2 TMDL and Implementation Plan presented* in Skagit County in February 2009. Ecology received comments on the draft and revised the implementation plan. The Response to Comments appears as Appendix D.

Ecology will submit this TMDL to EPA for approval, along with the Samish Bay Watershed Fecal Coliform Bacteria TMDL Volume 1 Water Quality Study Findings (Ecology, 2008). Together, these two reports establish the loading capacity and load and wasteload allocations required for the water bodies in the study to meet state water quality criteria for bacteria. The implementation plan sets out a process for Ecology and our local partners and the residents of the Samish watershed to begin the necessary tasks to improve water quality by 2014.

Geography and Land Uses

Samish Bay and its watershed (Figure 3) are located in northwestern Skagit and southern Whatcom counties, north of Padilla Bay and south of Bellingham Bay, within water resource inventory area (WRIA) 03. The Samish River is the largest single tributary to Samish Bay, contributing an annual average of 83 percent of the total freshwater discharge to the bay. The remaining freshwater flow (17 percent) to the bay comes from Colony Creek, Oyster Creek, and several sloughs and drainage ditches, including Edison Slough. Two larger tributaries of the Samish River are Friday Creek, an important salmon spawning stream that flows from Samish, Cain, and Reed lakes in Whatcom County, and Thomas Creek, which drains agricultural lands east of I-5 near Sedro-Woolley.

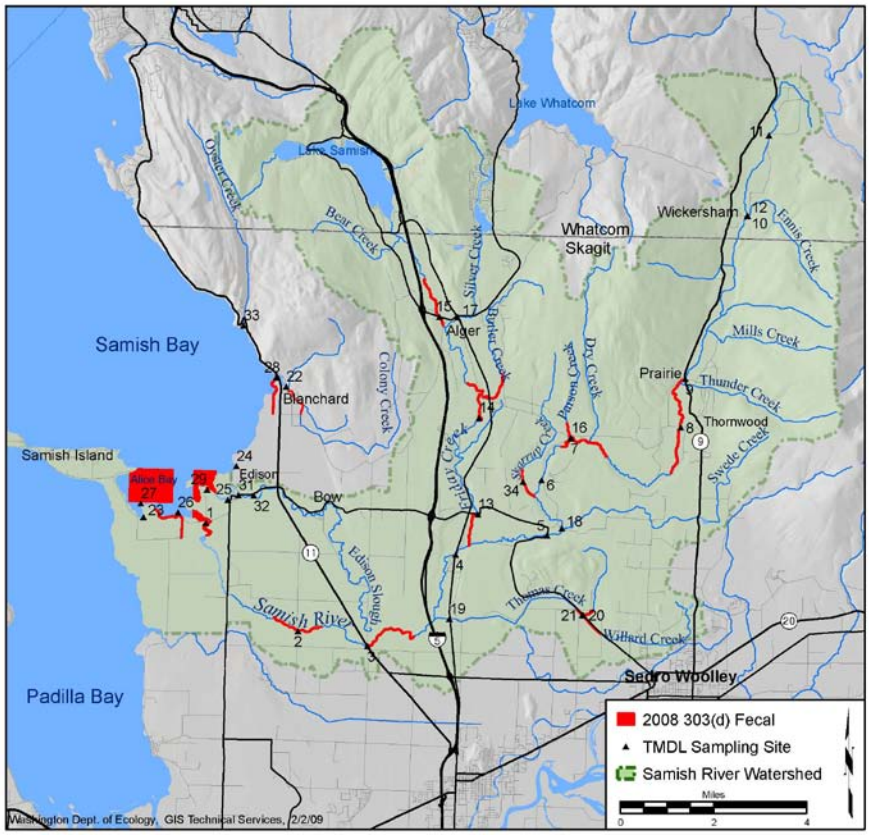

Figure 3. Samish Bay watershed in Skagit and Whatcom counties, *northwest Washington.*

The Samish watershed is 123 square miles in total area and consists of three major subbasins: the Samish River (62 percent in area), Friday Creek (30 percent), and Thomas Creek (8 percent) (Palmer et al., 1996). From its origins in a series of wetlands that divide the Samish and Nooksack watersheds, the Samish mainstem flows south in a low-gradient valley between Anderson Mountain (about 3,000 ft elevation) on the west and a 3,600-ft series of hills to the

southeast, before turning southwest and then west to drain to Samish Bay. In addition to Friday and Thomas creeks, other small tributaries flow into the main channel from adjacent higher terrain. Direct freshwater inputs to Samish Bay besides the Samish River include Oyster Creek, Colony Creek and McElroy Slough, Edison Slough and the Edison drainage system, an unnamed tributary just west of the Samish River, and Alice Bay Slough.

The discharge of this river system responds quickly to precipitation events (Figure 4; flow data from USGS gage 122015500 at Old Highway 99 Bridge; precipitation data from WSU Mount Vernon.) The flashy nature of the Samish River is likely due to rapid runoff from the surrounding hillsides. The Samish valley and stream channel are relatively narrow (confined) in the upper watershed. Precipitation on Anderson Mountain and Lyman Hill comes mainly in the form of rain rather than snow. Runoff is rapid due to the steepness of the tributaries coming off these highlands and the highlands bedrock composition with a low percolation/infiltration rate. This rapid response may also occur in the lower watershed, especially in the Friday Creek drainage. Rainfall runs quickly off the bedrock formations of Chuckanut Mountain and the southern end of Lookout Mountain. Impervious surfaces and logged areas contribute to the problem (B. Smith, 2009).

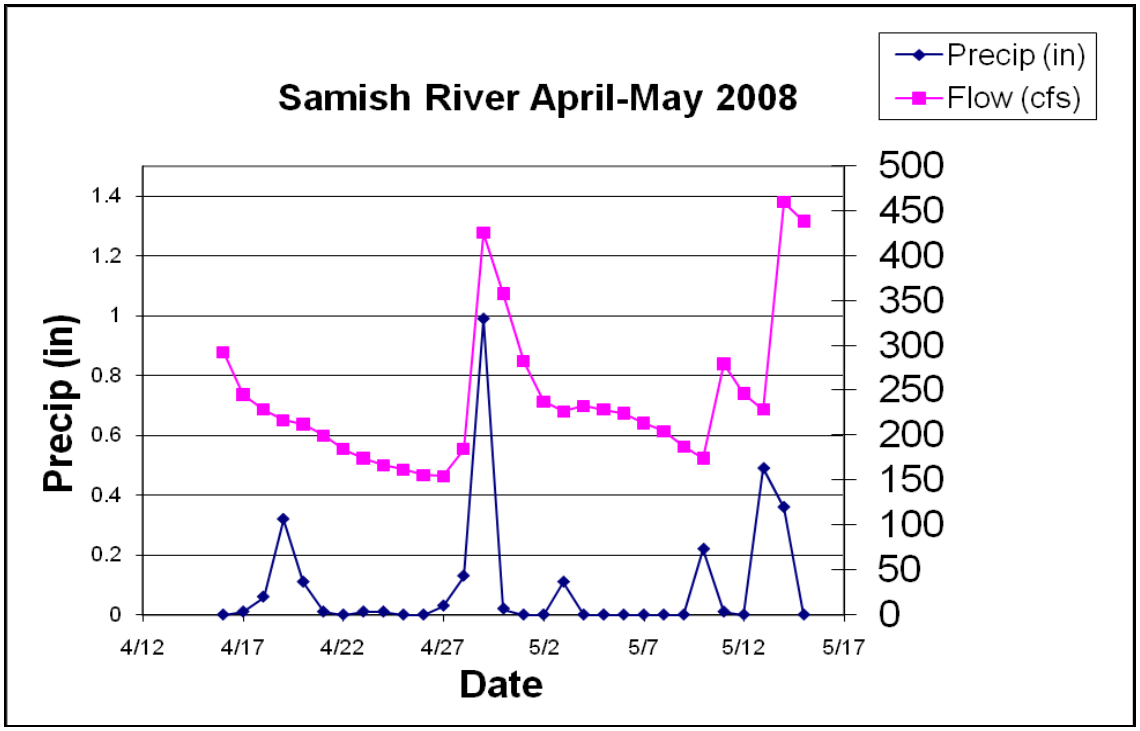

Figure 4. Mean daily flow in Samish River and rain at Mount Vernon *for April-May 2008.*

About 75 percent of the lower Samish basin is used for agriculture, including dairies, heifer and beef cattle operations, crop farms, and noncommercial farms. The lower mainstem Samish River is extensively channelized and diked. Both the river and the sloughs that drain to Samish Bay receive direct runoff and drainage from agricultural ditches, some with tidegates and pump stations. The tidegates, floodgates and drainage ditches are managed by five drainage districts

(Figure 5) that operate under Revised Code of Washington (RCW) 85.06, "Drainage districts and miscellaneous drainage provisions."

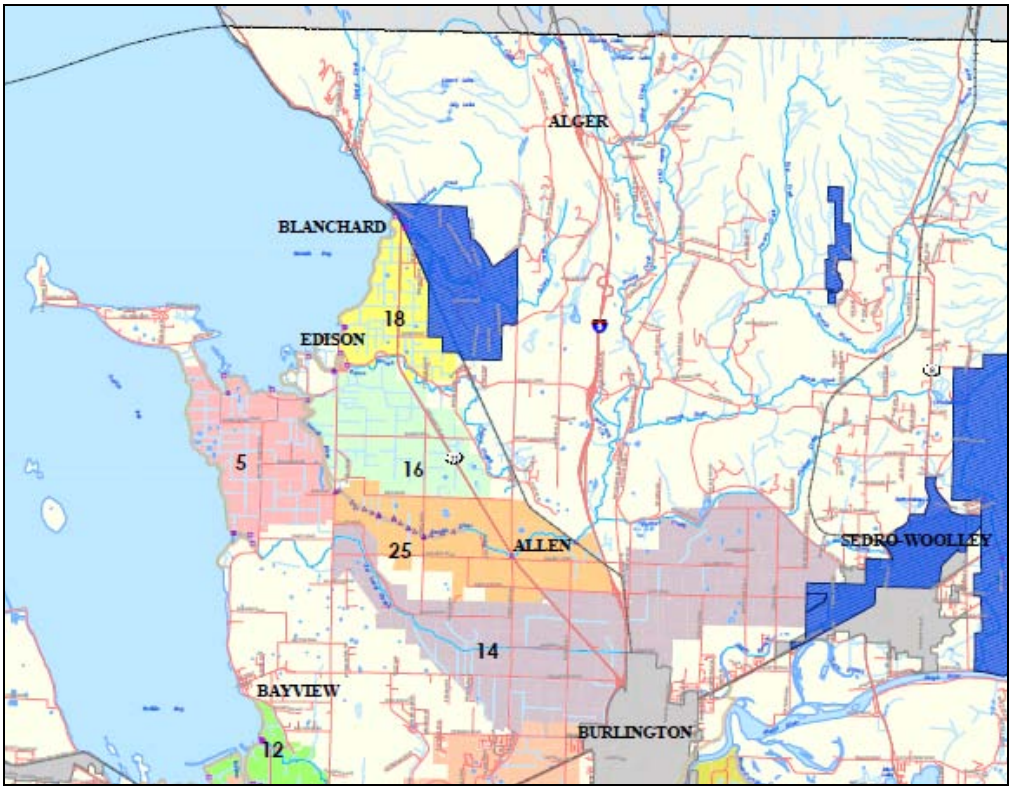

Figure 5. Drainage Districts in the Samish watershed *5, 14, 16, 18, and 25*

About 1,100 acres of Samish Bay tideflats are currently managed for the commercial production of shellfish, primarily Pacific oysters, Manila clams, and geoduck. Commercial growers include Taylor Shellfish, Blau Oyster Farm, Chuckanut Shellfish, Acme Seafood, Samish Bay Oyster Company, Steve Squires and Heckes Clams, Inc. Parts of Samish Bay are also used for recreational shellfish harvest.

Land use and potential bacteria sources

Samish watershed land uses include forest (about 68 percent of area); agriculture (24 percent); rural (three percent); and impervious area (four percent) (Figure 6). There are several sand and gravel operations in the central watershed but very little other industrial activity. Gravel pit operations are regulated by Ecology under a Sand and Gravel General Permit. One golf course is located on Kelleher Road in the Thomas Creek subbasin. Population is scattered throughout the basin, with the villages of Bow, Edison and Blanchard to the west; Alger and Allen in the central corridor; and Prairie, Thornwood, Wickersham, and Doran to the east near Highway 9, which follows the Samish valley north of Thornwood. The city of Sedro-Woolley borders the watershed just east of Thomas and Willard Creeks.

Several types of land uses and human activities in the Samish watershed have the potential to contribute bacteria to surface waters if not managed properly:

- Dairy, heifer, beef and poultry operations: inadequate manure management and livestock access to streams and ditches.
- Small noncommercial farms: inadequate manure management and livestock access to streams and ditches.
- Farms that use animal manure as fertilizer: inadequate manure management and lack of best management practices.
- Residences and businesses: failing or poorly managed onsite sewage systems.
- On the water (live-aboard boats and recreational boating): inadequate management of human waste.
- Fields planted to attract waterfowl: lack of vegetated buffers to reduce contaminated runoff reaching ditches and streams.
- Recreation: inadequate management of human and pet waste.

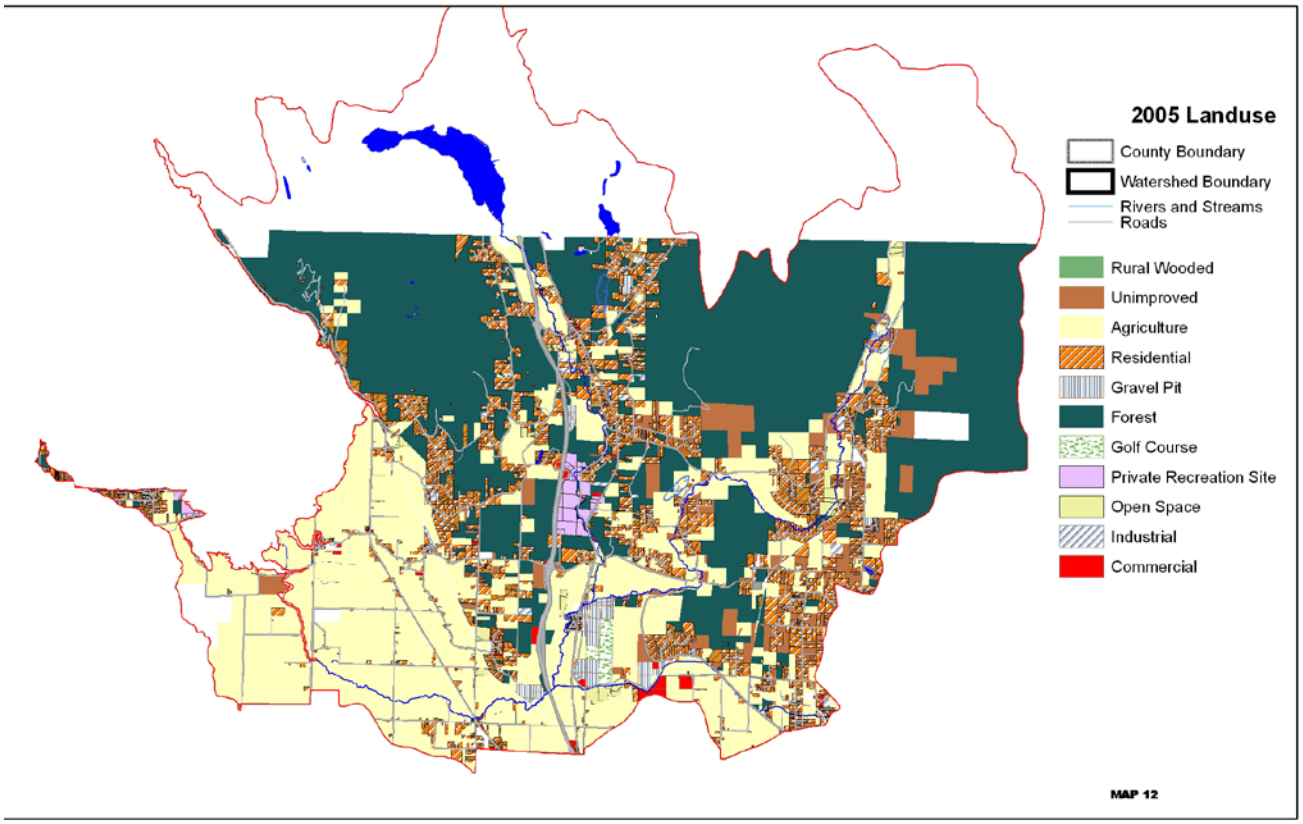

Figure 6. Land uses in the Samish watershed, *based on Skagit County 2005 assessor data (Skagit Conservation District)*

Agriculture

Agriculture in the watershed includes dairies, commercial and noncommercial livestock operations, and commercial cropland (Figure 7). These may contribute fecal coliform bacteria:

- Dairies produce large amounts of liquid and solid manure that must be managed and land applied. Unrestricted access of animals to streams and ditches leads to manure runoff and direct discharges of manure to streams. Animals can impact stream banks and streamside vegetation, thus reducing the filtering and infiltration capacity of the riparian area.
- Commercial livestock operations produce large amounts of manure that must be managed and land-applied. Unrestricted access of animals to streams and ditches leads to manure runoff and direct discharges of manure to streams. Animals can impact stream banks and streamside vegetation, reducing the filtering and infiltration capacity of the riparian area.
- Noncommercial livestock with unrestricted access to streams and ditches generate manure that can runoff via precipitation or be deposited directly to streams. Animals can impact stream banks and vegetation and reduce riparian area filtering and infiltration.
- Cropland (when animal manure is used as a fertilizer): Impacts to surface waters can occur when manure is applied above agronomic rates, during inappropriate times (weather, soil conditions), too close to streams and ditches, and on fields lacking vegetative best management practices or adequate manure setbacks.

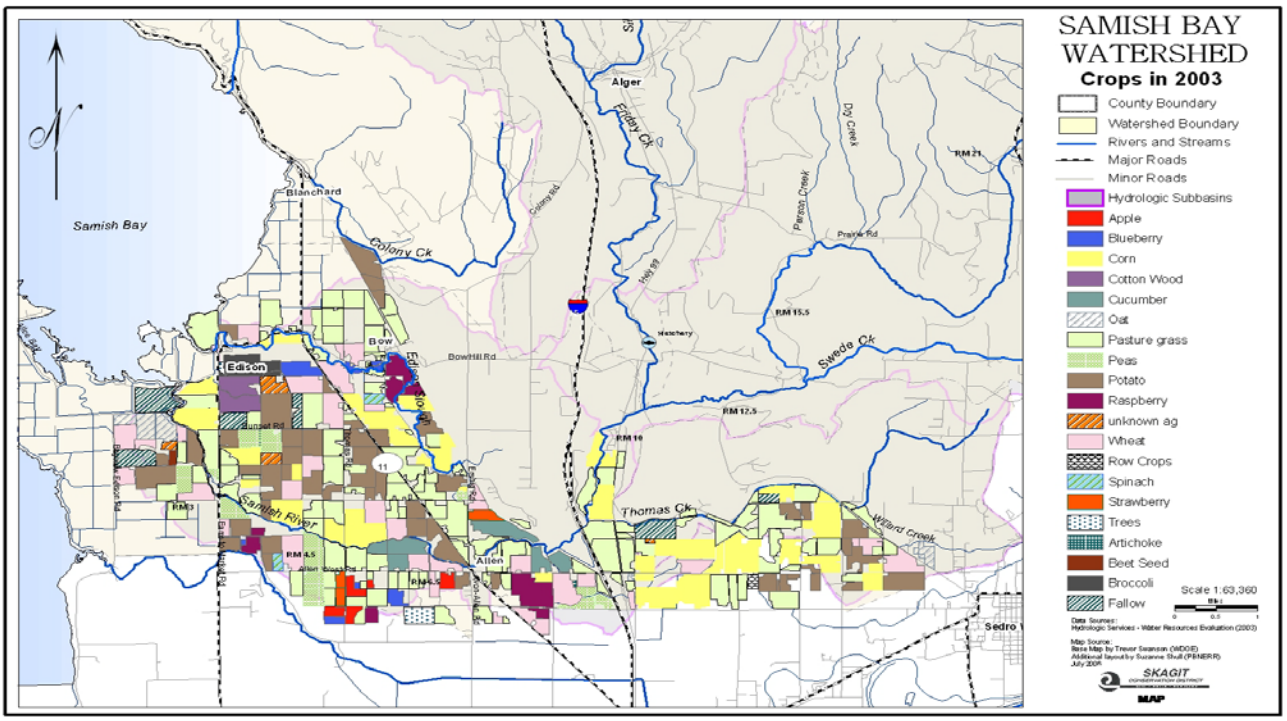

Figure 7. Crops grown in the Samish watershed, *2003 (Skagit Conservation District)*

The watershed has five dairies, about 30 cattle operations, a number of crop farms, and an estimated 360 noncommercial small farms. (Two additional dairies outside the watershed have

fields that may receive manure applications and drain to the watershed via drainage ditches.) Crops grown in the watershed include pasture grass, corn, peas, potatoes, cucumber, spinach, raspberry, strawberry, blueberry, trees, and row crops. Location and distribution of crops in Figure 7 change with crop economics and rotational practices.

Dairies in Washington State are regulated under the Dairy Nutrient Management Act, with oversight provided by Washington State Department of Agriculture. The Samish watershed has a number of heifer operations. If owned by a dairy, a heifer operation is covered under the dairy's nutrient management plan. However, some heifer operations are not owned by dairies and so are not covered by the state Nutrient Management Program. Skagit County Planning and Development Services does enforcement related to SCC 14.24.120, which limits livestock access to streams. Water quality concerns related to these independent operations default to Ecology.

Commercial beef (cattle) operations that are animal feeding operations (meaning they confine animals and provide food for them for 45 or more days per year) are potentially eligible for coverage under the state concentrated animal feeding operation (CAFO) general permit. Most commercial beef operations in the Samish fit the definition of an animal feeding operation.

Washington law does not require animal feeding operations to apply for coverage as a CAFO unless an operation has had a documented discharge to surface waters. The number of CAFOs statewide is small (about 30), and most have been brought under permit coverage through finding a discharge to state waters. Ecology's CAFO permit follows EPA's definitions of large and medium sizes; for beef, large animal feeding operations are those with 1000 or more animals, and medium animal feeding operations are those with 300 to 999 animals. Ecology has the authority to designate smaller operations as CAFOs if they have a discharge to surface waters and have been shown to contribute significantly to surface water quality degradation. CAFO designation is not limited to commercial facilities (having more than $10,000 per year in sales).

Besides heifer and beef cattle operations, poultry and egg processing operations, and alpaca ranches, other commercial animal facilities in the Samish include stables and riding facilities for horses, and dog kennels. Although these are licensed business operations, there is no regulatory program providing technical assistance and oversight for animal waste handling.

The Samish watershed also has many noncommercial farms with a wide variety of livestock, including alpacas, pigs, poultry, goats, horses, and others. (A noncommercial farm is one with less than $10,000 per year in sales.) Ecology estimates the Samish has about 360 noncommercial livestock operations. The locations of small livestock operations and their relationship to TMDL monitoring sites with high fecal coliform concentrations are shown in Figure 8. These noncommercial farms have no regulatory program providing technical assistance and oversight unless they either apply for coverage under the CAFO permit or are required to do so through the finding of a discharge that contributes significantly to water quality degradation.

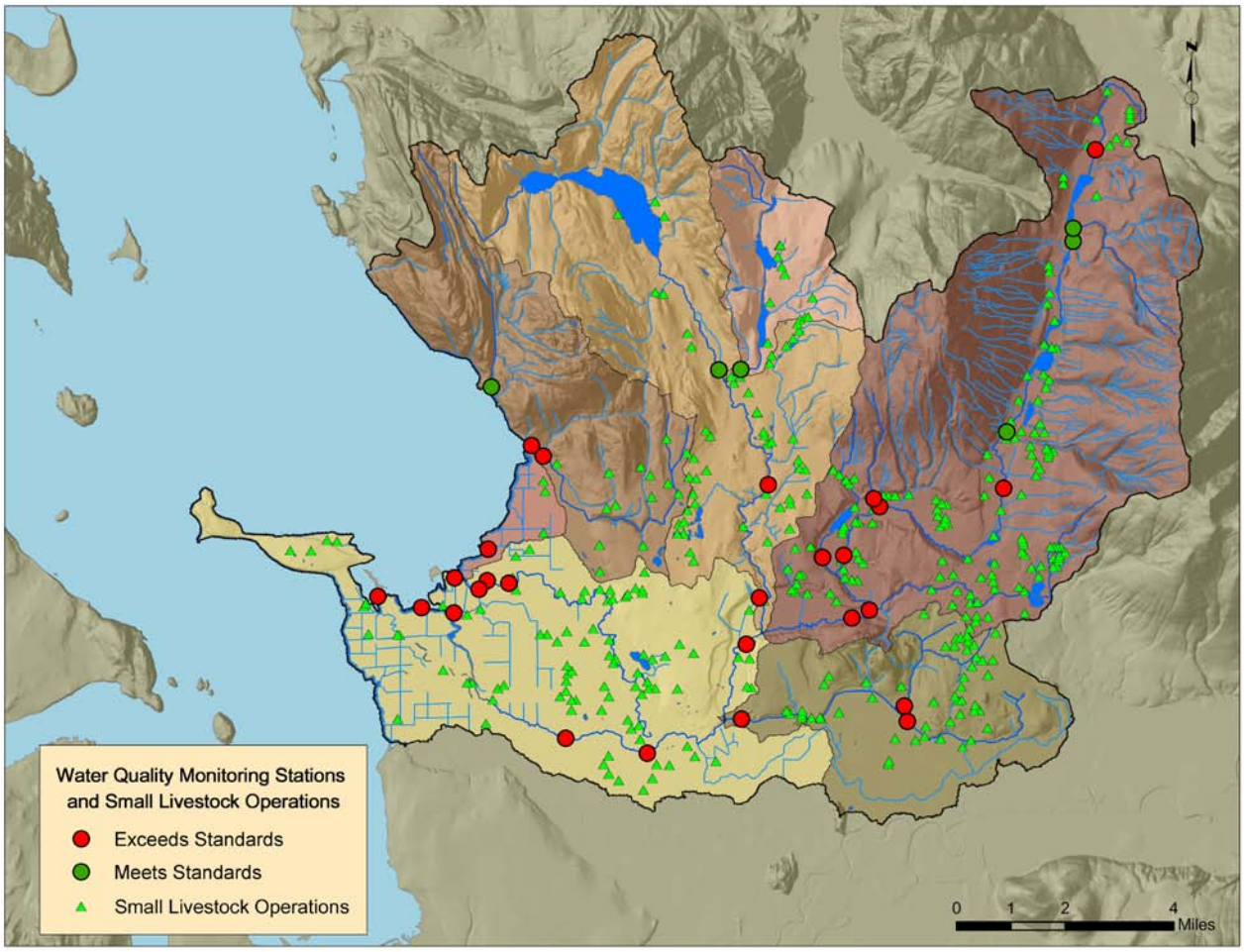

Figure 8. Locations of small noncommercial farms *including horse properties in the Samish watershed and TMDL monitoring sites that meet/do not meet state bacteria standard***s.**

Onsite sewage systems

Except for two neighborhoods, all homes and businesses in the Samish watershed use onsite systems to treat human waste. The exceptions are the community collection and treatment system for the village of Edison near Samish Bay and the residences along the east side of Lake Samish. East Lake Samish residences are served by a sewer collection line that runs south in the Old Highway 99 corridor to the city of Burlington's municipal wastewater treatment plant. In unincorporated Edison, homes discharge to a wastewater collection system built in 1996. Wastewater is treated biologically in a recalculating gravel filter, followed by ultraviolet disinfection and then discharge below ground via infiltrating trenches located approximately 750 ft south of Edison Slough. The system is not yet under permit; state Department of Health is responsible for issuing a state waste discharge permit for the ground discharge, and Skagit County will be the permit holder.

Based on estimates from Skagit County Health Department (SCHD), there are nearly 6,000 property parcels with residences in the Samish watershed. The county began permitting onsite

sewage systems in 1950s. Current SCHD records of permitted onsite sewage systems for the Samish watershed include information about the type and operating condition for approximately 2,000 systems. These records have no information about the presence or operating status of some 3,500 other assumed onsite systems. The SCHD has an active education and public outreach campaign as part of its effort to fill this data gap. Additional information about SCHD's program for inspections of onsite sewage systems in the Samish watershed is provided in the section, "Pollution sources and organizational actions, goals and schedules."

Recreation

Recreation is important in this watershed. Besides recreational shell fishing and boating or kayaking in Samish Bay, fishing, particularly for salmon, is popular on the Samish River. Hunting and birding are popular in the lower basin; migratory waterfowl are attracted to crop fields at privately-owned farms and WDFW conservation areas near Samish Bay that are managed for hunting in the fall. Approximately 1500 acres of land historically in crop production has in recent years been converted to private waterfowl hunting clubs with created wetlands and crops planted to attract waterfowl. This draws birds, hunters and dogs that could be contributing added fecal coliform loading. Hiking and hang-gliding are also popular on Blanchard Mountain, much of which is property owned by Washington Department of Natural Resources (DNR). Any of these activities may be a source of bacteria pollution if the waste of recreating humans and their pets is not disposed of properly and reaches surface waters.

Subbasins in the Samish watershed

The Samish watershed has seven subbasins, shown in Figure 9. The principal potential nonpoint sources of bacteria pollution in each subbasin are summarized in Table 3.

Table 3. Summary of principal potential nonpoint bacteria sources in Samish subbasins.

Sebastia[n]	Onsite Sewage Systems[b]	Noncommercial Livestock Parcels	Dairies[c]	Dairy parcels[d]	Cattle parcels
Lower Samish	1385	93	4	49	7
Friday Creek	547	49	0	0	0
Upper Samish	927	146	1	7	10
Colony Creek	339	14	0	0	1
Thomas Creek	1926	50	2	20	3
Samish Bay	27	3	0	7	0
Silver Creek	144	13	0	0	0
Total	*5295*	*368*	*7*	*83*	*21*

[a] *Subbasin boundaries shown in Figure 9.*
[b] *Numbers of permitted systems known to SCHD, which estimates there are likely about 6,000 improved parcels in the watershed that "ought to have" an onsite sewage system*
[c] *Number of dairies includes dairies with facility addresses in the Samish watershed and two dairies outside the watershed with parcels that drain to tributaries of the Samish.*

[d]*Estimated number of assessor parcels under dairy ownership that could potentially receive manure application.*

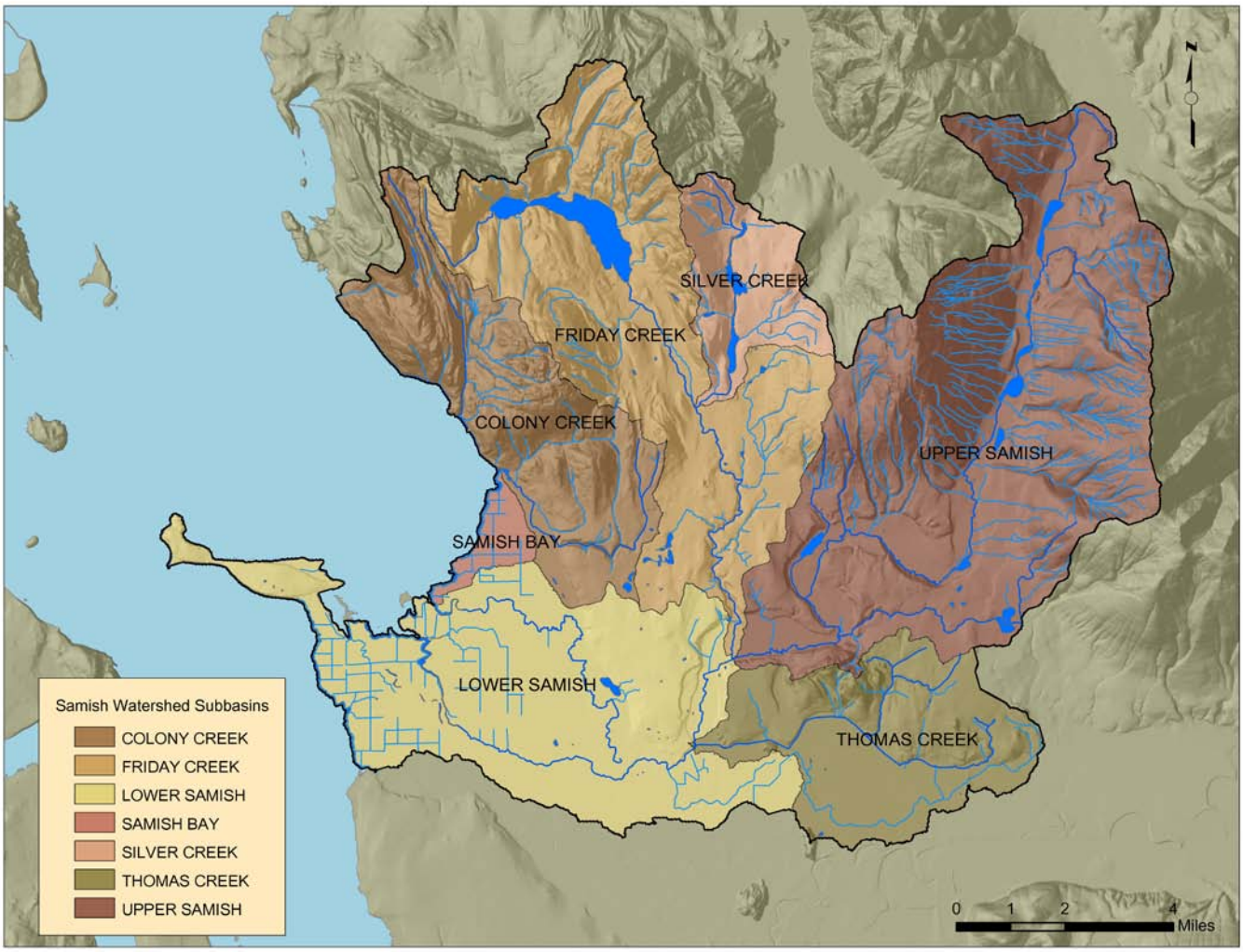

Figure 9. Subbasins in the Samish Bay watershed.

Lower Samish subbasin

The lower Samish subbasin's upstream boundary is at the Friday Creek confluence (Figure 9). The subbasin includes the Edison Slough area and the entire southern shoreline of Samish Bay and Samish Island. It includes the areas associated with three drainage districts: 5, 16 and 25 (Figure 5). Primary land uses include the businesses, residences, and agriculture of Edison and Bow, including four dairies, three heifer operations, seven cattle farms, as many as 93 noncommercial farms, a number of parcels used as pasture, and crop fields. About 1500 acres of former agricultural fields near the bay are managed to attract waterfowl for hunting. A WDFW Conservation Area is also managed for waterfowl and hunting.

Current records in Skagit County Health Department's database for onsite sewage systems indicate the status of improved parcels (those with homes) in the lower Samish and Samish Bay subbasins (Figure 10). The color key to onsite system status figures on the following pages is:

- Red = No inspection, no permit history (unknown)
- Yellow = Permit or maintenance history (such as a recent pump out of septic tank)
- Green = Recent O&M inspection or recent repair
- Purple = Sewer connect

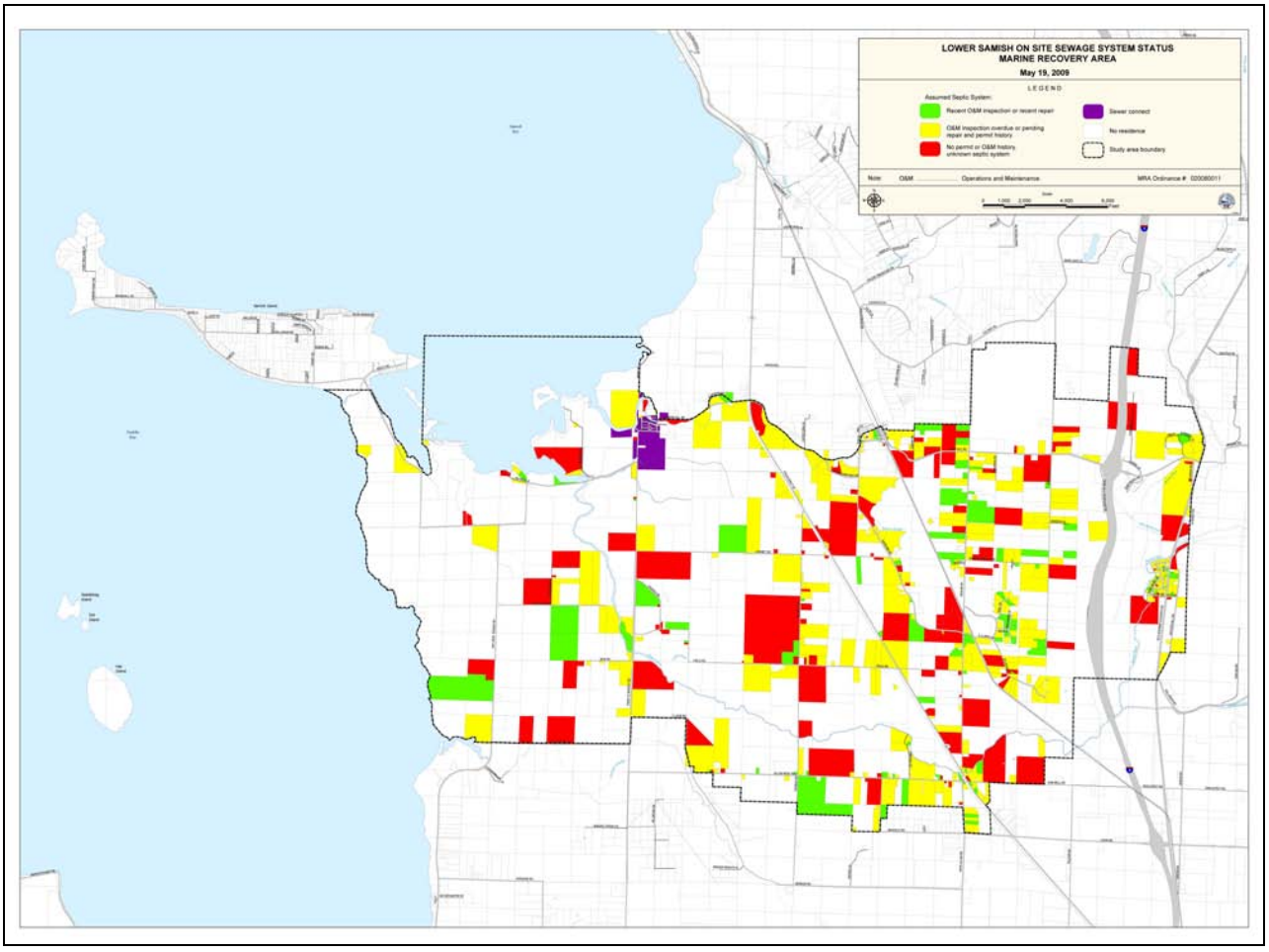

Figure 10. Onsite sewage system status in lower Samish watershed *(SCHD 2009).*

Friday Creek subbasin

The Friday Creek subbasin extends from several small drainages surrounding Lake Samish and terminates at the confluence of Friday Creek with the Samish River (Figure 9). The subbasin has forest and rural residential land uses and about 50 noncommercial farms. A Washington Department of Fish and Wildlife (WDFW) hatchery operates on Friday Creek just above its confluence with the Samish. Potential sources of fecal coliform pollution are primarily onsite

sewage systems and noncommercial farms. Onsite sewage system status for improved properties in Friday Creek and upper Samish subbasins is shown in Fig. 11.

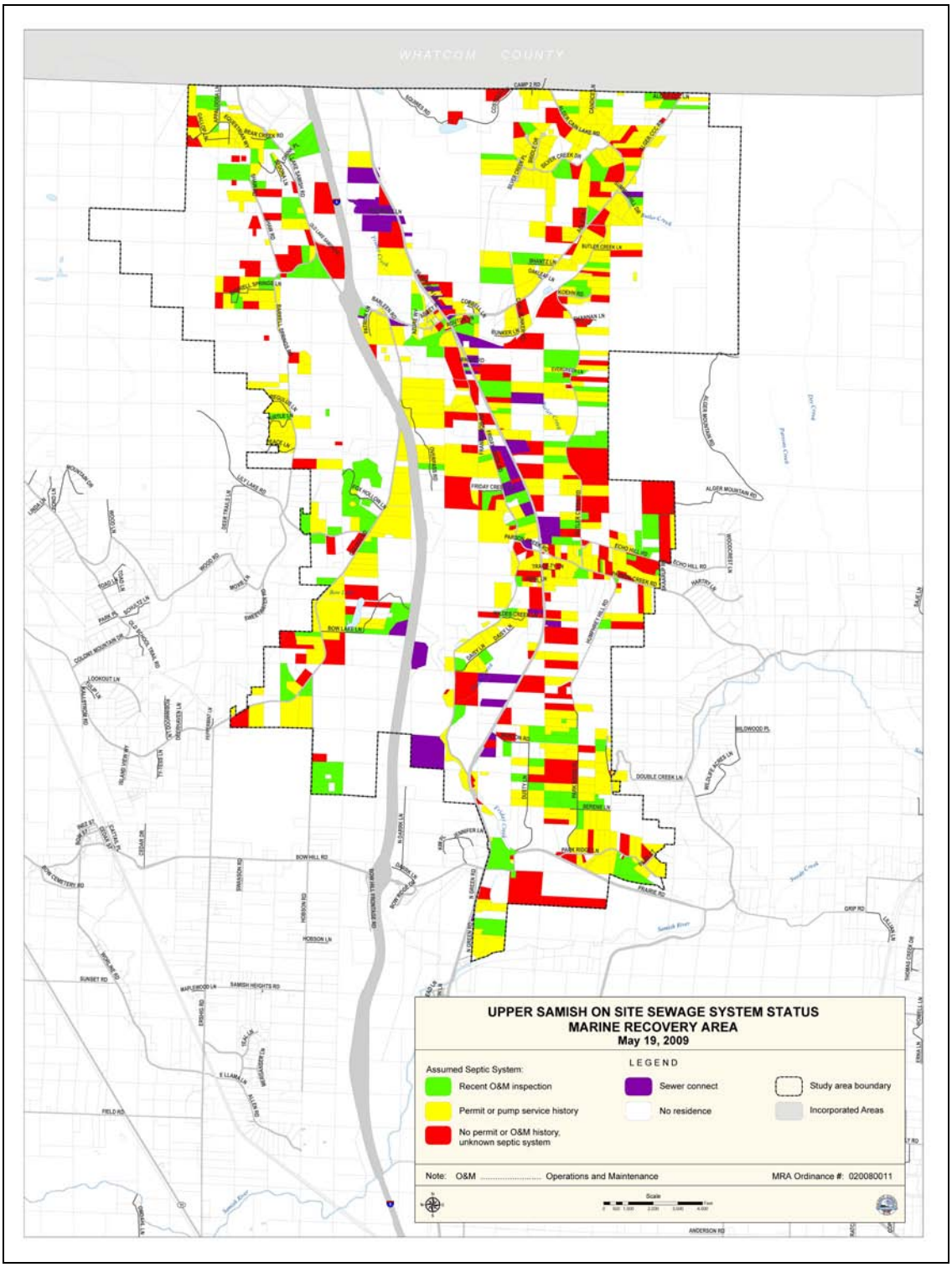

Figure 11. Onsite sewage system status in upper Samish, *Friday and Silver Creeks* *(SCHD 2009)*

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Thomas Creek subbasin

Thomas Creek drains agricultural, forest, and rural residential areas in the southeastern corner of the watershed (Figure 9). South of the creek is agricultural land, including two dairies considered part of Padilla Bay watershed but which have parcels for manure application that drain to Thomas Creek. Some beef operations, pasture, corn and other crops are located here. To the north are rural residential parcels and noncommercial farms on low, forested hills. Drainage District 14 manages flooding issues in Thomas Creek subbasin and the upper two-thirds of Joe Leary Slough, which drains to Padilla Bay. About 50 noncommercial farms are in the subbasin. Willard Creek is an important tributary of Thomas and includes residential and livestock land uses. Onsite sewage system status for improved parcels in Thomas Creek is shown in Figure 12.

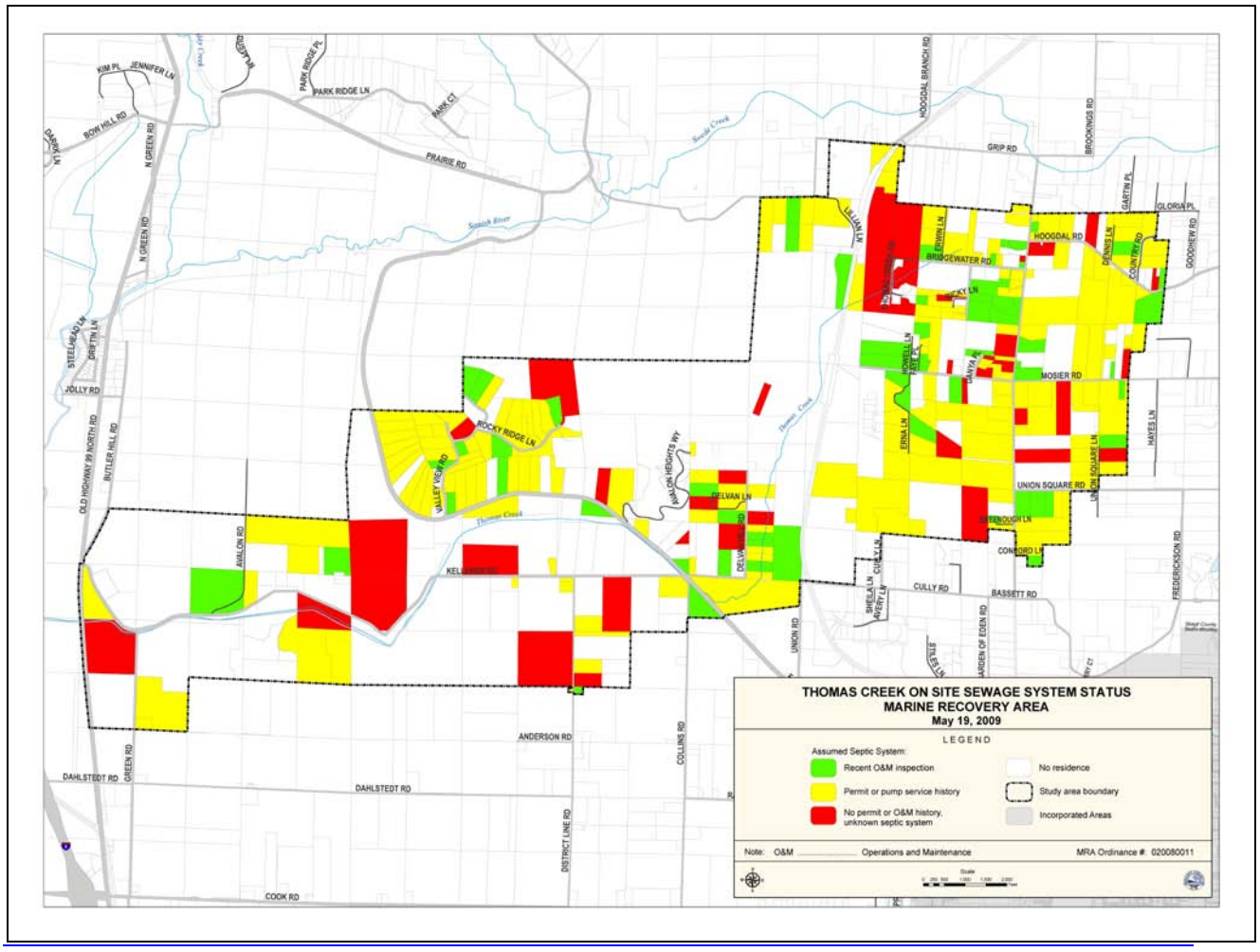

Figure 12. Onsite sewage system status in Thomas Creek subbasin *(SCHD 2009).*

Upper Samish subbasin

The upper Samish River begins in Whatcom County (Figure 9) in a channel that receives ground water from a hillside and flows through areas with cattle and some onsite sewage systems. Entering Skagit County, the river flows through wetlands in a narrow valley next to Highway 9 before wending westward through the community of Prairie. After Prairie, it flows through forest then open pasture with beef operations and one dairy. It receives drainage from several small creeks, including Parsons, Skarrup, and Swede, which were monitored for the TMDL. Friday Creek joins the river just before the Old Highway 99 Bridge. Besides one dairy and about ten beef operations, the subbasin has nearly 150 noncommercial farms. Onsite sewage system status for the upper Samish and Friday Creek basins is shown in Figure 11.

Colony Creek subbasin

The Colony Creek subbasin (Figure 9) includes Oyster Creek, a separate drainage to Samish Bay, and is mapped as part of water resource inventory area 1 (WRIA 1). Both creeks start in forested, steep slopes of the Chuckanut Mountains. There is little development on Oyster Creek, but the Colony Creek subbasin has many new rural residences, one cattle operation and 14 noncommercial livestock operations. Onsite sewage system status is indicated in Figure 13.

Samish Bay subbasin

The smallest of the subbasins is the shoreline area of Samish Bay north of Edison and south of Colony Creek (Figure 9). Its boundaries are fairly close to those of Drainage District 18 and include McElroy Slough and the north Edison drainage. Land uses include some residences, some pasture associated with dairies, and three noncommercial livestock operations. Onsite sewage system status for parcels in this subbasin is included in Figure 10.

Silver Creek subbasin

The Silver Creek subbasin lies just east of Lake Samish and just south of Lake Whatcom (Figure 9). Cain and Reed Lakes drain to Silver Creek, which flows through the village of Alger and joins Friday Creek just east of the I-5 corridor. The basin is densely settled around the two small lakes, but otherwise is rural and has about 13 noncommercial farms. Onsite sewage system status for this subbasin is included in Figure 11.

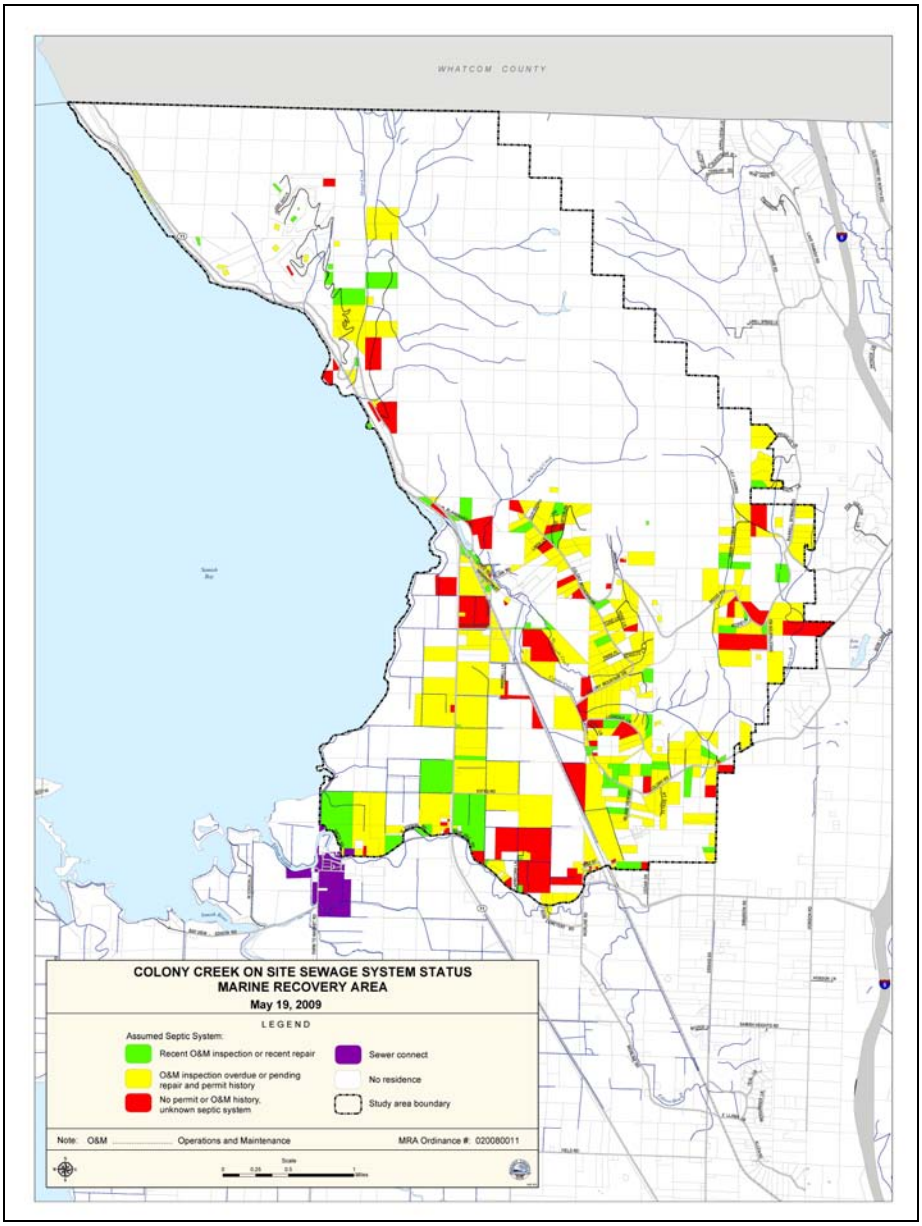

Figure 13. Onsite sewage system status in Colony Creek subbasin *(SCHD 2009).*

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Water Quality Standards for Bacteria

When the state establishes water quality standards for pollutants, they also designate the level of protection for different water bodies. Samish Bay and its freshwater tributaries, including the Samish River, are designated "Primary Contact" waters. This designation comes with specific numeric criteria for marine water bodies and freshwater.

Numeric criteria for freshwaters

For freshwater, the *primary contact* designation is assigned for waters "where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and waterskiing." More to the point, however, the use is to be designated to any waters where human exposure is likely to include exposure of the eyes, ears, nose, and throat. Since children are also the most sensitive group for many of the waterborne pathogens of concern, even shallow waters may warrant primary contact protection. To protect this use category: *"Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies/mL"* [WAC 173-201A-200(2)(b), 2003 edition].

Compliance is based on meeting both the geometric mean criterion and the ten percent of samples (or single sample if less than ten total samples) limit. These freshwater criteria (a geometric mean of 100 colonies per 100 mL and no more than 10 percent of samples to exceed 200 colonies per mL) (Table 4) are designed to allow seven or fewer illnesses out of every 1,000 people engaged in primary contact activities. Once the concentration of fecal coliform (FC) in the water reaches the numeric criterion, human activities that would increase the concentration above the criteria are not allowed. If the criterion is exceeded, the state will require that human activities be conducted in a manner that will bring FC concentrations back into compliance with the standard. (Note that Ecology uses the 90th percentile value as an equivalent statistic for a set of samples in place of the second part of the standard – no more than 10 percent of samples may exceed a value of 200 cfu/100 mL.)

Table 4. Freshwater fecal coliform standards.

Freshwater Standard	Geometric Mean (cfu/100 mL)	90th Percentile (cfu/100 mL)
Samish River and tributaries (Excellent)	100	200
Freshwater tributaries to Samish Bay (Excellent)	100	200

If natural levels of FC (from wildlife) cause criteria to be exceeded, no allowance exists for human sources to measurably increase bacterial pollution further. While the specific level of

illness rates caused by animal versus human sources has not been quantitatively determined, warm-blooded animals (particularly those that are managed by humans and thus exposed to human-derived pathogens as well as those of animal origin) are a common source of serious waterborne illness for humans.

Numeric criteria for marine waters

In marine (salt) waters, bacteria criteria (Table 5) are set to protect shellfish consumption and people who work and play in and on the water. Two bacterial indicators are used in the state's marine waters: (1) in waters protected for both primary contact recreation and shellfish harvesting, FC bacteria are used as indicator bacteria to gauge the risk of waterborne diseases and (2) in water protected only for secondary contact, enterococci bacteria are used as the indicator bacteria.

The presence of these bacteria in the water indicates the presence of waste from humans or other warm-blooded animals. Waste from warm-blooded animals is more likely to contain pathogens that will cause illness in humans than waste from cold-blooded animals.

To protect shellfish harvesting and primary contact recreation (swimming or water play): *"Fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100mL"* [WAC 173-201A-210(3)(b), 2003 edition].

Table 5. Marine fecal coliform standards.

Marine Standard	Geometric Mean (cfu/100 mL)	90th Percentile (cfu/100 mL)
Samish Bay (shellfish harvesting & primary contact recreation)	14	43

The criterion level set to protect shellfish harvesting and primary contact recreation is consistent with federal shellfish sanitation rules. Fecal coliform concentrations in our marine waters that meet shellfish protection requirements also meet the federal recommendations for protecting people who engage in primary water contact activities. Thus, the same criterion is used to protect both "shellfish harvesting" and "primary contact" uses in Washington State standards.

Compliance is based on meeting both the geometric mean criterion and the ten percent of samples (or single sample if less than ten total samples) limit. These two measures must be used in combination to ensure that the bacterial pollution in a water body will be maintained at levels that will not cause a greater risk to human health. While some discretion exists for selecting sample averaging periods, compliance will be evaluated for both monthly (if five or more samples exist) and seasonal (for example, dry-season versus wet-season) data sets.

Once the concentration of fecal coliform bacteria in the water reaches the numeric criterion, human activities that would increase the concentration above that criterion are not allowed. If the criterion is exceeded, the state will require that human activities be conducted in a manner that will bring bacteria concentrations back into compliance with the standards.

If natural levels of bacteria (from wildlife) cause criteria to be exceeded, no allowance exists for human sources to measurably increase bacterial pollution further. While the specific level of illness rates caused by animal versus human sources has not been quantitatively determined, warm-blooded animals are a common source of serious waterborne illness for humans.

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Current Water Quality Conditions

In 2006-2007, Washington Department of Ecology (Ecology) conducted a monitoring study of fecal coliform bacteria in the Samish Bay watershed. The study (Ecology 2008) provides the basis for developing a total maximum daily load (TMDL) that defines the loading capacity of the surface waters of the Samish watershed.

The TMDL study was designed to identify and characterize the concentrations and loads of bacteria from tributaries, point sources, and drainages to Samish Bay under various seasonal and hydrological conditions. Over the 13 months of data collection, Ecology measured fecal coliform bacteria, streamflow and other water quality parameters at 33 fixed locations, twice monthly. To investigate potential sources of bacteria, Ecology sampled at 28 other sites in the watershed on an as-needed basis. Ecology also monitored water quality in the basin during a two-day storm event, November 6-7, 2006.

The Ecology study provides a detailed picture of current water quality conditions in this watershed and the information necessary to establish the bacteria loading capacity of several water bodies' bacteria (Figure 14). Skagit County also monitors water quality twice monthly at 11 sites in the Samish (results at www.skagitcounty.net/SCMP).

This section uses the study results to describe, in general terms, the seriousness of the pollution in the Samish watershed, the use of the critical season in determining how much reduction in fecal coliform must occur, and how Ecology establishes load allocations and wasteload allocations. These terms refer to the amount of pollution that nonpoint (diffuse) sources and point (discrete) sources can legally discharge when the water bodies have been cleaned up to the point of meeting state water quality standards. Appendix B provides a step-by-step explanation of how the water quality study results are used to establish load and wasteload allocations.

How polluted is the Samish watershed?

Over the past ten years, hard work by Samish residents led to some improvement in water quality. At a long-term monitoring station on the Samish River at the Old Highway 99 Bridge in Burlington, Ecology sampling shows a significant decrease in bacteria between 1998 and 2008. Manure management at dairies improved since the state Nutrient Management Act was passed in 1995. The onsite sewage system repairs and replacements in Blanchard, and the new community onsite sewage system in Edison significantly reduced the bacteria going directly into Samish Bay. The work by the Skagit Conservation District and the Skagit Stream Team helped raise awareness among rural residents and livestock owners regarding the need for careful management of animal waste to avoid contaminating streams (Skagit Stream Team 2004).

However, Ecology's 2006-2007 study confirms that much more work remains to be done. Of the 34 sites monitored regularly for the TMDL, only 14 were in compliance (meeting both parts of the state standard for fecal coliform bacteria). Seven sites failed to meet both parts of the standard; an additional 12 met one part; and 1 site had insufficient samples for comparison.

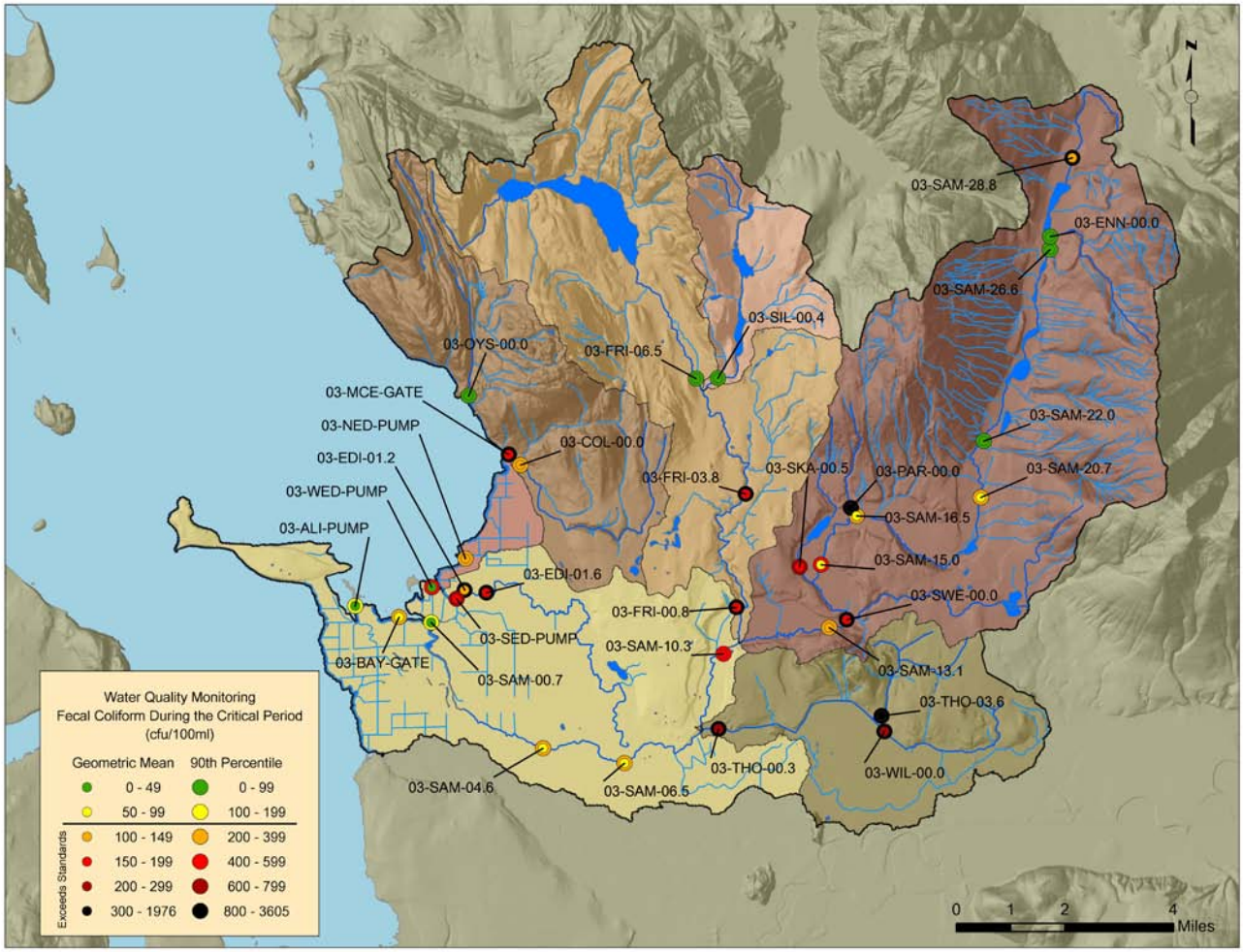

Figure 14. Ecology 2006-2007 monitoring statistics for bacteria during critical period *compared with state fecal coliform standards. To be in compliance, data must meet both parts of the state standard.*

The state Department of Health (DOH) shellfish classification map for Samish Bay shows that the "approved" areas are farther from shore and get greater mixing with clean seawater. The "prohibited areas" are Alice Bay, the areas closest to the mouth and drainage channel of the Samish River, and the area receiving discharge from Edison Slough and several agricultural drainage ditches around Edison (Figure 15) (Sullivan, 2008).

Is there a seasonal critical condition for bacterial pollution in the Samish watershed?

Clean Water Act Section 303(d)(1) requires that TMDLs be established at levels necessary to implement the applicable water quality standards with seasonal variations. The TMDL regulations also require that critical conditions for streamflow and loading of the pollutant of concern be taken into account. In other words, in order to improve water quality in Samish Bay,

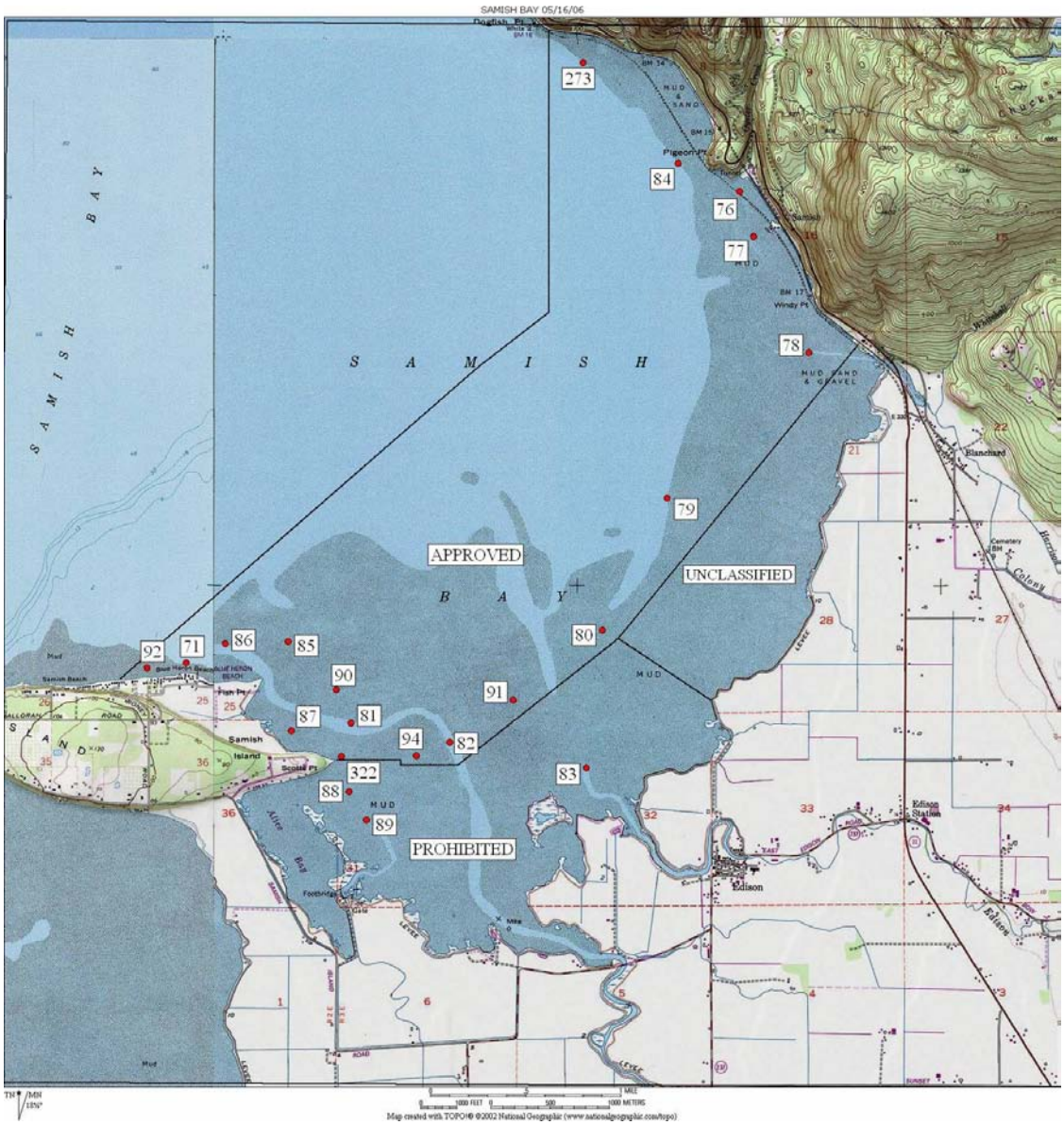

Figure 15. Shellfish growing area classifications and DOH sampling sites in Samish Bay, *December 2007 (Wash. DOH Office of Shellfish Protection).*

Ecology must determine what seasons and conditions in the watershed are associated with the highest (worst) levels of bacteria in Samish Bay.

In the Samish watershed, bacteria concentrations and loading vary seasonally. The "critical condition" refers to the season of the year with the poorest water quality. To determine the critical condition, Ecology reviewed state Department of Health's marine water quality for Samish Bay. These data have been collected for more than ten years. Ecology calculated the monthly average bacteria concentrations for Station 82 (the closest "approved" station to the mouth of the Samish River) (Figure 11) and found that the months November, December and January have the poorest water quality compared with other times of year (Figure 16).

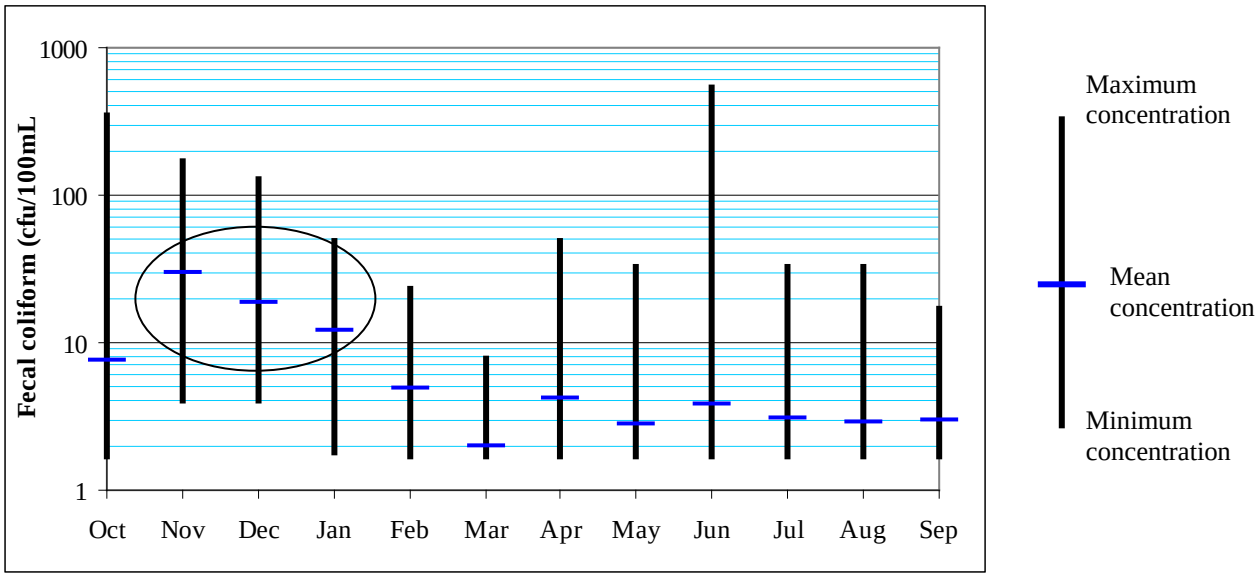

Figure 16. Monthly geometric mean and range of bacteria concentrations at DOH station 82 *in Samish Bay (DOH 1995-2007 monitoring data).*

Ecology then reviewed data for the Samish River to determine what months the river was carrying the largest *load* of bacteria to Samish Bay. (Ecology compares monthly *loads* [= flow multiplied by concentration] rather than concentrations because loading is a better measure of the total amount of bacteria delivered by the river to Samish Bay.)

Based on both Ecology data and Skagit County monitoring program data, the Samish River delivers the highest loads to Samish Bay in November, December, January and June (see Ecology 2008 for more detail). This shows good agreement with the bay's critical winter season, based on DOH sampling (Figure 16). One difference is the high load carried by the river in June. Fecal coliform bacteria are killed both by sunlight (ultraviolet light) and salinity. Even though the load in the river starts out high, with lower flows in June, the journey to Samish Bay is slower, and the bacteria are exposed to more hours of daylight both in the river and in the bay. With less river flow, the bacteria that do reach the bay are exposed to saline water more quickly. The effects of both daylight and salinity reduce the concentrations in the bay in June, though some high values have been measured (Figure 16).

Which freshwater sources carry the largest bacteria loads to Samish Bay?

The Samish River is the largest contributor of fecal coliform bacteria to the bay. On an average annual basis, it contributes 83 percent of the total freshwater discharge (flow) to the bay. However, it contributes 70 percent of the total bacteria loading to the bay (Figure 17). The remainder of the bacteria loading comes from several tidal sloughs (totaling 25 percent), Colony Creek (four percent) and Oyster Creek (less than one percent). Of the sloughs that drain to Samish Bay, the South Edison drainage (SED-PUMP) contributes half the estimated annual bacteria loading.

The distribution of loading to Samish Bay helps us determine where to focus cleanup actions. Actions that will reduce bacteria loading in the Samish River are the highest priority for reducing bacteria discharge to the bay. However, the tidal sloughs together with Colony Creek contribute a significant amount, and because they are close to the bay, reducing bacteria in these sources is also a high priority.

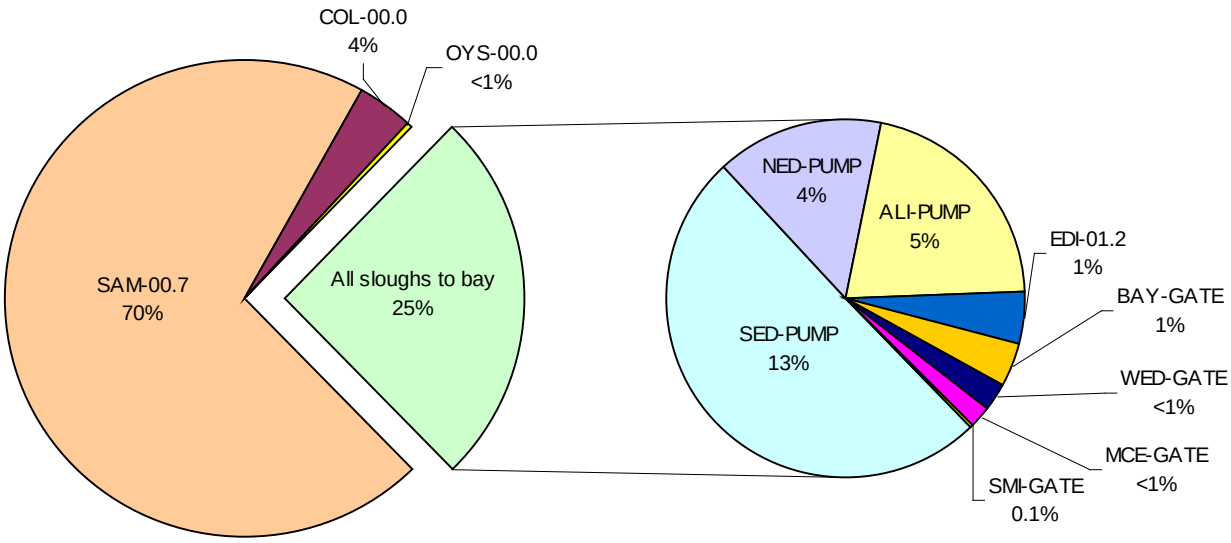

Figure 17. Estimated average annual loading from tributaries to Samish Bay *during the 2006-2007 TMDL study.*

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Targets for Bacteria Reduction

A total maximum daily load assesses the amount of pollutant a water body can accept and still meet standards. Ecology reviewed the locations in Samish freshwaters that do not meet standards (Figure 14). Then, we determined how much the bacteria need to be reduced at key locations so that both marine waters of Samish Bay and freshwaters will meet standards. Once the percent reduction of bacteria is calculated for each site, the remaining amount of bacteria allowed for nonpoint sources is called the load allocation, and that allowed for point sources is called the wasteload allocation.

The Samish TMDL study (Ecology 2008a, Tables 14-17) recommended fecal coliform targets (nonpoint load allocations) for all water body reaches above monitoring sites that did not meet standards during the critical period. Ecology developed these fecal coliform targets/load allocations, using the Statistical Rollback method (Ott, 1995) to determine the percent reduction in the geometric mean or the 90th percentile (whichever required the greatest reduction) needed to meet standards.

The methods used to calculate how much the bacteria needs to be reduced are explained more fully in Appendix B of this document and in the study itself (Ecology 2008a). The quality assurance procedures used to ensure that study design, sample collection methods, and statistical treatment of the data meet Ecology's standards are described in the Quality Assurance Project Plan (Swanson 2006).

What are acceptable levels of bacteria in the Samish River and other tributaries?

Most locations in the Samish watershed monitored by Ecology in 2006-2007 had too much bacteria to be in compliance with the state water quality standards (Figure 10). To set target concentrations, Ecology determined the critical season (period of highest concentration) for each monitoring site. These differed somewhat between sites, but generally occurred during summer (Tables 6 and 7).

To be conservative, Ecology calculated the percent reductions needed for the key monitoring sites to meet freshwater standards during the critical periods. Sites on the lower Samish River, Colony Creek, and other direct tributaries that are very close to Samish Bay need larger reductions in order to meet the stricter marine standards for fecal coliform bacteria.

The percent reductions in fecal coliform (FC) bacteria needed at key sites in the Samish watershed are shown in Tables 6 and 7 and Figure 18 (for Figure 18, the percent reductions are shown in ranges). You can see that the largest reductions (60 to 99 percent) are needed in the lower Samish below the confluence with Friday Creek, in the tributaries Thomas, Friday, Skarrup, Swede and Parsons Creeks, and in several direct discharges to Samish Bay. We can use these locations needing the largest percent reductions to help prioritize education and outreach to landowners and focus implementation efforts.

For the Samish River and tributaries (Table 6), the reductions needed range from 45 percent in the river at the third Prairie Road crossing to 95 percent in Parsons Creek. For Friday Creek, two sites need reductions of 78 and 79 percent, while the Silver Creek tributary and the highest upstream site on Friday Creek need no reductions. For Thomas Creek and tributaries, three sites need reductions of FC bacteria ranging from 78 to 94 percent.

For tidal sloughs and creeks that discharge directly to Samish Bay (Table 7), eight sites require FC bacteria reductions ranging from 18 to 79 percent. (Oyster Creek does not require a reduction because it meets state water quality standards for bacteria.)

These percent reductions are a useful indication of the level of effort needed to bring about improvement in these freshwater sources to Samish Bay. However, because of the effect of bacteria loads in freshwater on water quality of the bay, we also need to target the sites along the river with the highest current loads.

Seasonal waterfowl presence and bacteria concentrations

Various species of non-migratory birds were present throughout the Samish watershed at all times of year. Migratory birds, such as ducks and geese, were abundant in fall and early winter when they grazed in fields and temporary puddles and pools. Bird numbers and species changed from location to location, day to day, and year to year, making them nearly impossible to count accurately or to correlate with bacteria concentrations. However, the TMDL data suggest birds did not cause exceedances of fecal coliform criteria in the lower Samish River, because concentrations in the river generally decreased from river mile 10.3 to 0.7 near the mouth, where the greatest numbers of birds were noted. Bacteria load in the river also tended to stay fairly constant downstream of river mile 10.3, suggesting that no significant new sources were adding to the load below 10.3.

Since waterfowl in the Samish basin were more abundant in November through March, it could be expected that the critical period (the time of highest bacteria counts) would match this period of the year, if waterfowl fecal contributions were a significant part of the bacteria load.

However, review of the biweekly monitoring data for Samish River and tributaries and Samish Bay discharges (Table C-1 in Ecology 2008a) shows that only one of the monitoring sites (WED-GATE, the West Edison tidegate) has higher bacteria counts in November through late winter than at other times of year. All the other monitoring sites that discharge directly to Samish Bay, and that are in the lower flats of the watershed where overwintering geese and swans congregate, have higher bacteria concentrations in the April through September period.

If natural levels of fecal coliform bacteria (from birds and other wildlife) do cause criteria to be exceeded, no allowance exists for human sources to measurably increase bacteria pollution further. Since human-caused bacteria pollution is evident in the watershed, the target reductions for bacteria are considered appropriate.

Table 6. Samish River and tributary bacteria reductions, target concentrations and load allocations.

Site ID w/ River Mile	Location	Critical Period	2006-2007 FC (cfu/100 mL) during Critical Period		FC Reduc-tion[a]	FC Target Capacity (cfu/100 mL)		Load Allocation (cfu/day)
			90th %tile	Geomean		90th Percen-tile	Geomean	
03-SAM-00.7	Bayview/ Edison Rd	none	156	35	72%	43	10	9.8E+10
03-SAM-04.6	Thomas Rd	none	243	56	72%	67	15	9.1E+10
03-SAM-10.3	Highway 99	May-Oct	428	181	53%	200	85	1.7E+11
03-SAM-13.1	F&S Grade Rd	May-Oct	380	130	47%	200	69	1.5E+11
03-SAM-15.0	2nd Prairie Rd crossing from Highway 99	May-Aug	572	97	65%	200	34	6.2E+10
03-SAM-16.5	Off Prairie Rd upstream of Parson Creek	May-Aug	356	87	44%	200	49	1.0E+11
03-SAM-20.7	3rd Prairie Rd crossing from Highway 99	May-Aug	372	74	46%	200	40	2.4E+10
03-SAM-28.8	Innis Creek Rd (in Doran)	none	1604	149	88%	200	19	3.8E+08
03-THO-00.3	Thomas Ck at Old Hwy 99	May-Sep	920	254	78%	200	55	1.1E+10
03-THO-03.6	Thomas Ck off F&S Grade Rd above Willard Ck	May-Sep	3105	399	94%	200	26	3.6E+09
03-WIL-00.0	Willard Ck off F&S Grade Rd above Thomas Ck	none	2327	234	91%	200	20	9.8E+08
03-FRI-00.8	Friday Ck at Bow Hill / Prairie Rd	Jun-Sep	936	174	79%	200	37	2.4E+10
03-FRI-03.8	Friday Ck at Friday Ck Rd	Jun-Sep	911	159	78%	200	35	1.0E+10
03-SWE-00.0	Swede Ck at Grip Rd	Apr-Sep	828	157	76%	200	38	4.7E+09
03-SKA-00.5	Skarrup Creek at first road crossing	none	750	170	73%	200	45	6.5E+09
03-PAR-00.0	Parson Ck at confluence with Samish R	July-Oct	3605	1976	95%	182	100	1.7E+08

[a]Fecal coliform percent reductions are based on reduction needed for the 90th percentile to meet the water quality standard. Only for Parson Creek site (03-PAR-00.0) is the required percent reduction based on the geometric mean.

Table 7. Samish Bay tributary bacteria reductions, target concentrations and load allocations.

Site ID w/ River Mile	Site Location	Critical Period	2006-2007 FC (cfu/100 mL) during Critical Period		FC Reduc-tion[a]	FC Target Capacity (cfu/100 mL)		Load Allocation (cfu/day)
			90th %tile	Geomean		90th Percen-tile	Geomean	
03-COL-00.0	Colony Ck near mouth, up of tidegates	May-Oct	244	103	18%	200	85	9.9E+09
03-ALI-PUMP	Drainage to Alice Bay	none	127	16	66%	43	5	2.7E+09
03-NED-PUMP	N Edison drainage at Key Ave.	none	330	109	39%	200	66	1.7E+10
03-SED-PUMP	S Edison drainage near liquor store	none	601	167	67%	200	56	2.4E+10
03-BAY-GATE	Drainage W of Samish R mouth	none	342	52	42%	200	30	1.6E+09
03-MCE-GATE	Tidegate to McElroy/Col. Slough	Apr-Sep	836	196	76%	200	47	1.3E+09
03-WED-GATE	W Edison drainage near Edison Slough	none	428	41	53%	200	19	7.1E+09
03-EDI-01.2	Edison Slough upstream of tidegate in Edison	Apr-Jul	846	129	76%	200	31	1.2E+09

[a]FC percent reductions are the reduction needed for the 90th percentile to meet the water quality standard.

Load allocations

The t*otal maximum daily load* is the maximum amount of a pollutant that a water body can accept before there is a loss of beneficial uses (e.g., swimming, boating, shellfish harvest). Appendix B explains the calculation of the total maximum daily load, or *loading capacity*, of the freshwater sources to Samish Bay. Once the loading capacity is determined, we calculate the percent reductions in bacteria required so that all monitoring sites and receiving waters will meet state water quality standards. These percent reductions are applied to nonpoint (diffuse) sources and point sources in the watershed. The allowable contribution from a nonpoint source is called a *load allocation*. The allowable contribution from a point (discrete) source is called a *wasteload allocation*. Ecology establishes wasteload allocations for facilities with discharge permits, such as municipal treatment plants or industrial facilities.

The percent reductions in bacteria required to meet the watershed's loading capacity are indicated on the map (Figure 18) and provided in Tables 6 and 7. These target reductions are applied to both point sources and nonpoint sources that affect each site. In effect, the target reduction is what must be achieved for existing discharges in order for point sources to meet their wasteload allocation and for nonpoint sources to meet their load allocations.

Figure 18. Reductions in bacteria needed at TMDL monitoring sites *(black numbers) in the Samish watershed.*

Current bacteria loads during the wet season (November to June) at 17 sampling sites in the Samish River and tributaries can be compared with estimated future loads based on the target reductions (Figure 19). (The numbers along the horizontal axis are river miles; SAM 28.8 is in the headwaters in Whatcom County and SAM 00.7 is at the mouth of the Samish River.) The figure shows the current load and the expected reduced load for the wet season, if point and nonpoint sources are reduced by the target reductions listed in Tables 6 and 7.

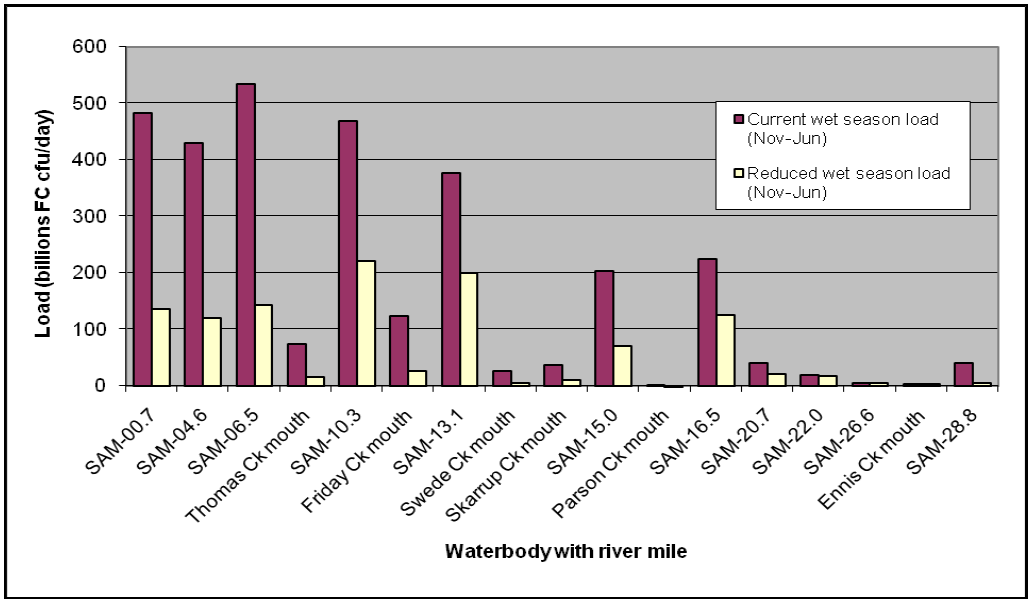

Figure 19. Current wet season load and expected reduced load *(after target bacteria reductions are achieved) for the mainstem Samish and its major tributaries.*

Wasteload allocations

Facilities that have been issued or will be issued Ecology discharge permits in the Samish watershed include Dynes Farms, a concentrated animal feeding operation (CAFO), and Washington State Department of Transportation (WSDOT). Several sand and gravel operations in the Samish watershed are covered under Ecology's general stormwater permit, but these were judged not to be significant sources of fecal coliform bacteria.

The Dynes Farms egg processing operation has a facility in Burlington and cornfields along the Samish River near the Old Highway 99 Bridge. Dynes Farms will be assigned a wasteload allocation (WLA) set at zero due to the "no discharge" requirement of Ecology's National Pollutant Discharge Elimination System (NPDES) CAFO permit, which only allows discharges in conjunction with a greater than 25-year, 24-hour storm event. The CAFO permit is expected to be issued to Dynes Farms in 2009.

All dischargers covered by NPDES permits must meet the required reductions for the drainage reach in which their stormwater is discharged. The combination of wasteload allocations for WSDOT stormwater and load allocations for nonpoint sources will enable the river reaches to meet the required percent reductions. Unmeasured point sources are assigned the same percent reduction as nonpoint sources for reaches that receive drainage from both point and nonpoint sources.

This TMDL assigns NPDES permittee WSDOT fecal coliform reductions for water body reaches that have been assigned nonpoint load allocations and that receive highway runoff. Monitoring for the TMDL did not include specific measurements of fecal coliform in highway runoff. However, there are a number of activities in the watershed that would likely contribute to highway and roadside ditch discharges of fecal coliform to surface waters. Examples include manure tracked onto highways from fields by tractors and other farm equipment, highway litter that attracts birds, and defecation on highways by rodents and other wildlife.

The following locations in the Samish watershed are downstream of state highway bridges or receive state highway ditch drainage and are within reaches assigned nonpoint load allocations. Seven locations in the watershed meet these criteria and are assigned *wasteload allocations* (Table 8) equivalent to the nonpoint load allocations:

- Chuckanut Drive (SR-11) roadside ditch drainage that reaches Colony Creek
- Chuckanut Drive (SR-11) crossing Edison Slough and roadside ditch drainage that reaches Edison Slough
- Chuckanut Drive (SR-11) crossing Samish River and roadside ditch drainage that reaches the Samish River
- I-5 crossing Samish River
- Highway 9 (SR-9) north of Sedro Woolley crossing Samish River and roadside ditch drainage that reaches the river
- Highway 9 (SR-9) north of Sedro Woolley crossing Swede Creek and roadside ditch drainage that reaches Swede Creek
- Highway 9 (SR-9) north of Sedro Woolley, roadside ditch drainage that reaches Bottomless Lake, source of Willard Creek

Table 8. Wasteload allocations for state highways in Samish watershed

State Highway	Highway crosses water body	Next downstream monitoring site	Monitoring site location	Critical Period FC Statistics					FC Target Capacity			
				Critical period	GM	90th %-ile	Current Load	FC Reduction	Allowed Load (LA + WLA)	GM	90th %-ile	WSDOT FC Reduction
Chucka-nut Dr (SR-11)	Drainage to Colony Creek	03-COL-00.0	Colony Ck near mouth, upstream of tidegates	May-Oct	103	244	1.2 E+10	18%	9.9E+09	85	200	18%
	SR-11 over Edison Slough at Post Office	03-EDI-01.6	Edison Slough at private drive	April - July	153	960	4.3E+09	79%	9.10E+08	32	200	79%
	SR-11 over Samish R	03-SAM-04.6	Thomas Rd	Year round	56	243	3.2E+11	72%	9.10E+10	15	67	72%
Interstate 5	I-5 over Samish R	03-SAM-06.5	Chuckanut Dr	Year round	65	226	4.0E+11	73%	1.10E+11	18	62	73%
Highway 9 (SR-9)	Hwy 9 over Samish R	03-SAM-20.7	3rd Prairie Rd crossing E of Old Hwy 99	May - Aug	74	372	4.50E+10	46%	2.40E+10	40	200	46%
Highway 9 (SR-9)	Hwy 9 over Swede Creek	03-SWE-00.0	Swede Ck at Grip Rd.	Apr-Sept	157	828	2.0E+10	76%	4.7E+09	38	200	76%
Highway 9 (SR-9)	Hwy 9 drainage to Bottomless Lake	03-WIL-00.0	Off F&S Grade Rd above Thomas Ck	Year round	234	2327	1.1E+10	91%	9.8E+08	20	200	91%

What Samish Residents Need to Do

Ecology's TMDL study confirmed that excessive amounts of fecal coliform bacteria are carried by the Samish River and other freshwater discharges to Samish Bay. Our review of land uses and potential pollution sources suggests that there is no simple, single land use practice that is polluting this watershed. We know that there are a great number of residents who already do "the right thing" by having their onsite sewage system inspected, making sure their livestock are fenced away from streams, properly managing livestock manure, or planting grass filter strips that separate areas of manure application from ditches.

Nevertheless, more of this good work needs to be done by a greater percentage of homeowners, livestock owners, dairy operators, and noncommercial farmers. Improving water quality *is* possible; for example, over the past 20 years we have seen significant improvement in Samish River water quality at Ecology's long-term monitoring station at the Old Highway 99 Bridge. Installing the community sewage treatment system in Edison and onsite repairs in Blanchard ten years ago also led to improved water quality on the east side of Samish Bay. More water quality improvement is clearly possible.

Ecology asks all residents to review their land management practices to make sure they are using best practices and extreme care to protect the water. For each type of bacteria source there is a set of best management practices that if properly implemented can reduce the amount of bacteria conveyed to surface waters, in turn ensuring these waters will meet state standards. Each of these potential sources can be managed safely if there is full understanding of the circumstances that lead to water pollution. Adjusting these practices appropriately when environmental conditions change is also important.

Ecology expects that these management practices will be implemented in order to improve water quality and protect public health. Many can be implemented without requiring large sacrifices on the part of Samish watershed residents. In some situations the practices may be required under either Skagit Code or state regulation. In any case, discharge of pollutants to waters of the state is prohibited by state law, and Ecology has been given the authority to enforce this prohibition.

This section includes recommendations and requirements for:

- ✓ Residents with onsite sewage systems.
- ✓ Operators that apply various animal manures to fields.
- ✓ Owners of livestock and heifer operations and noncommercial farms.

What do residents with onsite sewage systems need to do?

Skagit County has designated parts of the Samish watershed that drain directly to Samish Bay as "Marine Recovery Areas" and upper watershed areas as "Sensitive Areas." Homeowners in both parts of the watershed are required, under new rules, to have conventional gravity systems (Figure 20) inspected by a certified onsite sewage inspector once every three years. Alternative treatment systems with mechanical or electrical components need to be inspected yearly.

Skagit County Health Department (SCHD) conducted a number of workshops in 2008 to inform homeowners of the new requirements. In 2009, SCHD is planning a general mailing to all Samish watershed residents with information about the need to comply with the inspection requirement and deadlines for getting the inspections done.

Homeowners can learn to properly operate and maintain onsite systems by taking one of SCHD's "Septics 101" classes, which are offered frequently and listed on the Skagit County website at: http://www.skagitcounty.net/Common/asp/default.asp?d=Health&c=General&p=main.htm

Information on the website includes lists of certified maintenance specialists and installers who have taken training with and are certified by Skagit County Health Department.

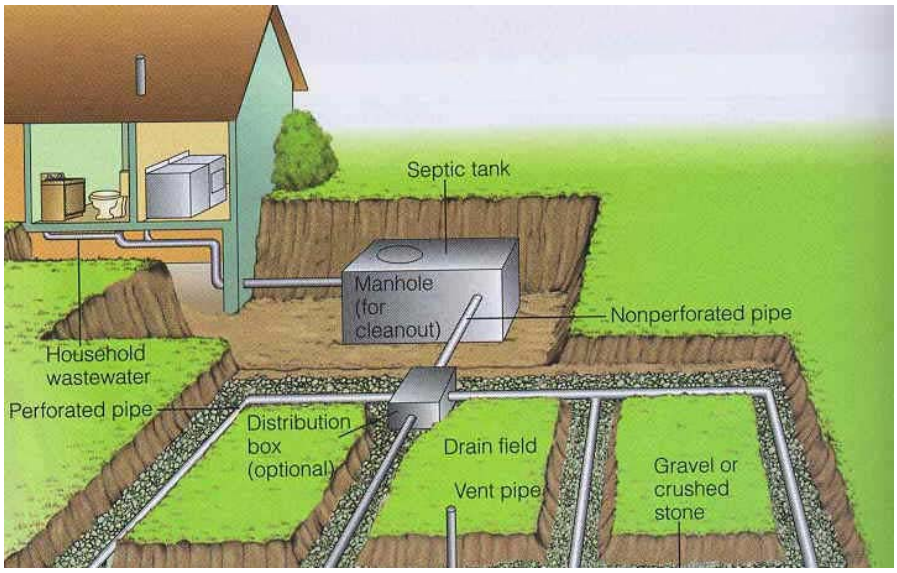

Figure 20. Components of a conventional gravity onsite sewage system.

Requirements & tips for onsite system owners

- ✓ Have system inspected by certified inspector (required)
- ✓ Use good practices to optimize performance & longevity of your system
- ✓ Pump regularly as recommended for your system and number of occupants

What can operators that apply manure to fields do to protect the Samish?

Operators that apply manure from poultry operations, dairies or other livestock operations to fields in the Samish watershed need to observe best management practices for manure application to protect ditches and streams.

For dairies, manure application is described in the Nutrient Management Plan (DNMP) as required under the Dairy Nutrient Management Act, RCW 90.64. If applied to crops, pasture and hay lands, the manure must be applied at appropriate rates and times of year so that growing plants can capture and use the nutrients for plant growth, thus reducing the amount of bacteria reaching waterways. In Skagit County, DNMPs (Appendix H) are approved by the Skagit Conservation District (SCD). The dairy must implement the plan, and SCD certifies that structural elements of the plan have been properly installed and nutrients managed according to the plan.

Operators that apply manure should also consider:

- ✓ Working with Skagit Conservation District, NRCS or a private consultant to identify practices and options to keep manure out of surface waters.
- ✓ Notifying Ecology when you are spreading. We will send a sampling technician to test water above and below your fields.
- ✓ Participating in twice-yearly Samish Adaptive Management workshops that include water quality reports and sharing of water protection practices that work.

Operators that apply manure to fields adjacent to reaches of river or creeks or with ditches draining their property are encouraged to work with the Skagit Conservation District or a qualified consultant to:

- ✓ Review and update nutrient management plans (Appendix H) for current herd size and soil conditions.
- ✓ Review manure application practices for fields that are ditched or upgradient from streams – see Manure Application Guidelines on the next page.
- ✓ Protect streams and ditches during manure application by establishing vegetated buffer strips where no manure will be applied.
- ✓ Review NRCS recommended filter strip widths (Figure 22) for parcels in the Samish based on data for local soil types and the 10-year, 24 hour storm for the watershed.

- Be careful not to smother the growing crop by applying too much manure with a high solids content.
- Frequently check manure application pumps, hoses, and spreading equipment to see if they are operating properly. Correct problems immediately.
- Be sensitive to neighbors and public concerns when applying manure.
- Monitor environmental conditions and manure characteristics AT ALL TIMES when using big gun applicators to apply manure. These applicators are highly susceptible to a number of factors that can change without warning, such as wind speed and direction, equipment failure, and the consistency of manure being pumped.
- Follow appropriate minimum setback requirements. A map of the field with the setback areas highlighted can help you plan your application strategy.
- Monitor weather patterns, primarily wind and rain, to reduce the chance of a weather event occurring that will move applied manure off the target area.
- Test manure for its nutrient content to ensure manure is applied only at agronomic rates.
- Spread manure accurately and evenly to assure even distribution of nutrients for plant growth.
- Maintain accurate records of manure application to fields (amount applied, date, crop, nutrient analysis, recent soil test, etc.).
- Accurately calibrate manure spreaders, tank wagons, and other application equipment.

Figure 21. Spreading manure on flooded fields *can result in discharge of fecal coliform bacteria to nearby surface waters.*

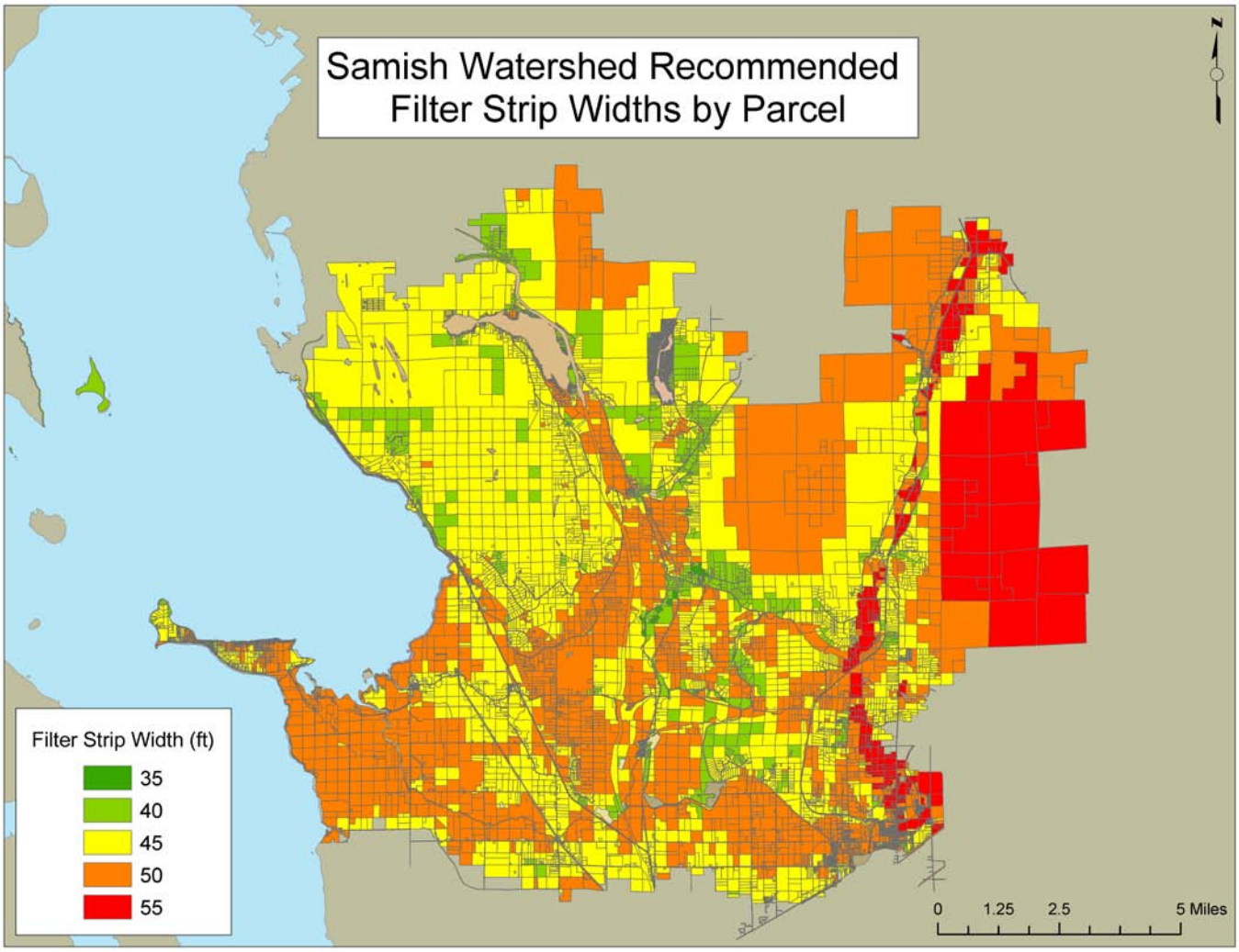

Figure 22. Recommended filter strip widths for Samish parcels, *based on NRCS guidelines.*

Vegetated buffer strips next to manure application areas effectively reduce the pollution risk to both surface and ground water. Buffers along fields bordering roads and neighbors also help keep manure on targeted areas. Factors to consider in determining the size of the buffer include slope and soil type, whether the area is vegetated or bare, and the method of manure application.

Natural Resource Conservation Service (NRCS) practice 393 uses local soil types and rainfall statistics -- the largest 24-hour rainfall that occurs on a frequency of once every 10 years (i.e., the 10-year, 24-hour storm) to determine optimal protection for water quality during spreading. Figure 22 uses soil and precipitation data and county parcel data to show recommended widths of grass filter strips throughout the Samish watershed, if those parcels had manure applied. Most parcels in the lower watershed should set aside 45 or 50 ft widths, whereas in the middle Samish, the range is 40 to 50 feet. In some locations in the upper Samish, recommended widths are as large as 55 feet. Grass or some other type of vegetation increases the protective nature of the buffer, since growing plants will absorb nutrients, trap sediment, organic material and runoff, and the soil itself will be more effective in reducing bacteria.

What do owners of livestock and heifer operations and noncommercial farms need to do?

How we take care of our soils, deal with livestock waste, manage pastured areas and the grazing of animals, handle runoff from outbuildings, and deal with mud in confinement areas are all examples of land management. Good land management practices can help save money, increase property values, improve livestock health, and protect water quality.

With population growth and an increase in the number of livestock and noncommercial farms, the land management practices that worked 20 years ago may not work now. The amount of animal waste that is reaching streams has likely increased, making it more important than ever that all livestock owners take extra care to protect water quality.

Samish watershed livestock operations, including small noncommercial farms that are adjacent to reaches of the river or creeks or with ditches draining their property, are encouraged to work with the Skagit Conservation District or a qualified consultant and to:

- ✓ Develop or update a farm plan with current livestock types and numbers and soil conditions.
- ✓ Review practices for handling manure and follow manure spreading guidelines to prevent contaminated runoff to streams or ditches.
- ✓ Fence animals away from streams and use alternative watering strategies. A solar powered water pump may work for your facility.
- ✓ Protect water quality by excluding livestock from streams and ditches and establishing vegetated buffers between grazing areas, manure application areas, and streams or ditches.
- ✓ Participate in twice-yearly Samish watershed Adaptive Management workshops that include water quality reports and sharing of water protection practices that work.

Some of these practices may be eligible for cost-share from the Conservation District.

Best Management Practices

Land management practices that protect land and water are called "best management practices," or BMPs. They focus on prevention and treatment of pollution. In general, landowners have some discretion to choose which management practices they will use to achieve compliance with state water quality standards. *But keep in mind that discharging material that pollutes water is a violation of state law.* And Skagit County Code 14.24.120 establishes a "no harm or degradation" standard for areas of the county designated for Ongoing Agriculture. The county code cites the state water quality standards as the standards to be achieved.

What's in a farm plan

A farm plan is a prescribed series of actions developed to meet the goals of a landowner while protecting water quality, soil, and other natural resources, including wildlife. Some of the things considered in a farm plan are farm size, soil type, slope of the land, proximity to streams and ditches, and types of livestock and crops. The plan considers the landowner's goals and resources, such as machinery, buildings, and available finances. The Skagit Conservation District is experienced in developing plans for farms of all sizes – from acreages with just one horse to large dairy and beef operations.

Some of the most important elements of farm plans for Samish watershed residents have to do with exposure of animals and animal waste, soil, and crops to rainfall, and their proximity to ditches and streams. Even if you are located on high ground, if livestock are on property that slopes to a stream and there is no vegetative buffer, animal waste may get carried quickly to a stream by surface runoff during a rainstorm.

Elements of farm plans that protect water quality and may help keep animals healthy include:

- ✓ Defining short and long term goals for your farm.
- ✓ Fencing animals away from streams and using alternative watering methods.
- ✓ Using gutters and downspouts to control where roof runoff goes to avoid creating muddy areas or manure runoff.
- ✓ Use waste storage facilities to improve manure handing and prevent manure run-off.
- ✓ Composting manure to reduce flies, odors, and manure pile size, and to kill pathogens and create a valuable soil amendment.
- ✓ Creating a sacrifice area away from streams and ditches for winter grazing and to allow remaining pasture to recover from trampling and grazing.
- ✓ Adopting management practices that improve pasture and soil quality, reduce erosion, protect the water, and improve livestock health.

Manure checklist for livestock owners

- ✓ Use downspouts to direct runoff from buildings away from manure.
- ✓ Pile manure and keep it under cover in a convenient site that's sheltered from wind and heavy rain.
- ✓ Pick up manure from farmyards and paddocks frequently and before rains.

- ✓ When using a tarp for a cover, use a durable, heavy-weight one large enough to fully cover the pile. Secure it well.
- ✓ Work with the local conservation district to make a plan and learn how best to handle your manure. You may be eligible for cost sharing to put your plan into action.
- ✓ Build a compost system or have an offsite compost facility collect the manure.

Figure 23. Horses at a small noncommercial farm in the Samish watershed.

What are the benefits for livestock owners?

The practices listed previously can keep your animals in better health and can prevent parasite re-infestation. They help protect ground water and keep it clean. They can prevent illness among children who play in the stream. They build good will with your neighbors. They keep you on the right side of water quality regulations, reduce smells, increase the beauty of the area, and reduce erosion and soil loss. Not just you, but also the whole watershed downstream of your property will benefit.

What Governments and Organizations Will Do

Implementation plan (summary of actions)

This implementation plan outlines four types of activities that Ecology and its partners believe will be effective in achieving compliance with Washington's fecal coliform bacteria standards in the Samish watershed and Samish Bay. The approach is based on current understanding of the likely sources of bacteria in the watershed, the different ways these sources can be addressed, and the roles and responsibilities of local organizations that will implement the TMDL. The activities are:

- Education, outreach and regulatory oversight.
- Pollution prevention and source control.
- Additional water quality monitoring and pollution source tracking.
- Adaptive Management workshops.

Education, outreach and regulatory oversight

To improve water quality in Samish Bay, fecal coliform bacteria from onsite sewage systems, farm animals and other domestic animals, and human recreational users must be eliminated or reduced in waters that drain to the bay. Table 9 lists the organizations with education and communications programs or have a regulatory oversight role related to these sources.

The drainage districts listed at the end of the table have authority limited to protecting life and property and maintaining the functions of ditches; they do not have a regulatory role related to water quality. Ecology encourages the drainage district commissioners to communicate with district members/property owners about water quality results and to advocate for restoration projects that can have multiple benefits for fish and water quality and reduce the need for maintenance.

Table 9. Organizations with educational and/or regulatory role related to bacteria sources.

FC Bacteria Source	Responsible Organization	Program Description
All sources	Skagit County Public Works and County Health Dept	Develop public outreach and water quality monitoring program for priority areas in the watershed to identify bacteria sources and ensure corrections are made. *(depends on grant funding)*
Onsite Sewage Systems	Skagit County Health Department	Septics 101 Workshops (education and public outreach) Implement Skagit County Onsite Sewage System Management Program, with notification and recordkeeping for onsite sewage system maintenance, repair, replacement in Marine Recovery Areas and Sensitive Areas
Field and bay workers	Skagit County Health Department	Outreach to row crop and shellfish farmers regarding the importance of providing and maintaining toilets and training employees on the importance of using them.

FC Bacteria Source	Responsible Organization	Program Description
Dairies and CAFOs	Washington State Department of Agriculture (WSDA)	Full regulatory role is described on pages 68-69. Under RCW 90.64 and 90.48, review NMP implementation and effectiveness during inspections. Conduct routine inspections of licensed dairies and CAFO permitted non-dairy operations about every 22 months. Note potential or actual water quality problems during inspections and refer dairy and permitted CAFO operators to local conservation district for additional technical assistance that may include a NMP update. Respond to complaints and reported discharges from dairies and permitted CAFOs. Conduct follow-up, technical assistance, and lagoon assessment inspections as needed. Where common implementation problems or technical issues are identified by WSDA, the conservation district or others, WSDA will participate in discussions to identify appropriate solutions or responses. WSDA will coordinate with other stakeholders, consistent with its authority, to help implement identified actions. WSDA will notify ECY if manure spreading activity has resulted in a reported discharge but generally is not notified when spreading is occurring.
Livestock Operations and Heifer Operations	Skagit County Planning & Development Services and Skagit County Public Works (SCPW)	SCPW needs to increase public awareness of its new water quality complaints phone line, required under Phase II municipal stormwater permit. Complaints line should apply to all areas of county with water quality data indicating non-compliance with state water quality standards, not just urbanized areas. SCPDS needs to follow up complaints and ensure compliance with SCC 14.24.120 (Critical Areas Ordinance for Ongoing Agriculture).
	Ecology	Follow up nonpoint source complaints, refer to local authorities and Skagit Conservation District as appropriate and ensure compliance under RCW 90.48.080.
	Skagit Conservation District	Continue outreach programs and provide farm planning technical assistance and cost share opportunities
Non-commercial farms	Ecology, and Skagit County Planning and Development Services	Identify small farm operations near streams & ditches that lack BMPs to protect water quality; respond to complaints Communicate with landowners near streams and ditches regarding need for WQ protection and availability of technical assistance Follow up with referral to Skagit Conservation District as needed

FC Bacteria Source	Responsible Organization	Program Description
	Skagit Conservation Education Alliance (SCEA)	Develop communications for Samish residents regarding need to protect water quality, including updates on monitoring results. Provide information of educational value to animal owners and about protecting water quality
	Skagit Conservation District	Provide farm planning technical assistance and cost-share opportunities Develop web-based self-check list on animal waste best management practices. Conduct workshops and advertise solar-powered watering systems & other methods to water animals away from streams. Work with other conservation districts in western Washington to assess outreach offered to different agricultural groups and assess what media, materials, venues, opportunities, or education methods are effective in reaching these audiences.
Pets	Skagit County Health Dept and Skagit County Public Works (as funds allow)	Identify properties near streams and ditches that have significant pet presence and lack BMPs to protect water quality. Make contact with owners regarding need for WQ protection and proper pet waste disposal
Waterfowl on private grain fields	Ecology & SCEA or Skagit Conservation District	(Ecology) Conduct targeted water quality monitoring before and during waterfowl presence *(dependent on staff & resource availability)* (SCEA or Skagit Conservation District, as resources allow) Provide to owners of fields, sampling results & information on grass filter strip effectiveness in reducing contaminated runoff
Waterfowl on WDFW Conservation Areas	WDFW	Install hedgerows, native shrubbery, grass filter strips or other buffer effective in reducing bacteria to safe levels in ditches, streams and Samish Bay Provide adequate toilet facilities for users and information on importance of using them.
Human recreational users	SCEA and other local organizations (as resources allow)	Assess need, provide additional Port-a-Potties at Samish River fishing spots and near conservation/hunting areas around bay. Ask local suppliers of hunting, fishing, and camping equipment for opportunity to post water quality message/safe behaviors. Develop & deliver periodic targeted outreach to recreational user groups.
Property owners in Drainage Districts	Drainage Districts 5, 14, 16, 18, and 25	Work with property owners, WDFW and WWAA to develop restoration projects that reduce bacterial inputs and sediment delivery to Samish drainage ditches and creeks. Plant native riparian shrubbery that can be mowed to provide access for equipment and shade out reed canary grass.

Regulatory oversight

The following agencies are responsible for ensuring compliance with local or state regulations that protect water quality of streams, ditches, lakes, rivers, and marine waters.

- Washington State Department of Ecology has authority to enforce state water quality laws under RCW 90.48 when monitoring data indicate pollution problems are continuing; when local programs are not successful in resolving water quality complaints; and/or when there is verifiable evidence that individual sites or facilities are causing pollution in violation of RCW 90.48.080. Ecology may pursue orders, directives, permits, or civil or criminal sanctions to gain compliance with state water quality standards.

- Skagit County Health Department (SCHD) has authority and requirements delegated under state public health regulations to administer public health and onsite sewage regulatory programs in the county. SCHD developed the Skagit County Onsite Sewage System Management Program. Under the program, the lower Samish and Colony Creek watersheds are designated Marine Recovery Areas, and the upper Samish and Thomas Creek subbasins are designated Sensitive Areas. With this designation, SCHD requires identification of unknown systems and inspections of all onsite sewage systems in the watershed by 2012, and will ensure compliance through a program of notifications, reminders, and a schedule of penalties for those who do not have their onsite sewage system inspected.

- Skagit County Planning and Development Services (SCPDS) enforce ordinances related to critical or sensitive areas as required under the state's Growth Management Act. New development is required to observe a 25- to 200-ft buffer next to streams and wetlands, but ongoing agriculture is not obligated to observe those buffers. The county's Critical Areas Ordinance for Ongoing Agriculture and Rural Resource Natural Resource Lands (Skagit County Code 14.24.120) requires instead that ongoing agriculture not "cause harm or degradation" of water quality or fish and wildlife habitat.

  Because it may be difficult to demonstrate *sources of harm*, ongoing agriculture is additionally required under the code to observe several "watercourse protection measures" — these are practices accepted by the county as protecting water quality and habitat without needing to demonstrate impairment. For example, the code requires that operators limit livestock access to streams to only the time needed for watering or crossing. Skagit County has begun to carry out compliance actions in cases of violation of the code.

- Washington State Department of Agriculture (WSDA) administers the Dairy Nutrient Management Act (RCW 90.64) and has responsibility to inspect dairies and Concentrated Animal Feeding Operations (CAFOs). WSDA responds to all water quality complaints related to dairies and permitted CAFOs. WSDA will respond to water quality complaints from other livestock operations as resources allow. Dairies in the Samish watershed are inspected every 22 to 24 months. WSDA and Ecology have separate responsibilities under the CAFO permit and must coordinate closely to ensure all functions under the

permit are carried out satisfactorily. Ecology administers the permit and WSDA provides field inspection and complaint response activities. WSDA gives Ecology all documents related to work with permitted dairies. Other details of WSDA authority are explained more fully on pp. 68-69.

Pollution prevention and source control

Sources of fecal coliform bacteria in the watershed are human waste (from failing or improperly maintained onsite sewage systems); livestock waste, including chicken and dairy manures, and waste from heifer operations; manure spreading on crop fields; cattle operations; small non-commercial farms; wildlife; and pet waste. In addition, recreation activities, such as hunting and fishing, occur in and around Samish Bay. These may attract folks who are not prepared to pack out their own wastes. Improper waste management by hunters, fishers, boaters, hikers, and others, some accompanied by dogs, contributes to fecal coliform pollution in the watershed. In addition, some fields near Samish Bay are planted with grain to attract waterfowl. The waterfowl tend to congregate on these fields to feed during fall and spring migratory periods. Pollution prevention and source control practices for these sources are outlined in Table 10.

Table 10. Pollution prevention and source control best management practices *(BMPs).*

FC Bacteria Source	Responsible Party	Pollution prevention/source control BMP
Onsite sewage systems	Property owner	Proper maintenance. Inspection and repair (replacement as needed) of systems as required by Skagit County Onsite Sewage Management Plan for Marine Recovery Areas and Sensitive Areas in Skagit County
Field and bay workers	Row crop and shellfish farmers	Provide adequate sanitary facilities for workers (required by state Dept of Labor and Industries under WAC 296-800-23020). Educate workers on importance of using these.
Dairies next to streams or ditches	Dairy owner/operator	Update and implement Dairy Nutrient Management Plan for current herd size and soil conditions Follow Dairy Nutrient Management Plan and manure spreading guidelines For parcels receiving manure, implement NRCS guidelines for grass filter strips to protect surface water
Livestock operations next to streams or ditches	Livestock owner	Develop and implement farm plan and follow manure checklist Fence livestock away from stream (stream water may be diverted for livestock watering according to Ecology policy). Make sure rain events will not carry manure into stream or ditch and that protective vegetation is in place to filter out nutrients and bacteria. Consult Skagit Conservation District (SCD) for technical assistance and cost-share for fencing, off-stream watering

FC Bacteria Source	Responsible Party	Pollution prevention/source control BMP
		options, and other BMPs
Heifer operations next to streams or ditches	Heifer producer	Develop and implement farm plan and follow manure checklist; fence livestock away from streams and ditches and install protective vegetative strip. Consult SCD for technical assistance and cost-share assistance for fencing, off-stream watering options, and other BMPs.
Manure spreading operations next to streams or ditches	Owner of dairy or CAFO source of manure being spread; operator spreading manure; and owner of application field	Manage spreading operations to protect water quality: Follow NRCS specifications for grass filter strip width needed to protect water quality during and after manure spreading; or notify WSDA or Ecology during sampling so that water quality can be monitored
Small non-commercial farms near streams or ditches	Noncommercial farm owners	Develop and implement farm plan and follow manure checklist; fence all livestock away from surface waters including ditches. Consult Skagit Conservation District for technical assistance
Pets	Pet owners	Manage pet waste to protect water quality. Pet waste should be collected from yards, bagged and put in garbage.
Waterfowl on grain fields	Field owners and WDFW	Install hedgerows, buffers or grass filter strips next to streams and ditches to protect water quality
Human recreational users & dogs	Hunters, fishers, boaters, hikers, birdwatchers	Use port-a-potties where available, otherwise bag waste and dispose properly. Boaters use pump-outs at marinas. Dog owners pack dog waste out.

Additional water quality monitoring and source tracking

Ecology and its partners determined that additional monitoring (Table 11) will help to identify sources of fecal coliform bacteria so that responsible parties can be identified and referred to local authorities and organizations for follow up and technical assistance.

Table 11. Additional monitoring underway or planned for the Samish TMDL.

Organization	Monitoring goal	Program description	Time period
Ecology	Determine presence or absence of cattle and human sources	Use source identification (PCR analysis) for human or cattle sources. ***Sampling and shipping cost assistance needed.***	August 2009-September 2010
Washington Dept of Health (DOH)	Establish growing area classifications	Marine monitoring – 6 times per year	Ongoing
	Establish temporary shellfish closures to avoid product recalls	Monitor marine water quality in response to specific storm events; coordinate with freshwater partners	As needed 2009-2010
Skagit County Public Works	Trend monitoring	Monitor 11 Samish sites (started in 2000)	October 2009 and ongoing
	Storm event monitoring with DOH	DOH-coordinated study of marine response to storm events	2009-2010
	Pollution identification and correction *(depends on future funding)*	Community education, outreach, monitoring and follow up with sources in sub-basin.	Grant application fall 2009; to start fall 2010 if funded
Skagit Conservation District	Annual monitoring	Skagit Stream Team volunteers educated on water quality issues and trained in monitoring and analysis. Eight Samish sites monitored since 1998.	October – June yearly
	Storm event monitoring with DOH	(As available), Skagit Stream Team volunteer assistance to DOH study of marine response to storm events	2009-2010

Organizational actions, goals, and schedules

Organizations with responsibility for implementing educational outreach and technical assistance or with a regulatory role for reducing bacteria in the Samish watershed are described in this section. Following the description of roles are the tasks needed to reach the goals of this TMDL.

The agencies and organizations described below are:

- Skagit County Health Department.
- Skagit County Planning and Development Services.
- Skagit County Public Works.
- Washington State Department of Agriculture.
- Skagit Conservation District.
- Skagit Conservation Education Alliance.
- Drainage Districts 5, 14, 16, 18 and 25.
- Washington State Departments of Ecology; Fish and Wildlife; Health; and Washington State Department of Transportation.

Skagit County Health Department

The Skagit County Health Department (SCHD) has authority and is required, under the Revised Code of Washington (RCW), to administer public health and onsite sewage (OSS) programs in the county. In addition, Chapter 246-272 (revised to 246-272A during 2004) of the Washington Administrative Code (WAC) Rules and Regulations of the Washington State Board of Health for Onsite Sewage Systems, grants local health jurisdictions authority to administer the code.

Under Skagit County Code (SCC) Chapter 12.05 Onsite Sewage Code – Rules and Regulations, the SCHD has authority to:

1. Permit site evaluations, OSS designs and installations.
2. Inspect installations during construction and at completion.
3. Certify OSS installers, Monitoring/Maintenance Specialists and pumpers.
4. Maintain records of OSS permits issued and of monitoring/maintenance activity in an integrated Operations, Monitoring, and Maintenance (O & M) database.
5. Require annual monitoring/maintenance inspection of Health Department licensees such as food service establishments, campgrounds and mobile home parks.
6. Require OSS inspections at time of property transfer.
7. Require annual O & M inspections of onsite sewage systems with proprietary treatment products.
8. Investigate complaints related to improper sewage treatment and disposal.

In 2000, Skagit County established an onsite sewage system operations and maintenance (O & M) program as required in the 1995 version of WAC 246-272. This program is designed to educate homeowners in the care of onsite sewage disposal systems, certify operations and maintenance inspectors, and employ social marketing techniques for communities to solve their onsite sewage disposal dilemmas. In the years since its inception, Skagit County has funded this program through the general fund, with help from Ecology in several areas.

The SCHD used a number of innovative approaches to increase OSS inspections and repairs throughout the county. They worked in a number of shoreline communities where failing onsite sewage systems were implicated in degradation of marine water quality. An important principle in SCHD's strategy is that solving community sewage issues is more likely to depend on finding an effective community process than on finding an appropriate science and engineering solution. SCHD used grant funding to incorporate a rebate program that provided an incentive for homeowners to have septic systems inspected and lids and risers installed to promote access. Also, SCHD used grant funds from Puget Sound Action Team and funding from the shellfish industry to develop public service announcements for cable television and other marketing approaches to educate the public about O & M for onsite sewage systems.

To assist homeowners facing septic repairs, the Skagit County Water Quality Improvement Fund, administered through the Treasurer's Office, is a State Revolving Loan Program funded by Ecology's Centennial Clean Water Fund for repair/replacement of failed septic systems.

In 2007, Skagit County adopted the onsite sewage management plan, required by WAC 246-272A, Onsite sewage code, and Chapter 70.118A, onsite sewage disposal systems - marine recovery areas. This plan designates the lower Samish watershed as a marine recovery area, and upper Samish and Thomas Creek basin as sensitive areas. After SCHD conducted a number of public workshops on the new requirements in the Samish watershed during winter and spring 2008, the Skagit County Commissioners approved the designations. The letter to residents of the Lower Samish subbasin, mailed in January 2008, is provided as an example in Appendix G. A recent SCHD "septics status" map for the Lower Samish subbasin is shown in Figure 10.

In summer 2009, SCHD will send an initial general mailing to all watershed residents explaining the required OSS inspections, followed by a series of reminder postcards. SCHD will send the reminder postcards 30 days prior to, 30 days following, and 60 days following the date the inspection is due. An escalating enforcement strategy will be used for those who do not complete an inspection. SCHD is currently revising its schedule of penalty charges to be assessed non-compliant homeowners.

SCHD actions necessary to reduce fecal coliform bacteria in the Samish watershed:

- Fully implement the OSS inspection requirements associated with designation of parts of the Samish watershed as a marine recovery area and other parts as sensitive areas through continued database tracking of O & M inspections; follow up mailings to noncompliant property owners; and penalties as needed to ensure compliance. A public outreach letter to residents is expected to be mailed by SCHD in summer 2009, initiating a schedule for required inspections.

- Continue public outreach, education and incentive programs aimed at improving citizen understanding and implementation of proper operation and maintenance practices for onsite sewage systems. Coordinate with Ecology and local agencies on strategies to increase awareness by Samish residents of the need to implement practices to protect water quality.

- With Skagit County Public Works, apply for funds to conduct a Pollution Identification and Correction Project (similar to the model developed by Kitsap County Health District) on one or more of the reaches of the Samish river or tributary to Samish Bay.

- Contact crop farmers and landowners leasing fields to hunting clubs regarding the County ordinance against defecation and urination in a public place or in a place with public exposure (SCC 9.36.010) to make sure they are providing adequate facilities to field workers and hunters.

Skagit County Planning and Development Services

Skagit County Planning and Development Services (SCPDS) enforce ordinances related to critical or sensitive areas as required under the state's Growth Management Act, as described in the "Enforcement" section in this TMDL document.

SCPDS actions necessary to reduce fecal coliform bacteria in the Samish:

- In next update of SCC 14.24.120, explicitly require livestock exclusion from surface waters that do not meet state water quality standards or that could be impaired by livestock access.

- Work with Ecology and local partner agencies staff to strategize improved public outreach to property owners in the Samish watershed to increase understanding of water quality problems and personal responsibilities.

- Review livestock operations near streams and ditches and ensure compliance with 14.24.120.
- Promote Low Impact Development practices; adopt ordinances and building codes that are compatible with, and will encourage Low Impact Development.

Skagit County Public Works

Skagit County Public Works manages a water quality monitoring program that assists the county, local and state organizations in understanding current water quality conditions in agricultural areas and at reference sites throughout the Lower Skagit and Samish basins. The program measures fecal coliform bacteria and other parameters at 40 sites in the Samish and Lower Skagit basins, including 11 sites in the Samish, since 2003. Originally funded by a Centennial Grant, the county monitoring program is now fully supported by local funds.

Public Works has contributed its understanding of water quality conditions in the Samish basin at Samish Technical Advisory Committee meetings. It has been an important partner as state DOH, the local shellfish industry, and others collected data to determine whether intense storm events in the Samish result in high bacteria loads and elevated counts in Samish Bay marine waters.

SCPW implementation actions:

- Apply for grant funds to conduct a pollution identification and correction project (similar to the model developed by Kitsap County Health District) on one or more of the reaches of the Samish river or tributary to Samish Bay. This work should be conducted cooperatively with other Skagit County agencies.

- Increase public awareness of the public water quality "hotline" already implemented by the County as required under the Phase II municipal NPDES stormwater permit issued by Ecology to Skagit County. The hotline should apply to water quality complaints and reports of spills and illicit discharges county-wide. Complaint referrals should be coordinated with Ecology Environmental Reporting and Tracking System.

- Report water quality monitoring results that appear to relate to inadequate management of animal manure or onsite septic system failure, to the appropriate agency (Skagit County Planning and Development Services for review in relation to SCC 14.24.120; Ecology for other livestock manure problems; WSDA for dairy manure; and Skagit County Health Department for onsite sewage system review).

Washington Department of Agriculture

Washington State Department of Agriculture (WSDA) administers the Dairy Nutrient Management Act (RCW 90.64) and has water quality enforcement responsibility for dairies. Under its regulations, WSDA has the authority to inspect dairies on a regular schedule and respond to complaints and conduct routine inspections of all dairies within a 22- to 24-month period. WSDA refers dairy operations to local conservation districts if the nutrient management plan (NMP) or implementation of the NMP fails to protect water quality or has the potential to pollute. If common issues are identified regarding plan effectiveness or implementation, WSDA will work with the Skagit Conservation District, as needed, to identify needed changes.

WSDA responds to complaints and reported discharges from dairies and permitted CAFOs. WSDA follows progress made on NMP updates and reviews the completed plan during the next inspection. WSDA may take compliance action on an operator if identified site issues are not addressed as required. WSDA notifies Ecology if a discharge has occurred.

WSDA conducts follow-up, technical assistance, and lagoon assessment inspections as needed.

Where common implementation problems or technical issues are identified by WSDA, the conservation district or others, WSDA will participate in discussions to identify appropriate solutions or responses. WSDA will coordinate with other stakeholders, consistent with its authority, to help implement identified actions.

Under the Dairy Nutrient Management Act, WSDA can *require* plans to be updated only when the plan results in a discharge. They can *request* a plan update if sufficient change has occurred at a dairy for certain criteria such as animal numbers, acreage, and nutrient test results.

In the course of regular work, if WSDA identifies a heifer or livestock operation that appears to pose a risk to surface water quality, WSDA will notify Ecology. WSDA will originate a complaint into Ecology Environmental Reporting and Tracking System if a serious problem from any livestock operation is identified. For non-dairy complaints, response by WSDA depends on available time and resources.

Where common implementation problems or technical issues are identified by WSDA, the Conservation District or others, WSDA will participate in discussions to identify appropriate solutions or responses. WSDA will coordinate with other stakeholders, consistent with its authority, to help implement identified actions.

WSDA will notify Ecology if manure spreading activity results in a reported discharge. Generally, WSDA is not notified when manure is being spread, so will not be able to routinely provide manure spreading information to Ecology. WSDA cannot require a dairy to do more than the current program requires unless it is under enforcement action. If an operation is under enforcement related to manure spreading, buffers or setbacks, WSDA can consider requiring the operator to report prior to spreading.

WSDA actions needed to reduce fecal coliform bacteria in the Samish:

- Administer the Dairy Nutrient Management Program, including proper implementation of best management practices. Conduct routine inspections as well as respond to complaints and reports of discharges. Refer dairy to local conservation district if the NMP or

implementation of the NMP fails to protect water quality or has the potential to fail to protect water quality. If common issues are identified regarding plan effectiveness or implementation, work with the Skagit Conservation District as needed to identify needed changes.

- As resources allow, assist Ecology in identifying heifer and other livestock operations that appear to pose risks to streams and ditches in the Samish watershed.
- Work with Ecology to learn about and locate poultry or dairy manure spreading operations so that both agencies can communicate with the operators and reinforce the need for water quality protection. Assist Ecology in determining whether best management practices are being used in manure spreading operations in the Samish watershed.
- As resources allow, work with Ecology and the conservation district to determine whether any poultry or dairy manure spread in the Samish is transported from outside the watershed, and whether best management practices are used for these operations.
- WSDA cannot require a dairy to do more than the current program requires unless it is under enforcement action. If an operation in the Samish is under enforcement related to manure spreading, buffers or setbacks, Ecology requests that WSDA require the operator to report prior to spreading.

Skagit Conservation District

The Skagit Conservation District (SCD) is a legal subdivision of Washington state government organized under "Conservation District Law" RCW 89.08 and administers programs to encourage farming practices that protect land and water. The district priorities and goals include:

- Protection and improvement of the quality of surface and ground water.
- Watershed planning and implementation.
- Riparian reforestation and enhancement.
- Forest stewardship.
- Wildlife habitat enhancement.
- Conservation education.
- Protection and preservation of prime farmlands.
- County government assistance.

SCD provides technical and financial assistance to agricultural operators throughout the county. SCD staff assists dairy operators with DNMPs and, as resources allow, also works with livestock owners and owners of small noncommercial farms to develop farm plans. The SCD provides education to residents interested in reducing their impacts to local surface waters and enhance wildlife habitat. The SCD holds several different workshop series, generally once each year, for example, "Living on the Land"; "Watershed Masters;" a Backyard Conservation Stewardship program; and Skagit Stream Team, where participants learn about and participate in water quality monitoring of streams that are part of TMDLs. SCD currently has grants to conduct Stream Team monitoring and provide public outreach education on stormwater in areas of Skagit County and Skagit-area cities covered by Ecology's Phase II NPDES Municipal Stormwater Permit.

SCD actions necessary to reduce fecal coliform bacteria in the Samish:

- Continue to develop effective strategies for informing livestock and noncommercial farm owners about the need for improved water quality protection. Develop an internet website-based self-check list so that property owners can assess their own impacts to surface waters and determine whether changes are needed.
- Promote the use of solar-powered water pumps and other off-stream watering options for livestock operations. Provide information, as needed, on Ecology policy regarding historic right to water for livestock use and explain the county's livestock ordinance with respect to limited access to water.
- Continue to foster citizen water quality education and coordinate volunteer monitoring program through the Skagit Stream Team Program.
- Continue to develop programs that educate different types of audiences, particularly new residents, to acquaint them with the values and vulnerabilities of the land and water of Skagit County.
- Secure adequate funding to enable rapid response in developing farm plans.

Skagit Conservation Education Alliance

The Skagit Conservation Education Alliance (SCEA) is a community-based, all-volunteer, non-profit 501(c)3 organization that works for the benefit of the greater Skagit ecosystem to protect water quality and watershed functions. Its mission is "to bring people together in the spirit of cooperation to protect, conserve, and enhance the natural ecosystems in the Skagit Watersheds."

Based in Mount Vernon, SCEA works in all Skagit County watersheds. SCEA provides watershed stewardship information at fairs and educational events, and developed a program to place portable Sanican toilet "Timeshares" at popular fishing or recreation sites where public restroom facilities are not available. In 2004-2006, SCEA managed a multiple-agency, five-year review of the implementation actions needed to address nonpoint pollution, based on the nonpoint action plans (e.g., Samish Watershed Management Committee, 1995) for three Skagit watersheds, including the Samish watershed.

As resources allow, SCEA actions that will assist in reducing fecal coliform bacteria in the Samish:

- Work with partner agencies to develop effective communications tools to increase Samish watershed awareness and understanding of need to protect water quality.
- Continue to provide portable restroom facilities at fishing spots and other recreational areas in the Samish; assess need for additional facilities. Post notices of need to protect water quality and work with local retailers that serve the hunting, fishing, and birdwatching communities to provide water quality protection information.
- Develop newsletter or effective outreach to inform Samish residents of water quality conditions, technical assistance, need for BMPs.

- Provide periodic informational and educational newsletters to near-shore residents/operators, and provide flyers and educational activities at local feed and farm implement stores.

Samish Watershed Drainage Districts

The Drainage Maintenance Agreements between Washington Department of Fish and Wildlife (WDFW) and individual Skagit and Samish drainage districts were developed to acknowledge the interests of both parties regarding the need for drainage maintenance and the need for fish protection, and to provide a framework for developing Drainage Maintenance Plans. The drainage maintenance plans allow maintenance activities for drainage infrastructure to be conducted while offering protection and enhancement of fish resources. Western Washington Agriculture Association assisted drainage districts in developing the plans. The plans require Corps of Engineers individual permits and certification by Ecology that they will be managed in a way that is protective of water quality. The plans generally include proposals for projects that would improve or restore fish habitat, and these often have potential to improve water quality.

Drainage maintenance plans are in preparation or have been recently prepared for Samish Watershed Drainage Districts 5, 16, 18 or 25 (Figure 5). If staff time is available, Ecology will provide comments during the 401 Certification review of the plans if they have potential to reduce or increase fecal coliform bacteria pollution.

As resources allow, Samish watershed drainage districts should:

- Provide outreach to landowners on need to protect, improve water quality in ditches.
- Develop riparian restoration projects that protect water quality. Consider native riparian plantings that can be mowed to provide maintenance access and shade out reed canary grass.

The drainage maintenance plan for Drainage District #14 (WDFW and DID#14, 2006) includes proposals for six reaches of Thomas Creek for riparian planting; wetland restoration; bank stabilization; increasing flood storage capacity; developing side channels for fish use; and installation of fencing to exclude livestock from Thomas Creek. Ecology recommendations for prioritizing these projects, because of potential value in implementing the Samish TMDL, are listed in Table 12. Reaches 1 through 6 of Thomas Creek are illustrated in Figure 24.

Table 12. Drainage District 14 proposed restoration projects, and TMDL priorities

TMDL Priority	Reach (#s)	Project or Action	Expected Improvement
1	3, 6	Pull livestock back from creek; exclude access with fencing; install shrubbery or grass filter strip as appropriate to reduce runoff to creek	Reduce fecal coliform bacteria in creek
2	All	Streambank and riparian zone plantings of native shrubs, conifers, deciduous trees ***(****as described in Addendum to Maintenance Plan****)*** to discourage reed canary grass, filter runoff from adjacent land uses, and provide shade	Reduce fecal coliform bacteria and creek temperature; increase dissolved oxygen
3	2, 5, 6	Wetland and side channel development, enhancement	Improve temperature and juvenile fish habitat
4	1	Lay back right and left banks to increase flood storage & bank stability & reduce erosion. (High sediment load provides refugia for bacteria and reduces uv light-induced mortality of bacteria)	Reduce sediment load
5	6	Evaluate sediment inputs to creek immediately upstream of culvert 890; assess need to replace culvert 890; reduce frequency of dredging	Improve flow and temperature regime

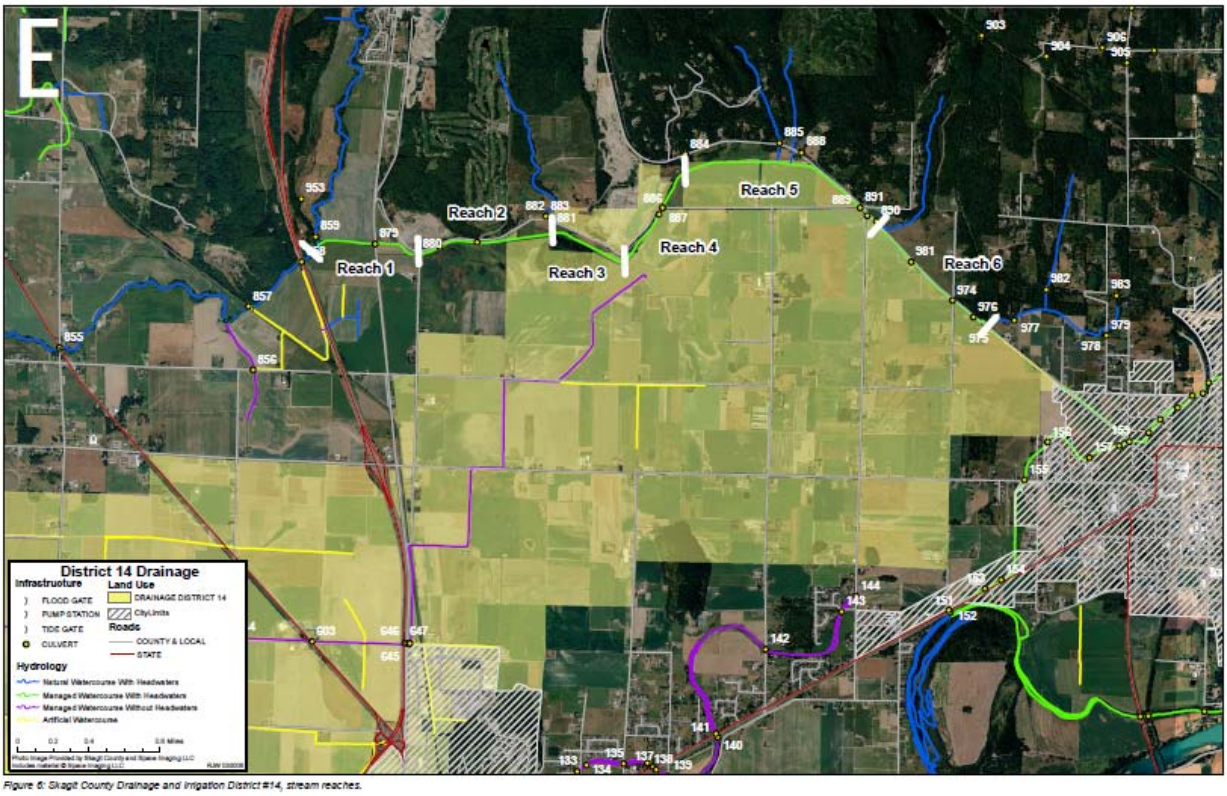

Figure 6: Skagit County Drainage and Irrigation District #14, stream reaches.

Figure 24. Six reaches of Thomas Creek with proposed fish habitat restoration projects.

Washington Department of Ecology

Ecology is responsible for overseeing and documenting implementation of the Samish Bay Watershed Fecal Coliform TMDL Water Quality Improvement Plan. Working with local organizations and reviewing water quality monitoring results will provide opportunity for additional ideas to shape and direct this plan and make sure it is effective. Once EPA approves this TMDL and its implementation plan, Ecology will be responsible for promoting water quality improvement projects and for periodically assessing progress in meeting water quality standards.

Ecology has regulatory responsibilities for nonpoint compliance for livestock; heifer operations; manure spreading by operators other than dairies; and small farms operations. Ecology also writes concentrated animal feeding operations (CAFO) permits and can enforce on CAFO permits. WSDA and Ecology may coordinate when enforcement is based on WSDA's inspection or response to a water quality complaint.

Ecology actions necessary to reduce fecal coliform bacteria in the Samish:

- Coordinate adaptive management meetings or other effective means to report progress on water quality to watershed residents.
- Develop a monitoring plan for microbial source tracking and coordinate with local agency partners to ensure that sample collection is initiated by December 2009.
- Work with local agency and state partners to develop an effective strategy for outreach to non-commercial farmers regarding the need to protect water quality.
- Follow up complaints and ensure compliance under RCW 90.48.080.
- Work with agency partners to identify heifer operations, livestock operations, manure spreading operations, and small non-commercial farms with the potential to adversely impact water quality in Samish drainages. For properties lacking in water quality protection BMPs, work with Skagit Conservation District to ensure implementation of best management practices that will ensure meeting water quality standards.
- Work with WSDA to develop guidance given to manure spreading operations regarding BMPs to protect water quality.
- Work with WSDA and Washington Conservation Commission (or local conservation district) to develop a process for updating dairy nutrient management plans in watersheds impaired with fecal coliform bacteria, to ensure protective practices in plans.
- Continue funding stream restoration and water quality improvement projects in the Samish**.**

Washington State Department of Fish & Wildlife

Washington State Department of Fish and Wildlife (WDFW) manages conservation areas near Samish Bay. The properties are planted in grain to attract migratory waterfowl.

WDFW actions necessary to reduce bacteria in the Samish:

- Review borders of conservation areas adjacent to ditches, streams, and Samish Bay. Plant native riparian vegetation or, at a minimum, grass filter strips sufficiently wide to reduce bacteria counts to safe numbers in these water bodies.
- Provide adequate toilet facilities for people recreating on their land.

Washington State Department of Health

Washington State Department of Health (DOH) Office of Shellfish and Water Protection, under statutory authority of Chapter 43.70 RCW, monitors marine water quality in commercial shellfish growing areas and reports annually on status and changes in growing area classification.

DOH plays an important role in communicating with state and local agencies when changes in marine water quality indicate that more stringent freshwater quality protection is needed. This TMDL plan does not prescribe specific actions for DOH, but acknowledges the role of DOH in monitoring marine water quality in shellfish growing areas, in coordinating and communicating with local watershed partners, and in leading the effort to develop a storm event monitoring and response plan for 2008-2009.

- Until pollution sources are identified and corrected, continue to communicate with shellfish growers regarding emergency closures of the bay to harvest in response to storm events.

Washington State Department of Natural Resources

Washington State Department of Natural Resources manages the 4800 acre Blanchard Mountain state trust lands and has set aside 1600 acres for trails and other recreation opportunities.

- Provide adequate toilet facilities in recreational areas; educate public to use them.

Washington State Department of Transportation

In February 2009, Ecology issued a National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit to Washington State Department of Transportation (WSDOT). The permit can be reviewed on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/municipal/wsdot.html

Under the terms of the stormwater permit, WSDOT is authorized to discharge stormwater runoff to waters of the state from municipal separate storm sewer systems. WSDOT land uses include highways, maintenance facilities, ferry terminals, weigh stations, and rest stops. As required by paragraph 402 (p)(3) of the Clean Water Act, the permit must effectively prohibit non-stormwater discharges into storm sewers that discharge to surface waters and apply controls to reduce the discharge of pollutants to the maximum extent practicable (MEP). The permit does not directly regulate discharges from agricultural runoff, irrigation return flows, process and non-

process wastewaters from industrial activities, and stormwater runoff from areas served by combined sewer systems. These types of discharges may be regulated by local and other state requirements if they discharge to municipal separate sewers.

Section S-6 of the WSDOT stormwater permit discusses the relationship between the permit and TMDL requirements. For TMDLs approved after the permit is issued (as expected for the Samish TMDL), should the TMDL find a connection between the pollutant of concern and WSDOT stormwater management practices, Ecology may establish TMDL-related permit requirements through a formal permit modification or through issuance of an appealable administrative order.

The TMDL study findings (Ecology 2008) did not suggest any specific contributions by WSDOT stormwater discharges to the high load of bacteria that frequently occurs in Samish waterways. State highways can be a contributor of fecal coliform bacteria under some conditions. For example, highway or rest stop litter can attract birds or wildlife that then leave fecal contributions. These contributions may be carried by runoff into highway stormwater systems that discharge to surface waters, usually at bridges and culverts. Tractors leaving agricultural fields may track manure onto highways, where the next rain may carry it into a highway ditch that goes to the Samish.

As this TMDL moves into followup monitoring and adaptive management, highway storm discharges could be found to be a significant source of bacteria. Should that happen, Ecology will use the avenues open to it under the WSDOT stormwater permit to require or recommend implementation actions, including source control and pollution prevention.

Figure 25. Samish River downstream of Old Highway 99 bridge.

Implementation Summary

The implementation actions assigned to organizations are summarized in Table 13.

Table 13. Summary of Samish Bay watershed TMDL implementation actions.

Organization	Action	Date
Skagit County government agencies	**SCPW:** Apply for Centennial Grant funding to lead Pollution Identification and Correction project in Samish Watershed. Coordinate with SCHD.	Fall 2009
	Increase public awareness of Phase II NPDES stormwater telephone line for reporting water quality complaints, illicit discharges, and spills. Coordinate with Ecology ERTS complaint phone line	June 2010
	SCPDS: In next update of SCC 14.24.120, explicitly require livestock exclusion from surface waters that do not meet state water quality standards or that could be impaired by livestock access.	Fall 2009
	Work with Ecology and other local agencies in developing effective outreach to small farms landowners regarding water quality protection and best practices for animal waste management. This outreach could include visits to farms in priority reaches of the Samish.	Ongoing
	Enforce SCC 14.24.120, Critical Areas Ordinance for Ongoing Agriculture and Rural Resource Natural Resource Lands.	Next update
	Promote Low Impact Development practices; adopt ordinances and development codes that are compatible with and will encourage Low Impact Development.	Ongoing
	SCHD: Fully implement county Onsite Sewage Management Program regulations related to Samish Marine Recovery Areas and Sensitive Areas. Continue citizen education through Septic 101 classes, as resources allow.	2009-2012
	Provide outreach to crop farmers and landowners leasing fields to hunters to make sure they provide adequate toilet facilities and educate users.	2009-2010
Skagit Conservation District (as funds and staff resources allow)	Assist Ecology and other local agencies in providing education on water quality protection and best practices for animal waste management. Develop web-based self check list on best management practices for farms with livestock.	Ongoing
	Promote use of alternative watering systems for livestock owners.	Two systems 2009
	Promote CREP projects to fund riparian improvements and improved vegetative buffers along ditches. Develop effective communications to explain CREP revisions and new leasing rates.	Ongoing
	Provide farm planning technical assistance and cost-share opportunities.	Ongoing
	Contribute to Samish outreach strategy by reviewing strategies being used	Ongoing

Organization	Action	Date
	by other Conservation Districts in western Washington.	
	Develop funds to coordinate and facilitate Skagit Stream Team.	Fall 2009
Samish-area Drainage Districts (5, 14, 16, 18 and 25)	Provide outreach to landowners on need to protect, improve water quality in ditches. Develop riparian restoration projects that protect water quality. Consider native riparian plantings that can be mowed to provide maintenance access and shade out reed canary grass.	2009 and ongoing
Washington State Department of Ecology (as resources allow)	Coordinate annual Adaptive Management meetings or other means of communicating progress.	Initiate 2010
	Write monitoring plan for bacteria source tracking of human vs. cattle sources in Samish watershed	Summer 2009
	Work with local agencies to develop effective outreach to small farms, either through educational visits on water quality protection and best practices for animal waste management, or other strategy.	Ongoing
	Follow up complaints and ensure compliance under RCW 90.48.080.	Ongoing
	Work with WSDA to determine locations of poultry and dairy manure spreading operations and develop ways to assess impacts of these operations on Samish water quality.	Ongoing
	Work with WSDA on effective guidance to manure spreading operations regarding BMPs to protect water quality.	Ongoing
	Work with WSDA and Washington Conservation Commission (or local Conservation District) to ensure dairy nutrient management plans are sufficiently protective of water quality where streams are impaired.	Ongoing
	Continue to fund stream restoration and water quality improvement projects in the Samish watershed.	Ongoing
Washington Dept of Fish & Wildlife	Install hedgerows or grass filter strips to effectively reduce to safe levels the bacteria in adjacent waterways from conservation area fields planted to attract waterfowl.	2010-2014
	Provide adequate toilet facilities for people recreating on WDFW lands.	2009 and ongoing
Washington Dept of Agriculture	Administer the Dairy Nutrient Management Program. Reinforce guidance and inspections related to water quality protection in Samish watershed. Continue programmatic requirements for reviewing implementation of DNM plans, responding to complaints, referrals to Conservation District for technical assistance, and working with Ecology as water quality protection issues arise that involve licensed dairies. As resources allow, assist Ecology in identifying heifer operations and other livestock operations with potential to affect water quality.	Ongoing Ongoing

Organization	Action	Date
	Assist Ecology in determining if poultry manure or dairy manure is being imported to the Samish watershed from other watersheds. Assist Ecology where appropriate in communicating with sources of poultry and dairy manure to make sure spreading operations are informed of best management practices needed to protect water quality. If a dairy in the Samish is under enforcement related to manure spreading, buffers or setbacks, WSDA should require the operator to report prior to spreading.	Ongoing Ongoing
Skagit Conservation Education Alliance (SCEA) (as funds allow)	Continue to provide portable restroom facilities at fishing spots and other recreational areas in the Samish; assess need for additional facilities. Post notices of need to protect water quality and work with local retailers that serve hunting, fishing, bird watching communities to provide water quality protection information. Work with Ecology, other agencies to develop effective outreach to Samish residents on need to protect water & what BMPs are effective.	2009-2011 2009 - 2011
Washington Dept of Natural Resources	Provide and maintain adequate toilet facilities on recreational lands. Educate public to use them.	Ongoing

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Adaptive Management

An adaptive approach will be used to adjust the implementation plan in response to new water quality monitoring data. If water quality standards are achieved, but wasteload and load allocations are not, the TMDL will be considered satisfied.

This plan proposes a two-year, proactive adaptive management phase of implementation with semi-annual meetings or progress reports coordinated by Ecology. The purpose of this two-year phase is to take advantage of current local concern and wide community support that has assisted the TMDL process since January 2006. This two-year period is also needed to conduct followup monitoring to better locate and correct sources of fecal coliform bacteria. Objectives of this phase are to:

- Use bacteria source tracking (using a method that differentiates bacteria from humans versus bacteria from livestock) at strategic locations where the result will assist in working with reluctant property owners to make corrections.
- Skagit County agencies will apply for grant funds to initiate and lead a pollution identification and correction project. The project would include outreach to local landowners and detailed sampling to better characterize sources of fecal coliform bacteria.
- Communicate with and engage members of producer communities (livestock producers, noncommercial farms, manure spreading operations, and heifer producers) in meetings or through other effective engagement. Offer at least one meeting or widely distributed report annually to share water quality monitoring information (report progress in the field) and explain how producers can help by making changes on the ground. Ecology will coordinate the meetings or reports and will request the assistance of WSDA and the Skagit Conservation District to help in outreach and communication.
- Work with WSDA, the dairy community and poultry operations to develop a better understanding of current manure spreading practices and whether they contribute significantly to bacteria loading in the Samish watershed. Part of this effort should be to review current protective practices employed during spreading and to develop effective ways to promote and ensure that best management practices will be used.

If the implementation actions outlined in Table 13 (Summary of Implementation Actions) are completed as expected, but a stream or reach still does not meet water quality standards, then revised implementation actions will be developed in consultation with appropriate local agencies. Consultation with local agencies will include discussion of whether the existing program of activities is appropriate; whether current enforcement tools available are adequate and effective; whether some sources are not being addressed effectively using existing tools; and whether additional resources, such as staff time or equipment or educational programs, would make a difference in reaching the TMDL targets according to the schedule.

For the adaptive approach to be successful there must be:

- A commitment by local residents to review and, if needed, modify their current management practices for land, animals and water.
- Improved understanding of pollution sources and fate and transport of bacteria in this watershed. It is expected such understanding will come through detailed review of local land uses, parcel by parcel, and the water quality protection measures that are in place for dairies, manure spreading operations, livestock and noncommercial farms. (This understanding will also improve with research on the conditions in water and sediment that affect bacteria survival and growth and with research that makes it possible to distinguish among a larger variety of bacteria sources – human, livestock, pets, waterfowl, and other wildlife.)

TMDL reductions should be achieved by 2014. Interim targets have been established for several key monitoring locations in the Samish watershed (Table 15). Partners will work together to monitor progress toward these goals, evaluate successes, obstacles, and changing needs, and make adjustments to the cleanup strategy as needed.

It is ultimately Ecology's responsibility to assure that cleanup is being actively pursued and water standards are achieved. Water quality monitoring (see the *Monitoring Plan* section in this report) is one of the tools Ecology uses to assess progress in achieving water quality standards.

Enforcement

Organizations with enforcement responsibility that are critical to the implementation plan's success are U.S. Environmental Protection Agency (EPA), Ecology, WSDA, Skagit County Health Department and Skagit County Planning and Development Services.

Ecology has authority under the Water Pollution Control Act (chapter 90.48 RCW) and the federal Clean Water Act to issue permits and regulations and to prohibit illegal discharges to surface water. It is the policy of the state to maintain the highest possible standards to ensure the purity of all waters of the state and to require the use of all known, available and reasonable means to prevent and control water pollution. Ecology is authorized to administer the Phase II NPDES Municipal Stormwater Permit, which includes audits and enforcement as elements of the stormwater permit program.

Ecology's enforcement authority adds reasonable assurance that the Samish Bay Watershed TMDL will be successful. Ecology will act to enforce state water quality laws when monitoring data indicate that pollution problems are continuing, when local enforcement programs are not successful in resolving water quality complaints, and/or when there is evidence that individual sites or facilities are causing pollution in violation of RCW 90.48.080. Ecology may issue orders, directives, permits, or pursue civil or criminal sanctions to gain compliance with state water quality standards. Ecology enforces water quality regulations under RCW 90.48.

Washington State Department of Agriculture has inspection and enforcement authority under the Dairy Nutrient Management Act, which covers licensed dairies. Ecology may assist WSDA where Ecology's water quality enforcement authority will help resolve pollution problems at dairies or CAFOs. Local governments are expected to continue to exercise their authority to protect public health and enforce local codes and ordinances that protect water quality. Ecology is available to assist local government in water quality enforcement where state enforcement authority is considered appropriate.

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Funding Opportunities

Financial assistance for water quality improvement activities is available through Ecology's grant and loan programs, state salmon recovery and outdoor recreation grants, Skagit Conservation District, Skagit County programs and other sources. Table 14 lists potential sources of funding. Ecology will work with stakeholders to identify funding sources and prepare appropriate scopes of work that will help implement this TMDL.

Table 14. Potential funding sources for TMDL implementation.

Sponsoring Entity	Funding Source	Uses to be Made of Funds
Department of Ecology, Water Quality Program	Centennial Clean Water Fund, Section 319, and State Revolving Fund http://www.ecy.wa.gov/programs/wq/funding/	Facilities and water pollution control-related activities; implementation, design, acquisition, construction, and improvement of water pollution control. Priorities include: implementing water quality implementation plans (TMDLs); keeping pollution out of streams and aquifers; modernizing aging wastewater treatment facilities; reclaiming and reusing waste water.
County Conservation District	Federal Conservation Reserve Enhancement Program (CREP) http://www.skagitcd.org/	Conservation easements; cost-share for implementing agricultural/riparian best management practices (BMPs).
Skagit County Permit Center or Treasurer's Office	State revolving funds	Low-interest loans for repair of individual onsite sewage systems (as funds are available)
Skagit County Public Works	Community grants for salmon stream restoration	Restoration, water quality improvement
Department of Ecology, SEA	Coastal Zone Protection Fund	Limited grants for on-the-ground projects funded by penalty monies collected by the Water Quality Program.
State Recreation and Conservation Funding Board	Recreation and Conservation Office http://www.rco.wa.gov/rcfb/grants.asp	Provides grants for habitat restoration, land acquisition and habitat assessment. Current grant programs include: • Aquatic Lands Enhancement Account • Land and Water Conservation Fund • Washington Wildlife Recreation Program
Natural Resources Conservation Service	Emergency Watershed Protection http://www.nrcs.usda.gov/programs/ewp/index.html	NRCS purchases land vulnerable to flooding to ease flooding impacts.

Sponsoring Entity	Funding Source	Uses to be Made of Funds
Natural Resources Conservation Service	Wetland Reserve Program http://www.wa.nrcs.usda.gov/programs/wrp/wrp.html	Landowners may receive incentives to enhance wetlands in exchange for retiring marginal agricultural land.
Natural Resources Conservation Service	EQIP (Environmental Quality Incentive Program) http://www.nrcs.usda.gov/programs/eqip/	Provides technical assistance, cost share, and incentive payments to assist crop and livestock producers with environmental and conservation improvements on the farm. Contracts last five to ten years.
Natural Resources Conservation Service	AWEP (Agriculture Water Enhancement Program) http://www.nrcs.usda.gov/programs/AWEP/	AWEP offers financial and technical assistance to help farmers and ranchers carry out water enhancement activities that conserve ground and surface water and improve water quality on agricultural lands such as cropland, pasture, grassland and rangeland.

Measuring Progress toward Goals

The Samish Bay Watershed implementation plan is a list of actions and programs to be undertaken by residents and organizations within the watershed. It recommends that resources be allocated to ensure that the Samish River and the creeks and sloughs that drain to Samish Bay will meet water quality standards by 2014.

To track progress of the TMDL following the two-year adaptive management period, Ecology will assist local organizations in conducting an annual review of the water quality monitoring data and status reports from each organization responsible for achieving bacteria reductions. The annual review will address three questions:

- Do water quality data from ongoing monitoring programs indicate sufficient progress is being made toward meeting water quality standards in 2014?
- Is each cooperating agency fulfilling its commitment to implementation?
- If implementation is occurring as expected but water quality is not improving, what additional activities are needed?

This TMDL is expected to take approximately five years to reach water quality standards. If fecal coliform reductions have not progressed 40 percent of the way toward the target after two years (and 60 percent after three years), then Ecology will work with local organizations to review the implementation plan and identify the additional activities, or different types of activities, needed to ensure progress. Detailed monitoring may be needed to increase the probability of identifying sources and meeting targets on schedule. It may also be helpful to assign local targets for specific sub-areas.

Performance measures and targets (Monitoring Plan)

The Samish Bay Watershed Fecal Coliform TMDL proposes fecal coliform bacteria targets for 26 locations in the watershed (Tables 6 and 7). To protect freshwater recreational uses, the state freshwater bacteria criteria of 100/200 would be sufficient. However, the targets were set lower than the freshwater criteria because lower fecal coliform concentrations are needed in these waters in order to achieve the stricter marine criteria needed for shellfish harvest and recreational uses in Samish Bay. Table 15 lists a subset of the bacteria target locations; the sites in the table are those that will be monitored in the next several years through commitments by local government and organizations. The monitoring data collected by these organizations will make it possible to track progress "in the water" as the activities required for implementation are undertaken.

Progress in this TMDL also will be monitored by tracking implementation actions. Appendix C includes tables to track the progress of implementation activities for each organization listed in the *Pollution Sources and Organizational Actions, Goals, and Schedules* section of this report.)

Ecology will work with the Skagit Conservation District and other members of the Samish Technical Advisory Committee to schedule periodic meetings to assess progress on the ground and determine whether different approaches are needed.

Effectiveness monitoring

Effectiveness monitoring determines whether the interim targets and water quality standards have been met after the Water Quality Implementation Plan is implemented. Ecology's Environmental Assessment Program usually conducts effectiveness monitoring of TMDLs. However, it is expected that if sufficient resources are available, Skagit County Monitoring Program could provide data needed to assess effectiveness. This plan includes monitoring that will be done by other entities if any is planned. This plan *does not* include monitoring conducted to determine whether individual BMPs are effective at reducing pollution.

Ecology and its partners will determine through the Adaptive Management process, which includes review of water quality monitoring data, when it may be appropriate to conduct effectiveness monitoring.

Table 15. Stations with ongoing water quality monitoring and fecal coliform bacteria targets.

Station Description	Ecology Station ID	Monitoring Organization and Station ID	Start Date	Current FC		2010 Critical Period FC Targets[2]		TMDL Target Conc./Target that 10% of Samples May Not Exceed
				Critical Period	GM/90th %ile	GM	90th %ile	
Samish R at Mouth	SAM-00.7	Skagit Stream Team	1998	none	35/156	30	133	10/43
Samish R at Thomas Rd	SAM-04.6	Skagit Public Works[1] Site 32	October 2003	none	56/243	48	209	15/67
Samish River at Old Highway 99	03B050 SAM-10.3	Ecology Long Term River Monitoring	Ongoing (monthly)	May-Oct	181/428	162	382	85/200
Samish River at State Route 9	SAM-22.0	Skagit Public Works[1] Site 11	October 2003	none	Meets Stds	100	200	100/200
Friday Creek at Prairie Rd	FRI-00.8	Skagit Public Works[1] Site 6	October 2003	Jun-Sep	174/936	147	789	37/200
Thomas Creek at Old Highway 99 N	THO-00.3	Skagit Public Works[1] Site 3	October 2003	May-Sep	254/920	214	776	55/200
Thomas Cr - F&S Grade	THO-03.6	Skagit Public Works[1] Site 4	October 2003	May-Sep	399/3105	324	2524	26/200
Swede Creek at Grip Rd	SWE-00.0	Skagit Public Works[1] Site 8	October 2003	Apr-Sep	157/828	133	702	38/200
Alice Bay pump station	ALI-PUMP	Skagit Public Works[1] Site 33	October 2003	none	16/127	14	110	5/43
N Edison pump station	NED-PUMP	Skagit Public Works[1] Site 38	October 2003	none	109/330	100	304	66/200
Edison Slough above tidegate	EDI-01.2	Skagit Public Works[1] Site 36	October 2003	Apr-Jul	129/846	110	717	32/200
S Edison drainage near liquor store	SED-PUMP	Skagit Public Works[1] Site 37	October 2003	none	167/601	145	521	56/200
Colony Cr at Colony Rd	COL-00.0	Skagit Public Works[1] Site 39	October 2003	May-Oct	103/244	99	235	85/200

(1) Currently monitored under Skagit County Water Quality Monitoring Program. Future monitoring may be subject to funding.

(2) For 2010, interim targets are 20 percent of the overall reduction needed

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Reasonable Assurance that Water Quality Improvements Will Occur

When establishing a TMDL, reductions of a particular pollutant are allocated among the pollutant sources (both point and nonpoint sources) in the water body. TMDLs (and related water quality improvement plans) must show "reasonable assurance" that these sources will be reduced to their allocated amount. Education, outreach, technical and financial assistance, permit administration, and enforcement will be used to ensure that the goals of this plan are met.

Fecal coliform pollution in the Samish watershed has both point and nonpoint sources, which require different approaches and uses of public resources. For point sources, the TMDL establishes wasteload allocations; for nonpoint sources, the TMDL establishes load allocations.

The Samish watershed has two point sources, Washington State Department of Transportation (WSDOT) and permitted farms. WSDOT manages stormwater from state highways and I-5 in the Samish watershed, and is covered under an NPDES municipal stormwater permit issued by Ecology in February 2009. Ecology's study of Samish fecal coliform pollution did not point to highway stormwater as a significant source. Nevertheless, as monitoring and adaptive management continue in this watershed, should state highway stormwater be determined to contribute significant amounts of bacteria to Samish waterways, the permit relationship provides avenues for Ecology to work with WSDOT and ensure compliance with the prohibition to discharge toxic or polluting substances in stormwater that reaches waters of the state.

Dynes Farms is an egg processing operation that is expected to be issued coverage under a concentrated animal feeding operation (CAFO) permit in 2009. This CAFO will have a wasteload allocation (WLA) set at zero due to the "no discharge" requirement of Ecology's National Pollutant Discharge Elimination System (NPDES) CAFO permit, which allows discharges only in conjunction with a larger-than 25-year, 24-hour storm event.

Nonpoint sources of fecal coliform pollution include failing or poorly operating onsite septic systems and improper management of manure from livestock operations, small non-commercial farms, workers and recreators in the watershed, and pets. These may be difficult to identify and confirm as sources of pollution to surface waters. The following agencies' commitments indicate sufficient progress will be made in reducing nonpoint bacteria pollution to meet water quality standards in this watershed by 2014.

- Ecology's Northwest Regional Office committed 0.1 FTE for the biennium 2009-2011 for technical assistance, coordination with local authorities, and nonpoint source investigations. While limited, this commitment is expected to lead to direct improvements in surface water quality through communication and follow up with property owners where livestock manure is degrading streams.

- Skagit County Health Department's designation of the lower Samish watershed as a marine recovery area, and other parts of the watershed as sensitive areas, means that homeowners in these designated areas will be required to have their onsite sewage systems

inspected. The designations were adopted into county code in September 2008. These designations are part of SCHD's Onsite Sewage System (OSS) Management Program, which includes ongoing communication with OSS owners and completion of a database of type, condition, and inspection status of all OSSs in the county. Enforcement of OSS inspections is a component of the OSS Management Program.

- Washington State Department of Health (DOH) Office of Shellfish and Water Protection conducts regular monitoring in Samish Bay. This office informs Skagit County Public Works and Ecology of changes in water quality and potential changes to shellfish area classifications. If marine water quality in commercial growing areas no longer meets classification criteria, DOH will downgrade these areas for harvesting. Such downgrades protect public health, call attention to pollution problems, and may lead to initiation of shellfish closure response plans and dedication of resources to address bacteria sources.

  In the fall of 2008, DOH initiated a study of the relationship between high precipitation events and marine water quality to test whether rapid response temporary closures after rain events would be an appropriate and useful tool for avoiding shellfish recalls. Thus far, shellfish recalls have been avoided with this approach. However, commercial shellfish farms were closed to harvest five times from May through December of 2008 and twice in early May 2009, with each closure lasting about a week. These closures resulted in considerable disruption and economic impact to the shellfish farms and their employees.

- Skagit County Public Works monitors 11 sites in the Samish watershed twice monthly and provides valuable coordination among DOH, Ecology and local partners. Public Works is currently assisting DOH by alerting them to high precipitation-high fecal coliform loading conditions in the freshwaters draining to Samish Bay. Where resources allow, Public Works conducted additional freshwater sampling to better characterize bacteria sources and fate.

- Skagit Conservation District (SCD) received two Ecology Centennial Grants for outreach and technical assistance to dairy and livestock owners, small non-commercial farmers, and other property owners in the Samish watershed. SCD plays an important role in water quality education and coordinated Samish Technical Advisory Committee (TAC) meetings. SCD also manages the Skagit Stream Team jointly with Padilla Bay National Estuarine Research Reserve in the Bayview neighborhood, south of the Samish watershed.

- SCD's Skagit Stream Team (a volunteer group) recently contributed to the DOH study of the relationship between high precipitation events, freshwater quality, and the quality of marine receiving waters. Depending on availability, they may have the ability to respond to a sampling request.

- Washington State Department of Agriculture (WSDA) administers the state Nutrient Management Program and conducts inspections of dairies and CAFOs in the Samish watershed. WSDA will assist Ecology in communicating information to dairies and CAFOs about the need for improved water quality protection. Ecology is requesting

WSDA assistance in assessing the role of heifer operations and manure spreading operations in contributing to the nonpoint pollution problems in the Samish.

While Ecology is authorized under Chapter 90.48 RCW to impose strict requirements or issue enforcement actions to achieve compliance with state water quality standards, it is the goal of all participants in the Samish TMDL process to achieve clean water through voluntary control actions.

Ecology will consider and issue notices of noncompliance in accordance with the Regulatory Reform Act in situations where the cause or contribution of cause of noncompliance with load allocations can be established.

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Summary of Public Involvement Methods

In January 2004, Washington State Department of Health convened a public meeting in Edison, following an outbreak of illness among consumers of commercial shellfish harvested from Samish Bay in late 2003. At the meeting, staff of state and local agencies, including Ecology, and citizens and tribes discussed avenues for improving water quality of Samish Bay. The group requested Ecology undertake a total maximum daily load (TMDL) project to monitor freshwater quality, determine bacteria sources, and work with local partners to develop a plan to achieve water quality improvement.

Ecology and local partners have provided information about the project to the public in a number of ways, including a website at: http://www.ecy.wa.gov/programs/wq/tmdl/samish/index.html.

1. January 2006 – public meeting at Edison Firehouse to receive input and announce the start of water quality monitoring for the TMDL.

2. Samish Technical Advisory Committee meetings coordinated by Skagit Conservation District and Ecology (approximately quarterly since 2006).

3. March 2007 – Tour of potential bacteria source locations near Samish Bay, with Skagit County Commissioner Munks and local and state agency representatives.

4. Spring 2008 – Ecology staff gave brief presentations about the Samish TMDL and need for improved water quality, at Skagit County Health Department's series of 8 workshops on the designation of Samish watershed as a Marine Recovery Area.

5. July 2008 – Ecology and Western Washington Agriculture Association organized a presentation of Samish TMDL study findings to Drainage District representatives.

6. August 2008 – At Skagit County public hearing, Ecology staff spoke in support of proposed designation of Samish watershed as Marine Recovery Area to provide greater oversight of residential onsite septic systems.

7. January 2009 – Ecology exhibited solar-powered water pump and water quality information at Washington State University Extension's Country Living/Livestock Winter Fair, Stanwood, Washington.

8. February 12, 2009 – Ecology and Skagit Conservation District organized an evening water quality workshop targeted to Samish-area livestock owners.

9. February 26, 2009 – Public meeting on draft Samish Bay Watershed Fecal Coliform TMDL Implementation Plan. The meeting was advertised (see next page) in the Skagit Herald and on Skagit County's website and copies of the draft were placed in three local libraries. The public comment period was from February 20 to April 17, 2009.

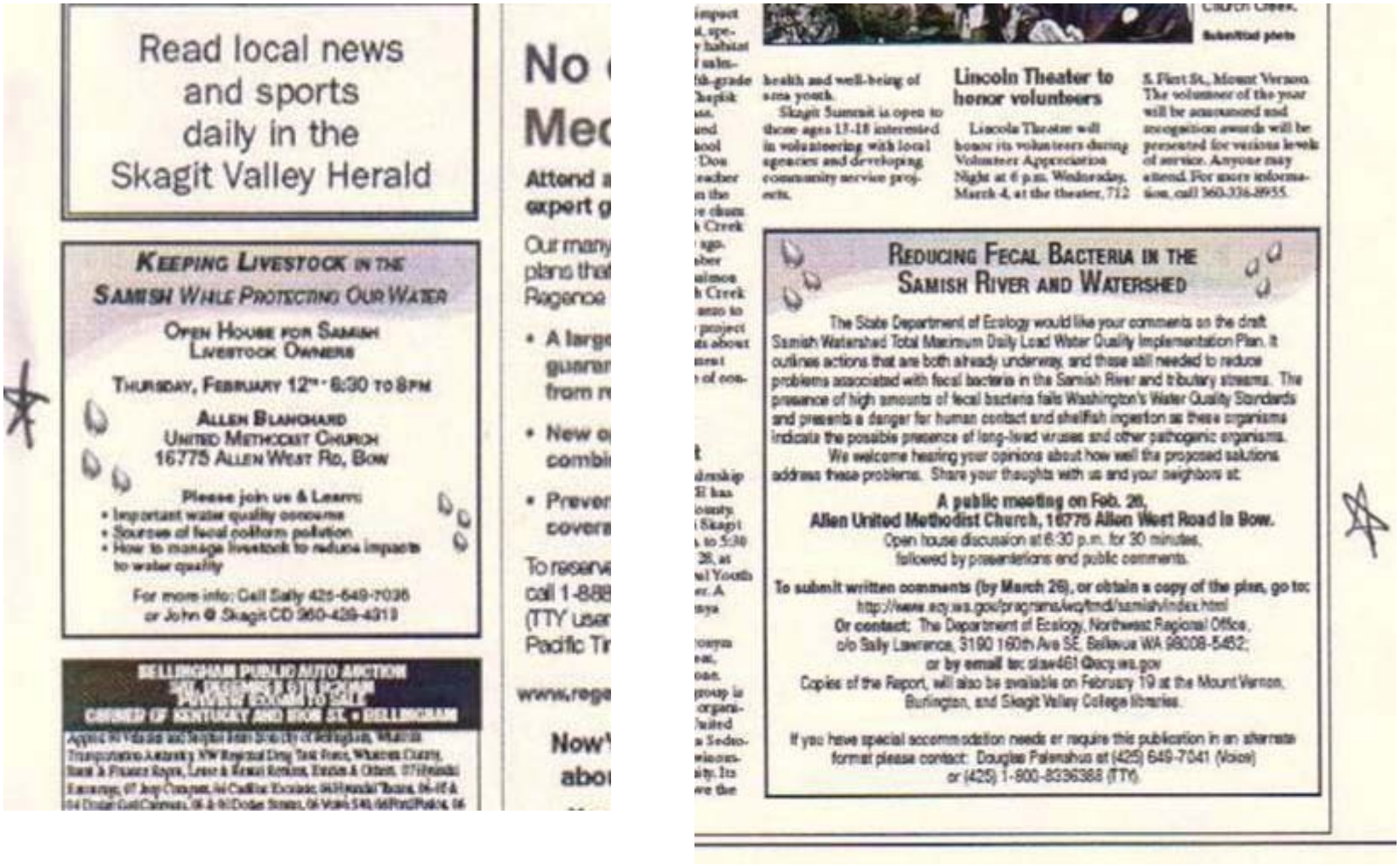

Figure 26. Skagit Herald ads for Samish livestock owners meeting and Samish TMDL Public Meeting.

Process and Information Gaps

In developing this TMDL, Ecology was unable to determine how widespread or significant poultry and dairy manure spreading may be as contributors of fecal coliform bacteria in the Samish watershed. The other significant sources of bacteria in the Samish — onsite sewage systems, livestock operations, and non-commercial farms — do not move around, so we can make rough correlations between occurrence of high bacteria concentrations in the water and upstream or adjacent land uses.

Manure spreading is different. A good manager of a manure spreading operation takes full account of soil nutrients, and when the nutrients measure high, he or she makes the sound decision to spread on a different field. Crops need to be rotated for other reasons – economics, soil health, and so on, so it makes sense to move the nutrient application to optimize crop production. As a result, manure spreading is not a constant at any location in relation to water quality monitoring sites. There are no reporting systems, required or voluntary, that would help an agency conducting water quality monitoring to understand whether manure spreading is affecting the result at a particular site.

The monitoring data (both Ecology's TMDL data and Skagit County Monitoring Program data) show occasional very large increases in bacteria concentration during late winter through the summer. There are also large bacteria loads in the river during rain events in the late spring. (For example, the late April-early May 2008 temporary shellfish closure in Samish Bay was established based on impacts from an intense rain event on April 29, 2008, when fecal coliform concentrations in the Samish River at the Thomas Road Bridge measured 17,000 cfu/100 mL---170 times the state standard.) Manure spreading is a noticeable activity in this watershed, and is most commonly practiced from February through July, but may occur into the fall.

Ecology has not been able to determine the specific level of pollution that can be attributed to manure spreading operations. Nonetheless, manure spreading operations are expected to implement management practice to protect streams and prevent the discharge of pollutions to surface and ground waters. To understand the relationship between manure spreading and monitoring data, we would need to be able to review:

1. What parcels received manure spreading, and on what dates?
2. What protective practices (grass filters strips or other vegetated buffer) were in place at the time of spreading?
3. Was the spreading done at agronomic rates?
4. Was there rain soon after the spreading that may have resulted in contaminated runoff to streams or ditches?

If manure spreading by poultry operations or dairies is found to be a significant source of bacteria in the Samish, then Ecology will need to work with the Washington State Department of Agriculture, the Skagit Conservation District, and the facilities themselves, to ensure there are both structural and operational improvements in practices to reduce water quality impacts.

While dairy nutrient management plans include the parcels used for spreading, poultry operations are not required to have nutrient management plans unless Ecology proves a discharge has occurred; then the operation may be required to apply for coverage as a concentrated animal feeding operation and develop a plan. Ecology does not have regulatory authority to review dairy plans to determine how protective they may be; whether NRCS guidelines are followed; what parcels belong to what dairies; whether manure is transferred from dairies and poultry operations to be spread at other locations not under the ownership of the dairy; and where those other locations are. Also, Ecology does not know whether poultry or dairy manure is being imported from other watersheds to the Samish for spreading.

The state nutrient management program with WSDA inspections and oversight currently does not provide a process for requiring the updating of nutrient management plans in watersheds where water quality standards are not being met. Under the Dairy Nutrient Management Act, WSDA can *require* plans to be updated only when the plan results in a discharge.

Onsite sewage systems, dairies and CAFOs are covered by regulatory programs that involve inspections, recordkeeping, and oversight. In contrast, non-dairy heifer operations, commercial livestock producers and small noncommercial farms are not covered under permits or subject to inspection unless Ecology determines there is a discharge and then can require coverage under the CAFO permit. Without an investigatory program in Skagit County, like Kitsap County's pollution identification and correction (PIC) program, the only means of identifying problems with such facilities is if complaints are filed. This is a significant gap in oversight, which means that finding and eliminating many significant sources of bacteria is slow, depends on the vagaries of citizens making complaints, and requires considerable expenditure of scarce regulatory agency resources.

By pointing to these process and information gaps, it is hoped that Ecology, WSDA and other agencies will work together to develop a system of oversight of dairy and poultry (and other livestock) manure management practices that, in concert with improvements in onsite sewage systems and effective outreach to commercial and noncommercial livestock owners, will lead to an efficient cleanup of the Samish Bay watershed.

Conclusions and Recommendations

Conclusions

Improvements in water quality over the past 20 years, and recent support by many individuals, organizations and local agencies for the concept of a cleaner Samish watershed, suggest making progress toward meeting water quality standards is possible, and can be accomplished by 2014.

Ecology also concludes that:

- Both state and county freshwater data for Samish basin indicate that fecal coliform bacteria occur above state water quality standards at most sites in the watershed.
- The highest loads of bacteria are discharged by Samish River to the bay in fall and winter when the bay has the poorest water quality. However, the highest concentrations in the river and smaller creeks occur during spring rain events or during summer low flows.
- Land uses adjacent to and upstream of locations with highest bacteria loading and concentrations do not fall into a single bacteria source category. Several reaches have beef cattle operations; three have dairies or parcels that receive dairy manure application; some have fields with applications of manure from other livestock; and all polluted reaches have both homes with onsite sewage systems and numerous small farms, including horse properties.
- Only one of these bacteria source categories has a clear and complete regulatory path for solving the problem. Skagit County Health Department (SCHD) requires that all onsite septic systems in this watershed be inspected and brought into good operating condition.

Recommendations

Because the SCHD program offers a solution for bacteria pollution from onsite systems through education and regulations, these recommendations focus on the remaining sources: noncommercial farms, commercial livestock operations, dairies, organizations that plant fields to attract waterfowl, and manure-applied fields.

Noncommercial farms

Noncommercial farms are not required to obtain permits, so getting better water quality protection at many of the 360 noncommercial farms in the watershed will require:

- ✓ Ecology and agency partners to develop effective outreach to livestock owners to protect water quality and get assistance from Skagit Conservation District (SCD). SCD needs to be adequately funded to provide farm planning assistance.
- ✓ Skagit County Public Works (SCPW) to increase public awareness of its telephone line for water quality complaints. The complaints line should be coordinated with Ecology's Environmental Reporting and Tracking System.

- ✓ Skagit County Public Works and cooperating county agencies to apply for funds for a pollution identification and correction project to assist in public outreach and better characterize bacteria sources, whether from livestock or human sources.
- ✓ The county to provide staff resources for following up telephone complaints with visits to problem locations, reviewing land uses and potential sources.
- ✓ Cost-share funding for BMPs. Funds are usually from state and federal sources and can be administered by SCD, Ecology and Skagit County.

Commercial livestock owners

Commercial livestock owners are required to get permits if they discharge or expect to discharge pollutants to surface waters. They are also subject to state water pollution law and to SCC 14.24.120, Skagit County Critical Areas Ordinance for areas of Ongoing Agriculture.

- ✓ Skagit County recently took commendable actions to ensure landowners are in compliance with SCC 14.24.120. Still, more effort is needed. WSDA and Ecology also need to be able to respond to complaints that fall under their regulatory authority.
- ✓ Skagit County Public Works (SCPW) should increase awareness of its water quality complaints phone line, and the county should provide resources for following up.
- ✓ Agencies such as SCD and Ecology need to work to ensure that farm planning technical assistance and cost-share funds for implementation are available.
- ✓ Ecology recommends the next update of SCC 14.24.120 make explicit the exclusion of livestock from surface waters already impaired by fecal coliform or low dissolved oxygen, or that could be impaired by the impacts of livestock access.
- ✓ Commercial livestock owners need to evaluate manure management in relation to land available for application. If located on surface waters polluted with bacteria or if soil tests indicate over-application of manures, then they need to be extra-vigilant in protecting these waters. They may need alternative locations for manure application or new markets or uses for the manure.

Dairies

Dairies in Washington are regulated under the Dairy Nutrient Management Act.

- ✓ Dairy nutrient management plans should reflect guidance from Natural Resource Conservation Service to be sure water quality is being protected. Operators should avoid spreading prior to rain events.
- ✓ WSDA needs to assist Ecology with these questions about Samish watershed dairy nutrient management plans:
    - o Are DNMPs sufficiently protective, using NRCS standards?
    - o What water quality protections are used during manure spreading?

- Did spreading occur recently in relation to high counts of bacteria in samples? If it occurred, where and when did it occur?

Organizations that plant fields to attract waterfowl

Many parcels around Samish Bay are managed to attract waterfowl for hunting. To prevent bacterial contamination of the ditches and streams that drain to the bay, these organizations, including WDFW, should make sure there are vegetated buffers to reduce bacteria in runoff. These organizations should provide adequate toilet facilities and education for their users.

Manure application fields and the problem of excess manure production

Landowners who receive manure from dairies, poultry operations, or other sources are responsible for preventing contaminated runoff from entering state waters. Ecology, WSDA, and SCD will work together to raise awareness of manure application best management practices. Ecology and WSDA will enforce against violations of state water quality laws.

Economics likely plays a role in the operations of manure generators (poultry operations; dairies; commercial livestock; noncommercial farming operations). WSDA, Western Washington Agriculture Association, and stakeholders in these agricultural sectors should work with appropriate partners, such as the Puget Sound Partnership, to explore these economic challenges and perhaps develop a regional strategy to better utilize manure. These agencies may be able to assist local dairies in moving to new "green solutions," including developing composted manure products and possibly send manure to biodigesters, as long as nutrients produced by these facilities are used in beneficial ways and not over-applied.

Row crop and shellfish growers

These farmers need to provide adequate toilet facilities for their staff and workers and train employees to use them.

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Appendices

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Appendix A. Glossary and Acronyms

303(d) List: Section 303(d) of the federal Clean Water Act requires Washington State periodically to prepare a list of all surface waters in the state for which designated uses of the water – such as for drinking, recreation, aquatic habitat, and industrial use – are impaired by pollutants. These are water quality limited estuaries, lakes, and streams that fall short of state surface water quality standards, and are not expected to improve within the next two years.

Best Management Practices (BMPs): Physical, structural, and/or operational practices that, when used singularly or in combination, prevent or reduce pollutant discharges.

Clean Water Act (CWA): Federal Act passed in 1972 that contains provisions to restore and maintain the quality of the nation's waters. Section 303(d) of the CWA establishes the TMDL program.

CAFO: Concentrated Animal Feeding Operation

Designated Uses: Those uses specified in Chapter 173-201A WAC (Water Quality Standards for Surface Waters of the State of Washington) for each water body or segment, regardless of whether or not the uses are currently attained.

DNMP: Dairy Nutrient Management Plan

DNR: Washington State Department of Natural Resources

DOH: Washington State Department of Health

Ecology: Washington State Department of Ecology

Enterococci: A subgroup of the fecal streptococci that includes *S. faecalis*, *S. faecium*, *S. gallinarum*, and *S. avium*. The enterococci are differentiated from other streptococci by their ability to grow in 6.5% sodium chloride, at pH 9.6, and at 10 degrees C and 45 degrees C.

EPA: U.S. Environmental Protection Agency

Existing Uses: Those uses actually attained in fresh and marine waters on or after November 28, 1975, whether or not they are designated uses. Introduced species that are not native to Washington, and put-and-take fisheries comprised of nonself-replicating introduced native species, do not need to receive full support as an existing use.

Extraordinary Primary Contact: Waters providing extraordinary protection against waterborne disease or that serve as tributaries to extraordinary quality shellfish harvesting areas.

Fecal Coliform (FC): That portion of the coliform group of bacteria which is present in intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within 24 hours at 44.5 (plus or minus 0.2) degrees Celsius. FC are "indicator" organisms that suggest the possible presence of disease-causing

organisms. Concentrations are measured in colony forming units per 100 milliliters of water (cfu/100mL).

Geometric Mean: A mathematical expression of the central tendency (an average) of multiple sample values. A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values, which might bias the mean if a straight average (arithmetic mean) were calculated. This is helpful when analyzing bacteria concentrations, because levels may vary anywhere from ten to 10,000 fold over a given period. The calculation is performed by either: (1) taking the nth root of a product of n factors, or (2) taking the antilogarithm of the arithmetic mean of the logarithms of the individual values.

Load Allocation (LA): The portion of a receiving waters' loading capacity attributed to one or more of its existing or future sources of nonpoint pollution or to natural background sources.

Loading Capacity: The greatest amount of a substance that a water body can receive and still meet water quality standards.

Margin of Safety (MOS): Required component of TMDLs that accounts for uncertainty about the relationship between pollutant loads and quality of the receiving water body.

Municipal Separate Storm Sewer Systems (MS4): A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains): (1) owned or operated by a state, city, town, borough, county, parish, district, association, or other public body having jurisdiction over disposal of wastes, storm water, or other wastes and (2) designed or used for collecting or conveying stormwater; (3) which is not a combined sewer; and (4) which is not part of a Publicly Owned Treatment Works (POTW) as defined in the Code of Federal Regulations at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES): National program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements under the Clean Water Act. The NPDES program regulates discharges from wastewater treatment plants, large factories, and other facilities that use, process, and discharge water back into lakes, streams, rivers, bays, and oceans.

Nonpoint Source: Pollution that enters any waters of the state from any dispersed land-based or water-based activities, including but not limited to atmospheric deposition, surface water runoff from agricultural lands, urban areas, or forest lands, subsurface or underground sources, or discharges from boats or marine vessels not otherwise regulated under the NPDES program. Generally, any unconfined and diffuse source of contamination. Legally, any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act.

Pathogen: Disease-causing microorganisms such as bacteria, protozoa, viruses.

Phase I Stormwater Permit: The first phase of stormwater regulation required under the federal Clean Water Act. The permit is issued to medium and large municipal separate storm sewer systems (MS4s) and construction sites of five or more acres.

Phase II Stormwater Permit: The second phase of stormwater regulation required under the federal Clean Water Act. The permit is issued to smaller municipal separate storm sewer systems (MS4s) and construction sites over one acre.

Point Source: Sources of pollution that discharge at a specific location from pipes, outfalls, and conveyance channels to a surface water. Examples of point source discharges include municipal wastewater treatment plants, municipal stormwater systems, industrial waste treatment facilities, and construction sites that clear more than 5 acres of land.

Pollution: Such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the state. This includes change in temperature, taste, color, turbidity, or odor of the waters. It also includes discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state. This definition assumes that these changes will, or is likely to, create a nuisance or render such waters harmful, detrimental, or injurious to (1) public health, safety, or welfare, or (2) domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or (3) livestock, wild animals, birds, fish, or other aquatic life.

Pollution Identification and Correction (PIC): Water quality monitoring, public education, and water quality improvement projects developed with Centennial Grant funding by Kitsap County (Washington) Health District.

Primary Contact Recreation: Activities where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and water skiing.

Salmonid: Any fish that belong to the family *Salmonidae*. Basically, any species of salmon, trout, or char. www.fws.gov/le/ImpExp/FactSheetSalmonids.htm

SCD: Skagit Conservation District

SCEA (Skagit Conservation Education Alliance): Non-profit organization focused on public education and outreach related to improving water quality and protecting natural resources in Skagit County.

SCHD: Skagit County Health Department

SCMP: Skagit County Monitoring Program (Skagit County Public Works)

SCPDS: Skagit County Planning and Development Services

Stormwater: The portion of precipitation that does not naturally percolate into the ground or evaporate but instead runs off roads, pavement, and roofs during rainfall or snow melt. Stormwater can also come from hard or saturated grass surfaces such as lawns, pastures, playfields, and from gravel roads and parking lots.

Surface waters of the state: Lakes, rivers, ponds, streams, inland waters, marine waters, wetlands and all other surface waters and water courses within the jurisdiction of the state of Washington.

Total Maximum Daily Load (TMDL): A distribution of a substance in a water body designed to protect it from exceeding water quality standards. A TMDL is equal to the sum of all of the following: 1) individual wasteload allocations (WLAs) for point sources, 2) the load allocations (LAs) for nonpoint sources, 3) the contribution of natural sources, and 4) a margin of safety to allow for uncertainty in the wasteload determination. A reserve for future growth is also sometimes provided.

Wasteload Allocation (WLA): The portion of a receiving water's loading capacity allocated to existing or future point sources of pollution. WLAs constitutes one type of water quality-based effluent limitation.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

WDFW: Washington Department of Fish and Wildlife

WRIA: Water Resource Inventory Area. The Samish watershed is partly in WRIA 1 and partly in WRIA 3 (Lower Skagit-Samish).

WSDA: Washington State Department of Agriculture

WSDOT: Washington State Department of Transportation

Appendix B. Total maximum daily load analysis

A t*otal maximum daily load* is the maximum amount of a pollutant that a water body can accept before there is a loss of beneficial uses (e.g., swimming, boating, shellfish harvest). In this section we explain how we determine the total maximum daily load, or *loading capacity*, of the freshwater sources to Samish Bay. Once the loading capacity is determined, we calculate the percent reductions in bacteria so that all monitoring sites and receiving waters will meet state water quality standards. These percent reductions are applied to nonpoint sources and point sources in the watershed. The allowable contribution from a nonpoint source, after its reduction is accomplished, is called the *load allocation*. The allowable contribution from a point source is called the *wasteload allocation*.

Volume 1, Ecology's water quality study of the Samish Bay watershed (2008), provides the data and analyses needed to determine the loading capacity of each of the freshwater sources to Samish Bay, and to calculate how much improvement is needed so that water quality standards can be met. In the study, Ecology monitored fecal coliform (FC) bacteria and other parameters at 34 sites on the Samish River, Thomas Creek, Friday Creek, and several creeks and ditches that discharge directly to Samish Bay (Figure B-1). Ecology also collected samples at 26 other investigatory sites to help determine sources. The study shows that most of the monitoring sites in the river, creeks, and tidal sloughs that drain to Samish Bay have too much FC bacteria. Finding high levels of bacteria in these freshwater sources helps explain why Samish Bay continues to have marginal water quality with limited areas approved for shellfish harvest.

This section is *not* a shortened version of Volume 1. Volume 1 provides a complete description of where in the watershed high concentrations of fecal coliform bacteria were found and how the bacteria in the river and streams were affected by season and discharge (streamflow). Volume 1 also explains how Ecology conducted the monitoring, measured flow, and found a relationship between periods of high river bacteria loading and the time of year when Samish Bay has the highest levels of bacteria.

Washington State FC bacteria TMDLs define *loading capacities* of water bodies using both loading estimates and statistical targets for bacteria concentrations. This is necessary because a loading analysis alone is not enough to predict compliance with state standards that are based on concentrations of bacteria. So, Ecology uses loading estimates to help determine the *critical condition* for the watershed – the seasonal or flow condition that produces the worst bacteria concentrations in the receiving waters. Then Ecology calculates "target reductions," which are the reductions of FC bacteria needed at all monitoring sites so the entire water body, including the marine receiving waters, will meet standards.

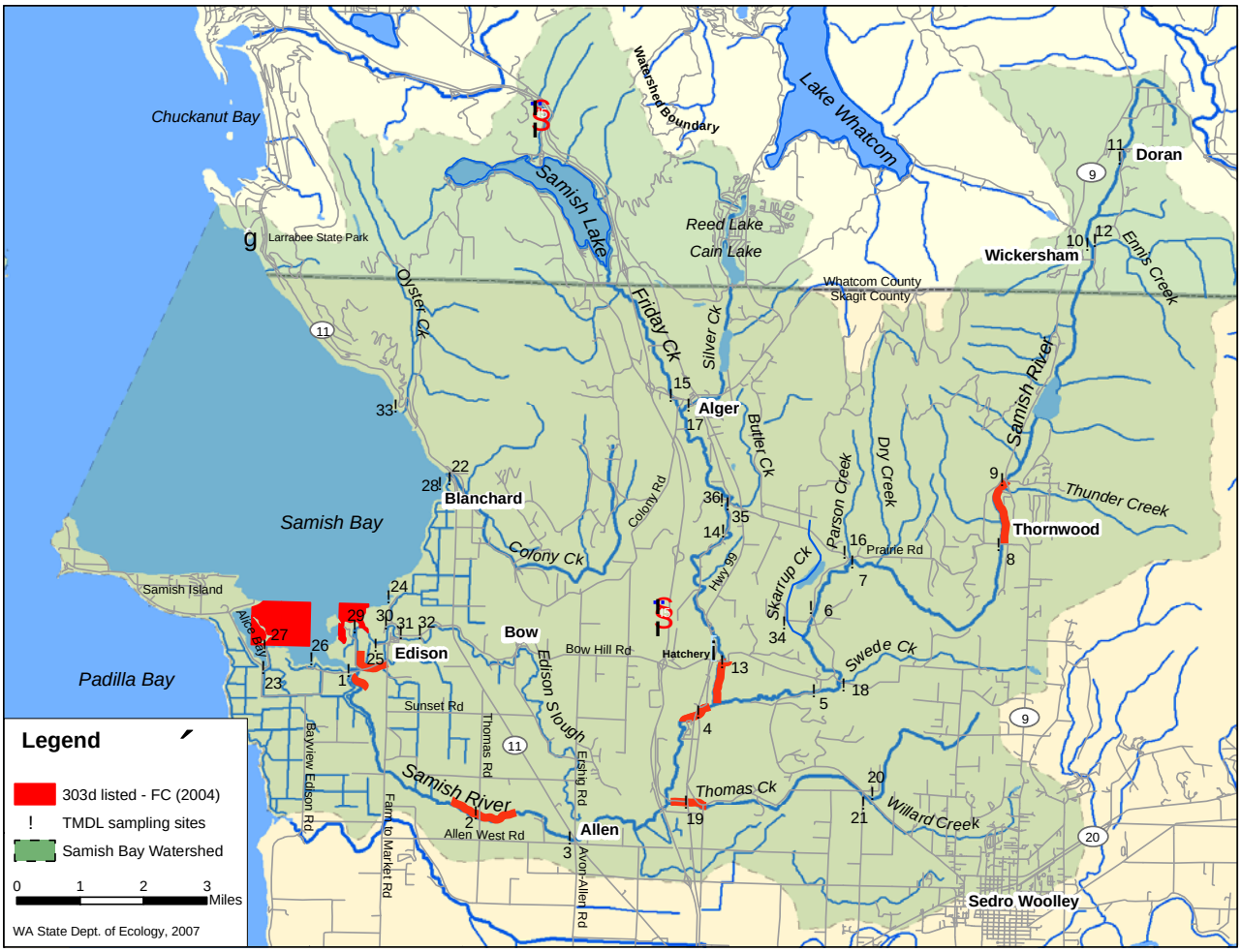

Figure B-1. Reaches of the Samish watershed on state 303(d) list for fecal coliform bacteria.

The target reduction is applied to both point sources and nonpoint sources that affect each site. In effect, the target reduction is what must be accomplished in order for a point source to meet its wasteload allocation and for nonpoint sources to meet their load allocations.

In the Samish watershed, most bacteria comes from nonpoint sources (onsite sewage systems, commercial and non-commercial agriculture, and wildlife). The point sources are an egg processor that is to be issued an Ecology permit to operate as a concentrated animal feeding operation (CAFO) and Washington State Department of Transportation, which manages stormwater discharge from state highways under a National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit from Ecology.

In Volume 1 (2008), Ecology analyzed the fecal coliform data collected in 2006-2007 to provide a detailed picture of the freshwater sources in the Samish watershed and to explain how these freshwater sources affect the water quality of Samish Bay. The 2008 report includes the following analyses, listed here and explained in more detail below (see corresponding number).

1. The geometric means and 90th percentile summary statistics for bacteria concentration at each of the 34 fixed sites monitored in 2006-2007 (Table B-1).

2. A determination of the freshwater critical conditions (whether river flow, or season of year, or rain condition) that result in the worst water quality in Samish Bay.

3. A comparison of the loads of bacteria (= river flow x bacteria concentration) among all the freshwater sources to Samish Bay, to help prioritize implementation actions.

4. An assessment of changes in load along the length of the major freshwater sources (Samish River, Friday Creek and Thomas Creek), to assist in source tracking.

5. Load allocations for nonpoint sources. For monitoring sites that do not meet state standards, Ecology calculated the percent reduction in FC concentration needed to meet standards during the critical condition period. For freshwaters that discharge to marine waters (which have stricter standards), Ecology calculated the total percent reduction needed in the downstream reaches of these freshwaters, so that marine waters can meet standards.

6. Wasteload allocations for point sources.

7. Margin of safety. In the TMDL analysis, Ecology made a number of conservative assumptions, including the use of the critical period concentrations at each site for calculating percent reductions needed. These conservative assumptions represent the margin of safety.

Detailed explanations

1. The geometric means and 90th percentile summary statistics for bacteria concentration at each of the 34 fixed sites monitored in 2006-2007 (Table B-1).

For the Samish, the data collected over a year at 34 sites in the watershed have been analyzed to determine which locations are currently meeting the state's water quality standards for bacteria. The geometric mean and 90th percentile statistics for the sites in the 2006-2007 study are provided in Table B-1. (Note that the data for the November 6-7, 2006 storm event, which showed higher than average bacteria concentrations, were not used for these summary statistics but are reported in the TMDL Study Findings [Ecology 2008].)

Table B-1. FC bacteria summary statistics (cfu/100 mL) at regularly sampled sites in Samish Bay watershed (2006-2007). *Data in shaded cells do not meet state freshwater FC standards*.

Field ID w/ River Mile	map #	Site Location	n	Min	Max	Geo-metric mean	90th percentile
Samish River							
03-SAM-00.7	1	At Bayview/ Edison Rd	25	2	220	35	156
03-SAM-04.6	2	Thomas Rd (average of both days)	25	6	385	56	243
03-SAM-06.5	3	Chuckanut Dr	25	11	330	65	226
03-SAM-10.3	4	Hwy 99	24	4	510	62	322
03-SAM-13.1	5	F&S Grade Rd	24	6	410	58	277
03-SAM-15.0	6	2nd Prairie Rd crossing from Hwy 99	24	5	950	34	177
03-SAM-16.5	7	Off Prairie Rd upstream of Parson Ck	24	3	650	30	154
03-SAM-20.7	8	3rd Prairie Rd crossing from Hwy 99	24	1	560	13	114
03-SAM-22.0	9	Hwy 9	24	1	800	11	103
03-SAM-26.6	10	Wickersham Rd	24	1	210	10	92
03-SAM-28.8	11	Innis Ck Rd (in Doran)	24	7	3000	149	1604
Samish River Tributaries							
03-ENN-00.0	12	Ennis Ck at mouth, Wickersham Rd	21	1	470	5	80
03-FRI-00.8	13	Friday Ck at Bow Hill / Prairie Rd (below Hatchery)	24	4	840	39	283
03-FRI-03.8	14	Friday Ck at Friday Ck Rd	24	4	1400	34	257
03-FRI-06.5	15	Friday Ck at Lake Samish Rd / Alger Cain Lk Rd	24	1	130	11	82
03-PAR-00.0	16	Parson Ck at confluence Samish R	24	1	3200	105	2839
03-SIL-00.4	17	Silver Creek at Friday Ck Rd	24	2	620	11	59
03-SWE-00.0	18	Swede Ck at Grip Rd	24	9	1200	75	441
03-THO-00.3	19	Thomas Ck at Old Hwy 99	24	8	1800	96	488
03-THO-03.6	20	Thomas Ck off F&S Grade Rd abv. Willard Ck confluence	24	22	5700	399	3105
03-WIL-00.0	21	Willard Ck off F&S Grade Rd abv. Thomas Ck confluence	17	13	15000	234	2327
03-SKA-00.5	34	Skarrup Creek at first road crossing	17	22	2400	170	750
Samish Bay Tributaries							
03-COL-00.0	22	Colony Ck near mouth, upstream of tidegates	25	6	310	52	189
03-ALI-PUMP	23	Drainage to Alice Bay	25	1	170	16	127
03-NED-PUMP	24	N Edison drainage at Key Ave., off Smith Rd	24	1	330	109	330
03-SED-PUMP	25	S Edison drainage near liquor store	21	32	2400	167	601
03-BAY-GATE	26	Drainage west of Samish River mouth, to Samish Bay	25	5	810	52	342
03-ALI-GATE	27	Drainage to Alice Bay	12	3	230	21	96
03-MCE-GATE	28	Tidegate to McElroy/Colony Slough	25	1	970	65	542
03-WED-GATE	29	W Edison drainage near Edison Slough mouth	15	1	610	41	428
03-SMI-GATE	30	Drainage to Edison Slough at Smith Rd nr. NED-PUMP	4	3	400	too few samples	
03-EDI-01.2	31	Edison Slough just upstream of tidegates in Edison	24	5	830	30	188
03-EDI-01.6	32	Edison Slough at private drive upstream of school	25	1	870	24	222
03-OYS-00.0	33	Oyster Ck near mouth	25	1	50	4	23

2. A determination of the freshwater critical conditions (whether river flow, or season of year, or rain condition) that result in the worst water quality in Samish Bay.

Ecology reviewed the bacteria data for all the freshwater monitoring sites listed in Table B-1 and determined the season with the highest concentrations. Although this varied from site to site, in general the highest concentrations were seen in the summer when flows were lower. These critical periods are listed for each site in Tables 6 and 7 of the main text of this document. Then, using the bacteria data for the critical condition season, Ecology calculated the necessary percent reductions in FC bacteria in order for each site to meet standards (step 5).

Ecology also wanted to know what freshwater conditions are associated with the poorest water quality (highest bacteria concentrations) in Samish Bay. We found that *bacteria load* in the river is a better predictor of poor water quality in the bay than is *bacteria concentration*.

The bacteria *load* in freshwater sources is calculated by multiplying bacteria concentration (cfu/100 mL) times river or creek flow (in units of cubic feet per second). The bacteria load is expressed as the counts of bacteria being carried by the river or creek in a day (cfu/day).

Bacteria loads in the Samish River follow a fairly consistent seasonal pattern, with much larger loads in the wet season (November to June) than in the dry season (July to October). Unlike the loading pattern which reflects seasonal changes in flow, the concentrations of FC bacteria in the Samish River and other freshwater sources tend to be quite variable from month to month and frequently do not show consistent seasonality.

To understand the relationship between the freshwater bacteria load and water quality of the bay, Ecology reviewed Samish Bay marine water quality data for a number of years (provided by state Department of Health [DOH]) and determined that the critical period in Samish Bay is November through January. This three-month period is the same three months of the year with the highest FC bacteria loads in the Samish River at RM 4.6 (Thomas Rd), based on seven years of data from Skagit County's monitoring program. It is also similar to the period of highest loading (October through January) for a monitoring station upriver (Samish River at Old Highway 99), based on Ecology data for 1995 to 2008.

When determining the percent reduction needed at each monitoring site, Ecology chose a more conservative approach than using the time period of highest loading in freshwater, which would be in November through January. In fact, the highest *concentrations* in freshwater are usually seen in the summer, e.g., May through August. This period of higher concentrations likely reflects the lower flows (less dilution) in the watershed in summer. By choosing the data for the time period with the highest concentrations and then calculating necessary reductions, Ecology is making the analysis more conservative (more protective of water quality downstream.) (This *Margin of Safety* is a necessary part of a TMDL and is required by federal regulation.)

3. **A comparison of the loads of bacteria (= river flow x bacteria concentration) among all the freshwater sources to Samish Bay, to help prioritize implementation actions.**

   The Samish River is the largest contributor of FC bacteria to the bay. On an average annual basis, it contributes 83 percent of the total freshwater discharge (flow) to the bay. However, it contributes 70 percent of the total bacteria loading to the bay (Figure 12 of the main report). The remainder of the bacteria loading comes from several tidal sloughs (totaling 25 percent), Colony Creek (four percent) and Oyster Creek (less than one percent).

   This comparison of loading sources to Samish Bay helps us determine where to focus cleanup actions. Actions that will reduce bacteria loading in the Samish River are the highest priority for reducing bacteria discharge to the bay. However, the tidal sloughs together with Colony Creek contribute a significant amount, and because they are close to the bay, reducing bacteria in these sources is also a high priority.

4. **An assessment of changes in load along the length of the major freshwater sources (Samish River, Friday Creek and Thomas Creek), to assist in source tracking.**

   At locations along the Samish River or the creeks where the load increases substantially between monitoring sites, we know that either a polluted tributary is contributing bacteria or there are sources of bacteria along the reach that are adding to the load. Thus, examining the loading pattern along a river or creek can help pinpoint sources.

   Figures in the TMDL Volume 1 (Ecology 2008) illustrate the seasonal changes in bacteria loading from upstream to downstream sites in the Samish River (Figure 4); in Friday Creek (Figure 10) and Thomas Creek (Figure 12). Ecology will review these results in consultation with Skagit County Health Department, Skagit County Planning and Development Services, Skagit Conservation District, and Washington Department of Agriculture, to determine locations where follow up visits and outreach and education could help lead to improved water quality.

5. **Load allocations for nonpoint sources.**

   Using the critical conditions period identified for the monitoring sites that are not in compliance, Ecology (2008) calculated percent reductions in FC bacteria concentrations for 24 freshwater sites in order for river, creeks and bay to meet water quality standards (Figure 24 in Volume 1; Figure 14 in this volume). These reductions in fecal coliform concentrations are recommended in order to protect the public from pathogens in freshwater and to protect recreational uses and shellfish harvesting in Samish Bay. The TMDL Volume 1 explains in detail how these percent reductions were developed.

   Target reductions and load allocations for freshwater sites.

   In Tables 6 and 7 of the main text, we present the percent reductions needed at each monitoring site so that freshwater standards will be met in the creeks and river and marine standards met in Samish Bay.

You can better understand how Ecology calculated the percent reductions and establishes the load allocations in Tables 6 and 7 (main text) by considering an example. We use, as an example, the first monitoring site on the Samish River (03-SAM-00.7, where Bayview-Edison Road crosses the river less than a mile upstream of the mouth).

- The year-round geometric mean at this site was 35 cfu/100 mL and the year-round 90th percentile value was 156 cfu/100 mL. These statistics are in compliance with the freshwater standards. However, at this location, very close to marine waters where the stricter standards of 14 cfu/100 mL (geometric mean) and 43 cfu/100 mL (90th percentile) apply, the FC targets need to be lower than the freshwater standard, to protect the Bay.

- We calculated that if these statistics were reduced by 72 percent, then the concentration of bacteria at this station, the closest to the bay, would meet the marine standards. The 90th percentile value for concentrations year round would be reduced to 43 cfu/100 mL. At the same time, the geometric mean, if reduced by a similar percentage, would fall to 10 cfu/100 mL.

  72% of 156 = 112.3
  156 – 112.3 = 43.7

- The same 72 percent reduction is then applied to the current load at this station, estimated using the average annual flow and multiplying by the geometric mean concentration, or 3.5×10^{11} cfu/day:

  72% of $3.5 \times 10^{11} = 2.52 \times 10^{11}$

  $3.5 \times 10^{11} - 2.52 \times 10^{11} = 0.98 \times 10^{11}$ (or 9.8×10^{10})

Thus, if the average annual load at Samish River site 03-SAM-00.7 is reduced by 72 percent to 9.8×10^{10}, the loading capacity for the river and bay will be met. To meet this loading capacity, the 90th percentile value for concentrations year round needs to meet a target of 43 cfu/100 mL.

(If the geometric mean at this site is reduced by the same percentage as the 90th percentile, it will actually fall below the marine standard of 14; however these statistics do not always fall at the same rate as water quality improves.)

6. Wasteload allocations for point sources.

Facilities to be issued Ecology permits in the Samish watershed include Dynes Farms, a concentrated animal feeding operation, and Washington State Department of Transportation (permit issued February 2009). Several sand and gravel operations in the Samish watershed are covered under Ecology's general stormwater permit, but these were judged not to be sources of fecal coliform bacteria.

Dynes Farms Egg Processor

Dynes Farms, an egg processing operation with facilities in Burlington and Hamilton, owns agricultural land adjacent to the Samish River downstream of the Old Highway 99 Bridge. After poultry manure was spread on flooded cornfields in December 2006, Ecology documented an exceedance of state water quality criteria for bacteria in a ditch next to these fields that drained to the Samish River. As a result, Ecology is issuing a concentrated animal feeding operation (CAFO) permit to Dynes. Under agreements between Ecology and WSDA, Ecology writes CAFO permits and has enforcement authority for them, while WSDA administers the permit by reviewing CAFO farm plans and conducting inspections.

This CAFO will have a wasteload allocation (WLA) set at zero due to the "no discharge" requirement of Ecology's National Pollutant Discharge Elimination System (NPDES) CAFO permit, which allows discharges only in conjunction with a larger-than 25-year, 24-hour storm event.

Washington State Department of Transportation

All dischargers covered by National Pollutant Discharge Elimination System (NPDES) permits must meet the required reductions for the drainage in which their stormwater is discharged. This TMDL establishes wasteload allocations for the Washington State Department of Transportation (WSDOT) equal to the nonpoint allocation for drainages that receive the stormwater from WSDOT facilities. That is, the same percent reduction in fecal coliform bacteria for each receiving water body is established for both NPDES permitted sources and nonpoint sources (Table 8 of main document).

7. Margin of safety

The federal Clean Water Act requires that TMDLs be established with margins of safety (MOS). The MOS accounts for uncertainty in the available data and uncertainty about the effectiveness of water quality controls that are put in place. In the Samish TMDL, the margin of safety is implicit, as allowed under the Clean Water Act, which means that conservative assumptions were built into the calculations that were used to establish the load and wasteload allocations. The following conservative assumptions (Ecology 2008) were made in the data analyses used to determine target fecal coliform reductions and from there, to establish the load and wasteload allocations for this TMDL.

- In most cases, the statistical rollback method was applied to FC data from the most critical season. The resulting target annual FC load reductions are more stringent than would be required to meet the listed Washington State Primary Contact and Secondary Contact Recreation uses.

- The rollback method assumes that the variance of the pre-management data set will be equivalent to the variance of the post-management data set. As pollution sources are managed, the occurrence of high FC values is likely to be less frequent, reducing the variance and 90th percentile of the post-management condition.

- The simple mass balance calculations and subsequent derivation of target values in freshwater assumed no FC die-off. Bacteria dilution and die-off in the tidally-influenced lowest reach of the Samish River was also not included in the analysis.

- Since variability in FC concentrations during low-flow conditions is usually high, the recommended TMDL targets and percent reductions estimated by the statistical rollback method are conservative, especially if a 90^{th} percentile is the critical criterion. In these cases, the high coefficient of variation of the log-normalized data can produce a 90^{th} percentile value for the population greater than any of the sample results used to calculate the value. This is especially true at sites with fewer than 20 data values.

- The cumulative tributary FC loads to the Samish River are expected to be reduced by 80 percent with the recommended TMDL reductions. A 72 percent reduction of FC is recommended at the terminal compliance site on the Samish River.

- Marine water criteria were used to calculate recommended terminal FC targets and load reductions for the Samish River and Alice Bay slough. Using these stricter criteria to set terminal freshwater targets and load allocations ensures further protection of Samish Bay.

- Fecal coliform targets and recommended load allocations at Samish River miles 4.6 and 6.5 were calculated so that the Samish River at the lowermost site (river mile 0.7) can meet Washington State marine water criteria.

- Recommended load allocations were set downstream from suspected nonpoint sources. The reduction or elimination of FC at upstream sources will likely bring downstream sites into compliance with water quality criteria. Setting strict targets at downstream sites reinforces the need to identify and reduce other nonpoint (diffuse) sources of FC bacteria.

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Appendix C: Schedule of implementation activities

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Table C-1. Schedule of implementation activities

Source	Organization	Implementation Actions	Potential Concern	Performance Measure	
				What	When
All sources	Skagit County Public Works	Apply for Centennial Grant funds for a Samish Watershed Pollution Identification and Correction project	All sources for one or more priority reaches of the Samish watershed	Grant application	Fall 2009
All sources	Skagit County Planning & Development Services	Promote LID and review codes and ordinances to ensure compatibility with Low Impact Development	Avoid changes in hydrology that result in increased stormwater contributions of pollution	Code, ordinance review	Fall 2010
Onsite Septic Systems	Skagit County Public Health	Implement Skagit County Onsite Sewage System Management Program, with enforcement of inspections for systems in Marine Recovery Areas and Sensitive Areas	Unknown systems; systems with no inspection record; systems with out of date inspection record	• Report number of inspections & update septic system status maps • All systems known & inspected	March 2010 and annually By 2013
		Provide Septics 101 classes and educational materials on maintaining septic systems to homeowners	Target classes & educational materials to homes within the watershed	Report number of classes and pamphlets handed out	1/year
Dairies and CAFOs	Washington State Dept of Agriculture	Implement the state Dairy Nutrient Management Program including dairy and CAFO inspections and review potential for current practices to impact Samish Bay water quality	Dairy manure management Manure spreading practices with respect to safe setbacks and timing of application; respond to complaints	Biennial inspections Interview operators regarding recent spreading practices & locations	March 2010 and annually Following temporary shellfish closure
		As resources allow, assist Ecology in identifying livestock operations or manure spreading operations that appear to pose problems for Samish water quality	Nonpoint pollution	N/A	Ongoing
Livestock, heifer and small farms operations	Skagit County Planning and Development Services (SCPDS)	Follow up complaints regarding livestock access to streams and ditches Develop outreach flyer explaining: • Need to protect WQ; • How County implements SCC 14.24.120; • Technical assistance availability at Skagit Conservation District • How to make a complaint	Livestock operations with potential to contribute FC bacteria to streams and ditches Outreach flyer	Report number of complaints and how followed up Flyer available	March 2010 and annually January 2010

Source	Organization	Implementation Actions	Potential Concern	Performance Measure	
				What	When
	SCPDS	Explicitly require exclusion of livestock from streams and ditches in next update of Critical Areas Ordinance	Nonpoint pollution	Revised ordinance	When updated
	Skagit County Public Works	Increase awareness of water quality complaints phone line	Skagit County residents	Determine best approach and implement it with tool to measure effectiveness	March 2010
	Ecology	Coordinate nonpoint response with SCPDS	Nonpoint inspections	Joint inspections	2 by January 2010
	Ecology	Respond to ERTS complaints and ensure compliance under RCW 90.48.080	Nonpoint pollution	Report number of complaints responded to and how followed up	March 2010
Dairy, livestock, heifer and small farms operations	Skagit Conservation District	Provide public outreach, farm planning technical assistance and cost share opportunities Develop web-based self check list so that property owners can better avoid impacts to water quality	Nonpoint pollution from these sources	Number of farm plans completed; number of property owners worked with Checklist on website	March 2010 June 2011
Samish watershed residents	SCEA & Ecology	Develop brochure about how to protect water quality Conduct door-to-door visits or other effective outreach	Residents including property owners with potential bacteria sources	Number of monthly visits or property owners contacted;	March 2010
Waterfowl on private grain fields	SCEA	Provide to owners of fields: information on effectiveness of grass filter strips in reducing FC discharges to surface waters	Property owners	Outreach summary	March 2010
Waterfowl on WDFW Conservation Areas	WDFW	Install grass filter strips to reduce FC discharge to Samish Bay	Nonpoint FC discharge	Number of fields with grass filter strips or other buffer	March 2010
Human recreational users	SCEA and other local organizations	Assess need for Port-a-Potties along Samish River fishing spots and near other recreational areas near Samish Bay	N/A	Report on needs assessment	June 2011
	WDFW	Provide adequate toilet facilities for recreational users	N/A	Report on no. of toilets available during fall hunting season	Annually
Property owners in drainage districts	Drainage districts 5, 14, 16, 18 and 25	Educate district members on the need for, and effective ways to reduce FC discharges to surface waters within district	N/A	Report on educational outreach	March 2010

Appendix D. Response to comments

Note: Comments that resulted in changes to the main text of this document are not included here. Lengthy comments were edited to conserve space. Where the same comment was made by a number of individuals or organizations, the comment is included here once.

Comment: I live in the Samish watershed and have an alternative onsite sewage system that has been inspected more than once and has passed more than one inspection. Why do the regulations require me to have an annual inspection?

Response: The annual inspection requirement for alternative septic systems (and once every 3 years for conventional systems) is in state law (WAC 246-272A, Section 0270). All 12 counties bordering Puget Sound were required to adopt the code by July 2007, and establish onsite sewage management plans. The Samish TMDL does not set the Operation & Maintenance requirement for inspections. The requirement is already established by the Washington State Board of Health and each county's Board of Health. If anything, the establishment of the Marine Recovery Areas (based on data showing water quality problems) and the TMDL study itself indicate there is a good basis for requiring annual O&M inspections.

Comment: Ecology has done a thorough job of quantifying the amount of Fecal Coliform in the watershed… and identifying the contributing bacterial loading shares among the various streams and watercourses in the lower Samish Basin. What still needs to be accomplished is the investigation and gathering of further information characterizing the contribution of this contamination by land use activity. Rural homeowners, livestock owners, dairy operators, residential hobby farmers, and concentrated waterfowl areas and recreational lands are all individually and collectively contributing at some level. More can be done to identify specific site location sources of fecal coliform. Most importantly, we also do not yet know what percentage of the problem is related to each of these land use sectors. We encourage the department to utilize available and accepted sampling and analytical methods to help determine this assignment of responsibility.

Response: Ecology continues to review progress in bacteria source tracking. At this time the science of bacteria source identification is not sophisticated enough to be able to attribute the bacteria load at specific locations in the watershed to categories of sources (e.g., 30% of the bacteria at this location are from cattle, 50% are from humans, 10% are from wildlife, etc). Should resources become available, Ecology will work with local partners to plan a pilot study using a microbial source tracking method that will tell us presence or absence of bacteria from human and ruminant animals in a water sample. This may be useful in some locations but will not answer the question about percent contributions from different sources.

Through conducting the TMDL Ecology has learned that many onsite septic systems in the watershed have not been inspected and that many commercial and noncommercial livestock owners have not adopted widely accepted Best Management Practices for animal and manure management. Thus, the first step in water quality improvement in the Samish is to inform

landowners that they are responsible, to assist them in understanding how best to protect water quality, and ensure that best management practices are adopted.

Comment: The draft plan, by the amount of discussion and number of recommendations, seems to place a disproportionate share of the attention and work on the dairy sector. The dairies remaining in the lower Samish Basin have a good compliance record under their permits. Yet the plan asks the dairies in this area to go well beyond compliance with any regulatory requirements without conclusive documentation of their total contribution to the problem.

Response: Ecology understands that the dairies in the Samish have a good compliance record under the WSDA Nutrient Management Program. Dairies are not singled out in the plan as the most important source but rather as one of a number of potential sources. The section of the plan, "Process and Information Gaps," page 95, explains that it is lack of information about dairy practices and spreading locations that prevents Ecology from excluding them from the list of potential sources. The practices that Ecology is recommending the dairies follow are widely accepted Best Management Practices in accordance with Natural Resources Conservation Service guidelines.

Comment: Many of the TMDL stream reaches identified in TMDLs and WQMPs do not meet the criteria described in the Clean Water Act (CWA) as appropriate stream segments required to have a TMDL. The proposed Samish River TMDL does not reflect that Washington Department of Ecology (Ecology) has conducted the TMDL assessments according to the law. Some segments listed in the current TMDL documents are ones that do not have specific point source discharges or point source permits and they should not be included in the TMDL.

Response: In accordance with the Clean Water Act, a nonpoint TMDL reveals noncompliance with the Water Quality Standards and directs how to attain compliance. The Clean Water Act does not describe that either 303(d) listings or TMDLs should apply only to waters that cannot attain water quality standards "due to the additional stressor of a point source." Throughout Washington state, U.S. Environmental Protection Agency has approved many TMDLs that (a) included both point and nonpoint sources; and (b) had only nonpoint sources.

Comment: Under current law a load allocation developed in the establishment of a Total Maximum Daily Load (TMDL) is "attributed" to non point sources and background. It is not assigned to them.

Response: Once the total amount of pollution in a water body is "attributed" to its various sources, load allocations are "assigned" which will not allow the loading capacity to be exceeded. In that sense, loading is "attributed" and load allocations are "assigned." If by attributing load allocations to nonpoint sources, the commenter means that Ecology should merely acknowledge nonpoint source loading and not try and control it, that would contravene Ecology's water quality mission and state law RCW 90.48.

The CWA explicitly states that load allocations "shall be established at a level necessary *to implement* the applicable water quality standards." 33 U.S.C. § 1313 (d)(1)(c) emphasis added. Load allocations are to be "attributed to either one of its *existing or future nonpoint sources of*

pollution..." 40 CFR 130.2(g) emphasis added. When Ecology "assigns" a load allocation, the regulatory implication is that the nonpoint source loading will be reduced to the assigned amount. Therefore, a load allocation must be assigned to *sources,* in order to ultimately achieve compliance with the water quality standards.

Comment: RCW 90.48 is the statute that tells DOE that it can only do what the EPA is able to do under the federal Clean Water Act (CWA) when it comes to TMDLs. Where EPA cannot create non point source only TMDLs and enforce them against non point sources under the CWA (Pronsolino Case), Ecology cannot do it under state law either because RCW 90.48 sets the jurisdiction over TMDLs to coincide exactly with federal EPA jurisdiction over TMDLs.

Response: This comment conveys a misunderstanding of the state's Water Pollution Control Act (WPCA), RCW 90.48, which accords Ecology, "the jurisdiction to control and prevent the pollution of streams, lakes, rivers, ponds, inland waters, salt waters, water courses, and other surface and underground waters of the state of Washington." RCW 90.48.030. Nothing in this state statute or in the entire Chapter precludes Ecology from creating or enforcing nonpoint TMDLs, or limits its authority to the jurisdictional reach of the CWA.

Washington State's over arching policy toward integration with the CWA is clearly enunciated in WPCA, RCW 90.48.010, which reads:

> The state of Washington in recognition of the federal government's interest in the quality of the navigable waters of the United States, of which certain portions thereof are within the jurisdictional limits of this state, proclaims a public policy of working cooperatively with the federal government in a joint effort to extinguish the sources of water quality degradation, *while at the same time preserving and vigorously exercising state powers to insure that present and future standards of water quality* within the state shall be determined by the citizenry, through and by the efforts of state government, of the state of Washington.

Washington State's broad power to insure…standards of water quality largely lies within the above mentioned jurisdictional statement, RCW 90.48.080, provisions of the Water Resources Act, RCW 90.54, and the implementing regulations of the water quality standards. The RCW 90.48.080 makes actions which cause or permit water pollution, unlawful, stating:

> It shall be unlawful for any person to throw, drain, run, or otherwise discharge into any of the waters of this state, or to cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharged into such waters any organic or inorganic matter that shall cause or tend to cause pollution of such waters according to the determination of the department, as provided for in this chapter. RCW 90.48.080.

Notably, nothing in the WPCA's statutory provisions distinguishes between point or nonpoint sources of pollution. The Washington state courts have broadly interpreted the WPCA as creating a non-delegable legal duty to refrain from acts which will pollute waters on another's land as well as their own. *Sea Farms, Inc v. Foster & Marshall Realty, Inc*. 42 Wash. App. 308,

711 P.2d 1049. So essentially, RCW 90.48.080 makes it unlawful for any person ―cause, permit or suffer‖ pollution of state waters, an interpretation expressly devoid of the point and nonpoint source dichotomy.

In addition to broad authority granted under RCW 90.48.030 and RCW 90.48.080, the WPCA explicitly grants Ecology the authority to implement the programs of the CWA under RCW 90.48.260. That statute provides that, *in addition* to other authorities granted under 90.48, the department of Ecology is granted the authority to implement the requirements of the CWA, including but not limited to:

> 2.) Program elements authorized herein may include, but are not limited to: … (b) applicable receiving water quality standards requirements… (i) enforcement of the program through penalties, emergency powers, and criminal sanctions

Comment: We are especially concerned with DOE's reliance on watershed data for fecal bacteria. The Non Point Source Plan should include some descriptions and discussion about how the field sampling can be changed to obtain an accurate reflection of the diffuse contributions from runoff versus that from point sources and/or rainfall events. It is insufficient to take a position and state that it's "just too hard" to conduct proper sampling. DOE has been given the charge to use science and refer to the best science available. We are aware of a number of studies where fecal bacteria have been measured and the bacteria identified by sources (Werblow, S., DNA whodunit: microbiologists use genetic fingerprinting to identify sources of water pollution. Conservation Technology Information Center, Know Your Watershed/CTIC Partners, October/November 1997). DOE should discuss including this type of testing in the plan so that meaningful projects can be implemented to curb pollution where meaningful answers have been obtained to identify facts regarding the non point source.

We suggest the non point plan insert a step to describe the proof of sample adequacy required to show which parameters are polluting state water and which ones are within the natural background of the local environmental factors. Nothing has been provided in the TMDL plan to indicate if the sampling (used to write this plan) was conducted with a level of confidence that would permit interpretations about non point source contributions. The plan should be edited to include this important information. DOE should seek consultations with researchers to develop good sampling methods for field work to ensure that the lab tests results are interpreted according to the sample adequacy performed on the field data. Skagit County's water monitoring program has set up an excellent sampling strategy and that data should be included in this plan as part of the cooperation by agencies in the region.

Response: As explained in response #2 above, Ecology is planning a limited study of bacterial sources in the Samish using the PCR method (polymerase chain reaction) made available through U.S. EPA Manchester, Washington, Laboratory. In our experience these studies do *not* provide information that tells what percent of a sample is from each type of source – human, cattle, horse, waterfowl, etc.

The sampling methods and analytical procedures used for the Samish Bay Watershed TMDL Study (Ecology 2008) are fully described in Quality Assurance Project Plan: Samish Bay Fecal

Coliform Bacteria Total Maximum Daily Load Study (Ecology 2006; available at www.ecy.wa.gov/biblio/0603102.html). The QAPP describes the sample protocols including field replicates and other quality control procedures that ensure confidence in the data. These methods have proven reliable in numerous TMDL studies of fecal coliform bacteria conducted throughout Washington State and have been reviewed and accepted by U.S. Environmental Protection Agency.

Ecology agrees that Skagit County has a good water quality monitoring program. The results of Ecology's 14-month TMDL monitoring study in 2006-2007 are in general agreement with Skagit County's results for 9 sites in the Samish basin for that period (Skagit County Public Works 2008) (Appendix I). The county program is providing valuable information by continuing to monitor these 9 sites and two additional Samish sites over a number of years; these data will be useful in charting progress in the Samish watershed over time.

There are significant differences between the county trend monitoring program for sites in the Samish watershed and the TMDL study. Ecology's TMDL study was more detailed spatially (33 stations monitored every two weeks year-round, plus 22 investigatory sites), and included flow measurements for all stations, so that loading of bacteria from different reaches in the watershed could be assessed and used to prioritize cleanup actions. Detailed flow measurements are not included in the county program, as an outside scientific review has noted (Water Research Center, 2008). So, on these points, the TMDL study provides more information than the county program about fecal coliform bacteria dynamics and priority reaches for cleanup in the watershed.

Ecology's long term monitoring station on the Samish River at Old Highway 99 continues to be monitored monthly, and we invite other interested groups to sample side by side with us and compare results.

Comment: Ecology's statement in the TMDL about excessive bacteria in the watershed exaggerates the issue. The sources of the FC are unknown…as written, the TMDL points a finger at certain entities in the watershed as being a cause or a source. In fact, it is unknown how the Samish River watershed fully functions and it is inappropriate to suggest that DOE can write a plan about fixing the problem before you even know what the problem is. DOE lacks state authority to approach individuals about "potential" sources of FC contributions and as used in this plan the document must explain the actions DOE will take to avoid doing more than handing printed information to landowners. The law does not state that DOE can enforce a TMDL and regulate human activities through coercion or handing off to another agency under the guise of there being a "potential" in lieu of known facts obtained through data collection.

Response: The TMDL data show that 19 out of 33 stations monitored over a year exceed water quality standards even when the data for a severe rain event with very high bacteria counts was excluded from the data set. Many landowners in the watershed have gone to great lengths to get their septic system inspected and to handle livestock manure properly. Despite these excellent efforts, many of the sample sites with high counts are downstream of properties with undocumented onsite sewage systems and livestock properties where best management practices for manure are not in place. In addition to the TMDL study and field observations, a large body

of scientific research, as well as years of agency study and field experience, further support our findings that unmitigated nonpoint pollutant sources in close proximity to the water are likely contributors to pollutant loading. Where septic systems have not been inspected, Skagit Health Department has the authority to require an inspection. Where Ecology has documented the discharge of pollution or conditions that have the potential to pollute, the department has the authority under RCW 90.48.080 to ensure compliance with the water quality laws.

Comment: DOE has no business trying to gain access to private land under the guise of "educational visits". We think workshops and public meetings as well as web site development and brochures are good choices. The state government does not belong on private property when DOE has made 98 references to livestock owners in the TMDL as being a definite target and cause of FC pollution. If DOE does not have evidence of a point source violation obtained through specific sampling near the area then DOE has nothing to accomplish by accessing the landowner's property. Give landowners information, but any attempt to be friendly while inspecting the property is an attempt to violate the rights of the landowners under false pretenses. We suggest deleting this part of the TMDL narrative.

Response: Comment noted. TMDLs address both point and nonpoint sources, as explained in an earlier response. Ecology nonpoint inspectors follow agency-prescribed procedures in working with landowners that may be causing pollution of surface or groundwaters. If pollution or potential to pollute has been documented, the inspector explains Ecology's enforcement authority and refers the landowner to Skagit Conservation District for technical assistance as appropriate or to Skagit County Health Department if the problem relates to onsite sewage system. Landowners are given opportunities to learn how to avoid polluting the water and to make corrections without penalty.

Comment: DOE can enforce point source discharges into the state waters, but does not have authority to use misguided interpretations of what a discharge is versus a contribution from non point sources. Clarification is needed to make clear what the role of DOE is regarding point source enforcement and non point source best management practices. DOE lacks direction from the state to force BMPs on individuals because BMPs are voluntary actions.

Response: Ecology has authority to ensure compliance with RCW 90.48.080, which prohibits the discharge of pollution to waters of the state. This law states "It shall be unlawful for any person to throw, drain, run or otherwise discharge into any of the state, or to cause, permit, or suffer to be thrown, run, drained, allowed to seep or otherwise discharge into such waters any organic or inorganic matter that shall cause or tend to cause pollution of such waters according to the determination of the department, as provided for in this chapter."

The agency's authority to take enforcement action on the discharge of pollution or on evidence of the potential to pollute has been upheld in numerous cases heard by the state Pollution Control Hearings Board. The TMDL includes recommended Best Management Practices that are widely accepted to be effective means of preventing pollution from animal waste. Property owners are not required to follow these specific BMPs but they are required, as all citizens of the state are required, to prevent their land management practices from causing pollution to surface and groundwater.

Appendix E. TMDL Study Sample Locations

Table E-1. Fixed network of sampling site locations and descriptions in the Samish Bay watershed. *Map numbers reference Figure B-1.*

Field ID w/ River Mile	Map #	Watershed or Subwatershed and Site Location
Samish River		
03-SAM-00.7	1	At Bayview/ Edison Rd
03-SAM-04.6	2	Thomas Rd
03-SAM-06.5	3	Chuckanut Dr
03-SAM-10.3	4	Hwy 99
03-SAM-13.1	5	F&S Grade Rd
03-SAM-15.0	6	2nd Prairie Rd Crossing from Hwy 99
03-SAM-16.5	7	Off Prairie Rd upstream of Parson Ck
03-SAM-20.7	8	3rd Prairie Rd crossing from Hwy 99
03-SAM-22.0	9	Hwy 9
03-SAM-26.6	10	Wickersham Rd
03-SAM-28.8	11	Innis Ck Rd (in Doran)
Samish River Tributaries		
03-ENN-00.0	12	Ennis Ck at mouth, Wickersham Rd
03-FRI-00.8	13	Friday Ck at Bow Hill / Prairie Rd (below Hatchery)
03-FRI-03.8	14	Friday Ck at Friday Ck. Rd
03-FRI-06.5	15	Friday Ck at Lake Samish Rd / Alger Cain Lk Rd
03-PAR-00.0	16	Parson Ck at confluence w/ Samish R
03-SIL-00.4	17	Silver Creek at Friday Ck Rd
03-SWE-00.0	18	Swede Ck at Grip Rd
03-THO-00.3	19	Thomas Ck at Old Hwy 99
03-THO-03.6	20	Thomas Ck off F&S Grade Rd abv. Willard Ck confluence
03-WIL-00.0	21	Willard Ck off F&S Grade Rd abv. Thomas Ck confluence
Samish Bay Tributaries		
03-COL-00.0	22	Colony Ck near mouth, upstream of tidegates
03-ALI-PUMP	23	Drainage to Alice Bay
03-NED-PUMP	24	N Edison drainage at Key Ave., off Smith Rd
03-SED-PUMP	25	S Edison drainage near liquor store
03-BAY-GATE	26	Drainage west of Samish River mouth, to Samish Bay
03-ALI-GATE	27	Drainage to Alice Bay
03-MCE-GATE	28	Tidegate to McElroy/Colony Slough
03-WED-GATE	29	W Edison drainage near Edison Slough mouth
03-SMI-GATE	30	Drainage to Edison Slough at Smith Rd nr. NED-PUMP
03-EDI-01.2	31	Edison Slough just upstream of tidegates in Edison
03-EDI-01.6	32	Edison Slough at private drive upstream of school
03-OYS-00.0	33	Oyster Ck near mouth

Table E-2. Investigatory, add-on, and special survey sampling site locations and descriptions. *Map numbers reference Figure B-1.*

Field ID w/ River Mile	Map #	Investigatory, Add-on, and Special Survey Sites
03-DRY-00.0		Dry Creek at mouth
03-SKA-00.5	34	Skarrup Creek at first road crossing
03-SAM-WF		Samish River "West Fork" (see Gazetteer)
03-BUT-00.0	35	Butler Ck at mouth
03-FRI-04.3	36	Friday Ck just abv. Butler confluence
03-VER-00.3		Vernon ck near mouth at Upper Samish Rd
03-SAM-28.8		Innis Ck Rd (in Doran)
03-SAM-HW1		About 0.1 RM upstream from SAM-28.8, just upstream from Doran Rd. bridge.
03-SAM-HW2		About 0.1 RM upstream from SAM-HW1
03-SAM-HW3		About 0.1 RM upstream from SAM-HW2
03-SAM-HW4		About 0.1 RM up from SAM-HW3, above pool and below a pipe from hillside.
03-WIL-00.0	21	Willard Ck Off F&S Grade Rd abv. Thomas Ck confluence
03-WIL-DIT		Unnamed trib flowing through cow pasture (wet season only)
03-WIL-00.2		Willard Ck just abv unnamed trib flowing through cow pasture
03-WIL-DIT2		Ditch draining hillside upstream of 03-WIL-00.2
03-WIL-01.3		Willard Ck at corner of Westerman Rd
03-WIL-01.6		Willard Ck at Garden of Eden Rd
03-WIL-01.7		Willard Ck at Birch St
03-SAM-09.2		Samish River below ditch on private property
03-DIT-00.0		Ditch flowing through private property
03-SAM-09.6		Samish River blw Bobcat Ck and above DIT-00.0
03-BOB-00.0		Bobcat Creek near mouth
03-SAM-10.0		Samish River above Bobcat Ck and private property
03-COL-00.0		Colony Ck near mouth, just before tidegates
03-COL-00.3		Colony Ck at Flinn Rd
03-COL-00.9		Colony Ck at S. Blanchard Rd; past slough
03-COL-01.2		Colony Ck at bridge 0.5 to 0.75 mi downstream of Colony Mountain Rd
03-COL-01.8		Colony Creek 500 feet upstream of Colony Mountain Road

Appendix F. Skagit Conservation District letter to Samish Watershed residents

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Samish Watershed Water Quality

Recent water quality monitoring in the Samish Watershed in April, May and June have resulted in some of the highest levels of fecal coliform bacteria in the Watershed on record. Besides directly impacting human health, fecal coliform contamination of the Samish River and its tributaries also affects the shellfish industry that is located in Samish Bay. All water that flows through or falls within the Samish Watershed eventually drains into Samish Bay. State Health Department policies require that shellfish beds be closed to harvest when fecal coliform levels exceed a certain amount. Not being able to harvest means lost revenue to the shellfish growers and their employees.

How You Can Help to Decrease Fecal Coliform Contamination

- ⇒ Septic systems should be inspected at least once every three years. The Skagit County Health Department has programs available that help defer the cost of inspections and upgrades to septic systems.
- ⇒ Livestock should be restricted from having access to surface waterways such as streams, drainage ditches, ponds and lakes.
- ⇒ Livestock waste should be collected and stored so that it does not runoff into surface waterways.
- ⇒ Pet waste should be collected and disposed of in garbage cans.
- ⇒ A 20-foot vegetative filter strip should be installed along all ditches, streams, ponds or lakes to filter out sediment, bacteria and nutrients from runoff before it reaches waterways.

Free Technical Assistance and Cost Share Funds Available

The Skagit Conservation District offers programs to that help to decrease the potential for surface and groundwater contamination. The District offers free assistance to landowners in writing conservation plans, designing Best Management Practices (BMPs) and starting in July, **cost share funds will be available to reimburse landowners for a percentage of the costs of implementing BMPs and other water quality practices**.

If you are interested in obtaining information on implementing BMPs or just general information about livestock waste management, please contact:

John Schuh
Skagit Conservation District
2021 E. College Way, Suite 203, Mount Vernon, WA 98273
(360) 428-4313
john@skagitcd.org

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Appendix G. Skagit County Health Department letter to Lower Samish residents

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PETER BROWNING, DIRECTOR
HOWARD LEIBRAND, M.D., HEALTH OFFICER
CORINNE STORY, **ENVIRONMENTAL HEALTH SUPERVISOR**

On Site Sewage System
Operations and Maintenance Program
700 South Second Street, #301, Mount Vernon, WA 98273

Date: January 4, 2008

To: Property owners of the Lower Samish River Watershed

From: Steve Olsen, Environmental Health Specialist

Subject: Public Meeting about proposed Samish Bay Marine Recovery Area and Septics 101

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There are literally thousands of **unknown** onsite sewage systems in the Samish River Watershed. In other words the Health Department does not know if these septic systems are working acceptably, or if they actually exist for every resident living in the watershed. What we do know is that the numerous creeks flowing into the Samish River and the river's water quality itself is impaired due to fecal contamination. In addition marine water quality data indicates the shellfish growing areas of Samish Bay are threatened with closure due to this contamination. An onsite sewage system that is working properly **will** protect water quality and public health.

Skagit County Public Health Department is hosting in cooperation with other water quality partners a series of Public Meetings to discuss the proposal to establish Samish Bay (and other areas in Skagit County) a Marine Recovery Area. Each meeting will be followed by a Septics 101 Clinic. The purpose of the meeting is to present to you water quality monitoring data, onsite sewage operations and maintenance (O&M) data and the new rules and regulations that require septic system inspections. The purpose of Septics 101 is to teach homeowners how septic systems work and how to properly care for them.

The Public Meeting and Septics 101 schedule:

Marine Recovery Area Public Meeting: Wednesday, January 16, 2008 at 6:00 p.m. at the Allen United Methodist Church, 16785 Allen West Road, Bow; Septics 101 to follow at 7:00 p.m. to 9:00 p.m.

Marine Recovery Area Public Meeting: Friday, February 8, 2008 at 1:00 p.m. at the Washington State University Extension Center, 16650 SR 536 (Memorial Hwy), Mount Vernon; Septics 101 to follow at 2:00 p.m. to 4:00 p.m.

Additional meetings and Septics 101s are scheduled through June. For additional meeting and class dates and times check the Skagit County website at www.skagitcounty.net/heatlh

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Appendix H. Minimum elements of a dairy nutrient management plan

Available at WSDA website:
http://agr.wa.gov/FoodAnimal/Livestock-Nutrient/DairyNutrientMgmtPlans.aspx

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H. Minimum Elements of a Dairy NMP

Dairy Nutrient Management Plans are designed to satisfy requirements of the Washington State Dairy Nutrient Management Act, RCW 90.64. The minimum requirements were established by the Conservation Commission in conjunction with technical advisors.

Approval Checklist used by Conservation Districts

- Do all standard practices meet the standards, specifications and methods described in the NRCS Field Office Technical Guide and the NRCS Agricultural Waste Management Field Handbook? If alternative practices are utilized, have they been approved by the Washington Conservation Commission?
- Is a summary of the operation included (name, location, acres available for nutrient management, herd size, existing nutrient management facilities)?
- Does the dairy nutrient management plan developed after November 1, 1998 follow the planning format adopted by the Washington Conservation Commission?
- Have the following been inventoried and evaluated to identify potential pollution sources and to determine water quality protection needs: all fields used in the dairy operation; cattle confinement areas; barns; milking facilities; waste collection, handling and storage facilities; feed storage and mixing areas; riparian areas; irrigation systems; and drainage systems?
- If the plan has not been fully implemented, is there a schedule of planned practices listing the location, what will be done, how much will be done and when it will be completed?
- Are forage & crop fields identified & their acreage shown on an aerial photo, topo map or plan map (to scale)?
- Is a month-by-month nutrient application schedule included? A nutrient balance sheet (including nutrient requirements of crops that will receive dairy wastes)?
- Are crop yield values or estimates supported in the plan, or in the dairy producer's case file?
- If manure must be utilized elsewhere, are off-site manure management agreements included in the plan?
- Is an operation plan included for the waste management system?
- Are the major factors influencing the quantity of manure and wastewater described (e.g., herd size and composition, climatic data, existing runoff controls, etc.)?
- Are existing manure and wastewater collection systems evaluated, and needed improvements described?
- Are storage facilities for solid and liquid manure described, are storage needs described, and are the calculations and worksheets used to determine storage needs included?
- Are transfer facilities and systems described?
- If the manure or wastewater is treated, is this described?
- Are soils described, including their physical capacity to accept nutrient applications?
- Is nutrient testing of soils and manure required, and testing procedures described?
- Is a recordkeeping system included that covers soil and manure tests, application of the solid and liquid components of the manure, cropping, and other significant factors and practices?
- Are the periods and conditions for safe and agronomic nutrient application described? Are the periods and conditions clearly described when dairy nutrients should not be applied?

Appendix I. Comparison of TMDL and Skagit County Monitoring Program data for common sites, 2006-2007

For the Samish TMDL, Ecology collected fecal coliform bacteria samples at 33 fixed sites in the watershed twice monthly for the period February 2006 to February 2007. Skagit County Monitoring Program has monitored 9 of these sites every two weeks for more than five years, including the 13 months of TMDL monitoring (Skagit County Public Works data available at: www.skagitcounty.net/SCMP). Since some reviewers of the February 2009 public review draft of the Samish TMDL wondered how similar the results might have been, this section provides a brief comparison of the summary statistics for the 9 sites monitored by the two programs.

The TMDL monitoring program uses similar sample collection methods as Skagit County's but a different method of bacteria analysis, Membrane Filtration, rather than the Most Probable Number method used by the county. These methods produce slightly different results, with MPN usually having a slight positive bias compared with MF. In the TMDL study, Ecology compared the two different analytical methods for 40 samples and found a significant relationship, but not a high correlation, between the results (Ecology, 2008).

Ecology's water quality standards guidance explains that data produced using the two methods are not intended to be directly compared, but both can be compared with the water quality standards for fecal coliform bacteria, to determine compliance.

In Table I-1, we provide bacteria statistics for the 9 sites monitored under both programs for the same time period. In the TMDL study, 8 of 9 sites do not meet one or both parts of the water quality standard. In the county data, 7 of 9 sites do not meet one or both parts of the water quality standard. We ranked each program's sites from lowest to highest, with the lowest having the lowest geometric mean for bacteria for the year of data, and the highest having the highest geometric mean for the year of data. Then we listed the ranks for both the TMDL dataset and the county dataset to see how similar the rankings are.

Overall, fecal coliform data from the two programs are very similar. This comparison provides a measure of confidence that the two programs produce a very similar assessment of water quality conditions at these sites.

Table I-1. Fecal coliform bacteria summary statistics and rank for Samish sites monitored by Ecology and Skagit County, February 2006 to February 2007.

Site Location	TMDL (n)[a]	TMDL Geomean	TMDL 90th percentile	TMDL Rank	Skagit (n)[a]	Skagit County Geomean	Skagit County 90th percentile	Skagit County Rank
Samish River at Hwy 9	24	16	80	**1**	27	15	62	**1**
Alice Bay Pump Stn	25	17	240	**2**	27	25	240	**2**
Friday Creek at Prairie Rd	24	39	559	**3**	27	41	100	**3**
North Edison Pump Stn	24	44	285	**4**	26	84	700	**5**
Samish R at Thomas Rd	25	84	240	**5**	27	74	240	**4**
Swede Creek at Grip Rd	24	148	900	**6**	27	94	900	**6**
Thomas Crk at Hwy 99	24	162	900	**7**	27	126	900	**7**
Edison Pump Stn	21	168	330	**8**	27	218	1180	**8**
Thomas Crk at F & S Grade Rd	24	399	2540	**9**	27	478	5040	**9**

[a](n) = number of monitoring dates