

**BIRCH BAY, WASHINGTON
COMPREHENSIVE STORMWATER MANAGEMENT STRATEGY
PROJECT**

PHASE 1

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1.0 PURPOSE

The Puget Sound Partnership (PSP), in cooperation with the U.S. Environmental Protection Agency (EPA) and Whatcom County, is developing a Comprehensive Stormwater Management Strategy (CSMS) for the Birch Bay watershed. This plan is not intended to supplant the extensive stormwater planning efforts already underway in the Birch Bay watershed management unit (WMU)¹ and adjacent watersheds in the Water Resource Inventory Area No. 1 (WRIA 1), but build upon these efforts in an attempt to identify cost-effective solutions, additional sources of funding, and other collaborative practices that will aid the local community in characterizing and implementing effective stormwater practices and resource management actions.

The CSMS is part of the initial step in a multi-agency-sponsored pilot project to develop methods for utilizing established watershed characterization tools in the development of watershed-based land use management plans focused on preserving and restoring ecosystem processes, while concurrently planning for and accommodating projected population growth and economic development. More specifically, the pilot project seeks to facilitate protection and restoration of ecosystem processes necessary for the long term functioning of marine, freshwater, and terrestrial systems in and adjacent to the Birch Bay watershed. The pilot project will also provide recommendations for developing more effective and efficient tools to facilitate the decision making process for land use management at the local level.

The Birch Bay watershed was chosen as the pilot case because Whatcom County has been actively seeking opportunities to use watershed-based planning tools to streamline development review and improve natural resource management. Currently Whatcom County recommends the use of low impact development strategies and techniques in its protection of Critical Areas such as wetlands and stream systems.

As an example, Whatcom County's Critical Area Ordinance (CAO) includes provisions that allow watershed plans to "substitute" for some critical area regulations and other land use restrictions. The CAO also includes detailed standards and procedures for mitigation banking based on and consistent with State banking standards.

The effort to develop the CSMS for the Birch Bay WMU is divided into the three phases described below:

1. Review plans and technical documents collecting and evaluating planning, stormwater, and resource management recommendations for the Birch Bay WMU.
2. Develop and/or refine existing watershed characterization tools² and analysis methods that are relevant statewide to test the applicability of the recommendations on a local scale.

¹ For the purposes of this pilot project the Birch Bay watershed is characterized by the WMU boundaries as defined by the WRIA 1 Salmonid Recovery Plan.

² Watershed characterization refers to the analysis of ecosystem processes related to the movement of water, sediment, nutrients, chemicals, energy or animals and plants at various scales (basin, subbasin, watershed). This is a Geographic Information Systems-based approach to manage, analyze, display and monitor ecological data and results. The results can be used to make informed decisions related to land protection, restoration, planning and permitting.

3. Demonstrate how integrating watershed characterization into local land use planning can improve decision-making, increase predictability during development review, reduce workload and cost, and improve the health of local and regional ecosystems.

This draft report is a summary of the Phase I findings. In recent years, significant resources have been allocated towards gathering and analyzing available information, as well as creating plans to guide development and manage resources within the Birch Bay WMU. Many of the ongoing planning efforts share common goals for managing stormwater and meeting natural resource objectives for maintaining ecosystem health, recovering salmonid populations and improving nearshore habitat conditions.

As described above, the intent of this initial phase of the CSMS is to review and synthesize the programmatic, regulatory, management, funding, and physical improvement recommendations of the pertinent reports and technical documents prepared for Whatcom County as they relate to development guidelines, stormwater, and natural resource management objectives that have been developed for the Birch Bay watershed and surrounding areas. In this manner, the pertinent recommendations summarized in this document are categorized based on the intent and function of the recommendation to improve conditions and clarify the management objectives for land use and ecosystem processes within the Birch Bay basin.

2.0 BACKGROUND

Birch Bay, Washington is an unincorporated urban growth area (UGA) along the shores of the Strait of Georgia in Whatcom County. Located approximately 20 miles north of the City of Bellingham, and 50 miles south of Vancouver, British Columbia this small but growing residential and resort community is concentrated around the protected coastal bay for which the community is named.

Birch Bay is the receiving water of a coastal watershed encompassing 31 square miles located between Semiahmoo Bay to the north and Lummi Bay to the south (Figure 1). The Bay includes the marine shoreline from the Semiahmoo Peninsula and Birch Point, south to Point Whitehorn including Birch Bay State Park. The watershed extends inland to the City of Ferndale, and includes Lake Terrell and Terrell Creek. Other water resources within the watershed include Fingalson Creek and numerous small streams that drain directly to Birch Bay. Wetlands are widespread and extensive in the Birch Bay watershed, currently covering approximately 25 percent of the basin area.

According to the U.S. census (2000) approximately 5,000 people resided within the Birch Bay census designated place (CDP). Since 1990, the population of the Birch Bay watershed has increased by 87 percent, and it is projected that by 2022 the population will again double to nearly 10,000 (Census). Development of the primarily residential and recreational community is currently concentrated along the shorelines of the bay. The primary land use in the upper portions of the Birch Bay watershed consists of agricultural areas and pasture lands.

The marine and freshwater resources within the Birch Bay watershed provide the ecological foundation for supporting both human and non-human use within the watershed. As an example, the approximately twelve lineal miles of marine shoreline in Birch Bay from Birch Point to Point Whitehorn are deemed shorelines of statewide significance (RCW 90.58.310) and support

significant fish, wildlife, and shellfish populations. Nearly two miles of the marine shoreline area located within the 194-acre Birch Bay State Park is publicly accessible. This area is a popular recreational area with extensive shellfish beds providing opportunities for recreational shellfish harvesting.

However, the water resources of the Birch Bay watershed and its associated fish and wildlife populations are susceptible to elevated nutrient and pathogen levels caused by pollution from human sources. Shellfish harvesting in Birch Bay has been periodically prohibited due to water quality problems. In July of 2003, Birch Bay was added to the Washington State Department of Health's (WDOH) list of 'threatened' shellfish harvesting areas because portions of the bay exceeded water quality standards for fecal coliform. This status indicates a downward trend in local water quality conditions, which could lead to expanding and/or extending harvesting prohibitions by the WDOH in an effort to ensure public health conditions and safety (CH2MHill, 2006).

In general, sources of fecal coliform bacteria in Birch Bay may include sewage treatment outfalls, on-site sewage systems such as septic systems, broken sewage conveyance pipes, waste discharge from boat tanks, runoff from agricultural fields, and wildlife/domestic pet waste (CH2MHill, 2006). Although marine waters are generally well mixed in Birch Bay due to the exposure of the shoreline, areas of relatively low energy do occur, primarily in the southeastern corner of Birch Bay near the state park. These low energy areas are potentially more susceptible to elevated nutrient/pathogen levels than other locations within the Bay.

Two other areas of concern for poor water quality conditions within Birch Bay include the outfall near the mouth of Terrell Creek and the mouth of the Birch Bay Village Marina in the northeast corner of the Bay. However, the local wastewater treatment plant outfall for the area discharges in deep water (deeper than Birch Bay) in an area with strong currents that rapidly disperse and dilute the discharge water. Thus, the outfall is unlikely to be a significant source of bacteria and contaminants in Birch Bay (CH2MHill, 2006).

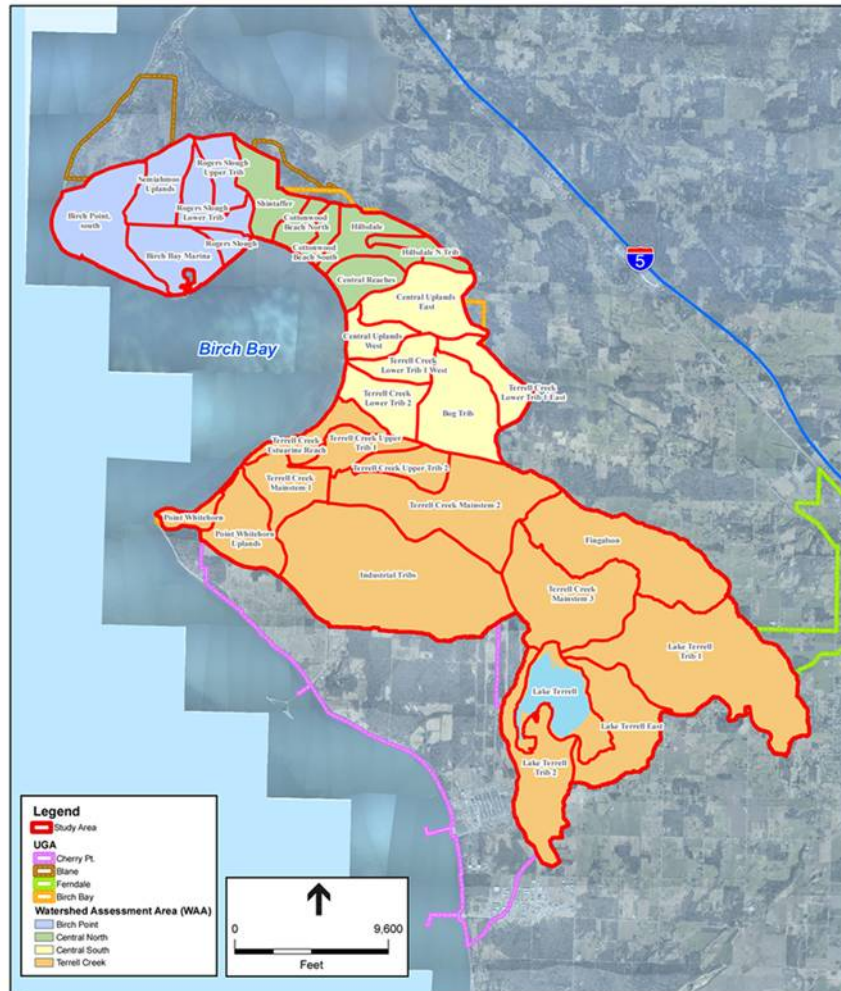


Figure 1. Birch Bay Watershed, Whatcom County (Source ESA Adolfson, 2007)

In addition to declining water quality in Birch Bay, several other types of surface water problems exist in the area. Localized drainage issues, including flooding and erosion/sedimentation, occur in several parts of the watershed (CH2MHill, 2006). Also, many areas of historical wetlands appear to have been affected by development, including former wetlands near the Birch Bay Village golf course and marina. Loss of historical wetland areas also appears to be extensive in the Cherry Point drainage (Gersib, 2001). These issues are affecting the quality of freshwater systems within the watershed, and have contributed to the degradation of available aquatic, wetland, and riparian habitat.

Research conducted by the Nooksack Salmon Enhancement Association (NSEA) found that Terrell Creek, the primary freshwater drainage within the Birch Bay WMU supports a variety of native fish species such as cutthroat trout and Coho salmon. However native fish population numbers within this 17 square mile drainage have declined significantly in the past 50 years. The causes of this decline are attributed to past and present land use practices, causing habitat degradation (primarily within the lower portion of the watershed) including loss of riparian habitat, barriers to fish passage, and extreme low flow rates during dry periods of the year. It is estimated that fifty-eight percent of the Terrell Creek riparian zone has been converted to non-

forest cover with no significant conifer stands remaining along the stream corridor (Smith 2002). Much of the remaining riparian cover along Terrell Creek is comprised of less than ideal scrub-shrub, deciduous, and immature mixed forest stands.

The WRIA 1 Salmonid Recovery Plan (2005) estimates that 19.4 percent of the Terrell Creek drainage is covered by impervious surfaces. According to recent findings, a general threshold of six to ten-percent impervious area in any given watershed within the Puget Sound Region creates a situation in which hydrological processes are significantly impacted and recovery becomes unlikely (Booth and Jackson, 1997; May et al., 1997).

The two areas of most intense development are along the marine shoreline and in the Terrell Creek drainage above Lake Terrell. Efforts are currently underway at local, county, state, and federal levels to manage this population growth and development within the watershed to more effectively protect and restore the quality and conditions of the hydrologic processes within the watershed. For example, on February 22, 2005 the Whatcom County Council decreed by local ordinance (2005-030) that the Birch Bay WMU become a Stormwater Special District and a Water Resource Special Management Area, required to regulate and protect water quality by managing the quantity and quality of stormwater generated by development actions. This declaration places additional regulatory provisions on residential development within the basin that requires on-site stormwater facilities and the implementation of erosion and sediment control (ESC) measures to prevent soil and sediment-laden runoff from leaving construction sites. After construction, sites must be re-vegetated or permanent ESC measures must be installed.

Development and other human activities have affected the quality and structure of nearshore habitats as well. The Birch Bay watershed has a total of thirty-five groins alongshore in Birch Bay, two jetties at the Birch Bay Village Marina entrance, and the three industrial piers at Cherry Point. Field surveys performed by Coastal Geologic Services in 2005 documented bulkheading, or sediment impoundment, along 7.2 percent (6,944 feet) of the Birch Bay shoreline (not counting bulkheads along the large accretion shoreform beach within Birch Bay). Obstructions to sediment transport, such as groins and jetties, commonly exacerbate erosion down-drift and cause wave refraction where sediment transport is blocked by the structure. The loss of beach sediment and focusing of wave energy can lead to beach lowering and sediment coarsening, thus leading to habitat degradation. Adjacent beaches can also be affected by bulkheads that cause wave refraction, and can result in erosion hot spots.

The Birch Bay marine shore includes many areas of shallow water and no-bank beaches with extensive intertidal and shallow subtidal flats. These high light environments have historically supported extensive eelgrass beds and tidal flat algal production, with their associated food webs. These shallow areas also provide an early spring source of prey items for migrating salmonid fry at a time when deeper habitats are not as productive. However, residential and commercial development along the marine shorelines, have displaced much of the marine riparian vegetation within Birch Bay.

3.0 METHODS OF ANALYSIS

3.1 Comparative Document Review

Each of the documents analyzed in this initial phase of the CSMS are compared and evaluated qualitatively, identifying and categorizing recommendations as they pertain to objectives for guiding development and managing stormwater and natural resources in the Birch Bay watershed. In this manner, the pertinent recommendations presented in each document are categorized based on the intent and function of the recommendation to improve natural resource conditions and clarify the management objectives for land use and ecosystem processes within the Birch Bay basin.

Each of the plans compared and evaluated, though all tied to water resources, have differing mandates and authority. For example, the Birch Bay Comprehensive Stormwater Plan (BBCSWP) specifically recommends structural solutions to stormwater quality and quantity, while only touching on wetland solutions knowing the Critical Area Ordinance (CAO) update and shoreline inventory covered that area more specifically. In addition, during the BBCSWP process the citizens of Birch Bay set the prioritization of projects with specific quantifiable criteria, while many of the other plans had only general comments from the public.

To facilitate the evaluation of the plans, recommendations are divided into two categories: non-structural and structural. The non-structural category includes programmatic, regulatory, and funding recommendations, while the structural category is comprised of physical recommendations and alternatives for actively improving the hydrological and ecological conditions of the watershed.

3.2 Evaluating and Synthesizing Recommendations

The processes and mechanisms shown in Figure 2 provide the conceptual, ecosystem-based framework through which this Phase I CSMS review qualitatively analyzes the intent and function of the structural and non-structural recommendations provided in the documents reviewed. This framework is used to identify and consider potential gaps in the current collection of documents and reports that provide land use management recommendations for the Birch Bay area. The recommendations reviewed range in scope from broadly stated recommendations intended to generally improve hydrological conditions to more specific recommendations designed to enhance ecosystem mechanisms and processes operating within the Birch Bay watershed.

Ecological System	Process	Mechanism
<i>Freshwater Streams, Lakes, and Wetlands</i>		
<i>Hydrology</i>		Infiltration/Recharge Surface Water Storage Runoff and Peak Flows Groundwater
<i>Sediment</i>		Delivery and Storage
<i>Water Quality</i>		Nitrogen Delivery / Removal Pathogen Delivery / Removal
<i>Organic Materials</i>		Riparian Conditions Large-Woody Debris Recruitment
<i>Heat/Light</i>		Canopy Cover
<i>Marine /Nearshore Environments</i>		
<i>Circulation</i>		Oxygen Levels Temperature
<i>Sediment</i>		Delivery and Storage
<i>Water Quality</i>		Nitrogen Delivery / Removal Phosphorus Delivery / Removal Pathogen Delivery / Removal
<i>Nutrient Dynamics</i>		Intertidal and Littoral Vegetation
<i>Heat/Light</i>		Nearshore Canopy Cover

Figure 2. Ecosystem mechanisms and processes used to evaluate document and plan recommendations

4.0 DOCUMENT SUMMARIES

Several State and County land use oriented plans and documents have been adopted or updated within the past two years, including the Whatcom County Comprehensive Plan, the Birch Bay

Community Plan (also known as the Birch Bay Sub Area Plan), and the Birch Bay Comprehensive Stormwater Plan. These plans and documents have been created to guide land use decisions and protect, and in some cases restore, ecosystem processes within the Birch Bay UGA and surrounding watershed³. Other, more ecosystem process-based plans have also been adopted in the past year including the WRIA 1 Salmonid Recovery Plan and the Whatcom County Shoreline Management Program update. The objectives of these documents are focused on managing hydrologic conditions and stormwater, maintaining salmonid populations, and improving the conditions of the highly valued shellfish resources along the marine shores of the watershed. These documents along with local ordinances and established development standards control growth and protect the existing environmental (natural, social, economic) conditions of the Birch Bay watershed. The intent and overall objectives of the plans reviewed in this evaluation are summarized below:

4.1.1.1.1 Whatcom County Comprehensive Plan (Kremen, 1997, Updated 2005)

Based on the requirements stipulated in the Washington State Growth Management Act (GMA; RCW 36.70A) Whatcom County's Comprehensive Plan (WCCP) is intended to guide and coordinate growth in unincorporated sections of the County in conjunction with the new urban growth plans of its incorporated cities. The fundamental purpose of the WCCP is to establish a framework, through inter-jurisdictional cooperation, to coordinate goals, policies and action items for the growth planning and implementation actions that are occurring in designated urban growth areas and in the county's rural areas.

The WCCP provides an overarching framework for land use management in unincorporated Whatcom County that includes policy guidance and action items related to stormwater and natural resource management, including fish and wildlife habitat protection/restoration, wetlands preservation, etc. Additionally, the WCCP supports protection of the County's natural resources through a comprehensive environmental management program that includes coordination, regulation, restoration, mitigation, and public education. As part of the adoption of the WCCP, the Whatcom County Council, in conjunction with all local cities, adopted a set of Countywide Planning Policies. The framework provided by these adopted planning policies ensures that local planning efforts will be consistent with one another and supportive of regional goals.

4.1.1.1.2 Whatcom County Comprehensive Water Resources Plan (Kremen, 1999, Updated 2001)

Originally written in 1999 and updated in 2001, the purpose of the Whatcom County Comprehensive Water Resources Plan (CWRP) is to identify the short and long-term water resource needs within Whatcom County, and to further clarify and provide guidance for establishing water resource management goals. The plan lists several long-term goals for managing the water resources within Whatcom County, including:

³ The document review focuses on key countywide and locally sponsored planning documents. It does not include additional planning efforts by Tribal agencies, nongovernmental organizations, academic institutions and the like which may be ongoing in this region.

- maintaining a reliable and sustainable water supply that supports existing needs, and provides for growth;
- protecting and contributing to the enhancement of fisheries, restoring shellfish populations, and satisfying Endangered Species Act requirements;
- developing a coordinated land use and habitat management plan that provides recreational opportunities while restoring and sustaining natural systems;
- protecting and promoting areas of groundwater recharge; and
- providing an effective water management structure that performs comprehensive planning and coordinates efforts that support the diverse needs and users while promoting the efficient use of available resources.

4.1.1.1.3 *Birch Bay Community Plan (Kask Consulting, Inc., 2004)*

The Birch Bay Community Plan (BBCP) was adopted as a sub-area of the Whatcom County Comprehensive Plan in 2004. Prepared under the direction of a citizen-based steering committee in context with the requirements stipulated by the GMA, the Shoreline Management Act (RCW 90.58), the State Environmental Policy Act (RCW 43.21C), and the Whatcom Countywide Planning Policies, the plan represents the community's vision for accommodating future growth in the area while also preserving and nurturing the natural systems and aesthetics that are valued in the community today. This adopted vision recognizes that a dynamic accord must be struck between future development actions and the preservation/restoration of natural system processes to maintain the quality of life so highly appreciated by residents within the Birch Bay community.

While working to establish the aforementioned vision, the plan is designed to provide both structural and non-structural recommendations in an attempt to guide practical, development-based actions for the community in making zoning decisions, subdivision actions, capital improvements decisions, shoreline development and other actions that shape the local community. It also recommends specific actions to rehabilitate and enhance portions of the beach along Birch Bay Drive to achieve ecological, aesthetic, recreational and public safety objectives.

4.1.1.1.4 *Birch Bay Comprehensive Stormwater Plan (CH2MHill, 2006)*

The Birch Bay Comprehensive Stormwater Plan (BBCSWP) was developed to examine the current surface water issues within the Birch Bay watershed and propose solutions to more adeptly manage those issues in accordance with the BBSAP goals and objectives for future growth and development within the basin. The BBCSWP provides both structural and programmatic recommendations for addressing the impacts of stormwater on both built and ecological systems, and also examines funding opportunities for the outlined solutions. The plan further discusses issues of regulatory compliance with potential Endangered Species Act (ESA), Clean Water Act, and National Pollutant Discharge Elimination System (NPDES) requirements.

4.1.1.1.5 *The WRIA 1 Salmonid Recovery Plan (Nooksack Natural Resources et al. 2005)*

The WRIA 1 Salmonid Recovery Plan (SRP) outlines a local strategy of projects, programs and timelines to recover salmonid populations, with a particular focus on Puget Sound populations of Chinook salmon and bull trout, listed as ‘threatened’ under the ESA. The WRIA 1 SRP includes a comprehensive look at the scientific data collected on salmonids and their habitat over the last several decades, explains the factors inhibiting salmonid populations, and describes strategies and actions needed to recover salmonids to self-sustaining numbers. Central to the plan are eight actions to be taken in WRIA 1 over the next ten years that will jump-start early Chinook recovery. Many of the actions proposed in the recovery plan focus on preserving and/or restoring aquatic habitat and riparian conditions, which is under management control of both public and private landowners.

4.1.1.1.6 The Salmonid Habitat Restoration Strategy (City of Bellingham et al., 2005)

The purpose of the WRIA 1 Salmonid Habitat Restoration Strategy (SHRS) is to provide greater detail and direction to the WRIA SRP. The strategy identifies and prioritizes specific projects to protect and restore the habitats and landscape processes essential to the recovery of ESA-listed Chinook salmon and bull trout, along with other salmonids native to WRIA 1.

The Strategy constitutes an important component of the SRP, which incorporates recommendations for four key factors that determine salmonid population health, known as the 4 “H’s” (habitat, harvest, hatchery, and hydropower) and, in addition to voluntary measures, also covers regulatory and incentive-based actions. Developed as a cooperative approach, the Strategy also supports and manages other active efforts from separate funding sources to restore and protect aquatic species in the WRIA 1, regarding all efforts as beneficial to the protection and restoration of ecological functions and landscape processes.

4.1.1.1.7 The Shoreline Inventory and Characterization Report (Parametrix and ESA Adolphson, 2007)

The Draft Shoreline Inventory and Characterization Report (ShICR) supports Whatcom County’s Shoreline Management Program (SMP)⁴ by documenting the existing shoreline conditions throughout Whatcom County. The report presents a baseline inventory and characterization of landscape processes and shoreline ecological functions in accordance with state shoreline guidelines. Specifically, the ShICR reports on the areas important for performing ecosystem processes at the watershed scale and describes ecological functions that influence the shorelines of Whatcom County; assesses the relationship between landscape processes and ecological function to identify current conditions; and, identifies specific opportunities and measures to protect and/or restore these functions and processes.

4.1.1.1.8 The Shoreline Restoration Plan (Parametrix and ESA Adolphson, 2007)

The Draft Shoreline Restoration Plan (ShRP) builds on the shoreline inventory and characterization document, supporting Whatcom County’s SMP. The plan is not intended to

⁴ The SMP is a component of the County’s Comprehensive Plan.

supplant other salmon recovery planning efforts or watershed planning under RCW 90.82, but to provide a complimentary and coordinated approach for restoration planning and practice. The ShRP creates a framework for fostering shoreline restoration through coordinated planning efforts and voluntary cooperative and non-regulatory implementation. The plan identifies degraded areas and sites with potential for restoration, establishes overall goals and priorities for the restoration of these degraded areas; identifies and incorporates ongoing projects and programs currently being implemented; identifies additional projects and programs needed to achieve local restoration goals; identifies timelines and benchmarks for implementing restorative measures; and finally, provides mechanisms or strategies to ensure that restoration projects and programs will be implemented according to plans. The ShRP further ensures that projects will be appropriately monitored to determine the effectiveness of project techniques to inform future projects and programs.

4.2 Document Reviews

The plans reviewed in this report have two primary foci: guiding development decisions, and managing ecosystem processes through preservation, enhancement, and restoration activities. The intent and scope at which these plans are developed and applied is what in many ways forms the distinction between plans. For example, the WCCP provides a range of programmatic and regulatory recommendations that are applicable to both the broader, countywide scale and the Birch Bay watershed, while the BBCSWP focuses more specifically on developing management and performance measures specific to the Birch Bay watershed. The BBCSWP provides programmatic, regulatory, and capital improvement recommendations to address drainage, flooding, and water quality issues at a higher spatial resolution.

The WRIA SRP and SHRS provide an ecosystem approach for managing ESA-listed Chinook salmon and bull trout, focusing recommendations most specifically on the Nooksack watershed, outside of the Birch Bay area. However, general programmatic recommendations provided in the WRIA SRP and the SHRS for the proliferation of salmonids and the improvement of habitat conditions have been incorporated into this review. The ShICR and ShRP also use an ecosystem-based approach specifically analyzing the conditions of the shorelines in Whatcom County. The ShRP makes specific programmatic and capital improvement recommendations for enhancing and restoring the functional ecosystem processes and habitat conditions of the Birch Bay shoreline and Terrell Creek.

The CWRP and the BBCP examine both development and ecosystem management issues within the Birch Bay watershed, and provide programmatic, regulatory, and capital improvement recommendations to address these issues. These documents provide a watershed specific, localized perspective for guiding future urban development patterns while also supporting natural resource conditions within the Birch Bay watershed.

4.3 Information Gaps

The documents evaluated for this report provide an overview of the complex ecosystem conditions and land use issues in the Birch Bay watershed and offer a plethora of non-structural, programmatic and regulatory recommendations for protecting ecosystem processes and guiding development patterns. However, aside from the recommendations provided in the BBCWSP, there are comparably few structural improvement projects recommended. What is missing in

many of these documents is the place-based (site-specific) best available scientific information needed for determining how ecological conditions can guide future land use decisions within the Birch Bay watershed.

This limitation is in part due to the small sample of documents evaluated in this initial recommendation review. Further iterations of this document review will benefit from a more broadly scoped analysis of recommendations generated in documents of, for example, management plans for specific areas within the Birch Bay watershed such as the Lake Terrell Management Plan, and reports generated by the Nooksack Salmon Enhancement Association (NSEA). The more finely scaled, structural recommendations, provided in these reports will provide more explicit information on the physical and biological conditions of the natural resources specific to the Birch Bay watershed.

5.0 RECOMMENDATION SUMMARIES

5.1 General Management Recommendations

The general management objectives from each of the plans are broadly categorized into: 1) watershed processes (see Figure 2), 2) critical areas⁵ and habitat structure, 3) biological concerns, and 4) social concerns. Figure 3 shows the categorical distribution of recommendations from each of the reviewed documents and plans.

However, making specific ecosystem process and mechanism based recommendations is often difficult because of potential impacts to the larger watershed ecosystem. For example, a recommendation to control discharge from Lake Terrell to manage lake water levels may be beneficial for the local lacustrine conditions, but may also have negative impacts on the larger watershed ecosystem by reducing baseflows within Terrell Creek potentially overriding groundwater influence to the stream. For this reason, planned management and restoration actions should be reviewed for consistency with both local plans like the Lake Terrell Management Plan as well as larger, watershed-wide management plans.

The recommendations generated in the reviewed documents for the watershed processes category focus primarily on water quality and quantity issues. Water quality is identified in all of the documents evaluated as a primary management objective, and forms the nexus through which the evaluated documents provide similar structural and non-structural recommendations. A decrease in water quality conditions is often a direct result of human influences on the landscape from both point and non-point pollution sources. Water quality also heavily impacts the biological conditions of the instream, lake, wetland, and nearshore environments.

From a water quantity perspective, infiltration rates in much of the Birch Bay watershed appear to be currently intact, a redistribution of water quantities from increased development can have serious impacts to critical areas such as streams and wetlands as well as their associated habitat structure. Impacts to habitat structure, in turn, influence, often negatively, responses from the biological resources within the watershed.

⁵ This includes critical areas as defined by the Growth Management Act and as designated by Whatcom County in the Title 16 WCC.

Closely related to physical processes is habitat structure. The functional processes of the ecosystem have a direct connection to the structure and availability of habitat within stream, wetland, and nearshore areas. Each of the documents under review recommends the preservation, conservation, and/or restoration of both terrestrial and aquatic habitat in critical resource areas.

For example, the loss of historical wetlands in Birch Bay as a result of direct anthropogenic influences such as filling and development often provide clear opportunities for restoration. Restoring these areas could improve water quality processes, which may have a positive effect on nearshore areas. Existing wetlands offer opportunities for habitat improvements via enhancement of existing vegetation communities, especially riparian wetlands within the Birch Bay and Fingalson Creek drainages which have many existing wetlands worthy of protection and/or enhancement.

Biological response is often the indicator used for determining the condition or quality of an ecosystem. A specific focus on preserving and enhancing salmonid populations within the Birch Bay WMU was only included in the SRP and SHRS, however, improving shellfish conditions was a primary objective for both ecosystem and planning-based reports. The July 2003 listing of Birch Bay by the WDOH as a 'threatened' shellfish harvesting area has motivated residents, planners, and natural resource managers to focus efforts on improving the shellfish conditions within the basin.

The primary social concerns are summarized as public education and outreach programs, issues of public safety, and land use designations. Each of the planning-oriented reports examined, including the WCCP, the CWRP, the BBSAP, and the BBCSWP, contend that development and urban growth strategies need to protect critical areas and incorporate an enhanced open space network that provides better access to recreation sites. In general, these plans contend that education and stewardship activities associated with open space sites will encourage the community to become more closely involved in managing the local environment.

Figure 3. Management Recommendations

Document	WATERSHED PROCESSES				CRITICAL AREAS / HABITAT			BIOLOGICAL CONCERNS		SOCIAL ISSUES		
	Water Quality	Flood Control	Groundwater Recharge	Erosion / Sediment Control	Stream / Riparian	Shoreline	Wetland	Salmonids	Shellfish	Education/ Outreach	Public Safety	Land Use
WCCP	X	X	X		X	X	X	X	X	X	X	X
CWRP	X	X	X		X			X	X	X	X	X
BBCP	X	X			X	X	X		X	X	X	X
BBCSWP	X	X		X	X					X	X	X
ShICR	X				X	X	X	X	X			
ShRP	X		X		X	X	X	X	X			
WRIA SRP	X	X		X	X	X		X		X		
SHRS	X	X		X	X	X		X		X		

WCCP = Whatcom County Comprehensive Plan

CWRP = Whatcom County Comprehensive Water Resources Plan

BBCP = Birch Bay Community Plan

BBCSWP = Birch Bay Comprehensive Stormwater Plan

ShICR = Shoreline Inventory and Characterization Report

ShRP = Shoreline Restoration Plan

WRIA SRP = WRIA 1 Salmonid Recovery Plan

SHRS (Strategy) = The Salmonid Habitat Restoration Strategy

5.2 Programmatic (non-structural) Recommendations

Although the documents and plans evaluated in this analysis vary in scope and intent they all contain programmatic recommendations for protecting, conserving, and in some cases restoring functional ecological processes to the Birch Bay watershed. Figure 4 provides a list of seven programmatic recommendations that represent a summary of those offered in the plans and technical documents evaluated. Categorically similar to the general management recommendations described previously, these programmatic recommendations focus on developing programs that commit to comprehensive ecosystem-based management approaches, actively identify and pursue potential funding sources, and foster communication within and between management agency and citizen-based groups.

Figure 4. Key Programmatic (non-structural) Recommendations

Commit to an adaptive ecosystem-based approach for managing the natural resources of the watershed including all waterbodies, freshwater and marine, shorelines, riparian areas, and wetlands;
Identify, protect, and/or restore both marine and freshwater processes and areas critical to the proliferation of salmonids and shellfish;
Provide a more complete assessment of the actual and potential environmental impacts of land use and development activities, including stormwater infrastructure, and options for preventing or minimizing these impacts at the watershed scale;
Commit to developing and implementing land use and zoning plans that respect our scientific understanding of ecological functions, processes, and conditions, and are representative of sustainable and low-impact development strategies;
Identify and assess potential funding sources that provide an alternative to increased drainage and utility rates. These alternative sources of funding will increase the ability of local governments and communities to manage stormwater to the necessary level to achieve established water quality standards and associated environmental outcomes;
Foster volunteer and stewardship efforts to improve the general community's understanding related to ecological functions and processes, as well as understanding of potential impacts associated with stormwater quantity and quality; and
Promote cooperative interagency and community partnerships that work to improve jurisdictional coordination and effectiveness while developing plans and implementation strategies that meet or at least address all stakeholder issues.

5.3 Regulatory (non-structural) Recommendations

The primary regulatory recommendations generated in the evaluated documents promote the strict regulation of development standards within Whatcom County and, more specifically, the Birch Bay watershed. The focus of several of these recommendations is to protect, preserve, and restore the ecosystem processes for the protection and

enhancement of terrestrial and aquatic habitat. Other regulatory recommendations proposed developmental restrictions in high quality and transitional habitat zones such as along shorelines and within riparian areas. In synthesis, the primary regulatory recommendation from the evaluated documents was for County agencies and citizen groups to develop and coordinate a clear set of goals, policies, and actions that establish a basis for defining development regulations and protecting critical areas and ecosystem processes.

A summary of regulatory recommendations from each of the evaluated plans and technical documents are described in Figure 5. Many of the recommendations shown in Figure 5 have already been implemented by Whatcom County, and reveal the active adoption of recommendations by the County into current land management policy.

Figure 5. Key Regulatory (non-structural) Recommendations

Develop and adopt a low-impact development ordinance implementing standards for narrower streets, limitations on impervious surfaces, tree retention policies, and stormwater techniques focused on retention and infiltration;
Improve inspection, compliance, and enforcement measures;
Administer stormwater management standards as developed by the Washington Department of Ecology (2005);
Enforce HB 1458 requiring health authorities to identify and correct failing septic systems;
Develop and apply regulations preserving access to public lands and protecting viewsheds;
Develop more strict land use restrictions to protect critical areas such as shorelines from intensive development; and
Pursue adoption and implementation of ground and/or surface water management plans and protection efforts.

5.4 Funding (non-structural) Recommendations

Potential sources for generating funds to support the recommendations proposed in these reports are diverse, but not extensive (Figure 6). The majority of available funding programs identified are public sources for improving drainage infrastructure conditions and enhancing ecological conditions for salmonids and shellfish. The WRIA SHRS does recommend an on-line, searchable database for watershed restoration funding in the Pacific Northwest (<http://ssrc.boisestate.edu>).

Figure 6. Potential Funding Sources

<i>Private Sources</i>
Nessett Foundation (Parks)
<i>Public Sources</i>
Public Works Trust Fund (Infrastructure)
Local Dedicated Funding
Salmon Recovery Funding Board (potential)
Aquatic Lands Enhancement Account (ALEA) (potential)
Department of Ecology (Instream flow)
PUD Ecology Phase 4 (potential)
<i>Grants</i>
Federal Appropriation
<i>Bonds</i>
General Obligation and Revenue Bonds
<i>Taxes</i>
Levys for protection districts
County General Fund
<i>Resources</i>
http://ssrc.boisestate.edu (funding database for restoration)

5.5 Physical Improvement (structural) Recommendations

As described in the previous sections, the documents evaluated in this report primarily provide broad programmatic and regulatory recommendations for guiding land use development and protecting critical areas and ecosystem processes. However, several of the documents, including the BBCP, BBCSWP, and ShRP developed specific physical improvement recommendations for the Birch Bay WMU. For example, the ShRP recommends measures to offset past alterations to nearshore processes in the Birch Bay WMU, which are largely related to anthropogenic structures that impede movement of sediment and negatively affect adjacent beaches and sediment impoundment by bulkheads. These structures are primarily located in the Birch Bay and Cherry Point reaches. Full restoration of these processes is only possible by removing the structures. Where removal is not an option, efforts to reduce impacts or perform compensatory mitigation may be partially effective alternatives.

As seen in Figure 7 these recommendations are presented here in three categories: Ecological Systems, Stormwater, and Land Acquisition.

Figure 7. Structural Recommendations

Ecological Systems	Recommendation	Source(s)
Marine Shoreline	Remove bulkheads between Point Whitehorn and Birch Point	ShRP
	Protect sediment sources that supply large accretionary beaches and marshes in Birch Bay	ShRP
	Restore and conserve shoreline sediment sources near Cherry Point and Point Whitehorn	ShRP
	Enhance riparian conditions	ShRP
	Restore Marsh along Public Shorelines	ShRP
Stream (Terrell Creek)	Replace culvert on Terrell Creek at Grandview Road	BBCSWP
	Enhance riparian conditions along Terrell and Fingalson Creeks	BBCSWP
	Restore Instream Conditions of Terrell Creek	ShRP; WRIA SRP; BBCSWP
	Protect / Restore Lake Terrell	ShRP
<u>Stormwater System</u>	Watershed-wide Stormwater System	BBCSWP; BBCP
	Spot Drainage Improvements	BBCSWP
<u>Public</u>	Acquire Available Open Space	WCCP; BBCP

5.5.1 Prioritizing Capital Programs and Structural Project Recommendations

Currently, a local strategy for prioritizing capital programs and structural project recommendations is presented in the BBCP (Figure 8). This prioritization strategy is based on the financial and physical impact of a proposed project or program to the Birch Bay Community, but does not incorporate the evaluation of potential impacts at the ecosystem scale. The information generated in the CSMS will enable an ecosystem-based evaluator to be incorporated into the BBCP project prioritization strategy. Adding such an evaluator to the prioritization strategy will further enable the Birch Bay community to address its vision for “achiev[ing] harmony between [the] natural and man-made environment,” and “to reach a mutually supportive balance within the [complex system of relationships between living things]” (BBCP, 2004; 5-4).

A potential ecosystem-scale evaluation strategy to be developed and incorporated into the current prioritization model could be based on whether or not the action or project would have beneficial impacts to multiple ecosystem processes as listed in Figure 2. For example, restoring the instream conditions of Terrell Creek not only addresses the need to improve habitat conditions and access within the system, but also addresses issues of water quality, flood abatement, and in an indirect way, groundwater recharge. Thus, such a recommendation would be given a higher ranking than a project that addressed a single ecosystem process.

Figure 8. Strategy for Prioritizing Capital Programs and Structural Project Recommendations (BBCP, 2004; 17-4)

1. Projects mandated by law, as well as by state and federal regulations, will receive priority consideration.
2. Projects necessary to correct existing deficiencies will receive priority consideration.
3. Projects previously initiated will be completed in subsequent phases and will receive priority consideration.
4. Projects providing for the renovation of existing facilities resulting in preservation of the community's prior investment or reducing maintenance and operating costs will receive priority consideration.
5. Projects whose construction or acquisition results in new or substantially increased operating costs will be considered after an evaluation of needs and operating costs have been identified.

5.5.2 Relative Costs for Physical Improvement Recommendations

The relative costs associated with the physical improvement projects are rough, planning-level estimates for design and implementation based on scope and technical difficulty of the recommendations (Figure 9). The specific recommendations are categorized into stormwater, Terrell Lake and Creek, Birch Bay shoreline, and open space. The cumulative costs for each of the categories is estimated to be high, however individual projects located beneath the categorical header range in relative cost from low to high depending on the recommendation.

Figure 9. Relative Costs for Recommended Capital Improvement Projects

<i>H Stormwater</i>	
H	Develop Regional Stormwater System
M/L	Spot Drainage Improvements
<i>H Terrell Creek and Lake Terrell</i>	
	Protect / Restore ecological functions of Terrell Creek and Lake Terrell
L	Enhance riparian conditions
M	Acquire / Restore mouth/delta Terrell Creek
M	Enhance instream conditions along Terrell Creek
M	Replace Terrell Creek culvert at Grandview Road
<i>H Birch Bay Shoreline</i>	
	Restore nearshore processes in Birch Bay
M	Restore nearshore marsh habitat
L	Enhance riparian conditions
M	Restore shoreline sediment sources near Cherry Point
M	Remove bulkheads between Birch Bay State Park and Point Whitehorn
<i>H Open Space / Recreation</i>	
	Increase quantity and quality of available open space
L	Coast Millennium Trail Connections
H	Acquire available open space

H = High; M = Moderate; L = Low

6.0 SUMMARY

Over the past several years, significant resources have been allocated for developing the documents evaluated in this recommendation review. Each of the documents provide recommendations for managing growth while protecting natural resources to maintain salmonid populations and improve the conditions of the highly valued shellfish resources within and adjacent to the Birch Bay watershed. All of the plans evaluated in this report provide pertinent information towards these ends, specifically focusing on individual components for managing land use and/or ecosystem processes.

Since 2005, Whatcom County has completed several activities developed from recommendations offered by these plans for managing growth and protecting natural resources, including the adoption of the Critical Areas Ordinance (CAO) and the Shoreline Management Program, and the update of the countywide planning policies. The documents and plans analyzed in this report, as well as the codes, ordinances, and standards that have been developed and adopted from their recommendations, provide policies that will impact both the long and short-term land use patterns within the

watershed by controlling development and providing potential protection of the existing Birch Bay environment (natural, social, economic.)

Collectively, the documents evaluated respond to a wide range of development and natural resource concerns and issues that arise when cultivating plans for managing future growth in a watershed based on ecosystem processes. However, no single document evaluated in this review utilizes a comprehensive ecosystem-based approach for evaluating the relationships between land use and watershed processes specific to the Birch Bay WMU. This lack of comprehensive watershed oversight reveals the explicit need to incorporate an ecosystems-based approach for developing plans and policies that promote development while also protecting and restoring ecosystem processes.

The non-structural programmatic, regulatory, and funding recommendations from each of the documents are repetitive and often relatively vague. In all the documents but the BBCP and the BBCSWP, the non-structural recommendations are offered on a relatively high level without supplying specifics for how adopting these recommended regulatory or programmatic actions would impact specific locations and actions within the Birch Bay watershed. Recommended sources for funding both programs and specific projects were also non-specific.

Several of the documents, most specifically those developed for the Birch Bay UGA or WMU, such as the BBCP and the BBCSWP, provide capital or structural project recommendations for improving both present and future conditions within the watershed. The ShRP also provides several specific structural recommendations for improving the nearshore habitat within Birch Bay.

Although all the documents address the need to incorporate educational and stewardship opportunities, the primary non-structural and structural recommendations from each of these documents focused on the need to improve the water quality conditions within the Birch Bay WMU, to not only reduce potential impacts to human health, but also to improve the conditions for fish and wildlife. Thus, from this evaluation, water quality forms the nexus on which all of the structural and non-structural recommendations from the evaluated documents relate, and provides a starting point for developing an ecosystem-based approach for managing land use and stormwater within the basin.

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