FALSE BAY WATERSHED CONSERVATION PLAN

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Prepared by the
SAN JUAN COUNTY CONSERVATION DISTRICT

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1.0 INTRODUCTION

The San Juan County Conservation District received a grant from the Washington State Centennial Clean Water Fund administered by the Department of Ecology in June of 2000. The grant project focuses on the identification and potential conservation of critical wetlands, riparian zones, instream habitats and intertidal regions in San Juan County. For this project, three target watersheds were identified based upon findings in the San Juan County Watershed Action Plan and Characterization Report (August 2000) and the interest of the community. Target watersheds include False Bay Watershed (San Juan Island), West Sound Watershed (Orcas Island) and Swifts Bay Watershed (Lopez Island).

Beginning in June of 2000 existing information and data about the False Bay Watershed was collected and geographical information was mapped. A field survey was carried out to verify existing data and to gather additional land use information. In November of 2000 a public workshop was held to provide watershed landowners with a characterization of the natural features and land uses present in the False Bay Watershed, and to establish restoration objectives for the watershed. This management plan is based upon the information collected.

2.0 THE FALSE BAY WATERSHED

2.1 OVERVIEW

Data and information on the current and historical conditions of natural resources in the Swifts Bay Watershed is limited and incomplete. What follows is a summary of available information.

The False Bay Watershed is roughly 12,000 acres in size, located in the central region of San Juan Island *(Figure 1: Watershed Map).* The drainage basin is flanked on the north by Cady Mountain *(elevation: 894 ft.),* and on the west by Mt. Dallas *(elevation: 976 ft.)* and Little Mountain *(elevation: 466 ft.).* These land forms dominate the landscape in the northwest and western region of the watershed with steep, rocky outcrops and sloping hillsides. The topography levels to a gentle, rolling grade into the watersheds' central-eastern region – the San Juan Valley.

The False Bay Watershed drainage system is fed by a network of small tributaries, wetlands and surface flows leading from the upper slopes of Cady Mountain and Mount Dallas, and from an extensive lowland wetland system in the northeastern region of the basin. Three primary channels carry surface drainage to False Bay. The largest of these, San Juan Valley Creek is a Class 2 stream – the only Class 2 stream body in the County. The watershed contains several lakes, including Trout Lake, the main water supply for the town of Friday Harbor and Lawson Lake, a 12.5 acre Class 1 water body which augments Friday Harbor's water supply. In addition, the watershed includes Wood Lake, a 29 acre impoundment, Zylstra Lake, a 70 acre impoundment created for irrigation, and several smaller lakes and ponds distributed throughout the watershed.

The marine embayment (False Bay) is a small (232 acre), semi-enclosed, shallow bay containing extensive tidal mudflats with substantial eelgrass and kelp beds located at the mouth and along the coastline adjacent the bay. The University of Washington-Friday Harbor Labs own 200 acres of tidelands and uplands at the bay. This area is used extensively by the Labs for research and education. Due to the bays' status as a biological preserve there is no boating, recreational shellfishing or commercial fishing in the bay.

3.0 NATURAL RESOURCE INVENTORY

3.1 SOILS

Soil is a living resource made up of different sized mineral particles (sand, silt and clay), organic matter and numerous species of living organisms. Soils play a significant role in both protecting and impairing water quality. Soils aid in reducing contamination by filtering water as it moves through the ground into sub-surface aquifers. Conversely, removal of the protective, overlying vegetation accelerates soil erosion and leads to water quality degradation. Increased surface runoff picks up soil particles, fertilizers and other contaminants, carrying these contaminants to surface water resources (lakes, ponds, wetlands and streams). This dynamic results in loss in soil nutrients and an increase in water turbidity (cloudiness) and suspended solids, leading to sediment loading (build up of particles) downstream and often leaving behind an environment that is less favorable for plant growth.

Identifying soil types (and associated soil characteristics) in the watershed is an important step in determining where and how water quality problems may occur through the type of land use and the way that natural resources are protected and managed. The soils classification and information presented in this document for the False Bay Watershed is based on the current soil survey for San Juan County, published in 1962 by the United States Department of Agriculture, Soil Conservation Service. This soil survey report is dated and too general for site specific application, however it remains widely used and does offer information about general soils placement on a relevant watershed scale. The existing soil survey will be updated beginning in the Fall of 2001 by the Natural Resource Conservation Service in cooperation with the San Juan County Conservation District and San Juan County. The new survey will provide more accurate identification of soils distribution and more specific delineation of soils placement. The following soils information is based on the 1962 soil survey report.

BASIN SOILS: Soils in the False Bay Watershed have been formed from geologic and glacial deposits left in the area. The entire watershed contains a variety of soils, including 40 individual soil types. Examining the structure and drainage tendencies of differing soil types is fundamental in identifying approaches for minimizing water quality impacts and in anticipating areas prone to high erosion and high runoff (prone to flooding). For these purposes, soil types in the watershed have been grouped into three generalized categories based on the infiltration capacity of the soils when thoroughly wet from long-duration storms. Infiltration rate is the rate at which water is penetrating the surface of the soil, usually expressed in inches per hour. The higher the infiltration rate (or the quicker the water seeps into the soil) the less runoff (and flooding) there would be.

The soil categories are **Well Draining Soils** (Indianola and Everette Soils), **Moderate Draining Soils** (Alderwood, Roche & Rock Land Soils), and **Poor Draining Soils** (Bellingham, Bow, Coveland, & Norma Soils, Orcas Peat & Semihamoo Muck). A generalized description of each is included below. *Figure 2* shows the general distribution of these soil groups.

WELL DRAINING SOILS – EVERETTE & INDIANOLA SOILS:

The drainage basin contains a very small percentage (roughly .05%) of these soils, which cover approximately 65 acres in the watershed. These soils have a high infiltration rate (low runoff potential) when thoroughly wet. They consist mainly of deep, well draining sands and gravelly-sandy soils formed on glacial till. The seasonal high water table depth is 6 feet or greater. These soils are important in aquifer recharge.

MODERATE DRAINING SOILS – ALDERWOOD, ROCHE & ROCKLAND SOILS:

The Moderate Draining Soils cover the majority of this watershed (65%). With much variability, these soils characteristically will have a layer that impedes the downward movement of water. The seasonal high water table is perched from November/December to March/April, ranging at a depth of from ½' to 2' below the surface, except for the Rockland Soils which have a water table depth of 6 feet or greater. With extended rainfall, the perched water table will produce standing water for short periods. Ponding (standing water in a closed depression) is likely to occur during the winter months when soils are thoroughly wet.

Runoff from these soils is slow to medium therefore, flooding should be quite minimal, however, these soils are extremely susceptible to compaction if compressed by heavy equipment or by high densities of livestock when wet. Compacted soils are impermeable and can quickly lead to ponding, high runoff on slopes and in turn, flooding. As well, erosion may be severe if soils are not protected by a cover of plants, particularly during the wetter months. In natural conditions, these soils support the growth of forested lands and woodlands.

POOR DRAINING SOILS – BOW, COVELAND, NORMA, ORCAS & SEMIAHMOO:

These are the "hydric soils" or "wetlands soils" in the watershed. This means these soils have a very slow infiltration rate, and in turn, high runoff potential. High runoff can increase flooding, e.g., the soil is not able to infiltrate water quickly enough so excess water runs off (over the surface, downslope). The seasonal high water table associated with these soils is typically at or just below the surface from November to May. Standing water to 18" deep for extended periods (up to 30 days) would not be uncommon. These soils will typically be wet for long enough periods during the year to support the growth of wetland plants (hydrophytes) – such as sedge, rush, and willow. This also means that areas containing these soils tend to be moist or ponded for longer periods

As expected, these soils are consistently found where there are known wetlands, floodzones, riparian zones and streams in the watershed. These soils and the hydrologic features they support serve an important function through stormwater retention, water purification, stream bank stabilization, and groundwater recharge. In addition, the wildlife habitat associated with well-vegetated wetlands, ponds, lakes and streams is greater in species richness.

These soils dominate the San Juan Valley. This valley contains the most actively used farmland in the county. During the winter most of the fields at the valley bottom have saturated soils and extensive ponding (2000, SJC Watershed Action Plan). Conservation recommendations will be focused on both, enhancement and protection of surface water functions *and* minimizing of flooding in areas critical to agricultural operations.

3.2 WATER

This watershed plan is concerned with surface water resources in the watershed -- in the condition and proper hydrologic function of wetlands, streams and lake bodies in the watershed, and in the water quality associated with these resources. Ground water is briefly discussed, especially in relation to saltwater intrusion and water conservation. However, restoration activities will be primarily focused on the conservation and protection of surface water functions and values.

Water resources in the False Bay Watershed are supplied by precipitation (rainfall). Like the rest of San Juan County, most rainfall in the False Bay Watershed falls seasonally from November to June. Estimated annual precipitation in the False Bay Watershed ranges from 23-32 inches, although actual precipitation may vary greatly in any one year.

HYDROLOGIC CYCLING: Through the continual process of "hydrologic cycling" *(Figure 3: Hydrologic Cycle)*, precipitation takes one of several paths as it reaches the watershed: 1) *runoff into surface waters,* 2) *filtration into sub-surface regions, and* 3) *return to the atmosphere through evapotranspiration*.

1) *RUNOFF* is accelerated on slopes and impervious surfaces. Rate of runoff is dependent on the amount of precipitation, the slope gradient, soil type, soil depth and vegetation cover. This means that measures to minimize contamination of surface runoff should be elevated in areas containing steep slopes (>30%), containing soils with high erosion potential or high runoff, containing shallow soils, and areas with reduced vegetative cover.

Regarding runoff, the slowing down and filtering of surface runoff in sloping or erosion prone areas is aided by vegetation roots and leaves that grab, bind and utilize moisture as it falls to the ground (through rainfall) and as it moves over the land (through storm runoff). This is a good thing. However, on more level landscapes with slower draining soils, such as those in the San Juan Valley the naturally slower moving surface flows impede drainage of surface water off of the land and into streams. This increases the frequency of flooding and ponding. This is nature being nature, and these hydrologic processes are valuable in the water purification and wildlife habitat they provide. . .*however,* the agricultural operations which dominate this area are susceptible to these processes as well. Ponding soils and slower surface drainage impacts agricultural practices. As previously discussed restoration and conservation recommendations identified for the San Juan Valley will attempt to serve the dual purpose of enhancing and protecting surface water resources *and* assisting agrarian landowners in addressing the flooding of cultivated and/or grazing lands.

2) The movement of precipitation through the ground into sub-surface regions and the depth or degree of lateral movement of water through sub-surface soils is dictated by the soil types and soil characteristics, i.e., moisture holding capacity or vertical permeability of the soils that are present. Water movement through sub-surface soils is complex and difficult to determine without hydrologic investigations that are beyond the scope of this plan. However, it can be inferred that areas in close proximity to surface water bodies are likely to be influenced more directly by sub-surface flow (through springs, seeps and water table transfer). This means that measures to minimize contamination of surface water should be elevated in areas adjacent streams, lakes, wetlands and marine waters. In practical terms, this is the "riparian zone" -- the transitional zone between uplands (dryer areas) and surface water bodies (streams and lakes).

3) Precipitation reaching the watershed may be cycled back into the atmosphere through evapotranspiration -- evaporation and transpiration *(Figure 5: evapotranspiration).* In the San Juan Islands, evapotranspiration is the major influence in annual water loss; and is greatest during the summer months when air temperatures are higher, precipitation is minimal and plants are actively respiring (SJCHCS, 2000). Local water loss due to evapotranspiration has been estimated at 42 to 49 percent (EBASCO Services, Inc., 1990) and as high as 74 percent (Town of Friday Harbor, 1999) depending on landcover and topography. Irrigation activities tend to cause evapotranspiration in those areas to be greater than average natural rates. This plan is primarily concerned with evapotranspiration in areas with reduced vegetation cover where more precipitation is reaching the ground. In these areas the water regime is altered to take on more surface water (due to lack of trees and shrubs, more precipitation reaches the grounds surface). This condition increases runoff and flood potential. Maintaining or re-establishing woody vegetation in areas bordering streams will play an important role in water quality protection and reduced flooding in the watershed.

GROUND WATER: The majority of landowners in the False Bay Watershed rely on ground water as their source for drinking water. Aquifers in the watershed are composed of unconsolidated glacial drift lying over a mix of sedimentary and volcanic bedrock. Freshwater which recharges these aquifers moves through the ground down-slope, eventually depositing in the ocean. (USGS SWIR).

SURFACE WATER INFLUENCES: Generally, drinking water wells are drilled deep enough to ensure that contaminants are filtered out of ground water as it passes into deeper subsurface regions. But, land use practices that lead to contamination of surface waters can indirectly impact ground water and drinking water reserves as well. Contaminants picked up in surface waters through land use practices performed without measures to protect water quality can reach ground water through fractures in the underlying bedrock or at the surface if the well casing is improperly sealed. Also, some contaminants, such as nitrates (generally indicating contamination from animal wastes) do not filter out like other contaminants do. In a case like this, there are only two ways of correcting nitrate contamination in ground water. The first is through the presence of woody root systems (trees and shrubs) on the surface, which use up the nitrogen picked up in surface runoff. The second is through dilution of contaminated ground water with enough uncontaminated water to dilute the level of nitrates in the ground water.

Restoring water quality in a contaminated well is an arduous task, if even possible. Preventing this situation and the potential health risks associated with drinking water contamination through proven water and soil conservation practices is the approach of this plan. . . .much more practical than efforts to correct ground water contamination after it has occurred. Recommendations will center around *reducing the incidence of surface water degradation*. . . . the most achievable and cost-effective approach to lowering the risk of surface waters contaminating ground water reserves.

SALTWATER INTRUSION: Saltwater intrusion is the migration of saltwater into sub-surface freshwater reserves. Intrusion of seawater into freshwater resources can usually be attributed to 1) extraction of well water at a rate faster than infiltration can recharge the aquifer, or 2) drilling wells that are too deep and exceed the freshwater zone *(Figure 6).*

In the Spring of 2000 the United States Geological Survey completed a study to determine whether saltwater intrusion is affecting ground water on Lopez Island. The results of the USGS study show a trend of increasing chloride concentrations over a 16-year period. The False Bay Watershed, as do all watersheds in the county, are susceptible to saltwater encroaching into drinking water reserves. Although chloride concentrations measured in 1997 were higher than those taken in 1981, the increase was found to be study wide and not just in the aquifers closer to the shoreline. Therefore, measures to conserve water use should be heightened throughout the watershed.

SURFACE WATER: Surface water resources in the watershed include several lakes and streams, and a series of wetlands and floodzones. This section focuses on the location and estimated condition of these surface water features. Subsequent sections offer recommendations for minimizing potential and abating actual water quality degradation, and for conserving water use. Surface water resource maps were produced using data from San Juan County, the United States Geological Survey (USGS), & the Federal Emergency Management Agency (FEMA). *(Figure 7)*

The water supply for the town of Friday Harbor comes from the False Bay Watershed. Their water rights, issued through the Department of Ecology, are approved for 1,473.5 acre feet per year. The water source is Trout Lake with two supplementary streams augmenting the supply from Trout Lake.

According to the SJC Watershed Characterization report, the watershed produces an estimated 1028 million gallons of runoff per year, roughly 25% of which is used for human activities. The remainder of this water supports streams, wetlands and the marine system of False Bay.

STREAMS: A network of streams conveys surface water through the drainage basin and into False Bay. For the purposes of this plan, stream "types" have been preliminarily determined by evaluating stream segments using information that is currently available. Streams were located using USGS digitized stream data overlaid on San Juan County's aerial photo base. From this stream locations were determined and estimates of riparian vegetation coverage. Field reconnaissance was performed in some areas to corroborate current conditions with aerial information. From this information, stream types were determined. Stream "types" are based on classifications defined by the Washington Administrative Code (WAC) Chapter 222-16-030 and the Revised Code of Washington (RCW) Chapter 90.58. The watershed stream network has been broken into 15 stream segments, which are classified (typed) and described below. *(Figure 8 - stream segments)*. More qualitative stream typing would be beneficial in locating unknown natural drainageways, and in providing a comprehensive stream system baseline for the county.

SEGMENT #1:

This stream section runs from Lawsons Lake to the drainage channel crossing Boyce Road. The pump station for AUG 1 (one of two augmented water supply sources for the Town of Friday Harbor) is located at the outflow of Lawsons Lake. This stream segment is a type x stream.

Water quality testing in June, 1997 measured pH, Total Suspended Solids and water temperature at the AUG 1 pump station.

LAKES: The watershed contains several significant lakes and impoundments. Trout Lake is a 00 acre, Class 1 lake located in the northwest region of the watershed. This lake is the primary source for drinking water for the Town of Friday Harbor. Trout Lake is protected by a 00 acre buffer zone surrounding the lake.

Lawson's Lake, a Class 1, 12.5 acre lake augments the towns drinking water supply. This lake is fed by upland surface runoff, subsurface flows and seeps and is conveyed to the lake through an extensive drainage swale above the lake.

WETLANDS: In 1992, San Juan County conducted a field inventory of wetlands on the major islands of the county. The inventory identified and mapped the location and general boundaries of some of the wetlands in the county. Wetlands were located by analyzing information from the 1987 National Wetlands Inventory (NWI) mapping, the Washington Hydric Soils List, and 1991 color aerial photos of the county. Field verification was performed for some of the wetlands identified through this process. New wetlands (not previously mapped by the NWI) were added to the inventory; wetlands already mapped by the NWI were checked to determine the level of mapping accuracy and whether the wetland still contained the wetland communities identified during the NWI process, and wetlands which no longer exist were removed from the inventory. This inventory identifies 193 wetlands in the False Bay Watershed, ranging in size and composition. ***(Map 3). Appendix # contains a table summarizing each inventoried wetland.***

This section focuses on *where wetlands are located* in the watershed. Later sections discuss what additional information we have about the condition of these wetlands and what types of activities may be practical and timely in protecting and sustaining the important functions and values of wetlands in the False Bay Watershed.

Although the county's wetland inventory did not include all wetlands in the county it can be used as a resource baseline to add to and amend as additional information is obtained about wetlands in the county. Beginning in the fall of 2001 the Natural Resource Conservation Service will be updating the San Juan County Soil Survey. The information collected during this soil investigation will provide clarification and refinement for both, the 1992 County wetland inventory and the 1962 County Soil Survey.

4.0 LAND COVER & LAND USE

Land cover and land use have everything to do with the quality and function of surface water resources. Land cover and the land use activities on a piece of land can work for or against the dynamic natural soil and water processes continually at work. Minimum affect or interference of these processes is the goal in using conservation management practices. Through awareness and a conscious conservation approach to the land, disturbance to these natural processes can be minimized.

4.1 LAND COVER

Approximately 40-45% of the watershed is covered in forest and woodlands. Grasslands (pasture) cover 30 – 35% of the watershed. **Map 4** provides a visual representation of land cover distribution. An important factor here is the location of wetlands, streams and other natural surface water features in relation to land cover. In general, areas with less vegetative cover are effectively less protected from runoff problems due to the higher percentage of precipitation reaching the ground in these areas. Of particular concern are wetlands and streams with no protective vegetation buffer. Restoration or enhancement of these areas wherever possible, along with a raised awareness of the importance of ongoing protection of vegetative buffers bordering wetlands and streams are two management approaches that will help to protect water quality and hydrologic functioning in the watershed.

Much of the forested land is harvestable timber (SJC Watershed Characterization Report, 1999). Stewardship of forested lands during harvest or conversion is important, especially near surface water features. The drainage system in this watershed is small and less capable of managing sediment loading than larger stream and river systems. (Sediment loading is sediment carried to a water body through storm runoff). Restoration and conservation management practices should include methods for protecting the vegetated borderlands of wetlands and streams in forested areas.

4.2 LAND USE

For the purposes of this plan, three primary land uses in the watershed are discussed. Agricultural, Residential, and Forestry land use. Roads and driveways are also discussed for their role in collecting and conveying surface runoff within the drainage basin. Determining what land uses are occurring in the watershed is done by observing the designated land use codes. Land use codes are broad land use categories used by the County Assessor for taxing purposes. These land use codes can also be used as a tool in natural resource management to examine the distribution and extent of land uses over a large area, like a watershed. This is helpful in determining what types of restoration activities and conservation management practices are needed and appropriate in connection with the natural land covers and types of land uses in the watershed as a whole.

Landuse

33% agricultural, 28% in residential, 22% in conservation, 11% in forestry, 5% in an other category, 1% undeveloped and less than 1% commercial.

SEPTIC
ANTICIPATED GROWTH

AGRICULTURE: Approximately 30% of the watershed – nearly 500 acres, is currently used for agriculture. Grazing and pasture land for cattle and sheep make up the majority. Restricting animals access into streams and wetlands is a critical factor in maintaining water quality and in protecting the physical structure of these resources. Preventative, conservation practices in these areas should focus on pasture management and manure management.

Much of the riparian vegetation bordering streams and wetlands on agricultural lands in the watershed has been removed. Under natural conditions much of the land in agricultural use would be wetlands. Hydric soils are prevalent in these areas. ***(Map 2)*** As would be expected, most of these wetlands have been drained or altered. Restoration or enhancement of vegetative buffers, where needed, around streams and wetlands on agricultural lands will be important for maintaining water quality in these areas. Also, it may be beneficial for conservation technicians to work with landowners in assessing site drainage in areas where wetlands and soils have been ditched and drained, for improving drainage processes and to enhance natural or artificial wetlands in these areas.

RESIDENTIAL: Nearly 40% of the watershed is in residential use. A primary issue associated with residential land use is on-site septic performance. Water contamination due to on-site septic failure is one of the leading non-point pollutants in the county as a whole. Soils play a major role in the effectiveness of septage treatment. Proper installation and maintenance of septic systems are equally critical in preventing contamination of surface water resources. Other "residential" activities of consequence include vegetation clearing (of course), grading, road building and soil compaction through development activities. The cumulative effect of these activities, on a watershed scale can have a significant affect on surface water systems (wetlands, streams, lakes and receiving marine waters). Restoration and conservation recommendations should include hands-on education and assistance for landowners in septic maintenance and needed system upgrades. Public education and training for land owners and land movers (contractors, developers) that covers soils behavior or how soils respond to various land activities would be beneficial.

FORESTRY: Forestry land use designations in the watershed include Designated Forest Land (DFL) and Open Space –Timber (OST). About 10% of the watershed is categorized as DFL or OST land. Both designations require that a certain acreage of land remain in forest production. Timber harvest like any land use practice of scale can be friendly or unfriendly (environmentally sound or harmful) depending on how that land use is carried out. Conservation management programs and education for landowners on lands designated for timber production as well as lands in forested cover not in a timber harvest program should be a component of restoration activities in the watershed.

ROADS AND DRIVEWAYS: One landscape feature easily overlooked, but very important in water drainage and water quality management is roads and driveways. These impervious (non-porous) surfaces cover a surprisingly large proportion of the landscape, even in rural areas. Roadway ditches basically function as feeder streams, transporting runoff from the road and land and often draining directly into streams and lakes. Public roads and road right-of-ways (where the drainage ditch is located) are maintained by the Public Works Department. Private roads are not. Landowners have a lot of influence in how well roadside drainages work – or whether they even exist on private roads and access drives. It would be valuable information and educational for landowners to identify and inventory roadway drainage patterns and assess their effectiveness in the watershed. Carrying out restoration and stewardship projects would be a logical next step.

4.3 CONSERVATION & PRESERVATION LAND

Land protection through preservation or conservation easements is a viable option for landowners who wish to set aside or restrict certain uses in important resource areas like riparian habitats bordering streams and wetlands. Landowners can receive financial benefit for land that is placed in a "conservation easement" or land bought through "fee-simple" purchase. The San Juan Preservation Trust, a private land trust organization, and the San Juan County Land Bank have both worked with landowners in purchasing and protecting natural resources in the watershed. The County's Open-Open Space Program also works to maintain qualifying areas of land in a natural state for reduced taxes. Land preservation is a very effective method for protecting critical surface water resources and lands bordering these.

Over 20% (340± acres) of land in the watershed lies in preservation status. This is an unusually high percentage and implies that landowners in the watershed value the natural features and processes. ***Map 5*** shows parcels that are all or partly held in conservation status Continuing this trend in the watershed will be included in restoration and conservation goals.

5.0 NATURAL RESOURCE ASSESSMENT

5.1 WATER QUALITY

In May of 1997, preliminary water quality testing was carried out by San Juan County (SJC) as a part of the development of the SJC Watershed Action Plan. Six sampling sites were located in the False Bay Watershed. Sites include SJ1, SJ2, SJ3, SJ13, SJ18,& SJ21. *(Figure 0.0)* Testing parameters included the measurement of **fecal coliforms --** associated with animal and/or human wastes; **pH**--acidity/ alkalinity…critically important to all fish and aquatic life; **total suspended solids (TSS) --** indicates amount of sediment loading, too much of which can have many adverse effects on aquatic systems; **dissolved oxygen (DO)** -- the right amount is critically important to all fish and aquatic life; and **temperature** -- critical to sustaining aquatic life. Streams in San Juan County are Class AA (extraordinary). The table below shows the results of this testing compared to the allowed limits for these parameters for Class AA fresh waters in Washington State surface waters.

1997 WATER QUALITY TESTING

Test Site	Fecal Coliforms sampleυ allowed #	pH sampleυallowed	Total Sus. Solids sample υ allowed #	Dissolved Oxygen sampleυ allowed #	Temperature sampleυallowed #
SJ1	460/100mL υ<50/100	7.5υ 6.5-8.5	15.2/100mL υ≤50/100	10.8 υ>9.5 mg/L	17° C υ ≤ 16°
SJ2*	636/100mL υ<50/100	7.7υ 6.5-8.5	54/100mL υ≤50/100	6.7 υ>9.5 mg/L	7° C υ ≤ 16°
SJ3	3/100mL υ<50/100	8.0υ 6.5-8.5	20.0/100mL υ≤50/100	3.8 υ>9.5 mg/L	17° C υ ≤ 16°
SJ13	43/100mL υ<50/100	7.3υ 6.5-8.5	0.1/100mL υ≤50/100	7.7 υ>9.5 mg/L	13° C υ ≤ 16°
SJ18	23/100mL υ<50/100	8.0υ 6.5-8.5	56.0/100mL υ≤50/100	18.6 υ>9.5 mg/L	13° C υ ≤ 16°
SJ21	no sample taken	7.6υ 6.5-8.5	23/100mL υ≤50/100	3.4 υ>9.5 mg/L	15° C υ ≤ 16°

**Seven samples were taken at site SJ2 (5/97 – 2/98). Readings shown on this table are show the average from samples that measured outside of the allowable range. If all seven samples were within the allowable range this table shows the average measurement of all seven.*

Hummel Lake (L22) was in range for all parameters. The samples taken from the freshwater input into the lagoon (L27), and the creek outlet from the lagoon into the bay (L21) exceeded State thresholds for pH and for temperature. Both, temperature and pH are highly critical in sustaining of freshwater aquatic organisms.

In 1999, a water quality monitoring program was carried out by the Huxley College of Environmental Studies (Western Washington University) at selected freshwater and marine sites throughout the county to provide an overview of current water quality conditions. One sampling site was in the Hummel Lake drainage located on Cross Road, 0.4 km west of Port Stanley Road, on the north end of the culvert. Monitoring was performed March,1999 thru February, 2000. This site was found to have "marginal water quality. The site was dry from June through December, 1999. Temperature and pH measurements met Class AA standards. Water quality problems included high fecal coliform counts (Class C or lower), low dissolved oxygen concentrations (Class B), and high total phosphorus concentrations ". (Wiseman, Matthews, & Vandersypen, 2000).

In addition, the Lopez High School's Environmental Science Class completed some water quality monitoring of Hummel Lake in the 1999-2000 school year. They collected samples at three different times to measure dissolved oxygen, light transference, calcium and sulfate ions, total nitrogen, PH, Biological oxygen demand, coliform, and turbidity. They did not identify any significant pollution or trends through these sampling efforts.

Water Quality

Water has the potential to transport pollutants within a watershed. Although water quality problems orignate from both point (from a specific pipe) and non-point sources, with in the false bay watershed the primary cause of pollution is non point. Non point source pollution results from rainfall moving over and through the ground picking up and carrying away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. Examples of non point pollution include excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas; oil, grease, and toxic chemicals from urban runoff and energy production; sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks; and bacteria and nutrients from livestock, pet wastes, and faulty septic systems.

Water quality sampling was carried out in 1997 and in 1999. In 1997, the two streams leading into False bay were found to have high fecal choliform counts. In 1999, two sites were sampled, one at --- road and one AT

5.2 LAKE ENVIRONMENT

PLANTS: The lake contains a dense, extensive aquatic plant community. The littoral zone (light penetrating area next to shore) is dominated by coontail (Ceratophyllum demersum), extending to 2 meters deep and choking much of the lake in summer months (Downen and Muller, 2000). Most of the shore is lined with common cattail (Typa latifolia) and bulrush (Scirpus sp.). Yellow water lily (Nuphar sp.) occurs extensively along the south side of the lake, and semi-terrestrial read canary grass (Phalaris arundinacia) and nightshade (Solanum sp.) are encroaching along much of the lake margin. (Downen and Muller, 2000). Frequent algae blooms occur regularing in the lake.

FISH: Rainbow trout (Oncorhynchus mykiss) were first introduced into Hummel Lake in the 1930's. Prior to this there were no known native sportfish in the lake (WDFW, 2000) As part of a standard trout management program the WDFW. In the 1980's the WDFW began stocking several warmwater species in the lake due to the intensive managment required to maintian quality trout populations under environmental conditions not prime for trout. Warmwater species stocked by the WDFW included bluegill (Lepomis macrochirus), largemouth bass (Micropterus salmoides) and channel catfish (Ictalarus punctatus). A stock assessment study conducted in the fall of 1998 shows that the lake is currently populated with largemouth bass, bluegill, brown bullhead and rainbow trout. Of the fish sampled, more than 90% were largemouth bass and bluegill. Brown bullhead accounted for 2% and rainbow trout accounted for 2% of the sample.

RIPARIAN HABITAT: Riparian vegetation surrounding the lake is in good shape. On the west side of the lake surface water collected from the upper watershed has been channelized and inlets the lake through a culvert under Center Road. Riparian vegetation here is non-existent. Two flood zone regions directly north and east of the lake are well vegetated. The flood zone lying to the north of the lake is a well established fresh water marsh and is currently held in conservation (Open-Open Space) status. The condition of the flood zone to the east has not been studied, but this area appears to be wooded an fairly in tact. The lower end of the flood zone contains a bog.

RESOURCE ASSESSMENT: The lake edge is well vegetated and appears to be in good condition. Keeping the lake-shore well vegetated with grasses, sedges, shrubs and trees should be a high priority. Structurally, the lake appears to be in good shape (WDFW--Aug,1999), however assessment work would need to be done to verify this. The lake shows signs of high productivity. Aquatic plant growth dominates the littoral zone (light penetrating area next to shore). Frequent blooms of green and blue-green algae have been occurring regularly in the lake for many years which suggests high primary production and possible system enrichment (nutrient rich runoff into lake) (Downen, 2000). *Warmwater Enhancement Options* recommended by the WDFW are included in **Appendix A**.

5.3 STREAM ENVIRONMENT

STREAM HABITAT: There is no known comprehensive data about the plants, animals, instream habitat and stream channel conditions in the stream corridor. Glimpses of the stream system from roadside offers pieces of information and the WDFW have visited the area investigating the potential for fish spawning/passage. However, this information does not provide the thorough data needed for making restoration or management decisions about the physical condition of the stream and drainage system as a whole.

Following a 1999 field study, the WDFW noted that the slow erosional process occurring in the earthen dam (between Cross Road and the Lagoon) would eventually undermine the end of the dam and may cause the pond to drain. The ponds stops all downstream flow of gravel and sand.

Over time the channel downstream may have become "starved" of new material and cut ever deeper, and steeper.

RIPARIAN HABITAT: Much of the wetland and riparian habitat associated with the stream system above Hummel Lake has been altered. Approximately 95% to 98% of the wetland habitat and riparian vegetation has been removed and replaced with grasses. Below the lake, wetlands and riparian areas are approximately 75% vegetated and contain tree canopy. The remaining 25% has minimal to no riparian vegetation and tree canopy. Most of this area is now kept in pasture grass. There are portions of the stream that have been channelized, and protective, vegetation canopy has been removed. In the lower region of the watershed, nearing Swifts Bay stream flow is diverted through a small dam. Beyond this point protective riparian cover is reduced as the channel meets a dry salt marsh and salt water lagoon. A flood gate holds tide water from entering the marsh area, so this area no longer functions as a tidal salt marsh.

RESOURCE ASSESSMENT: The stream condition is generally unknown. Baseline information is needed. Stream habitat restoration or enhancement projects may be recommended depending on conditions found during baseline data collection.

5.4 WETLAND ENVIRONMENT

FRESH WATER WETLANDS: Many wetlands in the watershed have been ditched and drained for agricultural uses. In the upper watershed, above Hummel Lake over 90% of wetland vegetation appears to have been removed and replaced with grasses. In the lower half of the watershed, below the lake, wetlands are approximately 75% vegetated. Most of this area is now kept in pasture grass as well. There are an unknown number of dug ponds that may or may not be connected to surface water resources.

RESOURCE ASSESSMENT: In general, wetlands in the watershed are greatly altered. Enhancement of wetland vegetion wherever possible would be of benefit to wetland functions and wildlife habitat. Updated soils information (through to 2001 NRCS soil survey update) will aid in more thoroughly locating and assessing wetlands in the watershed.

5.5 MARINE ENVIRONMENT

MARINE HABITAT: Swifts Bay is a fairly open marine embayment with extensive mud shores. The intertidal region contains native eelgrass (Zostera marina) and kelp beds. The beach is a popular shellfishing area. Fishing and shrimping and crabbing occurs offshore.

SALT WATER LAGOON: The estuarine lagoon is situated in the lower watershed and conveys watershed surface drainage from the upland to the bay. The lagoon is cut off from tidal influence by a cement-encased, steel tidal flood gate at the top of the shoreline. The shoreline has been bermed to block wave and tidal action from reaching houses lining the shoreline. The lagoon is surrounded by salt tolerant marsh vegetation, however, the salt marsh no longer receives tidal flushing.

There are fish in the lagoon and the outlet channel. Interestingly, the outlet channel where the fish were observed has a gravel bed, and receives some tidal flushing. These fish are thought to have been spine stickleback (Buchanan, 1999). The lagoon has escalating algae blooms, possibly through the influence of nearby aging septics.

RESOURCE ASSESSMENT: The lagoon and salt marsh are not functioning in their natural state due to the shoreline berm that blocks tide and wave action from reaching shoreline houses. Baseline information is needed on the lagoon to assess conditions over time. Water levels and flow rates should be monitored as should water quality. In earlier testing, temperature and pH both measured high (over state thresholds). Increasing algae blooms are also a problem. Septic systems in this area may be failing due to age and due to poor soils inhibititing proper septage treatment.

Restoration goals should include one or more public forums to allow shoreline owners to discuss and share ideas and identify objectives for the lagoon, marsh and shoreline system. Providing public education and raising public awareness of the workings and the value of a natural estuary would aid decision making and promote conservation practices. If possible, through this process landowners should determine restoration or enhancement plans. In particular, the tidegate may need upgrading, both, for storm drainage capacity and to improve possible fish passage. There would be a benefit to marine species and birds by allowing tidal flushing into this lagoon. There would be a change in the plant community, and in the quality and quantity of water in the lagoon. There may be a benefit to juvenile salmonids living in the nearshore -- their origin would be the Frazier River, Vancouver Island, or possibly northern Washington rivers like the Nooksack, Samish, and Skagit (Buchanan, 2000).

Regulatory and management framework

Talk about the Comprehensive Plan and Heritage Plan stuff.

Wetland regulations – Clean Water Act Section 404 and 401, Rivers and Harbors Act, Shoreline Management Act, Hydraulic Code, Forest Practices Act, Growth Management Act, State Environmental Policy Act.

Management Alternatives:

Water quality trout lake
Win win engineering
NRCS programs

EQIP – The Environmental Quality Incentive Program is a voluntary conservation program through which land owners can receive technical financial and educational assistance to apply solutions to soil, water and related natural resources problems through 5-10 year contracts. Eligible property must be engaged in livestock or agricultural production. In order to apply, a conservation plan is developed in cooperation with the San Juan County Conservation District which identifies resource concerns. Your plan is then ranked according to the environmental benefits achieved verses the total cost share assistance dollars requested. Usually the USDA will pay up to 75% of the eligible costs for projects.

Recommendations

The San Juan County Watershed Committee has recently completed a report of Watershed Action Strategies to reduce non-point source pollution in the county. The following recommendations take the broad guidelines in this report and make them specific to the False Bay Watershed.