CITY OF SAMMAMISH

Shoreline Master Program Update

Final Shoreline Restoration Plan

Prepared for:

City of Sammamish

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ESA Adolfson

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1.0 Introduction

The character of the City of Sammamish is closely linked to Lake Sammamish, as well as to Pine and Beaver Lakes. These waters are important amenities because of their cultural, recreational, aesthetic, and ecological value. They are also focal areas for residential development. Use and development of the lake shores for residential and other purposes must occur in accordance with the State Shoreline Management Act (SMA) (Revised Code of Washington [RCW] 90.58). The SMA also requires that the City identify opportunities to restore these lakes to improve their function and value over time compared with current conditions.

This Shoreline Restoration Plan provides initial recommendations for restoring the shorelines of Lake Sammamish, Pine Lake and Beaver Lake. The Restoration Plan builds on and incorporates information from the City's Final Shoreline Inventory and Characterization Report (ESA Adolfson, 2007) and other ongoing local and regional efforts to understand and manage the City's three main lake systems. Following additional review and discussion with City staff, members of the Planning Commission, and the City Council, a series of restoration goals and commitments will be adopted for incorporation into the City's Shoreline Master Program (SMP) as an element of the City's Comprehensive Plan. An update of the City's SMP is currently underway to comply with the Shoreline Management Act requirements and the State's SMP guidelines (Washington Administrative Code [WAC] 173-26, Part III), which were adopted in 2003.

The Shoreline Management Act is charged with balancing how shorelines are developed, protected, and restored. The Act has three broad policies or mandates: 1) encourage water-dependent uses, 2) protect shoreline natural resources, and 3) promote public access. Restoration planning is an important component of the environmental protection policies of the Act.

The SMP guidelines specify that local governments must include within their shoreline master programs a "real and meaningful" strategy to address restoration of shorelines. The guidelines also specify how the policies in the SMP must promote "restoration" of impaired shoreline ecological functions, where such functions are found to have been impaired based on an inventory and characterization of shorelines and associated watersheds. Local governments are further encouraged to plan for and support restoration through the SMP and other regulatory and non-regulatory programs.

This report provides a framework for: 1) understanding how restoring ecological function can be accomplished in Sammamish; and 2) suggesting pathways to use the SMP process to restore impaired shoreline functions associated with the City's SMA-regulated lakes. A glossary of terms is included as Appendix A at the end of this Restoration Plan.

1.1 Regulatory Background

The restoration plan is an important component of the SMP process under the 2003 SMP guidelines. As such, local governments must develop SMP provisions "…to achieve overall improvements in shoreline ecological functions over time when compared to the status upon adoption of the master program."

The concept of no net loss of shoreline ecological function is embedded in the Act and in the goals, policies and governing principles of the shoreline guidelines. The State's general policy goals for shorelines of the state include the "protection and restoration of ecological functions of shoreline natural resources." This goal derives from the Act, which states, "permitted uses in the shoreline shall be designed and conducted in a manner that minimizes insofar as practical, any resultant damage to the ecology and environment of the shoreline area." Furthermore, the governing principles of the guidelines clarify that protection of shoreline ecological functions is accomplished through the following (WAC 173-26-186):

1. Meaningful understanding of the current shoreline ecological conditions,
2. Regulations and mitigation standards that ensure that permitted developments do not cause a net loss of ecological functions,
3. Regulations that ensure developments that are exempt from permit requirements do not result in net loss of ecological functions,
4. Goals and policies for restoring ecologically impaired shorelines,
5. Regulations and programs that fairly allocate the burden of mitigating cumulative impacts among development opportunities, and
6. Incentives or voluntary measures designed to restore and protect ecological functions.

The policies and regulations of the master program address items 1 through 5 listed above. This restoration plan addresses item 6. The activities identified in the restoration planning component of the SMP are intended to occur primarily through voluntary actions, as opposed to regulatory actions. Restoration planning is focused on economic incentives, available funding sources, volunteer programs, and other programs that can contribute to a no-net-loss strategy.

To date, restoration, rehabilitation, enhancement or other improvements to shoreline ecological functions have either been voluntary or required as mitigation for impacts resulting from development. Preservation of existing conditions has been, and continues to be, the primary regulatory approach to protecting ecosystem functions:

> *"Through numerous references to and emphasis on the maintenance, protection, restoration, and preservation of "fragile" shoreline "natural resources," "public health," "the land and its vegetation and wildlife," "the waters and their aquatic life," "ecology," and "environment," the act makes protection of the shoreline environment an essential statewide policy goal consistent with the other policy goals of the act."* (WAC 173-26-186(8))

The shoreline guidelines further state:

> *The goal of this effort is master programs, which include planning elements that when implemented, serve to improve the overall condition of habitat and resources within the shoreline area of each city and county* (WAC 173-26-201(c)).

1.2 Defining Restoration

There are numerous definitions for "restoration" in scientific and regulatory publications. Significant scientific publications indicate that restoration means the re-establishment of pre-

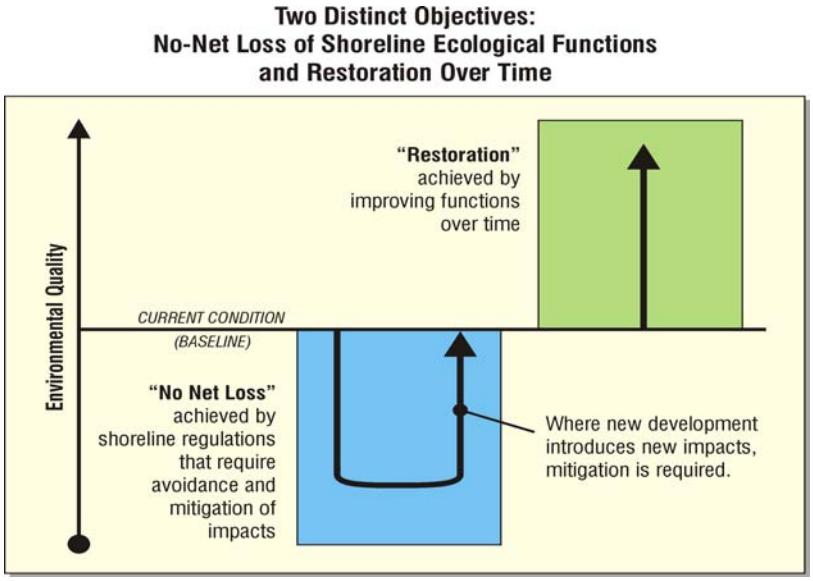
disturbance aquatic functions and related physical, chemical, and biological characteristics (Cairns 1998; Magnuson et al. 1980; and Lewis 1989 in National Research Council 1992). Restoration results in a net increase in the amount, size, and/or functions of an ecosystem or components of an ecosystem (Thom et al. 2005).

Ecology (2005a) defines restoration as any activity that ensures that the watershed processes associated with a key area are reinstated. Specific elements of these and other definitions often differ, but the core element of repairing damage to an existing, degraded ecosystem remains consistent. In the SMP context, the WAC defines "restoration" or "ecological restoration" as:

> *"…the reestablishment or upgrading of impaired ecological shoreline processes or functions. This may be accomplished through measures including, but not limited to, revegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions"* (WAC 173-26-020(27)).

In this context, restoration can be broadly implemented through a combination of programmatic measures (such as surface water management; water quality improvement; public education) and site-specific projects (such as use of bioengineered shoreline stabilization or shoreline plantings) that raise the ecological baseline (Figure 1). This is different from mitigation, which is generally required as a condition of permit approval. Proponents of shoreline development are typically required to mitigate impacts such that there is no net loss of ecological functions, but the mitigation does not have to improve functions above baseline levels. Although incentives programs can be implemented to implement restoration opportunities on a parcel-by-parcel basis, the restoration planning element generally focuses on the City as a whole rather than a parcel-by-parcel, or permit-by-permit solution.

Figure 1. Difference between Restoration and Mitigation in the Context of Shoreline Master Planning



(Source: Department of Ecology)

1.3 Restoration Framework

Significant national attention is being applied to developing an approach to restoring watershed ecosystems that will more consistently improve long-term ecosystem functioning (Brinson, 1993, Kondolf, 1995, Palmer et al, 2005, Bernhardt et al, 2005). These national efforts have recommended a three-phased approach to watershed restoration: (1) Decision, (2) Design and Implementation, and (3) Monitoring and Assessment. This framework is offered here to provide: (1) background and insight into how current approaches to ecosystem restoration have been developed; and (2) a way to consider how to integrate new information as it comes available.

Phase 1: Decision – The goal of this phase is to determine where restoration, as opposed to conservation or protection, should occur to most successfully improve the processes of the watershed or basin. Restoration focuses on improving areas that have been impaired. The City of Sammamish Final Shoreline Inventory and Characterization Report (ESA Adolfson, 2007) identifies areas that should be targeted for enhancement or restoration as well as areas that need conservation or protection to maintain current properly functioning conditions. Conservation and restoration go hand-in-hand, but the focus of this report is on restoration planning and potential actions.

Significant previous work performed by the City as well as federal, state, and regional entities (e.g., WRIA 8, King County, etc.) provide the basis for the decision-making process. Sammamish's regional partners have examined ecosystem-wide processes in their baseline monitoring and have identified priority restoration actions, an approach consistent with the

restoration framework. The East Lake Sammamish Basin (King County 1994) and the Pine and Beaver Lake Management Plans (Tetra Tech, 2006 and King County, 2000, respectively) among others have recommended specific measures aimed at improving water quality in the three SMA-regulated lakes.

Phase 2: Design and Implementation – The goal of this phase of the framework is to restore ecosystem-wide processes at the watershed or basin scale, rather than on a piecemeal basis. Since our understanding of how different ecosystem elements interact is far from complete, a broad-based approach that targets self-sustaining systems allows a greater probability of success.

Restoring ecosystem processes typically needs to be considered within the context of existing conditions at the watershed and site-specific scales. Since existing conditions can play a significant role in what can be accomplished, it is important that the City of Sammamish continues to work with other cities and regional entities to share information about what efforts are underway, and what their successes have been. The City occupies a small percentage of the total basin area and an even smaller percentage of WRIA 8 watershed, so working with other cities and regional entities will likely focus resources on the locations that will benefit the watershed ecosystem the greatest.

Phase 3: Monitoring and Assessment – The restoration of lake ecosystems is still a developing discipline. As more examples of successful and unsuccessful projects are available, the assessment of what worked and what did not work will help to improve future efforts. By setting goals and policies that require monitoring and adaptive management, the success of future restoration projects will increase.

1.4 Key Elements of Restoration Planning in the SMP Update Process

The state guidelines provide six key elements for shoreline restoration planning as part of a local jurisdiction's master program, as outlined in WAC 173-26-201(2)(f). These elements are summarized in Table 1, keyed to the section of this report where they are discussed.

Table 1. Restoration Planning Structure

Key elements for the shoreline restoration planning process WAC 173-26-201(2)(f)	Chapter in this report
Identify degraded areas, impaired ecological functions, and sites with potential for ecological restoration.	Chapter 2. Identification of Degraded Functions and Shorelines
Identify existing and ongoing projects and programs that are currently being implemented which are designed to contribute to local restoration goals (such as capital improvement programs [CIPs] and watershed planning efforts [WRIA habitat/recovery plans]).	Chapter 3. Evaluation of Existing Plans and Programs
Identify additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs.	Chapter 4. Restoration Actions and Opportunities; and Chapter 6. Implementation Framework, Section A (programmatic and site-specific restoration opportunities)
Establish overall goals and priorities for restoration of degraded areas and	Chapter 5. Developing Restoration

Key elements for the shoreline restoration planning process WAC 173-26-201(2)(f)	Chapter in this report
impaired ecological functions.	Goals and Policies
Identify timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals.	Chapter 6. Implementation Framework
Provide for mechanisms or strategies to ensure that restoration projects and programs will be implemented according to plans and to appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals (e.g., monitoring of restoration project sites).	Chapter 6. Implementation Framework

These key elements establish the organization and content for this report. The assessment of existing degraded areas and/or functions relies heavily on the City of Sammamish Final Shoreline Inventory and Characterization Report (ESA Adolfson, 2007).

1.5 Shoreline Restoration Vision Statement

The following statement is intended to point the way to the future by creating an overarching vision of restored and functioning shoreline ecosystems in the City of Sammamish. The vision statement provides a concept from which Sammamish has worked to establish restoration goals and policies to address degraded areas and functions. As Sammamish moves forward to prioritize and assess potential restoration actions and projects, this vision statement will serve as a clarifying reminder to ensure that the intent of ecological restoration is achieved.

> **Shoreline Restoration Vision:** *Degraded ecological functions and habitats along and influencing Sammamish shorelines are restored while allowing for planned and desired residential use within the City. Sammamish's restored shorelines meet all State water quality criteria, are part of functioning hydrologic systems, and provide high value fish and wildlife habitat. Sammamish's restored shorelines link to stream, wetland, and upland habitat corridors, and provide access and recreation opportunities for the public. Private landowners are encouraged and rewarded for implementing restoration measures on private lands and the City acquires lands where restoration goals can be achieved. Shoreline restoration occurs over time by leveraging opportunities presented by development and land use activities.*

2.0 Degraded Functions and Shorelines

Shoreline restoration planning begins by identifying "degraded areas" or areas with "impaired ecological functions." The City's Final Shoreline Inventory and Characterization Report (ESA Adolfson, 2007) examines the ecosystem processes that maintain the ecological functions, and identifies impaired ecological functions. Key findings of the inventory and characterization are summarized below. Opportunities and implementation strategies for restoration of impaired ecological functions are described in Chapters 4 and 6 of this report.

2.1 Watershed Context

The Sammamish watershed includes portions of the cities of Sammamish, Everett, Lynnwood, Kenmore, Brier, Mill Creek, Bothell, Woodinville, Redmond, Bellevue, and Issaquah as well as unincorporated areas of King and Snohomish Counties. The watershed is part of the Cedar – Sammamish River Water Resource Inventory Area (WRIA) known as WRIA 8, which includes two major river systems, the Cedar and Sammamish Rivers, as well as Lake Sammamish, Lake Washington, Lake Union, and numerous tributaries to each (Figure 2). WRIA 8 is located predominantly within the borders of King County, with the northwest portion extending into Snohomish County. The boundaries of WRIA 8 follow the topographic features that define the drainage divide between the Snohomish WRIA (WRIA 7) to the east, and the Green/Duwamish WRIA (WRIA 9) and Puget Sound to the west (Kerwin, 2001)[1]. The majority (approximately 86 percent) of WRIA 8 is in the Puget Lowlands physiographic region, while the upper (eastern) portion of the WRIA is in the Cascade foothills.

WRIA 8 covers a land area of approximately 692 square miles and is the most populated WRIA in the state with roughly 1.4 million residents (Kerwin, 2001). The City and its PAA (Potential Annexation Area) occupy approximately 21 square miles or about 3 percent of the WRIA 8 land area.

The majority of the City drains to the Sammamish watershed portion of WRIA 8, via the East Lake Sammamish (ELS) and Evans Creek basins. The far eastern edge of the City drains to the Snoqualmie watershed portion of WRIA 7 via the Patterson Creek basin, within the Snoqualmie Watershed (Figure 3). The Patterson Creek basin is discussed in further detail below.

The ELS basin encompasses most of the City of Sammamish including the City's three SMA-regulated lakes, as well as areas to the west and south of the City. The Evans Creek basin includes a small area of northeastern Sammamish and unincorporated areas northeast of the Sammamish City limits.

The Sammamish watershed has changed dramatically since the arrival of white settlers (U.S. Army Corps of Engineers and King County, 2002; Kerwin, 2001), and intensively during the last few decades. During the first part of the 20th century, forests in the Sammamish area were largely

[1] A small portion of the City of Sammamish and PAA (east of Beaver Lake) is located in WRIA 7. WRIA 7 is the second largest area draining to the Puget Sound. The City and its PAA occupy approximately 2 square miles or about 0.1 percent of the land area in WRIA 7.

harvested for lumber and many timber mills were located in present day Sammamish. After the area was cleared of timber it was used for dairy farming and other forms of agriculture for several decades. Significant watershed changes occurred in 1917 with the construction of the Hiram Chittenden Locks, which were built to connect the Lake Washington system with Puget Sound. The navigational project lowered Lake Washington by 9 feet and Lake Sammamish by 6 feet, draining many of the associated wetlands, eliminating the majority of riverine and off-channel rearing-habitats for juvenile salmon, and ultimately reducing the Sammamish River gradient and flow patterns (the Sammamish River now represents a substantial thermal migration-barrier[2] to adult salmon returning to their spawning grounds). Other major changes involved channelizing the Sammamish River for flood control purposes in the 1960s (which eliminated 12 miles of river channel), diverting and straightening tributary channels, withdrawing water from streams and aquifers, decreasing floodplain connectivity, filling and draining wetlands, and development of urban infrastructure (Kerwin, 2001; Kahler, 2000).

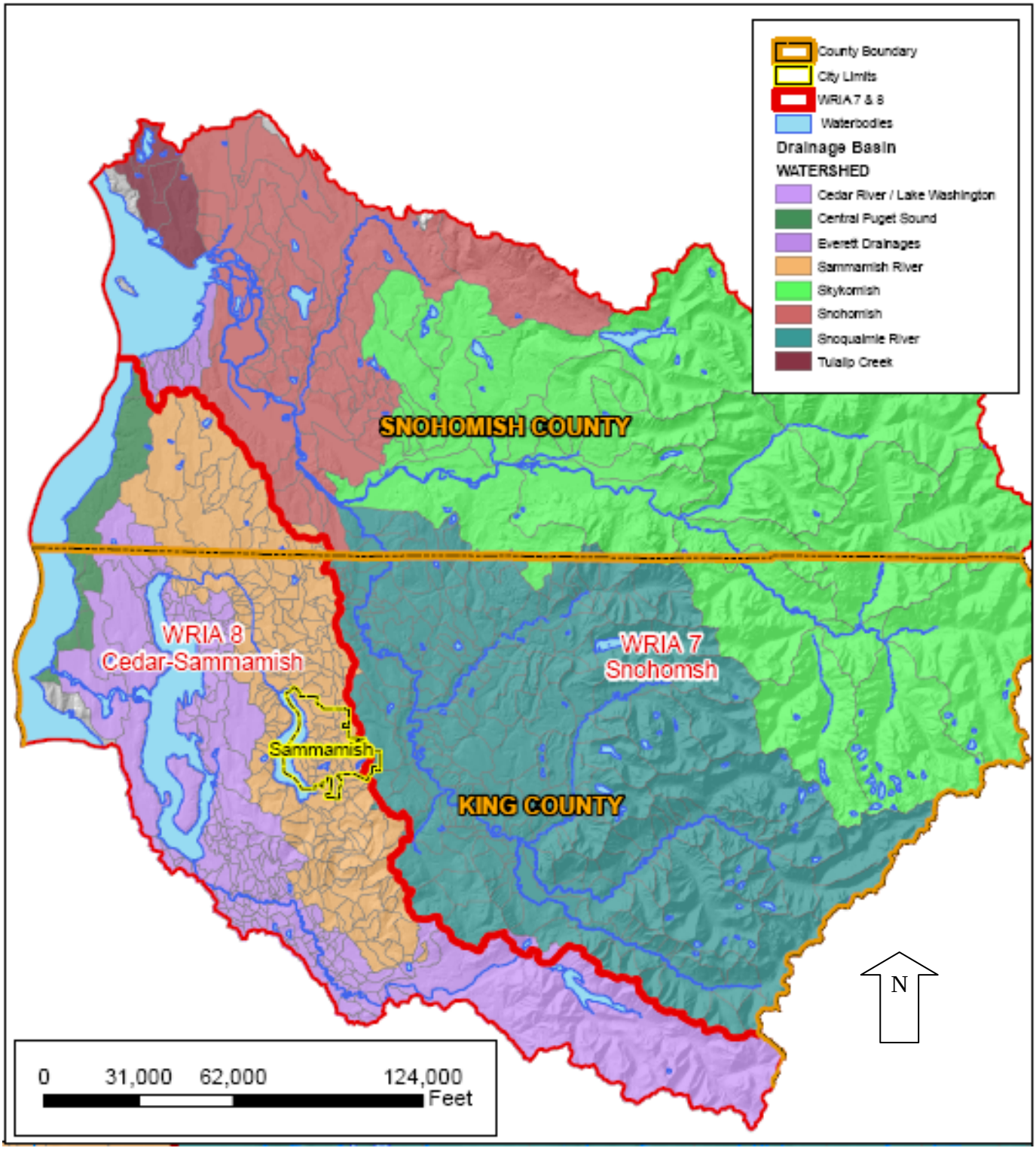
Beginning in the 1970s, rural farms were subdivided and platted for residential and commercial development. Sammamish was part of unincorporated King County until it incorporated as a City in August 1999. Since that time urban development and services have increased, and growth has continued to transform and alter the ecology of the watershed.

Lake Sammamish is a primary feature of the Sammamish watershed. Approximately 44 percent of the total area of Lake Sammamish is in the City's jurisdiction. The two major tributaries to the lake lie mainly outside the Sammamish City limits. Issaquah Creek[3], which enters at the south end of the lake, contributes approximately 70 percent of the surface flow (Entranco et al., 1996). Tibbetts Creek, which also enters the south end of the lake west of the Issaquah Creek mouth, is the second largest tributary, contributing approximately 6 percent of surface flow to the lake. The third major tributary is Pine Lake Creek, which is located entirely within Sammamish and contributes about 3 percent of flow entering the lake (Entranco et al., 1996). Surface water discharges from Lake Sammamish through the Sammamish River at the north end of the lake, where a flow control weir at Marymoor Park controls the discharge volume and rate. Additional information on Lake Sammamish is provided in the Final Inventory and Characterization Report (ESA Adolfson, 2007).

[2] The low rate of flow and shallow depths of the Sammamish River cause higher water temperatures in this water way than under historical conditions; high water temperatures can stop or hinder salmon from migration through a waterway, as they are unable to physiologically function at or above certain temperature thresholds.

[3] A small portion of the Issaquah Creek subbasin crosses the southern edge of the Sammamish City boundary.

Figure 2. Water Resource Inventory Area 7 and Water Resource Inventory Area 8



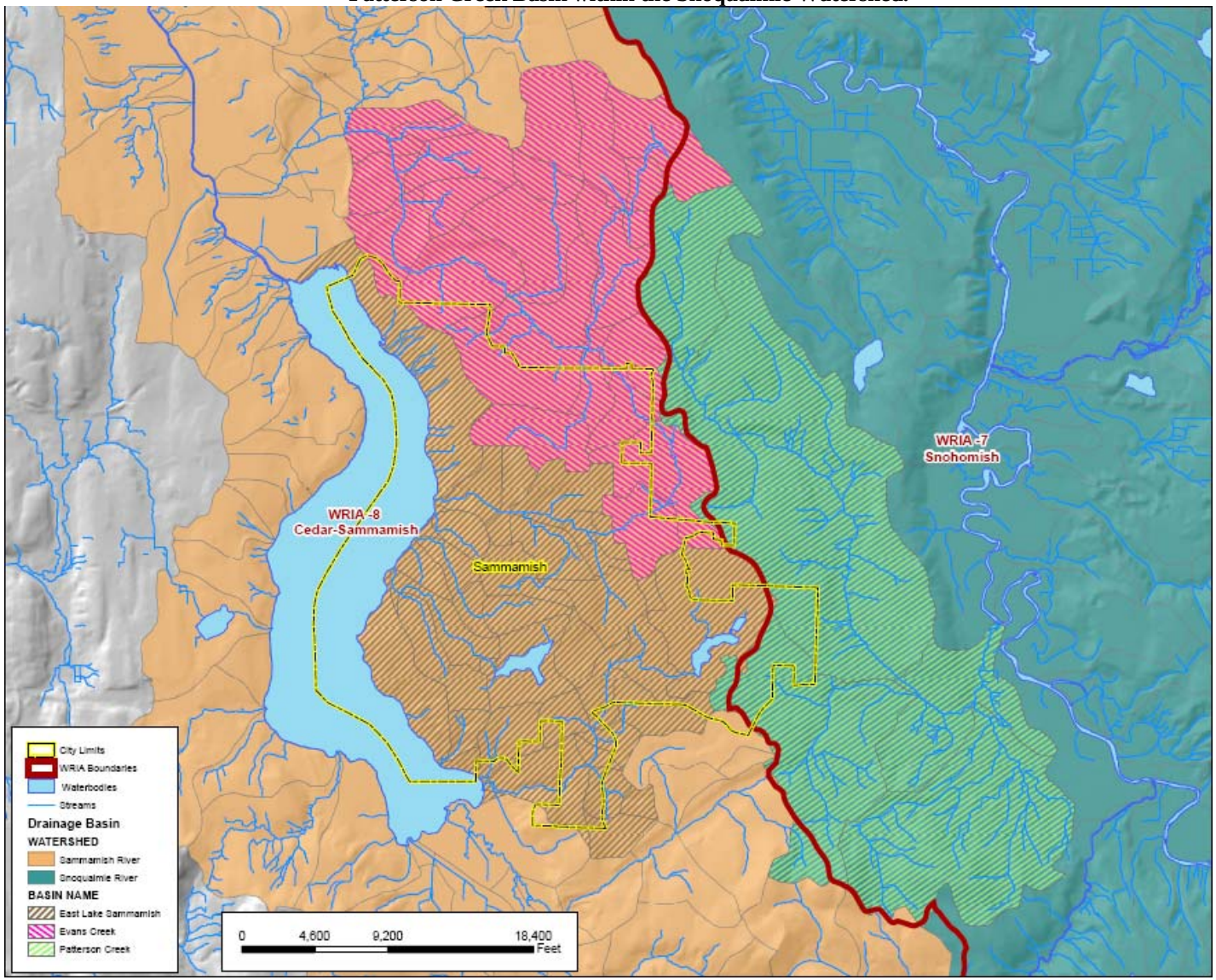
(Source: King County, 2006; Sammamish, 2005) (The majority of the City of Sammamish is within WRIA 8, in the Sammamish Basin, however a small portion in the southeast of the City is within WRIA 7, in the Snoqualmie Basin).

2.2 East Lake Sammamish Basin and Subbasins

The ELS basin (Figure 3) consists of approximately 16 square miles on the eastern shoreline of the lake and is composed of six individual subbasins — Inglewood, Panhandle, Monohan, Thompson, Pine Lake, and Laughing Jacob (CH2MHill, 2001, King County, 1994) (Figure 4).[4] These basins drain to Lake Sammamish via several surface streams. The major streams in the area are, from north to south, George Davis Creek (WRIA 0144), Zaccuse Creek (0145), Ebright Creek (0149), Pine Lake Creek (0152) including Kanim Creek (0153) and Many Springs Creek (0164). Laughing Jacobs Creek (0166), located at the southeastern end of Lake Sammamish, is also part of the ELS basin; however, its mouth and a significant portion of its drainage area are located within the City of Issaquah. About a dozen very small, named and unnamed streams and seeps also drain the western Sammamish Plateau (Figure 4). As noted previously, the Issaquah Creek / Tibbetts Creek drainage contributes 76% of the surface water flow entering the Lake Sammamish, with Pine Lake Creek contributing more flow than any other ELS Basin stream (at only approximately 3%)(Entranco et al., 1996). Although flow contributions from individual streams within the City of Sammamish represent a relatively small portion of the total flow entering Lake Sammamish, the water quality, sedimentation, and habitat value of these streams is significant. The significance of these streams and their relationship to Lake Sammamish is described in further detail in the subbasin descriptions below.

[4] The City's other subbasins drain to the Evans Creek and Patterson Creek basins. A small portion of the ELS basin at the north end of the lake is in Redmond and unincorporated King County.

Figure 3. East Lake Sammamish Basin and Evans Creek Basin within the Sammamish Watershed; Patterson Creek Basin within the Snoqualmie Watershed.



(Source: King County, 2006; Sammamish, 2005)

2.2.1 Inglewood Subbasin

Conditions in the Inglewood subbasin are described in the Inglewood Basin Plan (Entranco, 2005). The subbasin is in the center of the City and includes numerous wetlands, including an open-water wetland known as Llama Lake, and George Davis Creek (Figure 4). A series of culverts at the mouth of the George Davis Creek create a partial barrier to upstream fish passage[5]. Populations of resident salmonids have been documented in upper reaches of George Davis Creek, as well as tributary streams. The upper reaches of George Davis Creek and its associated wetlands (upstream of 228th Ave SE) are part of a designated wildlife corridor connecting the riparian and wetland areas to the Evans Creek corridor, Laughing Jacobs Lake, and other habitats within and outside the City.

The Inglewood basin is in transition from rural, hobby farm-type development to more dense residential and commercial development and these land uses are potential sources of point and nonpoint pollution. Recent sampling of George Davis Creek showed elevated levels of total phosphorus and copper in the creek, although the creek is not listed as an impaired water for these contaminants according to the 2004 Washington State Water Quality Assessment, known as the 303(d) list. Elevated levels of fecal coliforms were documented in George Davis Creek in the early 1990s[6] and leaking septic systems were implicated as a potential source of this pollutant. Other possible bacteria sources include livestock, domestic pets, and waterfowl (Entranco, 2005). Stormwater samples from commercial areas had elevated levels of suspended solids and heavy metals, but base flow samples did not exceed state standards for dissolved oxygen, temperature, or pH. No recent water quality samples have been collected to update the creek's water quality status (Entranco, 2005).

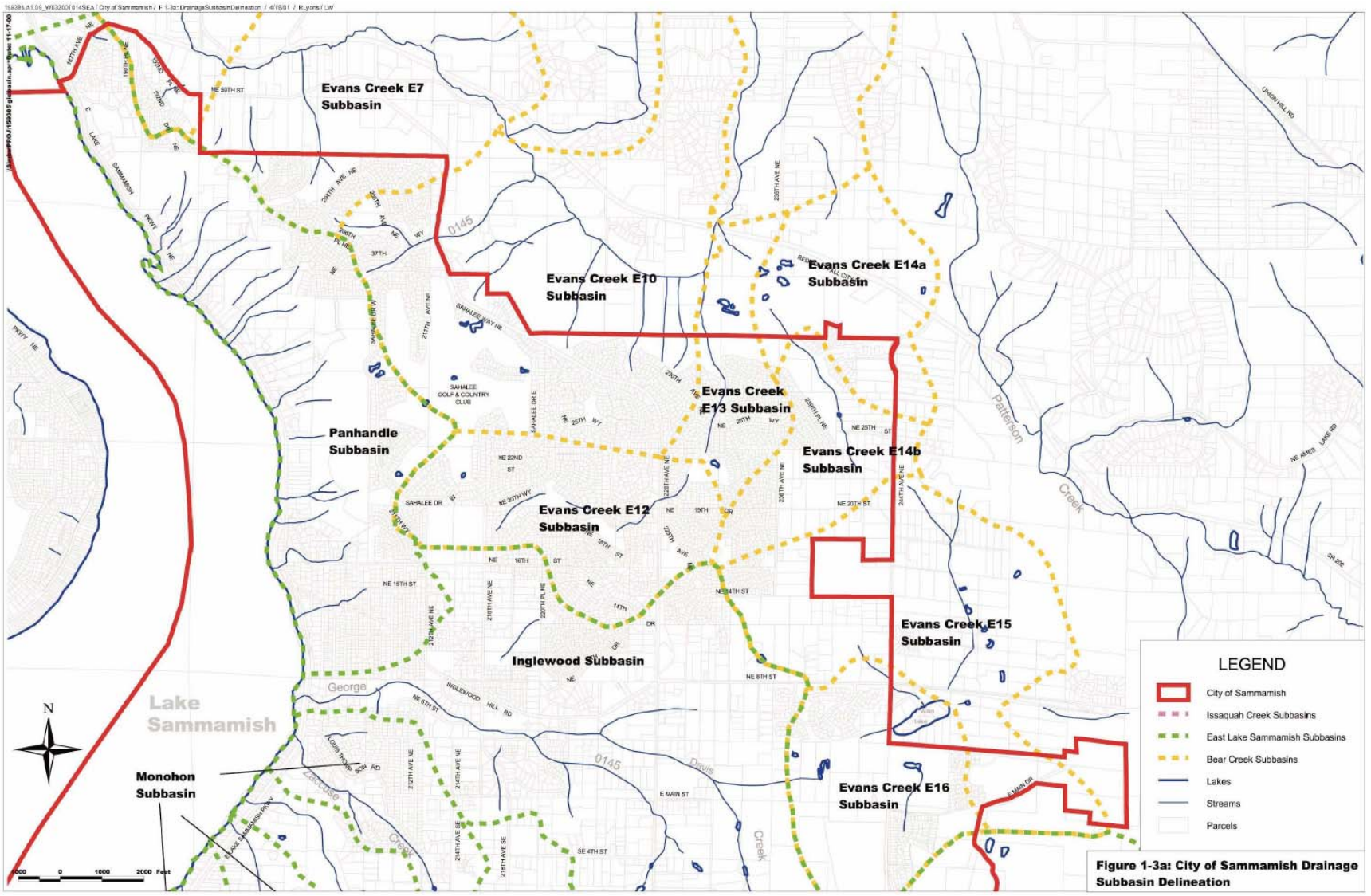
2.2.2 Panhandle Subbasin

The Panhandle subbasin is a narrow subbasin bordering Lake Sammamish in the northwest corner of the City. Steep slopes with few areas of level ground characterize the subbasin. Landslide and erosion hazard areas are mapped along the entire west side of the basin. Thirteen unnamed drainages have been identified in this subbasin (King County, 1994). The Panhandle subbasin has relatively few wetlands compared to other areas in Sammamish, and most of these have been affected by upstream development; however this subbasin still has significance to downstream habitats. The 1994 ELS Basin Plan noted a change from a predominantly groundwater driven hydrologic regime to one characterized by concentrated surface flow (King County, 1994).

[5] A recent electrofishing study conducted for a private property owner identified that there is salmonid use in George Davis Creek above Lake Sammamish Parkway (Kathy Curry, Personal communication, 2006).

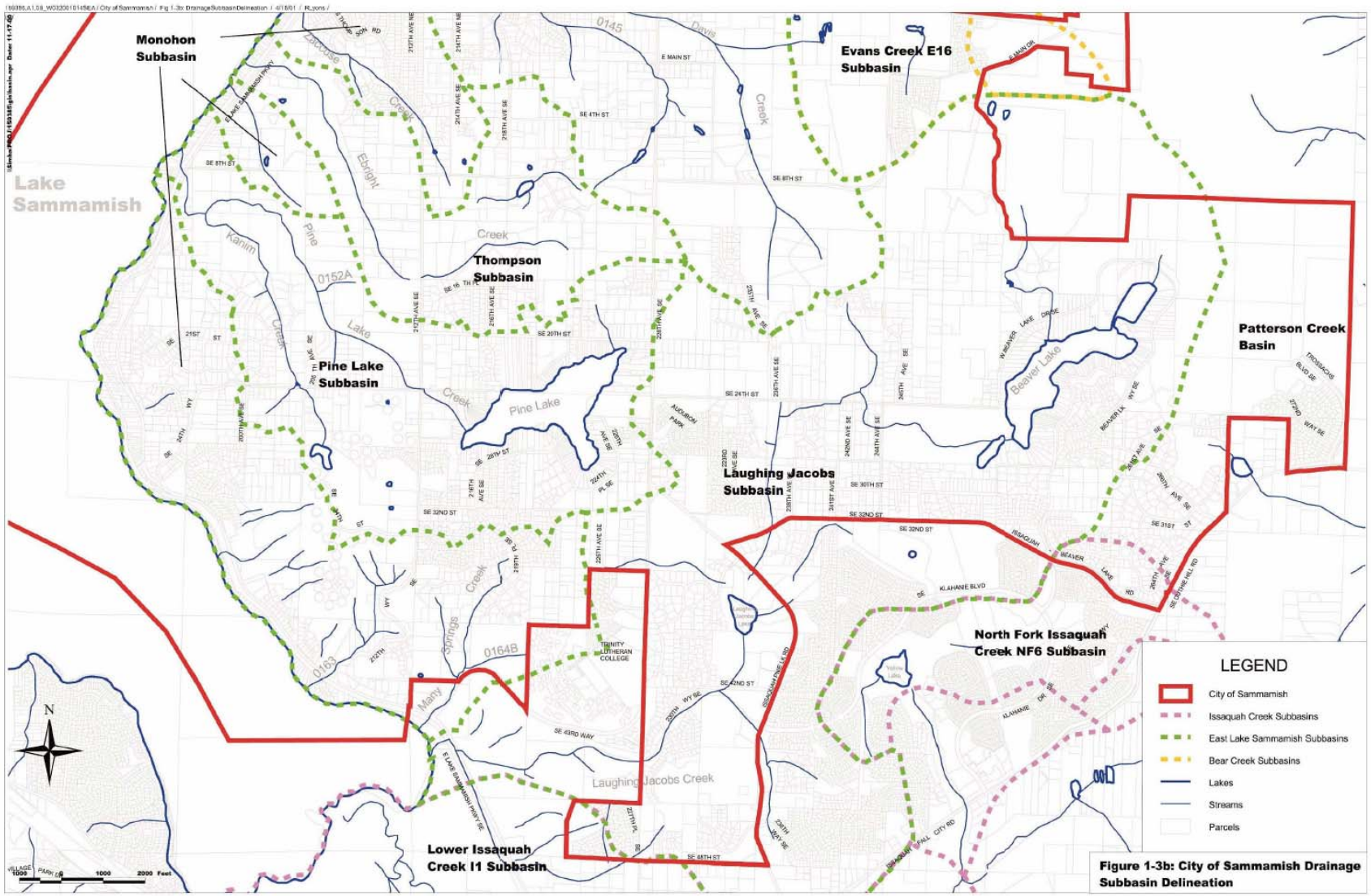
[6] The creek was listed as impaired for fecal coliform on the 1998 303(d) list.

Figure 4. Subbasins and Streams in the City of Sammamish, Northern Portion



(Source: Stormwater Management Comprehensive Plan, CH2M Hill, 2001)

Figure 5. Subbasins and Streams in the City of Sammamish, Southern Portion



(Source: Stormwater Management Comprehensive Plan (CH2M Hill, 2001

2.2.3 Monohon Subbasin

Interspersed between the Inglewood, Thompson, and Pine Lake subbasins are several areas that collectively form the Monohon subbasin. The northern area is drained by Zaccuse Creek, the middle area by an unnamed tributary, and the southern area by Many Springs Creek, Tributary 0163, and several small unnamed streams. Although not as steep as the Panhandle subbasin, drainages in the Monohon subbasin are susceptible to erosion due to the underlying geology (King County, 1994). Landslide and erosion hazard areas are mapped near Many Springs Creek, Tributary 0163, and along the west facing slopes above the lakeshore south of Sulphur Springs Point. As a result, erosion and sedimentation are key concerns in this subbasin. The 1994 ELS Basin Plan pointed to channel incision and high suspended sediment loads as problems in Many Springs Creek and potentially elsewhere in the basin (King County, 1994).

This subbasin has limited aquatic habitat. Fish use of the streams is limited due to gradient and artificial passage barriers; only portions of Zaccuse Creek and Tributary 0163 are accessible to anadromous salmonids. A bog-like wetland (estimated to be about 3.5 acres in size) occurs in the headwaters of Many Springs Creek, but there are few other wetlands (King County, 1994). Bog wetlands are rare throughout Western Washington, and require high levels of protection because they contain unique plant species that only grow within the low pH environments; bogs are highly susceptible to impacts from surrounding development, and can not be replicated through mitigation activities.

2.2.4 Thompson Subbasin

Ebright Creek is the primary drainage in the Thompson subbasin. Although the lower portions of Ebright Creek provides habitat for resident cutthroat trout as well as kokanee, coho, and sockeye salmon[7], anadromous fish access is limited to the lower half-mile of Ebright Creek due to artificial passage barriers. Ebright Creek is part of a designated wildlife corridor that connects Lake Sammamish to other habitats within and east of the City. As established under the rules of SMC 21A.50.327(2), the wildlife corridor follows the course of Ebright Creek and includes the undeveloped riparian corridor. The wildlife corridor links with the George Davis Creek undeveloped riparian corridor, and eventually links with a designated King County wildlife habitat network to the east. The City's Critical Areas (SMC 21A.50) rules indicate that wildlife corridors must maintain an undeveloped width of at least 150 feet. The George Davis Creek riparian / wildlife corridor typically has an undeveloped width of 300 feet or greater.

There are numerous wetlands in the Thompson subbasin, some of which occur on organic deposits in the Ebright Creek headwaters. These wetlands have been identified as important water storage areas that if maintained could help mitigate impacts associated with increased peak flows caused by urban development (King County, 1994). Partially because of the highly variable geological conditions within the subbasin, ecological responses to increased development are expected to be significant. The 1994 ELS Basin Plan predicted that peak flows would increase in this basin by as much as 150 percent without mitigation. Increased erosion and sedimentation, turbidity, and/or nutrient loading can be expected to accompany the higher

[7] The Stormwater Management Comprehensive Plan (CH2MHILL 2001) states that Chinook salmon have been sighted in Ebright Creek, citing data from the Greater Lake Washington Technical Committee, 2001.

peak flows (King County, 1994). Ebright Creek is currently listed as a Category 5 (impaired) water for fecal coliform on the state's Water Quality Assessment, indicating it is a polluted water requiring a Total Maximum Daily Load (TMDL)[8]. For all of the above reasons, wetland and wetland buffer areas associated with the Ebright Creek headwaters should be prioritized for restoration activities.

2.2.5 Pine Lake Subbasin

The City recently prepared a draft Management Plan for Pine Lake Water Quality that describes conditions in the Pine Lake subbasin as they relate to water quality and hydrology. In addition, the City has designated Pine Lake and its environs as a special management district, primarily for purposes of controlling total phosphorus loading and other development impacts within the Pine Lake watershed.

The Pine Lake subbasin is one of the most important subbasins in the ELS basin in terms of aquatic resources. Key features of this area include Pine Lake (which is discussed in more detail below), Kanim and Pine Lake Creeks and their tributaries, and numerous wetlands. One of the largest wetlands known as ELS 30 (approximately 50 acres) is adjacent to the southwest corner of Pine Lake.

Kanim and Pine Lake Creeks provide some of the best habitat for resident and anadromous fish in the ELS basin. Pine Lake Creek has a year-round flow regime and high quality pool/riffle habitat in its lower reaches. Portions of both the Pine Lake and Kanim Creek ravines are mapped as erosion or landslide hazard areas, and some channel erosion has occurred. Other concerns in the basin are related to water quality, peak flow increases, and habitat loss.

2.2.6 Laughing Jacobs Subbasin

The southeastern one-third of the ELS basin comprises the Laughing Jacobs subbasin, which drains to Lake Sammamish via Laughing Jacobs Creek and five smaller tributaries (King County, 1994). The Laughing Jacobs subbasin includes Beaver Lake (which is discussed in detail below), Laughing Jacobs Lake, and many important wetlands including the Hazel Wolf Wetland Preserve (King County, 2000). The 116-acre wetland/wildlife preserve was established in 1995 by concerned citizens, corporations, county government and the Cascade Land Conservancy and includes a 50-acre wetland complex (ELS 10) and is in proximity to wetland ELS 21, a 13-acre wetland located to the northeast of Beaver Lake 1. The area, which is located in unincorporated King County and is adjacent to the City's Beaver Lake Preserve, is heavily used by local residents and also used weekly as a field laboratory for local high school students.

There are more than 20 large wetlands documented in this subbasin, which represent some of the most valuable habitat found in the urbanizing areas of King County. These wetlands perform important functions related to water storage, nutrient cycling, and flood attenuation/desynchronization. In addition, a significant portion of this subbasin is designated as

[8] The TMDL or Water Quality Improvement Project process was established by Section 303(d) of the federal Clean Water Act (CWA), which requires states to identify sources of pollution in waters that fail to meet state water quality standards and develop Water Quality Improvement Reports to address those pollutants. The TMDL establishes limits on pollutants that can be discharged to a waterbody and still allow water quality standards to be met.

a high aquifer recharge area pursuant to the City's Critical Areas Ordinance (CAO, Chapter 21A.50 of the Sammamish Municipal Code). These critical aquifer recharge areas are susceptible to groundwater contamination.

Despite the low gradient of the majority of the subbasin streams and the bedrock substrate over which they flow, King County has identified active landslide areas in the Laughing Jacobs Creek ravine that contributed to sediment deposition in the lower reaches and localized flooding at the downstream end of the channel (King County, 1994). Poorly managed runoff from developed areas is believed to have contributed to the increased sediment delivery.

Water quality is a key concern in this subbasin. The City has designated Beaver Lake and its surrounding watershed as a special management area subject to stringent development standards designed to maintain the lake's water quality and ecological integrity (King County, 2000). Management recommendations have been developed through an ongoing effort involving King County, the City, and local residents since the 1980s. The Beaver Lake Management Plan was initially prepared in 1993 and updated in 2000. The plan, which is described in Chapter 3 below, provides a detailed account of water quality conditions and a comprehensive approach for mitigating surface water impacts associated with future land development.

2.3 Patterson Creek Basin

The Patterson Creek Basin covers 12,711 acres (19.86 square miles) in eastern King County, along the east slope of the Sammamish Plateau. Patterson Creek is 12.1 miles long and flows into the Snoqualmie River north of Fall City. The Snoqualmie River flows into the Snohomish River and is one of three major watersheds within WRIA 7 (Figure 2). Further development in this subbasin poses a threat to habitat conditions.

Canyon Creek is the primary subbasin of Patterson Creek within the PAA. This area has higher residential densities, including areas of R-6 and R-8 zoning, than other areas of the basin. A subbasin alteration analysis by King County indicated that existing development in the upper watershed has altered the hydrology and negatively affected the stream channel (King County, 2004). This report recommends that riparian habitat projects in this subbasin focus on preserving existing conditions and reducing the level of impacts from culverts and landscape alteration.

2.4 City of Sammamish Shorelines

The City of Sammamish SMA-regulated shorelines are the Lake Sammamish, Pine Lake, and Beaver Lake shorelines. Within City jurisdiction, the Lake Sammamish shoreline forms the western boundary of many of the previously described subbasins (Figures 3 and 4). City jurisdiction extends to the north-south trending centerline of the lake; however the western upland border of the City is the east shoreline of Lake Sammamish. Pine Lake is completely within the upper Pine Lake subbasin and Beaver Lake is completely within the upper Laughing Jacobs subbasin. Both Pine Lake and Beaver Lake are completely within the City of Sammamish.

2.4.1 Lake Sammamish Shoreline

Key management issues for Lake Sammamish discussed in this section include:

- Water quality degradation related to increased sediment delivery and increased contaminant inputs (namely fecal coliform from septic systems and phosphorus from fertilizers, phosphate-bearing detergents, septic tank leachate, animal waste, and over-release of natural phosphorus compounds due to development derived erosion);
- Effects of upland development on hydrology and sediment processes, primarily increased impervious surface;
- Alteration of shallow water/near-shore habitat characteristics caused by shoreline modifications (docks, piers and bulkheads); and
- Impacts of recreational activities on the lake.

Increased residential and commercial development within the ELS basin and along the lakeshore has impaired several key ecological components of shoreline habitat. Increased impervious surface in upland areas has altered the intensity, timing, and duration of peak flows in many tributary streams in the basin (King County, 1994). The short-circuiting of the natural drainage pathway that occurs when surface flows are concentrated rather than allowed to percolate has eroded many of the stream channels that drain the west slope of the plateau and increased their sediment transport capacity. Downstream habitat impacts at the mouth of these tributaries include reduced fish access due to channel incision, blocked culverts, buried spawning habitat, and localized flooding and turbidity. These conditions have been exacerbated by the degradation and loss of headwater wetlands, which provided important water storage and nutrient cycling functions (CH2M Hill, 2001).

Water quality degradation is directly linked to the altered flow and sediment processes and to increased source inputs associated with urban land uses practices. Fine sediment is an effective transport vector for phosphorus, and the increased sediment inputs threaten the nutrient status of Lake Sammamish. The high percentage of homes on septic systems suggests that fecal coliform contamination may continue to be a problem in Lake Sammamish. The Lake Sammamish Water Quality Management Plan estimated that 62% of the phosphorus load in Lake Sammamish was derived from single-family residential areas; this percentage was expected to rise with increasing levels of residential land cover. Use of high phosphorus fertilizers (as opposed to zero-phosphate fertilizers) for lawn maintenance and the use of phosphate-bearing detergents along the lakeshore and on the plateau, as well as release of phosphorus from septic tank leachate, animal waste, construction sites, and other sources, could trigger algal blooms during the summer months when the lake is highly stratified. This in turn could further decrease dissolve oxygen levels, which already create a limiting factor for salmon and other aquatic organisms (CH2M Hill, 2001).

Shoreline modifications are another significant concern along Lake Sammamish. The proliferation of residential docks, piers, and bulkheads along the lakeshore has reduced the quality and accessibility of rearing and migratory habitat for juvenile salmonids and other species (Table 2). Much of the dense woody and emergent vegetation that once lined the Lake Sammamish shoreline has been replaced by structurally simple docks and piers. This results in a

decrease in woody debris, overhanging vegetation, and detrital inputs. Docks and piers create artificial shading that reduces the amount of light available to phytoplankton and aquatic macrophytes, which can decrease primary productivity and ultimately reduce fish and invertebrate diversity (Kahler, 2001).

Bulkhead construction waterward of OHWM has also eliminated shoreline vegetation and displaced shallow-water refuge, foraging and possibly spawning habitat for juvenile salmonids. Bulkheads can also change the slope, configuration, and/or substrate composition of the shoreline by cutting off upland sediment supply and increasing erosion on neighboring properties without bulkheads. In relatively low energy environments like Lake Sammamish, these effects tend to be localized, but they can still have adverse implications for aquatic habitat (Kahler, 2000).

Artificial shoreline structures associated with piers and docks alter natural predator-prey interactions and tend to create favorable conditions for predator fish species such as sculpin and smallmouth bass. Prey species require complex cover (such as brush piles, rootwads, and undercut banks) to avoid predators. Where natural cover has been replaced by artificial structures, prey species can become more vulnerable to ambush and other forms of predation. Some evidence suggests that predator species actually aggregate near piers and other structures. Kahler (2000) reported that unpublished data collected by the Muckleshoot Indian Tribe indicates that smallmouth bass were preferentially locating nests near residential piers in Lake Sammamish. Although the data on predator aggregation near piers is somewhat inconclusive, the fact that bass (especially smallmouth bass) thrive in lakes with developed shorelines while salmonids and other species decline suggests that predator species have an advantage over prey fish in structurally simple environments (Kahler, 2000).

Historically, docks and piers were constructed of chemically treated wood, which is a source of polycyclic aromatic hydrocarbons (PAHs) and heavy metals. These preservatives can leach into the water column and become toxic to aquatic organisms. The number of chemically treated wood docks on Lake Sammamish is not known, however most new docks are constructed using alternative, less harmful materials such as metal. The State WDFW requires that all in-water work receives a hydraulic project approval and the U.S. Army Corps of Engineers requires compliance with a regional general permit (RGP-3) or equivalent project-specific standards. These required permits currently limit the use of chemically treated wood pilings, docks and piers. Most docks are now made of steel pilings and open decking (to allow light penetration).

Table 2. Use and Shoreline Modification of Existing Residential Parcels along Lake Sammamish, Pine Lake, and Beaver Lake[9]

	Total number of Parcels	Vacant Parcels		Docks		Shoreline parks and open spaces
		Number	% of total	Number	% of total	
Lake Sammamish	421	70	16%	368	87%	No existing areas of park, however several open space parcels are along the shoreline that are open to public access
Pine Lake	147	8	5%	111	75%	Pine Lake Park: park on east side of lake w/ 450 ft. of minimally modified shoreline
Beaver Lake	125	8	6%	91	73%	NE Beaver Lake: open space w/ 1800 ft. of natural shoreline; SW: Park w/ 2100 ft. of minimally modified shoreline

Shore-spawning sockeye and kokanee salmon species in Lake Sammamish are especially susceptible to the construction of docks, piers, bulkheads (including skirted docks and piers) or any alterations that modify habitat structure, substrates, hydrology, water temperature, or water quality. Spawning areas can be degraded with sediment as scoured streambed material and fine sediment eroded from building sites and impervious surfaces are transported downstream to the lake. Vulnerable beach spawning areas include near-shore substrates that receive spring-fed upwelling, as well as alluvial fans at stream mouths. Although actual spawner numbers are unknown, shore spawning populations are believed to be declining (Parametrix, 2006).

No single form of shoreline modification is to blame for the loss of high quality aquatic habitat in Lake Sammamish. Shoreline modifications occur in the context of urban development, which creates a suite of physical, biological, chemical responses that occur at different scales of space and time. In summary, bulkheads, piers and docks can:

- Reduce primary productivity due to shading (docks);
- Alter predator-prey interactions in a manner that favors salmonid predators;
- Modify the physical configurations of the shore by disrupting sediment pathways, causing erosion;
- Introduce toxic chemicals such as PAHs and heavy metals;
- Eliminate shallow water habitat which is an important migratory pathway for juvenile fish;
- Create noise and vibration, which can startle juvenile fish;

[9] Existing dock count based on analysis of 2007 oblique shoreline photos; 2006 aerial photos and field verification by Maren Van Nostrand, City of Sammamish. Vacant parcel analysis conducted by City of Sammamish staff, 2007.

- Displace natural shoreline vegetation and reduce the organic inputs (terrestrial insects and detritus) to the lake; and
- Decrease shoreline habitat complexity due to loss of rootwads, overhanging vegetation and undercut banks.

Recreational use of Lake Sammamish creates additional challenges for maintaining ecological functions. Potential impacts include spreading exotic species of plants and plankton, noise impacts to fish and wildlife, increased wave energy and shoreline erosion, direct physical injury due to contact with people and watercraft, re-suspension of contaminated sediments and/or increased turbidity caused by propeller scour, and possible introduction of chemical pollutants from boat emissions.

2.4.2 Pine Lake Shoreline

Preservation and improvement of water quality are the key management objectives for Pine Lake. Development throughout the Pine Lake subbasin has increased contaminant input and modified natural water quality processes. Historic land clearing was predominantly related to forestry, but more recently, the clearing has been associated with residential development. Increased impervious surface in upland areas as well as alteration and loss of wetland habitat around Pine Lake have eliminated areas for nutrient storage, nutrient cycling, and biotic uptake and altered the basin's natural water and sediment transport regimes (Tetra Tech, 2006). Under natural conditions, Pine Lake would have had very minimal sediment input, but road construction, residential development and changes in peak flow have increased sediment delivery to the lake, which leads to increased phosphorus input.

Preservation of existing woody vegetation along the lakeshore is a priority for Pine Lake because the existing trees shelter the lake from wind mixing and reduce the potential for releasing phosphorus trapped in the hypolimnion (cold, under layer of lake water) into the epilimnion (warm, upper layer of lake water) during the stratification period. Additionally, implementation and enforcement of the City's Critical Areas Ordinance which requires phosphorus retention during development are critical to ensuring good water quality in Pine Lake.

Many of the issues described above for Lake Sammamish related to dock, pier, and bulkhead construction are pertinent to Pine Lake, except that Pine Lake does not support anadromous salmonids.[10] Shoreline modifications occur in the context of urban development, which creates a suite of physical, biological, chemical responses that occur at different scales of space and time. In summary, bulkheads, piers and docks on Pine Lake can:

- Reduce primary productivity due to shading (docks);
- Alter the physical configurations of the shore by disrupting sediment pathways, and causing erosion;
- Introduce toxic chemicals such as PAHs and heavy metals;

[10] Pine Lake contains resident populations of cutthroat trout.

- Displace natural shoreline vegetation and reduce the organic inputs (terrestrial insects and detritus) to the lake; and
- Decrease shoreline habitat complexity due to loss of rootwads, overhanging vegetation and undercut banks.

2.4.3 Beaver Lake Shoreline

Development throughout the Beaver Lake watershed, within the Laughing Jacobs subbasin, has modified natural shoreline processes. Many of the issues related to development within the watershed are similar to those described above for Pine Lake and Lake Sammamish. Key issues along the Beaver Lake shoreline include:

- Limited native vegetation cover in the lakeshore riparian area;
- Shading of the lake bed from docks, many of which are abandoned or broken (Table 1); and
- Increased areas of impervious surface along the shoreline and throughout the subbasin.

As with Pine Lake, a variety of shoreline modifications have occurred in the context of urban development, which creates a suite of physical, biological, chemical responses. In summary, bulkheads, piers and docks on Beaver Lake can:

- Reduce primary productivity due to shading (docks);
- Alter the physical configurations of the shore by disrupting sediment pathways, and causing erosion;
- Introduce toxic chemicals such as PAHs and heavy metals;
- Displace natural shoreline vegetation and reduce the organic inputs (terrestrial insects and detritus) to the lake; and
- Decrease shoreline habitat complexity due to loss of rootwads, overhanging vegetation and undercut banks.

Preserving existing woody vegetation along the lakeshore is a key issue for Beaver Lake, as with Pine Lake. Shoreline woody vegetation provides habitat complexity that supports documented populations of resident salmonids, as well as other wildlife. However, lakeshore vegetation along significant portions of Beaver Lake is currently protected as park and open space. Further restoration of shoreline vegetation in these areas should be considered during restoration planning.

3.0 Evaluation of Existing Plans and Programs

A number of existing City and regional plans and program are seeking to improve the health of aquatic systems (i.e., marine waters, lakes, streams and wetlands), improve water quality, enhance habitat for fish and wildlife, and recover threatened salmon stocks to healthy levels. These efforts provide a basis for identifying specific shoreline restoration goals, policies, and in some cases, projects, for the City of Sammamish. Several of the plans/programs listed below have implementation or funding systems that work towards the identified recommendations. Other plans and programs were developed as guidance materials, without defined implementation or funding programs. In both cases, applicable recommendations from these existing plans and programs represent useful guidance for the City's shoreline restoration planning efforts, and are adopted by reference as part of this Shoreline Restoration Plan. In many cases, the City is acting on or in the process of implementing recommendations from these existing plans and programs and is therefore contributing to the overall goal of improving ecological functions over time.

3.1 City Plans and Programs

A series of City plans and programs, as detailed within the subsection below, provide guidance for lakeshore restoration.

3.1.1 City of Sammamish Storm Water Management Comprehensive Plan

The City's Storm Water Management Comprehensive Plan (SWCP) (CH2M Hill, 2001) is guided by the City's Comprehensive Plan. The City's Public Works division is responsible for managing the City's surface water systems, which involves protecting developed and undeveloped properties from flooding, controlling runoff and maintaining water quality, while continuing to accommodate new development. Public Works also promotes the preservation of natural drainage systems, and protects fishery resources and wildlife habitat. The SWCP includes an assessment of the City's surface waters, including the three SMA-regulated lakes as well as major stream and wetland areas, and highlights both city-wide and location-specific stormwater-related problems.

The SWCP documents the impact of erosion, sedimentation, and non-point pollution on surface and ground water; identifies pollutants of significant concern in the City; and describes known or potential fish passage barriers in the City's streams. Also included within the SWCP are a series of policy recommendations that, if implemented, would help to improve shoreline ecological functions over time. Many of these policy recommendations, which address protection/restoration of sensitive areas and alternative development standards/sustainable development alternatives, are directly relevant to shoreline restoration and management.

As detailed within Section 7 of the SWCP, the City should consider:

- Working with King County to conduct a program for comprehensive local flow control mapping of surface waters, wetlands, and other sensitive resource areas. A sensitive areas map could be used in the adoption of area-specific standards for storm and surface water

management regulations. Such mapping would allow the City to tailor its regulations and programs to specific sensitive resources and problem areas.

- Establishing a program to identify and restore degraded aquatic habitats. Such a program would identify the capital improvement projects and funding sources necessary to improve in-stream and riparian habitat. Projects could include stream bank stabilization, placement of large woody debris, installation of in-stream flow control and habitat structures, and planting native plants and trees as buffers between riparian areas and developed areas.

- Creating educational programs for the Lake Sammamish, Bear Creek, and Issaquah Creek Basins. This would include public education and involvement efforts for stormwater and surface water management issues in these sensitive basins, and educating. citizens about non-point source pollution and how their actions affect local surface water resources and fish habitat.

- Encouraging construction of taller and narrower buildings and homes, which would reduce the "footprint" of impervious surfaces. Research from the University of Washington's Center for Urban Water Resources Management suggests that fish populations begin to decline in a watershed when as little as 10 percent of the surface area becomes impervious. For comparison, conventional low-density suburban development has approximately 40 to 50 percent impervious surface.

- Using smaller lot sizes and allowing accessory dwelling units to increase densities, but maintaining the look and feel of single-family neighborhoods.

- Promoting infiltration wherever feasible. Research suggests that the only way to protect natural stream hydrology and fish habitat in urban environments is through infiltration. All rooftop runoff should be infiltrated and retention/infiltration BMPs should be implemented in new development wherever feasible.

- Promoting pervious pavement except for regular travel lanes. Narrow local streets could be built using permeable pavement wherever practicable, and grass swales could be used instead of curbs for stormwater conveyance.

Elements of the above listed policy recommendations have been or are being incorporated into the City's planning system and land use and development regulations. For example, the updated Critical Areas Ordinance includes incentive systems to incorporate low impact development strategies. However, ongoing examination of policies, even if already incorporated, should occur to determine if they can be further applied or strengthened within the City.

3.1.2 Management of Pine Lake Water Quality

The recently prepared draft Management Plan for Pine Lake Water Quality (Tetra Tech Inc., 2006) describes conditions in the Pine Lake subbasin as they relate to water quality and hydrology. Included within the report is a management plan, which focuses on in-lake, shoreline, stormwater, and water quality goals for the lake and basin. Phosphorus is identified as a major issue within the report, and as such is highlighted as a priority within stormwater and water quality management goals. The management plan within the report reinforces the City's CAO

requirements for phosphorus removal and supports the use of the "All Known and Reasonable Technologies" (AKART) standard called for in the CAO.

In-lake, wetland, and stream water quality monitoring is also recommended within the report, again highlighting phosphorus as a primary water quality parameter of concern. Additionally, fecal coliform and nitrogen are also highlighted as water quality concerns, with suspected failing residential septic systems identified as a potential source.

Lastly, the management plan highlights the importance of conserving and restoring riparian, open space, and shoreline areas. The report strongly recommends that the Storm Water Management Comprehensive Plan and CAO be fully implemented in all development and redevelopment activity. The report highlights bio-filtration and infiltration strategies as being of primary importance in managing water quality within the subbasin. The report suggests that these actions will reduce the amount of phosphorus and other polluting agents entering Pine Lake and associated basin surface waters.

3.1.3 Beaver Lake Management Plan

The City, in collaboration with King County and subbasin residents, first prepared a Management Plan for Beaver Lake in 1994. This plan was more recently updated in 2000, and includes a number of management recommendations aimed at achieving water quality and habitat goals identified in the plan. The 12 management recommendations (R1 through R12) are presented below as divided within the report across five key focus areas (sections 3.1.3.1 through 3.1.3.5).

3.1.3.1 Wetland and Resource Land Preservation

R1, Acquire Additional Open Space: Important parcels targeted for land acquisition include areas of Wetland ELS 21 and/or adjoining upland habitat. Several specific parcels are highlighted, including a 57-acre public acquisition that is now complete, to the southwest of Wetland ELS 21 along the north shore of Beaver Lake. Since 2000, the City of Sammamish has acquired additional land in the Beaver Lake area in an effort to link natural areas. In 2007, a 17-acre property acquisition adjacent to the Beaver Lake Preserve was completed by the City. The additional property creates contiguous public ownership of land from Beaver Lake and Beaver Lake Preserve to the County's Soaring Eagle Park.

R2, Increase Wetland and Stream Buffer Size: Recommends that the City of Sammamish increase buffer area on several specific wetlands (typically from 100 feet to 200 feet) and two specific streams (from undefined levels to required levels) to protect and enhance the wetland functions of these systems. Wetlands specified include all of ELS 21 and portions of ELS 10, ELS 57, and ELS 35. Streams specified are Tributaries 0166 and 0166D, which are outlets of wetlands ELS 21 and 10, respectively.

R3, Promote Long-term Land Conservation through Incentive Programs: Highlighting the importance of non-acquisition strategies, including promotion of existing property tax reduction incentive programs.

3.1.3.2 Future Land Development Guidelines

R4, Enforce Seasonal Clearing and Grading Requirements: Suggests a strict enforcement of existing requirements administered by the City of Sammamish. Strict enforcement is meant to include that extreme caution will be used in granting waivers to seasonal requirements.

R5, Enforce Temporary Erosion and Sediment Control (TESC) Standards: Originally funded through a King County pilot program in the mid 1990s, TESC inspections had continued through 2000. The report recommended continued TESC inspection at development sites within the basin, and suggested that the City should be active in securing funding for a dedicated TESC inspector.

3.1.3.3 Ongoing Stormwater Management

R6, Maintain AKART Standard for New Development: Focused on phosphorus removal and focused on King County guidelines developed in 1995, basin stormwater facilities were important to maintaining water quality throughout the basin. This action recognizes the continued importance of using the AKART Standard.

R7, Maintain Stormwater Facilities: This action suggested the development of a regular maintenance schedule for all systems within the basin, and included a suggested basic system of inspection and maintenance prior to the wet weather season and routine inspection during the wet weather season to ensure proper function.

3.1.3.4 Shoreline and Watershed Actions

R8, Restore Shoreline Vegetation: Recognizing the importance to shoreline residents of maintaining view corridors and shoreline access, this action suggests that there are landscaping options available that would improve shoreline conditions without greatly impacting views and uses. Recommendations include the use of a native vegetation buffer and the reduction of lawn size.

R9, Reduce Fertilizer Use and Lawn Size: This action focuses on the reduction of lawn size and the use of other landscaping choices. By doing so, residents can reduce maintenance and fertilizer needs in their yards.

R10, Maintain On-site Septic Systems: This action recognizes the impact of septic systems on water quality, and suggests that regular inspection, maintenance, and pumping should be undertaken by system owners to reduce potential pollution impact.

R11, Reduce Phosphorus from Pet Waste, Car Washing, and Exposed Soil: As both pet waste and soapy water from washing cars are laden with phosphorus, this action recommends that basin residents should be encouraged to dispose of pet waste as sewage or securely bundled garbage, and that car washing should be done at a car wash facility. Likewise, encouragement should be made to residents to plant or mulch exposed soils to reduce potential erosion impacts.

3.1.3.5 Monitoring

Recognizes the role the community has played in supporting a monitoring program, and the importance of monitoring as a strategy for identifying potential problems at a very early stage.

Action **R12**, Continue Lake and Stream Monitoring, supported the 5 year monitoring program under development for 2001 implementation, and suggested additional steps that could be taken to further basin monitoring.

3.1.4 Inglewood Basin Plan

The City's 2005 Inglewood Basin Plan (Entranco, 2005) describes conditions within the Inglewood Subbasin. The Plan focuses on the unique hydrologic and geologic conditions of the basin, specifically identifying the subsurface flow through the glacial outwash in the central portion of the basin. This area serves to create the equivalent of 7,000 acre-feet of water detention, a very high level of subsurface detention compared to other East Lake Sammamish basins. The plan focuses on this and other unique characters of the subbasin, and identifies a series of regulatory programs, flood prevention measures, and habitat restoration and conservation actions aimed at maintaining the subbasin. Recommendations include the following actions:

- Maintain current stormwater detention standards;
- Encourage widespread use of low impact development techniques;
- Maintain hydraulic connectivity to infiltration areas;
- Map infiltration areas;
- Identify potentially flood prone properties;
- Improve wetland maps;
- Preserve infiltration areas as a natural resource;
- Develop public outreach and education programs;
- Reduce the amount of phosphorous input to Lake Sammamish;
- Remove solids (impervious surfaces) for protection of infiltration areas;
- Limit livestock access to creeks; and
- Fill information gaps, including the installation of gages in the upper basin and investigating the sources of fecal coliform bacteria.

3.2 Regional Plans and Programs

The following regional programs are in place with the overall goal of restoring Puget Sound and freshwater aquatic habitats for salmon recovery and related purposes. The applicable recommendations of each plan/program are noted below along with a statement concerning the City's progress toward accomplishing the recommendation. The ecological functions of Sammamish's shorelines can be expected to improve over time as the goals of these programs are achieved.

3.2.1 Puget Sound Partnership: 2005-2007 Puget Sound Conservation and Recovery Plan

The Puget Sound Partnership (formerly the Puget Sound Action Team) was established to help define, coordinate and implement Washington State's environmental agenda for Puget Sound. While primarily focused on restoring and protecting Puget Sound marine waters, the Plan also focused on mitigating adverse effects of urban stormwater runoff and improving water quality in the freshwater habitats of the Puget Sound region.

Every two years the Partnership develops a plan to guide their work. The 2007-2009 Plan proposes a combined budget of $333 million funded through state agency budgets to address eight priority areas. The specific priority areas that are appropriate for the City of Sammamish are:

- Prevent harm from stormwater runoff;
- Protect functioning marine and freshwater habitats;
- Restore degraded marine and freshwater habitats;
- Prevent nutrient and pathogen pollution caused by human and animal wastes; and
- Prepare for and adapt Puget Sound efforts to a changing climate.

3.2.1.1 Recommendations

The stormwater recommendations, which are applicable to Sammamish shorelines and basins include the following:

- Expand the regulatory program of National Pollutant Discharge Elimination System (NPDES) Phase II stormwater permits[11];
- Increase the use of innovative techniques known as low impact development (LID);
- Continue development of local comprehensive stormwater programs.

3.2.1.2 Status in Sammamish

Sammamish prepared a Stormwater Management Comprehensive Plan in 2001 (see Section 3.1 above for more information). The stormwater plan meets the regulatory requirement of the NPDES Phase II Rule and the Puget Sound Water Quality Management Plan. Elements of the above listed stormwater recommendations have been or are being incorporated into the City's planning system and land use and development regulations. For example, the City has developed

[11] NPDES stormwater permits, under Phase I and Phase II of the regulatory program, are required for many municipal separate storm sewer systems and construction projects; through expansion of the regulatory program, a greater amount of future development with the potential to pollute the City's surface waters would be held to NPDES standards.

a draft LID ordinance that is currently under consideration. The Critical Areas Ordinance also includes incentive systems to incorporate low impact development strategies. However, further examination of policies, even if already incorporated, should occur to determine if they can be further applied or strengthened within the City.

3.2.2 Shared Strategy for Puget Sound: Puget Sound Salmon Recovery Plan

Shared Strategy for Puget Sound (Shared Strategy) is a collaborative effort to protect and restore salmon runs across Puget Sound that was initiated as a result of Endangered Species Act (ESA) listings of salmonid species in the Puget Sound region. Shared Strategy engages local citizens, tribes, technical experts and policy makers to build a practical, cost-effective recovery plan endorsed by the people living and working in the watersheds of Puget Sound.

Shared Strategy developed a salmon recovery plan (Shared Strategy, 2007) that provides a blueprint for salmon recovery strategies throughout Puget Sound and incorporates, by reference, local watershed plans for salmon recovery. The Draft Shared Strategy recovery plan was subsequently reviewed by the Northwest Region of the National Marine Fisheries Service (NMFS). In December of 2005, NMFS released a supplemental document which, in concert with the Shared Strategy plan, serves to act as the federally mandated (ESA Section 4f) guide to salmon recovery for Puget Sound populations (NMFS, 2005). Amongst other strategies described in the plan, Shared Strategy describes their 'Top 10 Actions Needed for Salmon Recovery', many of which have additional beneficial impacts for humans.

3.2.2.1 Recommendations

The Shared Strategy recommended actions that are most relevant to the City of Sammamish are:

- Restore riparian areas to stabilize river banks and create complex side channel and pool habitats; and
- Improve water quality by reducing or eliminating sources of point and non-point pollution and by cleaning-up contaminated sediments.

3.2.2.2 Status in Sammamish

The City is working to improve water quality in lakes and streams by implementing new development regulations. As an example, the City's CAO (SMC 21A.50.355) generally requires that all new development in the watersheds that drain to Pine and Beaver Lakes incorporate stormwater BMPs that remove 80 percent of new total phosphorus. In addition, the City has developed a draft LID ordinance that would provide incentives for new developments to incorporate LID techniques such retaining native vegetation and minimizing impervious surfaces. These LID measures would help offset potential adverse impacts caused by non-point pollution and erosion/sedimentation. The Draft LID ordinance is under review by City officials at this time.

3.2.3 Water Resource Inventory Area (WRIA) 8 Planning Efforts

The WRIA 8 (Cedar/Lake Washington/Sammamish watershed) multi-agency planning efforts have taken major steps to identify and prioritize recommendations for improving stream and shoreline functions. These efforts are best represented by two plans: the **Chinook Salmon Conservation Plan** and the **Near Term Action Agenda for Salmon Habitat Conservation**. As the titles indicate, WRIA 8 efforts have focused on sustaining and improving habitat conditions for the area's salmon populations. However, this focus is presented in the context of salmon as a key indicator species; in that the success of salmon populations is indicative of the health of the upland, riparian, riverine, lacustrine, and marine habitats that support them.

The Chinook Salmon Conservation Plan highlights efforts that are needed in WRIA 8 to restore Chinook salmon populations to healthy sustainable levels. Many of the recommended measures are directly applicable to shoreline management and restoration in Sammamish. Implementing these measures would have dual benefits of helping to recover salmon populations and generally improving shoreline functions and values over time.

3.2.3.1 Recommendations

The Chinook Salmon Conservation Plan calls for the following actions:

- Restore sandy beaches with gentle slopes that maximize shallow water habitats for juvenile salmon;
- Reconnect tributary creek mouths that serve as juvenile rearing areas;
- Remove bulkheads and other shoreline armoring to create and restore shallow sandy habitats;
- Encourage salmon friendly design during development and redevelopment, developing incentive programs for voluntary bulkhead removals and other salmon friendly improvements;
- Encourage restoration of overhanging riparian vegetation;
- Address water quality and high flow impacts through NPDES Phase 1 and Phase 2 permit updates, consistent with Washington Department of Ecology's 2001 Stormwater Management Manual12 including using low impact development techniques and on-site stormwater detention, and controlling sources that discharge directly into the lakes;
- Address stormwater impacts from new and expanded roadways proposed during the next ten years;
- Encourage low impact development through regulations, incentives, education/training, and demonstration projects throughout the subarea;

[12] Although the Chinook Salmon Conservation Plan calls for consistency with Ecology's 2001 Stormwater Management Manual, this manual was most recently updated and revised in 2005; Sammamish should seek to maintain consistency with the most up to date version of the Ecology Stormwater Management Manual.

- Protect and restore water quality and other ecological functions in tributaries to reduce effects of urbanization and reduce conditions that are detrimental to cutthroat trout;
- Protect and restore riparian buffers, wetlands, and creek mouths by revising and enforcing critical areas ordinances and Shoreline Master Programs, incentives, and flexible development tools; and
- Promote, through design competitions and media coverage, the use of "rain gardens" and other low impact development practices that mimic natural hydrology. Combine a home/garden tour or "Street of Dreams" type event featuring these landscapes /engineering treatments.

In addition, the Chinook Salmon Conservation Plan highlights site-specific restoration projects at the mouths and within the lower reaches of Ebright and Zaccuse Creeks.

Whereas the Chinook Salmon Conservation Plan creates goals intended to lead to long term health of salmon populations, the Near Term Action Agenda provides general actions for immediate reduction and reversal of existing trends that are destructive to salmon habitat. Included below are recommendations with specific relevance to Sammamish shoreline conditions:

- Manage mainstem and tributary river flows to more closely emulate the natural flow regime that promotes habitat-forming processes (for example, creation and maintenance of side channels, pools, river meanders) and long-term salmon survival (for example, incubation/fry emergence, flood refuge areas, migration);
- Perform a regionally consistent baseline assessment of existing conditions and current land use impacts on the natural stream hydrology. Studies should be carried out on a subarea or a smaller scale to help prioritize conservation efforts;
- Avoid the establishment of hydrologic regimes (seasonal and annual stream flow patterns) that are detrimental to the survival of fish;
- Identify and protect important areas of groundwater recharge that contribute to the maintenance of baseflow conditions;
- Eliminate or minimize increased sedimentation that can result from new construction and development;
- Monitor streambed scour and deposition on a watershed-wide basis and take remedial actions where necessary;
- Conduct a regionally consistent, detailed assessment of current riparian conditions throughout the watershed to determine functional value and to evaluate potential protection, enhancement, and restoration opportunities and constraints;
- Establish, enhance, and protect appropriately sized riparian buffers around rivers, streams, wetlands, lakes, and marine near-shore areas to protect salmon habitat and prevent the compromise of salmon conservation efforts; base these buffers on scientific

data and principles of landscape ecology, and ecosystem and conservation biology, as well as long-term feasibility;

- Protect and preserve areas containing mid- to late-stage riparian habitat;
- Replant existing degraded riparian habitats with an emphasis on native plant species that will contribute to bank stabilization and become a future source of large woody debris in stream, lake, and estuarine ecosystems;
- Protect significant source areas (especially connected and isolated wetlands) of groundwater infiltration that contribute to stream water temperature control, especially during seasonal low-flow conditions;
- Reduce the discharge of pesticides and organic compounds into all surface water within the watershed; and
- Reduce excess nutrient loading in areas that are sensitive to excessive nutrient loading or excessive primary production (for example, Lake Sammamish).

In addition, the Agenda identifies two goals specific to the Lake Sammamish shoreline:

- Protect and restore habitat-forming processes and habitat conditions in the Lake Sammamish environment that contribute to the ecological requirements of adult and juvenile salmon, such as feeding, migration, rearing, spawning, and refuge areas; and
- Protect and restore biological communities favorable to salmon recovery.

3.2.3.2 Status in Sammamish

Several of the recommendations, from both WRIA 8 plans, are currently being addressed via existing and proposed City regulations and practices. As an example, the City is currently drafting an LID Ordinance to promote use of LID techniques as noted above. In addition, the Critical Areas Ordinance includes provisions to encourage LID and offers incentives to landowners who remove bulkheads. Section 21A.50.315 of the CAO allows Lake Sammamish property owners to reduce the required 45-foot-wide buffer by 15 feet if an existing bulkhead is removed or if the shoreline is restored to a natural or semi-natural state when no bulkhead is present but the shore is otherwise altered. Buffer reduction opportunities are also available to Lake Sammamish landowners who preserve or restore native shoreline vegetation along 75 percent of their lake frontage. These provisions reward property owners who improve the ecological conditions of their property and help achieve the goals of the WRIA 8 Recovery Plan and this Shoreline Restoration Plan.

The City is examining opportunities to restore fish habitat and access to streams that drain to Lake Sammamish as part of ongoing public works efforts such as the proposed East Lake Sammamish Parkway improvement project.

And, as noted above, the City Sammamish prepared a Stormwater Management Comprehensive Plan in 2001 to meet the regulatory requirement of the NPDES Phase II Rule and the Puget Sound Water Quality Management Plan.

4.0 Restoration Actions and Opportunities

This section summarizes key programmatic opportunities (such as the City's future LID ordinance, the use of additional incentives programs, and enforcement of existing development regulations) and site-specific restoration actions and opportunities (such as improvements to fish passage barriers along the City's streams and restoration action at publicly owned shoreline parcels) that would improve shoreline ecological functions over time.

4.1 Programmatic Restoration Opportunities

In Sammamish, programmatic approaches are a critical component of the overall shoreline restoration strategy. Because so much of the City's shorelines are privately owned and already developed for single-family residential uses, opportunities to implement site-specific restoration may be limited. The programmatic restoration actions identified below are intended to promote better stewardship of shoreline resources through policy implementation, and public education/ outreach. This section of the Restoration Plan – developed as Tables 3, 4, and 5 – prioritizes the previously identified impairments and corresponding restoration actions and briefly highlights expected outcomes.

One of the most important restoration actions that can be implemented on a programmatic basis city-wide is low impact development (LID). LID standards should be implemented through regulations, as already occurs through the Critical Areas Ordinance and through homeowner or developer incentive programs. LID standards and practices should include, but not be limited to:

- Reducing impervious area of all structures – including buildings, roads, courtyards, and sidewalks – through design reductions in footprint size;
- Utilizing pervious surfaces whenever possible, including use in roads, parking areas, sidewalks, and ball courts;
- Directing roof runoff from all structures into pervious treatment systems to allow for infiltration;
- Using low flow or other wastewater reducing bathroom fixtures;
- Enhancing infiltration and stormwater treatment processes through use of bioswales, vegetated road shoulders, and other alternative stormwater treatment mechanisms;
- Enforcement of seasonal clearing and grading requirements;
- Enforcement of temporary erosion and sediment control standards; and
- Maintenance of AKART (all known, available, and reasonable methods of prevention, control, and treatment) standard for new development.

Specific LID recommendations including the City's Stormwater Management Comprehensive Plan, should also be considered. Furthermore, local regulations should continue to encourage and expand upon the regulatory program of the NPDES stormwater permits.

Table 3. Lake Sammamish – Summary of Shoreline Impairments, Restoration and Management Opportunities, and Implementation Outcomes

Impairment	Shoreline Ecological Functions Affected	Restoration and Management Opportunities	Implementation Outcomes
Impervious development: Summer low flows in the East Lake Sammamish tributaries have declined. Causes include increased impervious area and increased stormwater runoff. **(A basin wide impairment)**	Hydrologic Hyporheic	• Protect groundwater and natural surface water sources to the lake. Restore wetlands. • Minimize impervious surface especially in areas of high infiltration (e.g., Inglewood and Laughing Jacobs subbasins).	Natural annual stream flow regimes restored, with more moderate winter peak flows and summer low flows.
Stormwater run-off and non-point pollution: Lake water quality is at risk due to inputs from septic systems, phosphorus, and altered sediment delivery from upstream areas. **(A basin wide and reach specific impairment)**	Hydrologic Hyporheic Water quality	• Encourage wise stewardship of shoreline properties to minimize inputs from lawns, septic systems, and other residential sources; develop incentives programs. • Implement BMPs to minimize erosion and sedimentation in upslope areas. • Limit or prohibit new subdivisions with septic systems. Amend subdivision code and Comp Plan to prohibit new septic systems in subdivisions.	Reduced phosphorus and septic-based inputs, reduced sedimentation – all creating improved water quality.
Lack of shoreline vegetation: The lack of lakeshore vegetation and riparian structure has decreased the habitat diversity, habitat quality, and reduced large woody debris and other forms of complex cover/structure. **(A reach specific impairment)**	Water quality Biological functions	• Provide/encourage native landscaping along the lakeshores, including forested riparian habitat wherever possible. • Promote development of natural in-water habitat structures such as downed trees and rootwads. • Minimize future removal of shoreline trees. • Educate property owners on the importance of the lakeshore zone and general lakeside stewardship practices.	Improved riparian vegetation along lakeshore, both in residential and undeveloped areas. Increased shoreline habitat complexity – resulting in improved shoreline fish and wildlife habitats.
Effects of lake recreation activity: Potential impacts include spreading exotic species of plants and plankton, noise impacts to fish and wildlife, increased wave energy and shoreline erosion, sediment and turbidity impacts from propeller-scour, and possible introduction of chemical pollutants from boat emissions. **(A reach specific impairment)**	Water quality Riparian habitat Biological functions	• Educate recreational boat users about the potential impacts to the shoreline and near-shore environment from boating activity; include recommended practices to minimize potential impacts. • Implement/enforce requirements to protect shoreline and near-shore areas from harmful recreation impacts, including but not limited to enforcement of boat maximum speeds and cleaning of watercraft in order to minimize the spread of exotic species.	Reduced impact to fish and wildlife through reduction in noise levels. Reduced shoreline erosion and sediment/turbidity impacts. Reduced likelihood of introduction of invasive/exotic species.

Impairment	Shoreline Ecological Functions Affected	Restoration and Management Opportunities	Implementation Outcomes
Shoreline modifications: Docks, riprap and other hardshore armoring disrupt natural connections between the lake and riparian habitats. These structures also increase vulnerability of juvenile salmon to predation, as they provide cover to non-native species such as large and smallmouth bass. Docks were historically constructed with chemically treated wood, leaching harmful chemicals directly into lake waters. **(A reach specific impairment)**	Hydrologic Riparian habitats Biological function	• Limit bulkhead and dock construction and promote replacement of armoring with soft shore alternatives; develop incentives programs. • When docks are to be constructed or replaced, encourage use of alternative materials that are not harmful to the shoreline and near shore environment; require all docks to be in compliance with U.S. Army Corps of Engineers RGP-3 permit. • Replant riparian habitats using native trees and shrubs.	Reconnection of upland environment and hydrology with the lake shoreline. Improved juvenile salmon near-shore habitat.
Stormwater run-off and impervious development: Increased surface water runoff from impervious surfaces delivers pollutants and sediment to the lake, which in turn adversely affects lake water quality. The potential causes of water quality impairment delivered via surface water include: leaking septic systems, animal wastes, and residential landscaping or other development sources (delivering increased nitrates, phosphorus and pesticides). **(A basin wide impairment)**	Hydrologic Water quality Riparian habitat	• Continue efforts in surface water quality improvement. • Manage, detain and treat stormwater discharging to the lake. • Coordinate with King County and adjacent cities to develop and implement the use of BMPs with existing property owners to reduce runoff and pollutant loading; develop incentives programs. • Protect and restore wetlands adjacent to the lake and in the upper basin that serve to improve water quality. • Target wetland restoration and mitigation in areas where they would provide water quality functions. • Encourage Low Impact Development and infiltration. • Retrofit existing roads to provide water quality treatment.	Improved habitat and water storage/treatment within public open spaces (including wetland and riparian areas) and within privately owned undeveloped areas. Reduced phosphorus and septic-based inputs, reduced sedimentation – all creating improved water quality. Restored natural annual stream flow regimes.

Table 4. Pine Lake – Summary of Shoreline Impairments, Restoration and Management Opportunities, and Implementation Outcomes

Impairment	Shoreline Ecological Functions Affected	Restoration and Management Opportunities	Implementation Outcomes
Lost / degraded wetlands: Loss / disturbance of wetlands in the basin eliminates essential storage, recharge, or water quality improvement functions. **(A subbasin wide and reach specific impairment)**	Hydrologic Hyporheic Water quality	• Encourage local wetland restoration and mitigation to increase storage, detention, and water quality functions. • Maintain connectivity of wetland areas to Pine Lake.	Natural annual stream flow regimes restored, with more moderate winter peak flows and summer low flows.
Lack of shoreline vegetation: Woody vegetation is lacking in areas of the shoreline. Woody vegetation protects shoreline from wind mixing and maintains water quality. **(A subbasin wide and reach specific impairment)**	Hydrologic Hyporheic Water quality	• Provide/enhance native landscaping along the lakeshores, including forested riparian habitat • Minimize future removal of trees. • Educate property owners on the importance of the near-shore zone and general lakeside stewardship practices.	Improved riparian vegetation along lakeshore, both in residential and undeveloped areas. Increased shoreline habitat complexity, resulting in improved shoreline fish and wildlife habitat – all creating improved water quality.
Shoreline modifications: Docks, riprap and other hard shore armoring disrupt natural connections between the lake and riparian habitats. **(A reach specific impairment)**	Water quality Riparian habitat	• Limit dock construction and promote replacement of armoring with softshore alternatives. • Require any new in-water structures to use non - chemically treated pilings. • Replant riparian habitats using native trees and shrubs.	Reconnect upland environment and hydrology with the lake shoreline.
Stormwater run-off and impervious development: Increased surface water runoff from impervious surfaces delivers pollutants and sediment to the lake, which in turn adversely affects lake water quality. The potential causes of water quality impairment delivered via surface water include: leaking septic systems, animal wastes, and residential landscaping or other development sources (delivering increased nitrates, phosphorus and pesticides). **(A subbasin wide impairment)**	Hydrologic Water quality Riparian habitat	• Provide continued efforts in surface water quality improvement. • Manage, detain and treat stormwater discharging to the lake. • Implement and enforce CAO. • Protect adjacent wetlands that serve to improve water quality. Target wetland restoration and mitigation in areas where they would provide water quality functions. • Encourage Low Impact Development and infiltration. • Limit or prohibit new subdivisions with septic systems. Amend subdivision code and Comprehensive Plan to prohibit new septic systems in subdivisions.	Improved habitat and water storage/treatment within public open spaces (including wetland and riparian areas) and within privately-owned undeveloped areas. Reduced phosphorus and septic-based inputs, reduced sedimentation – all creating improved water quality. Natural annual stream flow regimes restored.

Table 5. Beaver Lake – Summary of Shoreline Impairments, Programmatic Restoration and Management Opportunities, and Implementation Outcomes

Impairment	Shoreline Ecological Functions Affected	Restoration and Management Opportunities	Implementation Outcomes
Lost / degraded wetlands: Wetland ELS 21 provides essential water quality and hydrologic protection for the lake; development pressures within the basin are straining this and other associated lake wetlands and decreasing their water quality functions. **(A subbasin wide and reach specific impairment)**	Hydrologic Hyporheic Water quality	• Encourage local wetland restoration and mitigation to increase storage, detention, and water quality functions. • Maintain connectivity of wetland areas to Pine Lake. • Continue and encourage further low impact development within the sub basin.	Improved water quality within Beaver Lake and downstream in Laughing Jacobs Creek. Enhanced wildlife complexity at Beaver Lake and within associated wetland and upland areas.
Lack of shoreline vegetation: Significant areas of woody vegetation protect the north and west shores of the 3 Beaver Lake 'waterbodies' and provide important wildlife habitat; other areas of the Beaver Lake shoreline are highly modified and lacking complex riparian habitat. **(A reach specific impairment)**	Hydrologic Hyporheic Water quality	• Provide/enhance native landscaping along the lakeshores, including forested riparian habitat • Minimize future removal of trees. • Educate property owners on the importance of the lakeshore and general lakeside stewardship practices.	Improved riparian vegetation along lakeshore, both in residential and undeveloped areas. Increased shoreline habitat complexity, resulting in improved shoreline fish and wildlife habitat – all creating improved water quality.
Shoreline modifications: Docks, riprap and other hard shore armoring disrupt natural connections between the lake and riparian habitats. **(A reach specific impairment)**	Water quality Riparian habitat	• Limit dock construction and promote replacement of armoring with softshore alternatives. • Require any new in-water structures to use non - chemically treated pilings. • Replant riparian habitats using native trees and shrubs.	Reconnect upland environment and hydrology with the lake shoreline.
Stormwater run-off and impervious development: Increased surface water runoff from impervious surfaces delivers pollutants and sediment to the lake, which in turn adversely affects lake water quality. The potential causes of water quality impairment delivered via surface water include: leaking septic systems, animal wastes, and residential landscaping or other development sources (delivering increased nitrates, phosphorus and pesticides). **(A subbasin wide impairment)**	Hydrologic Water quality Riparian habitat	• Provide continued efforts in surface water quality improvement. • Manage, detain and treat stormwater discharging to the lake. • Implement and enforce CAO. • Protect adjacent wetlands that serve to improve water quality. Target wetland restoration and mitigation in areas where they would provide water quality functions. • Encourage Low Impact Development and infiltration. • Limit or prohibit new subdivisions with septic systems. Amend subdivision code and Comprehensive Plan to prohibit new septic systems in subdivisions.	Improved habitat and water storage/treatment within public open spaces (including wetland and riparian areas) and within privately-owned undeveloped areas. Reduced phosphorus and septic-based inputs, reduced sedimentation – all creating improved water quality. Natural annual stream flow regimes restored.

4.2 Site-Specific Restoration Actions

The Final Shoreline Inventory and Characterization Report, WRIA 8 planning documents, and the City's basin plans, have identified site-specific opportunities along the Lake Sammamish, Pine Lake, and Beaver Lake shorelines and in the basins that drain to them. These opportunities are summarized below.

4.2.1 City and Other Publicly Owned Shoreline Areas

The shoreline areas of all three City lakes, and especially that of Lake Sammamish, are largely privately owned. However, limited areas of publicly owned and managed shoreline and near shore areas do exist. The existing publicly owned and managed areas include Pine Lake Park at Pine Lake and the Beaver Lake Preserve (which connects the Lake to the Hazel Wolf Wetland Preserve – ELS 10 Wetland, which is outside of City limits), as well as the ELS 21 Wetland and Beaver Lake Park, at Beaver Lake. The City's main public access on the Lake Sammamish shoreline is the interim East Lake Sammamish Trail. This recently completed interim trail runs north to south along the entire east shoreline in an abandoned railroad right-of-way. The trail surface generally lies between 50 and 300 feet east of the lake edge. It offers views of the water, but no physical water access.

The City of Sammamish owns 300 linear feet of lakefront property near the northern City limits. This future city park encompasses a narrow strip of undeveloped land consisting of two wooded parcels situated between the East Lake Sammamish Trail and the Lake, covering 0.6 acre. The City of Redmond owns the adjoining parcel to the north with additional shoreline frontage[13]. The property appears relatively undisturbed, so active restoration measures (such as bulkhead removal, planting, etc.) may not be necessary. Nevertheless, preserving this land is an important component of the Sammamish's overall shoreline management strategy. Furthermore, protecting undeveloped areas of the Lake Sammamish shoreline north of Weber Point, where the potential future park is located, is one of the near–term action agenda projects in the WRIA 8 Chinook Salmon Conservation Plan (King County et al., 2005).

As indicated in the Parks, Recreation, and Open Space Plan, the City has identified a need for additional recreational facilities within Sammamish. With this need in mind, the majority of designated park area within the City (including the few park areas on or near the three designated shorelines) are being considered for additional development to allow for expanded recreational use. Future development should not occur at the expense of preserving ecologically functioning and valuable areas within these parks. Whenever possible, as park development occurs, the LID techniques identified in the previous section and in any adopted LID ordinance should be implemented. When implemented, these alternative development mechanisms should be made apparent through use of interpretive signage or other means to heighten public awareness of water quality and other ecological issues.

[13] According to the City of Redmond, their property could include a swimming beach, picnic area, fishing access, restrooms, parking, and access to the East Lake Sammamish Trail.

4.2.2 Other Site-Specific Opportunity Areas

Many of the City's streams historically supported significant populations of anadromous salmonids, but habitat loss and blockages have reduced salmonid use to comparatively few areas. The streams, which generally originate in headwater wetlands on the Sammamish Plateau and drain west through steep ravines to Lake Sammamish, typically pass through culverts under East Lake Sammamish Parkway and the interim East Lake Sammamish Trail. Some of these culverts are partial or complete blockages to fish passage. In addition, local flooding and drainage problems are common as a result of changes in drainage patterns due to the roads, residential development, natural seeps and springs and in some cases poorly maintained drainage systems (CH2M Hill, 2001). As the Final Shoreline Inventory and Characterization (ESA Adolfson, 2007) and many other plans have identified, fixing fish barriers and repairing damaged habitat are significant restoration opportunities.

Fish passage barriers along major City of Sammamish streams were identified and mapped within the East Lake Sammamish Basin and Nonpoint Action Plan (King County, 1994) and are described within Table 6. A recently completed stream daylighting project near the mouth of Zacccuse Creek has improved the partial fish passage barrier identified in the 1994 King County plan.

Table 6. Opportunities to restore major known or suspected fish passage barriers along the Lake Sammamish shoreline

Stream (WRIA 8 stream #)	Subbasin	Fish Use	Fish Passage Barriers[14]
George Davis Creek (0144)	Inglewood	coho salmon, cutthroat trout, rainbow trout	Four impassable fish barriers: three located near the creek mouth and the other downstream of the intersection of NE 6th Street and 216th Avenue NE.
Zaccuse Creek (0146)	Monohon	coho salmon, cutthroat trout	At the culvert crossing beneath East Lake Sammamish Parkway; partial barrier – limited documented anadromous fish use above barrier, and recent (Sept. 2007) daylighting project downstream of the Parkway has additionally improved fish passage.
Ebright Creek (0149)	Thompson	Chinook salmon, sockeye salmon, coho salmon, kokanee salmon (spawning only), cutthroat trout, rainbow trout	Located north of SE 8th Street and west of 212th Avenue SE.
Pine Lake Creek (0152)	Pine Lake	coho salmon, sockeye salmon, kokanee salmon, cutthroat trout, rainbow trout	Located west of 204th Avenue SE and south of SE 8th Street.
Kanim Creek (0153)	Pine Lake	coho salmon, cutthroat trout, rainbow trout	Located at the culvert crossing beneath SE 19th Street

[14] No anadromous fish presence above most downstream barrier.

Stream (WRIA 8 stream #)	Subbasin	Fish Use	Fish Passage Barriers[14]
Many Springs Creek (0164)	Monohon	coho salmon, cutthroat trout	Located upstream of SE 43rd Way
Laughing Jacobs Creek (0166)	Laughing Jacobs	coho salmon, sockeye salmon, kokanee salmon, cutthroat trout, rainbow trout	Located outside the City limits (south of Trinity Lutheran College and SE 43rd Way)
Unnamed tributaries (0145B, 0152A, 0163, 0164B, 0166D, 0166E)	Variable	0163: coho salmon, cutthroat trout, rainbow trout 0166D, 0166E: rearing for cutthroat trout	Many of these unnamed creeks and small tributaries have fish passage barriers, most notably in the lower reaches, near Lake Sammamish.

The **Stormwater Management Comprehensive Plan**, the **Beaver Lake Management Plan**, the draft **Pine Management of Pine Lake Water Quality Report**, and the **East Lake Sammamish Basin Plan** all identify several additional recommendations for maintaining water quality and the ecological integrity of the City's SMA-designated lakes and other surface waters. These recommendations include acquisition of additional open space areas and increases in wetland and stream buffer size. Areas that are already identified, or are identified by future studies as being highly important to maintenance of ecosystem processes and/or wildlife populations, should be targeted for preservation as open space whenever possible.

Protecting high value open spaces is especially important in the Inglewood and Laughing Jacobs subbasins, which contain significant potential for groundwater infiltration. CAO regulations protect aquifer recharge areas; however additional regulations and/or homeowner incentives programs could be implemented to further maintain a high percentage of pervious area in these subbasins.

In several of the East Lake Sammamish subbasins, **significant wetland and stream headwater open areas** provide significant stormwater retention and treatment functions, and should continue to be targeted for permanent protection and, where needed, restoration. These areas are identified, especially within the Laughing Jacobs Creek, Pine Lake, and Thompson subbasins, within the Final Inventory and Characterization Report (ESA Adolfson, 2007). The Hazel Wolf Wetland Preserve, within the headwater areas of the Laughing Jacobs Creek Subbasin, was established in 1995 by a coalition of concerned residents, corporations, King County, and the Cascade Land Conservancy. The preserve is heavily used as a nature area for passive/active recreation and education by the local community and local students. The preserve should serve as an example for other high function open spaces within neighboring subbasins.

5.0 Developing Restoration Goals and Policies

The following is a discussion of potential shoreline master program goals and policies focused on restoration that the City could incorporate into the SMP. The proposed goals and policies provide direction that is consistent with the overall restoration framework described the SMP Guidelines (WAC 173-26). These goals and policies are informed by the Shoreline Management Act, the results of the Shoreline Inventory and Characterization work (ESA Adolfson, 2007), and the existing plans and programs described in Chapter 3.

5.1 Proposed Restoration Goals and Policies

Goal 1. *Protect shoreline ecological functions while allowing planned development to occur.*

Policies:

1. Continue to work with the State, King County, Watershed Resource Inventory Area (WRIA) 8 Steering Committee, and other governmental and non-governmental organizations, to explore how local governments can contribute to the preservation of ecological processes and shoreline functions.
2. Continue to work with the WRIA 8 forum to restore shoreline habitats and seasonal ranges that support listed endangered and threatened species, as well as other anadromous fisheries.
3. Continue to work with WRIA 8 and King County to implement effective fish passage barrier removal projects in lower reaches of City streams.

Goal 2. *Ensure that shoreline habitats and processes are successfully restored and enhanced on publicly owned lands.*

Policies:

1. Prioritize enhancement and restoration efforts at public parks and open space lands where possible; utilize low impact development practices when public parks or open spaces are developed.
2. Identify and prioritize restoration opportunities within public right-of-ways, including potential buffer enhancement and culvert improvement efforts. Implement restoration activities on all right-of-way development and improvement projects whenever the goals of the Shoreline Restoration Plan can be met.
3. Work with owners of other publicly owned land, such as the neighboring cities and the Washington State Parks, to encourage restoration and enhancement projects, including funding strategies.
4. Promote vegetation restoration, and the control of invasive weeds and nonnative species, to avoid adverse impacts to hydrology and to reduce the hazard of slope failures or accelerated erosion.
5. Develop a funding program to implement restoration projects. An annual program and budget, as specified within the City's Stormwater Comprehensive Plan (SWCP, 2001), would identify the capital improvement projects and funding sources necessary to improve in-stream and riparian habitat. Projects could include stream bank stabilization, placement of large woody debris,

installation of in-stream flow control and habitat structures, and planting of native plants and trees as buffers between riparian areas and developed areas.

6. Monitor and adaptively manage restoration projects on City-owned and managed property.

Goal 3. *Improve water quality within the SMP-regulated lakes and other City waters until all state water quality standards are met and surpassed.*

Policies:

1. Create incentives that will make it economically or otherwise attractive for development and redevelopment proposals to integrate LID strategies that enhance stormwater quality and treatment both during and after construction.
2. Encourage and educate homeowners to use alternative mechanisms to reduce dependency on fertilizers and other harmful chemicals through public education and other mechanisms.
3. Limit the installation of new septic systems to single-family lot development and redevelopment; discourage use of on-site septic systems. Projects necessary to reduce the need of new septic systems in developing and redeveloping areas should be identified and targeted for funding in future capitol improvements programs.
4. Continue efforts to create comprehensive local flow control mapping of surface waters, wetlands, aquifer recharge areas, and other sensitive resource areas. Subbasin and area-specific flow control mapping should be used to pursue adoption of area-specific standards for storm and surface water management regulations. Incorporation of area-specific regulations should be considered in future updates to shoreline and critical areas regulations.

Goal 4. *Implement a successful stewardship program focused on incentives for voluntary shoreline restoration.*

Policies:

1. Adopt incentives, such as the CAO buffer reduction incentive, into the updated Shoreline Master Program to encourage private landowners to remove existing bulkheads and maintain desirable shoreline vegetation.
2. Encourage enhancement or restoration of native shoreline vegetation through non-regulatory programs.
3. Provide information and education materials concerning bioengineering and/or soft engineering alternative design approaches to shoreline to shoreline landowners.
4. Establish education materials prepared for shoreline landowners concerning the benefits of native vegetation plantings.

Goal 5. *Use the shoreline stewardship program to educate the public about the ecological aspects and community values of the City's shorelines.*

Policies:

1. Explore opportunities with other educational organizations and agencies to develop an on-going program of shoreline education for all ages.
2. Identify areas where kiosks and interpretative signs can enhance the educational experience of users of the shoreline.

3. Encourage shoreline stewardship by hosting targeted public meetings aimed at educating property owners about the shoreline environment and opportunities available to restore shoreline ecological functions.

4. Pursue design, funding, and implementation of a restoration demonstration area at a City park or other public property that would be accessible to the public and provide a physical location at which restoration education and volunteer training could occur.

5. Develop strategies to fund these education and outreach efforts and projects.

Goal 6. *Eliminate non-point pollution affecting the shoreline environment by 2016.*

Policies:

1. Create incentives that will make it economically or otherwise attractive for property owners to reduce the use of pesticides, fertilizers, or other materials that pollute ground and surface waters.

2. Team with non-profit organizations to provide household pollutant-specific education to property owners.

6.0 Implementation

This section describes general strategies and approaches for implementing the recommended restoration measures noted previously. Implementation of some of the recommended actions may require additional and/or site-specific information that is not fully available at this time. Further study and evaluation may be required before a detailed implementation plan can be developed.

6.1 Strategies

This section discusses strategies and measures that the City should consider in accomplishing the prioritized restoration projects and programs described in this Restoration Plan. The wide variety of strategies presented will require use of the City's internal resources and support from other public, private and non-profit entities. The City and Sammamish citizens and organizations will likely use a suite of the presented strategies, as well as other techniques, to implement this plan.

6.1.1 Volunteer Coordination

The City should look to accomplish restoration projects by working with and coordinating community volunteers. Volunteers could be recruited for project implementation and monitoring, with the City providing equipment, expertise, and other resources. In order to coordinate volunteer efforts, Sammamish should consider funding a volunteer coordinator to organize projects, solicit various environmental groups and individual volunteers to complete the projects, and partner or coordinate with other government entities on projects.

6.1.2 Regional Coordination

As recommended within the SWCP (2001) the City should continue coordinating with King County and the WRIA 8 planning group rather than attempting to duplicate activities and efforts of these organizations. Efforts and recommendations of both the County and WRIA 8 are identified in Chapter 3 of this report. The City should seek assistance from regional partners in prioritizing, planning, and funding restoration projects.

6.1.3 Municipal Development and Projects

Development activities on City property, from road improvements to construction of necessary public facilities, provide a unique opportunity for the City to implement restoration activities. Design and development efforts allow for implementation of restoration actions that otherwise might not be possible. The City should incorporate restoration into land use activities whenever feasible and in-line with the goals and objectives of this restoration plan.

6.1.4 Development Incentives

The City's Critical Areas Ordinance includes incentives for removing bulkheads and similar hard shoreline structures. The incentives allow property owners to reduced buffer widths when they agree to use alternative (soft-shore) armoring. Expanded use of incentives programs to achieve restoration on privately owned shorelines should be considered whenever feasible and beneficial.

6.1.5 Restoration Demonstration Project

Development strategies that allow for land use planned for within the City's Comprehensive Plan, and other land use plans, while minimizing impacts to (and restoring shorelines and other environmentally sensitive areas) are readily usable. However they are frequently unknown to private property owners. The creation of a restoration strategy demonstration area serves as a valuable tool to educate the public and provides them with information to restore their own property. Through pairing a variety of restoration strategies with interpretive signage and information, Sammamish residents would witness low impact and alternative development strategies in action.

The demonstration project area could additionally serve as a meeting area, providing opportunities for stewardship workshops or restoration volunteer training.

6.1.6 Shoreline and Basin Stewardship

A City-wide stewardship system could be developed through a cooperative arrangement using City resources and citizen time and energy. 'Shore Stewards' programs developed elsewhere in the State have keyed on guidelines for shoreline living. For example, Island County Shore Stewards use the following guidelines:

1. Use water wisely.
2. Maintain your septic tank.
3. Limit pesticide and fertilizer usage.
4. Manage upland water runoff.
5. Encourage native plants and trees.
6. Know permit procedures for shoreline development.
7. Minimize docks, bulkheads, and other shoreline structures.
8. Preserve native near shore vegetation.

6.1.7 Backyard Sanctuary Program

The City could encourage and promote local participation in the Washington Department of Fish and Wildlife Backyard Sanctuary Program.

6.2 Partnership Opportunities

By partnering with other organizations, the City may be able to capitalize on existing financial and technical resources to leverage restoration. There are several active citizen stewardship groups within the City that are focused on basin and shoreline issues. In addition, King County and WRIA 8 programs and plans could provide and/or lead to partnership opportunities for the City. A few of the most relevant citizen- and agency-based programs with partnership potential are described below.

6.2.1 Save Lake Sammamish

Save Lake Sammamish (SLS) is a non-profit Washington corporation that was established to promote and encourage improved water quality in Lake Sammamish and the Sammamish watershed. SLS strategies include "fostering greater public awareness of the environmental and wildlife concerns relating to Lake Sammamish and its watershed and any potential development thereon" (SLS, 2006). Prior activities have included:

- Fostering community awareness through publication of a newsletter (distributed to 3000 homes in the Puget Sound area), press releases, and flyer distribution;
- Maintaining a website as a source for passing information and gaining new members;
- Representation at local government meetings and hearings concerning changes in laws and regulations affecting the environment;
- Speaking out on proposed developments when it is felt adequate attention has not been given to environmental concerns;
- Taking legal action to prevent actions detrimental to Lake Sammamish; and
- Participation in activities such as Stewardship Saturday organized by King County Water and Land Resources to improve water quality.

Sammamish should involve interested and active citizens as a resource in restoration planning and projects.

6.2.2 King County Lake Stewardship Program

The King County Natural Resources and Parks, Water and Land Resources Division Lake Stewardship Program has been collecting data on both Pine Lake and Beaver Lake since the 1980s. This baseline information is discussed at length within the respective basin plans cited earlier within this document. The City should continue to coordinate efforts with King County for shoreline restoration opportunities on the City's lakes. Lake characteristics and health are summarized in the King County Lake Monitoring Report for Year 2004 (King County, 2005).

6.2.3 Cascade Land Conservancy Conservation Program

The Cascade Land Conservancy (CLCs) Conservation Program seeks to conserve urban and rural natural spaces within the Central Puget Sound region, including areas throughout King and Pierce Counties. Priority natural areas include lands along streams, rivers, other areas in the

Cascade foothills, and estuary areas. Additionally, the CLC also works to preserve working farms and forests. The CLC conservation strategies have included securing lands through purchase and donation, conservation easements, and ownership agreements. Since 1989, the CLC has completed 139 projects that have conserved a total 117,783 acres (85% in King County).

In 1995, the CLC and King County, as well as other agencies, achieved permanent preservation of a 116-acre wetland area to the north of Beaver Lake (ELS 21). This area, now known as the Hazel Wolf Wetland Preserve, is managed by the CLC. This action, along with the adjacent 57-acre Beaver Lake Natural Area Preserve (acquired by the City in 2002) and an additional 17-acre property (acquired by the City in 2007), results in a large and contiguous natural open space was formed connecting Beaver Lake to important wetland, stream, and upland habitats.

The CLC has not identified specific recommendations for shoreline or ecological restoration in Sammamish. However, the CLC is an obvious potential partner for future land acquisition efforts in Sammamish.

6.3 Funding Opportunities

Funding opportunities for restoration projects include both federal and state grants and legislative funds administered by state agencies. For potential projects in Sammamish, the greatest likelihood to obtain funding would result from continued participation in the WRIA 8 Steering Committee; interaction with Sammamish-oriented and regionally-oriented environmental non-government organizations (NGOs); and/or strategic partnering with King County agencies. Targeting funding requests through these groups and agencies would fit well into the scientific and restoration plans and goals of the organizations listed below, particularly if they address wetland and open space restoration, water quality improvement, and fish passage barrier removal projects. A few of the programs and organizations most relevant to Sammamish are described below.

6.3.1 King County Conservation District

The King Conservation District (KCD) is a non-regulatory natural resources assistance agency founded in 1949. The District promotes conservation through demonstration projects, educational events, providing technical assistance, and, in some cases, providing or pointing the way to funds that may be available for projects. The WRIA 8 Steering Committee allocates a significant portion of King Conservation District funds annually to support habitat protection and restoration projects, stewardship projects and programs, and essential technical assessments.

6.3.2 Community Salmon Fund

The Community Salmon Fund is established by the National Fish and Wildlife Foundation (NFWF) and Salmon Recovery Funding Board (SRFB) to stimulate small-scale, voluntary action by community groups, in cooperation with landowners and businesses, to support salmon recovery on private property in the Cedar River – Lake Washington – Sammamish Watershed (WRIA 8). Grants are jointly selected by NFWF and King County and administered by the

Foundation to fund habitat protection and restoration projects that have a substantial benefit to watershed health and are consistent with local salmon habitat plans.

The Fund awards grants of up to $75,000. Grant requests in the $10,000-$20,000 range are strongly encouraged. The program's primary focus is smaller, community-based restoration projects. Costs associated with restoration of habitat within and along salmon-bearing rivers and streams are eligible and could potentially meet the stream enhancement needs of the City. The Fund has also previously funded project design and development needs when there is anticipation of a resultant on-the-ground restoration project within 18 months.

6.4 Other Partnership and Funding Agencies

The following agencies and groups could provide additional opportunities for partnerships, either through funding, cooperative work, or volunteering:

1. Day in the Park Program – Earth Share of Washington
2. Beaver Lake Community Club and the Beaver Lake Management District
3. Coastal Protection Account – WA Department of Ecology
4. Aquatic Lands Enhancement Account – WA Department of Natural Resources
5. Five-Star Restoration Program – Environmental Protection Agency
6. Habitat Conservation - U.S. Fish and Wildlife Service Coastal Program
7. Non-point Source Implementation Grant (319) Program – Environmental Protection Agency, WA State Department of Ecology
8. Puget Sound Wetland Restoration Program – Washington State Department of Ecology
9. Regional Fisheries Enhancement Groups – Washington State Department of Fish and Wildlife
10. Wetland Protection, Restoration, and Stewardship Discretionary Funding – Environmental Protection Agency

6.5 Timelines and Benchmarks

In the context of the SMP update, restoration planning is a long-term effort. As stated earlier, the SMP guidelines include the general goal that local master programs "include planning elements that, when implemented, serve to improve the overall condition of habitat and resources within the shoreline area" (WAC 173-26-201(c)). As a long-range policy plan, it is difficult to establish meaningful timelines and measurable benchmarks in the SMP by which to evaluate the effectiveness of restoration planning or actions. Nonetheless, the legislature has provided an overall timeframe for future amendments to the SMP. In 2003, Substitute Senate Bill 6012 amended the Shoreline Management Act (RCW 90.58.080) to establish an amendment schedule for all jurisdictions in the state. Once the City of Sammamish amends its SMP (on or before December 1, 2009), the City is required to review, and amend if necessary, it's SMP once every seven years (RCW 90.58.080(4)). During this review period, the City should document progress toward achieving shoreline restoration goals. The review could include:

- Re-evaluating adopted restoration goals, objectives, and policies;
- Summarizing both planning efforts (including application for and securing grant funds) and on-the-ground actions undertaken in the interim to meet those goals; and
- Revising the SMP restoration planning element to reflect changes in priorities or objectives.

Another mechanism that may serve to establish timelines and benchmarks would be implementation of a shoreline restoration program organized like or integrated with the City's capital improvement program (CIP). Similar to an infrastructure CIP, a shoreline restoration CIP would be evaluated and updated regularly. The CIP would be focused on site-specific projects and would be funded through grants. Further, other CIP projects, such as stormwater facility improvements, could be evaluated to determine if their design could advance shoreline restoration goals.

6.6 Mechanisms for Effectiveness

The SMP guidelines for restoration planning state that local programs should "…appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals" (WAC 173-26-201(2)(f)). In the case of Sammamish, the intent to undergo a City-wide restoration program creates a unique opportunity to ensure that all projects and programs are targeted at achieving the restoration goals.

On a regular and periodic basis, the City should assess the progress toward achieving the specific restoration goals outlined in Chapter 5. Since each of the goal statements describes a desired restoration outcome, the City can determine whether the goals have been met based on whether the outcomes have been achieved.

In addition, the City can use the following general implementation criteria to help prioritize specific projects and actions:

1. Restoration addresses a known impairment or degraded condition.

2. Restoration creates sustainable benefits that require minimal ongoing human intervention.

3. Restoration of habitat forming processes is generally of greater importance than restoration of habitat structure.

4. Restoration avoids cascading impacts to other functions or processes.

5. Restoration priority is given to conditions that are determined to be progressively worsening.

6. Restoration has a high benefit to cost ratio.

7. Restoration is feasible – such as being located on and accessed by public property or private property that is cooperatively available for restoration – and should consider potential conflicting uses with surrounding land uses.

8. Restoration is feasible when there is public support for the project.

9. The project is supported by and/or consistent with other restoration plans (such as for neighboring jurisdictions or for WRIA 8).

Despite all efforts to approach restoration on a City-wide and priority-based fashion, individual projects implemented within Sammamish will incur unexpected setbacks. As restoration projects are designed and implemented, ongoing assessment of project successes and limitations must still occur. A restoration framework developed by Palmer et al, 2005 provides a general roadmap for assessing restoration actions and revising the approach to meeting restoration goals. It includes the following key points:

- Monitor post-restoration conditions;
- Adaptively manage restoration projects; and
- Use monitoring and maintenance results to inform future restoration activities.

Budgeting for restoration projects should consider these post-installation components in order to ensure ongoing success and ultimate achievement of restoration goals and policies.

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APPENDIX A
GLOSSARY OF TERMS

A

"Adfluvial fish" means fish species that spend most of their lifecycle in a lacustrine environment, but return to rivers and streams to reproduce.

"Administrator or Shorelines Administrator " means the Director of the Community Development Department who is to carry out the administrative duties enumerated in this Program, or his/her designated representative.

"Advance outwash sands" means a soil type deposited as glacial ice receded from the Puget Sound lowlands which are typically highly permeable and generally contain significant amounts of groundwater

"Adverse impact" means an impact that can be measured or is tangible and has a reasonable likelihood of causing moderate or greater harm to ecological functions or processes or other elements of the shoreline environment.

"Alluvium" means a general term for clay, silt, sand, gravel, or similar other unconsolidated detrital materials, deposited during comparatively recent geologic time by a stream or other body of running water, as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta.

"Alteration" means any human induced change in an existing condition of a shoreline, critical area and/or its buffer. Alterations include, but are not limited to grading, filling, channelizing, dredging, clearing (vegetation), draining, construction, compaction, excavation, or any other activity that changes the character of the area.

"Anadromous fish" means fish species that spend most of their lifecycle in saltwater, but return to freshwater to reproduce.

"Appurtenance" means development that is necessarily connected to the use and enjoyment of a single-family residence.

"Archaeological Object" means an object that comprises the physical evidence of an indigenous and subsequent culture including material remains of past human life including monuments, symbols, tools, facilities, graves, skeletal remains and technological byproducts.

"Archaeology" means systematic, scientific study of the human past through time.

"Armoring" means the addition of hard structures or hardened material along the shoreline to decrease the impact of waves and currents or to prevent the erosion of banks or bluffs.

"Associated Wetlands" means wetlands that are in proximity to tidal waters, lakes, rivers or streams that are subject to the Shoreline Management Act and either influence or are influenced by are such waters. Factors used to determine proximity and influence include but are not limited to: location contiguous to a shoreline waterbody, formation by tidally influenced geo-hydraulic processes, presence of a surface connection including through a culvert or tide gate, location in part or whole within the 100 year floodplain of a shoreline, periodic inundation, and/or hydraulic continuity.

B

“Bedlands” means those submerged lands below the line of navigability of navigable lakes and rivers.

"Bedrock" means a general term for rock, typically hard, consolidated geologic material that underlies soil or other unconsolidated, superficial material or is exposed at the surface.

"Best management practices" means conservation practices or systems of practices and management measures that:

- Control soil loss and reduce water quality degradation caused by nutrients, animal waste, toxins, and sediment;
- Minimize adverse impacts to surface water and ground water flow, circulation patterns, and to the chemical, physical, and biological characteristics of waters, wetlands, and other fish and wildlife habitats;
- Control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw material.

“Bioengineered shoreline stabilization” means biostructural and biotechnical alternatives to hardened structures (bulkheads, walls) for protecting slopes or other erosive features. Bioengineered stabilization uses vegetation, geotextiles, geosynthetics and similar materials. An example is Vegetated Reinforced Soil Slopes (VRSS), which uses vegetation arranged and imbedded in the ground to prevent shallow-mass movement and surficial erosion.

“Boathouse” means any roofed and enclosed structure built onshore or offshore for storage of watercraft or floatplanes.

"Boat Lift" is an in-water structure used for the dry berthing of vessels above the water level and lowering of vessels into the water periodically. A boat lift as herein defined is used to berth and launch a single vessel, suspended over the water's surface. A boat lift is generally a manufactured unit without a canopy cover and may be placed in the water adjacent to a dock or as stand-alone structure. A boat lift may be designed either for boats or personal watercraft. A boat lift is to be differentiated from a hoist or crane used for the launching of vessels.

“Bog” means a type of wetland dominated by mosses that form peat. Bogs are very acidic, nutrient poor systems, fed by precipitation rather than surface inflow, with specially adapted plant communities.

"Buffer (buffer zone)" means the area adjacent to a shoreline and/or critical area that separates and protects the area from adverse impacts associated with adjacent land uses.

“Building” means any structure used or intended for supporting or sheltering any use or occupancy as defined in the International Building Code.

“Bulkhead” means a wall-like structure such as a revetment that is placed at or near the ordinary high water mark and parallel to shore primarily for retaining uplands and fills prone to sliding or sheet erosion, and to protect uplands and fills from erosion by wave action.

C

"Candidate" means under a species consideration for listing as threatened or endangered under the US Endangered Species Act, indicating that there is a possibility that the species has potential to be at risk of becoming endangered in the foreseeable future.

"Channelization" means the straightening, relocation, deepening or lining of stream channels, including construction of continuous revetments or levees for the purpose of preventing gradual, natural meander progression.

"Chemicals" mean any synthetic substance or mixture of such substances used for a fertilizer, herbicide, pesticide, insecticide, or rodenticide.

"Clearing" means the removal of vegetation or plant cover by manual, chemical, or mechanical means. Clearing includes, but is not limited to, actions such as cutting, felling, thinning, flooding, killing, poisoning, girdling, uprooting, or burning.

"Commercial Development" means those primarily used for retail, service or wholesale trade or other commercial business activities. Included in this definition are hotels, motels, bed and breakfast establishments, shops, restaurants, banks, professional offices, grocery stores, laundromats, recreational vehicle parks, commercial rental campgrounds and cabins, whether public or private, and indoor or intensive outdoor commercial recreation facilities. Not included are private camping clubs, marinas, signs, utilities and other development.

"Conservation" means the prudent management of rivers, streams, wetlands, wildlife and other environmental resources in order to preserve and protect them. This includes the careful use of natural resources to prevent depletion or harm to the environment.

"Conservation easement" means a legal agreement that the property owner enters into to restrict uses of the land for purposes of natural resources conservation. The easement is recorded on a property deed, runs with the land, and is legally binding on all present and future owners of the property.

"Contaminant" means any chemical, physical, biological, or radiological substance that does not occur naturally in ground water, air, or soil or that occurs at concentrations greater than those in the natural levels (Chapter 172-200 WAC).

"County" means King County, Washington.

"Critical aquifer recharge area" means areas designated by SMC 21A.50 that are determined to have a critical recharging effect on aquifers (i.e., maintain the quality and quantity of water) used for potable water as defined by WAC 365-190-030(2).

"Critical area report" means a report prepared by a qualified professional or qualified consultant based on Best Available Science, and the specific methods and standards for technical study required for each applicable critical area. Geotechnical reports and hydrogeological reports are critical area reports specific to geologically hazardous areas and critical aquifer recharge areas, respectively.

"Critical areas" The following areas as designated in the Chapter 21A.50 of the City's code:

- Critical Aquifer Recharge Areas
- Wetlands

- Geologically Hazardous Areas
- Frequently Flooded Areas
- Fish and Wildlife Habitat Conservation Areas

“Critical habitat” means habitat areas with which endangered, threatened, sensitive or monitored plant, fish, or wildlife species have a primary association (e.g., feeding, breeding, rearing of young, migrating). Such areas are identified herein with reference to lists, categories, and definitions promulgated by the Washington Department of Fish and Wildlife as identified in WAC 232-12-011 or 232-12-014; in the Priority Habitat and Species (PHS) program of the Department of Fish and Wildlife; or by rules and regulations adopted by the U.S. Fish and Wildlife Service, National Marine Fisheries Service, or other agency with jurisdiction for such designations.

D

"Deepwater habitats" means permanently flooded lands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium in which the dominant organisms live. The boundary between wetland and deepwater habitat in the riverine and lacustrine systems lies at a depth of two meters (6.6 feet) below low water; however, if emergent vegetation, shrubs, or trees grow beyond this depth at any time, their deepwater edge is the boundary.

"Delineation" means the precise determination of wetland boundaries in the field according to the application of the specific method described in the 1997 Washington State Wetland Delineation manual and/or the, Corps of Engineers Wetlands Delineation Manual 1987 Edition, as amended.

“Developable Area” means the portion of a parcel devoted to construction of a building to accommodate an allowed use, together with access facilities, appurtenances, landscaping, and other associated features.

Development” means a use consisting of the construction or exterior alteration of structures, dredging, drilling, dumping, filling; removal of any sand, gravel or minerals; bulkheading; driving of piling; placing of obstructions; or any project of a permanent or temporary nature that interferes with the normal public use of the surface of the waters overlying lands subject to the Act at any state of water level. This term includes subdivision and short subdivisions; binding site plans; planned unit developments; variances; shoreline substantial development; clearing activity; fill and grade work; activity conditionally allowed; building or construction; revocable encroachment permits; and septic approval and both exempt and substantial developments.

“Dock” means all platform structures or anchored devices in or floating upon water bodies to provide moorage for pleasure craft or landing for water-dependent recreation including but not limited to floats, swim floats, float plane moorages, and water ski jumps. Excluded are launch ramps.

E

“Ecological Functions” or ”Shoreline Functions” means the work performed or role played by the physical, chemical, and biological processes that contribute to the maintenance of the

aquatic and terrestrial environments that constitute the shoreline's natural ecosystem. See WAC 173-26-200 (2)(c). Functions include, but are not limited to, habitat diversity and food chain support for fish and wildlife, ground water recharge and discharge, high primary productivity, low flow stream water contribution, sediment stabilization and erosion control, storm and flood water attenuation and flood peak desynchronization, and water quality enhancement through biofiltration and retention of sediments, nutrients, and toxicants. These beneficial roles are not listed in order of priority.

“Ecosystem Processes”, or “Ecosystem-wide processes” means the suite of naturally occurring physical and geologic processes of erosion, transport, and deposition; and specific chemical processes that shape landforms within a specific shoreline ecosystem and determine both the types of habitat and the associated ecological functions.

"Emergent wetland" means a wetland with at least thirty percent (30%) of the surface area covered by erect, rooted, herbaceous vegetation as the uppermost vegetative strata.

“Endangered” means listed and protected under the US Endangered Species Act, indicating that the described species is in danger of extinction throughout all or a significant portion of its range.

“Enhancement” means actions performed within an existing degraded shoreline, critical area and/or buffer to intentionally increase or augment one or more functions or values of the existing area. Enhancement actions include, but are not limited to, increasing plant diversity and cover, increasing wildlife habitat and structural complexity (snags, woody debris), installing environmentally compatible erosion controls, or removing nonindigenous plant or animal species.

“Epilimnion” means the top-most layer of the lake water column, above the hypolimnion. It is warmer and typically has a higher pH and dissolved oxygen concentration than the hypolimnion. Being at the surface, it subject to surface wind-mixing.

“Erosion” means a process whereby wind, rain, water and other natural agents mobilize, and transport, and deposit soil particles.

“Erosion hazard areas” means lands or areas underlain by soils identified by the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) as having “severe” or “very severe” erosion hazards and areas subject to impacts from lateral erosion related to moving water such as river channel migration and shoreline retreat.

“Eutrophic” means having waters rich in mineral and organic nutrients that promote a proliferation of plant life, especially algae, which reduces the dissolved oxygen content and often causes the extinction of other organisms.

“Excavation” means the disturbance, displacement and/or disposal of unconsolidated earth material such as silt, sand, gravel, soil, rock or other material from all areas landward of OHWM.

"Exotic" means any species of plants or animals that is not indigenous to the area.

F

“Fill material” means any solid or semi-solid material, including rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mining or other excavation

activities, and materials used to create any structure or infrastructure, that when placed, changes the grade or elevation of the receiving site.

“Filling” means the act of transporting or placing by any manual or mechanical means fill material from, to, or on any soil surface, including temporary stockpiling of fill material.

“Fish and wildlife habitat conservation areas” are areas important for maintaining species in suitable habitats within their natural geographic distribution so that isolated populations are not created, as designated in SMC 21A.50.

"Fish habitat" means a complex of physical, chemical, and biological conditions that provide the life supporting and reproductive needs of a species or life stage of fish. Although the habitat requirements of a species depend on its age and activity, the basic components of fish habitat in rivers, streams, ponds, and near-shore areas include, but are not limited to, the following:

- Clean water and appropriate temperatures for spawning, rearing, and holding;
- Adequate water depth and velocity for migrating, spawning, rearing, and holding, including off-channel habitat;
- Abundance of bank and instream structures to provide hiding and resting areas and stabilize stream banks and beds;
- Appropriate substrates for spawning and embryonic development. For stream and lake dwelling fishes, substrates range from sands and gravel to rooted vegetation or submerged rocks and logs. Generally, substrates must be relatively stable and free of silts or fine sand;
- Presence of riparian/near-shore vegetation as defined in this article. Riparian vegetation creates a transition zone, which provides shade, and food sources of aquatic and terrestrial insects for fish;
- Unimpeded passage (i.e. due to suitable gradient and lack of barriers) for upstream and downstream migrating juveniles and adults.

“Fisheries” means all species of fish and shellfish commonly or regularly originating or harvested commercially or for sport in Lake Sammamish and its tributary freshwater bodies, together with the aquatic plants and animals and habitat needed for continued propagation and growth of such species.

“Fisheries Enhancement” means actions taken to rehabilitate, maintain or create fisheries habitat, including but not limited to hatcheries, spawning channels, lake rehabilitation, planting of fisheries stocks.

“Float” means a floating platform similar to a dock that is anchored or attached to pilings.

“Flood or Flooding” mean a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland waters and/or the unusual and rapid accumulation of runoff of surface waters from any source.

“Floodplain, FEMA” means all lands along a river or stream that may be inundated by the base flood of such river or stream.

“Floodplain Management” means a long term program to reduce flood damages to life and property and to minimize public expenses due to floods through a comprehensive system of planning, development regulations, building standards, structural works, and monitoring and warning systems.

“Food Chain” means the hierarchy of feeding relationships between species in a biotic community. The food chain represents the transfer of material and energy from one species to another within an ecosystem.

“Forest Land” means all land that is capable of supporting a merchantable stand of timber and is not being actively used, developed, or converted in a manner that is incompatible with timber production.

“Forest Practices” mean any activity conducted on or directly pertaining to forest land and relating to growing, harvesting, or processing of timber; including, but not limited to: (1) road and trail construction; (2) fertilization; (3) prevention and suppression of diseases and insects; or other activities that qualify as a use or development subject to the Act. Excluded from this definition is preparatory work such as tree marking, surveying and removal of incidental vegetation such as berries, greenery, or other natural products whose removal cannot normally be expected to result in damage to shoreline natural features. Also excluded from this definition is preparatory work associated with the conversion of land for non-forestry uses and developments. Log storage away from forest land is considered under Industry.

“Frequently flooded areas” means lands in the floodplain subject to a one percent (1%) or greater chance of flooding in any given year and those lands that provide important flood storage, conveyance and attenuation functions, as determined by the County in accordance with WAC 365-190-080(3). Classifications of frequently flooded areas include, at a minimum, the 100-year floodplain designations of the Federal Emergency Management Agency and the National Flood Insurance Program, as designated in SMC 21A.50.

“Function assessment or Functions and values assessment” mean a set of procedures, applied by a qualified consultant, to identify the ecological functions being performed in a shoreline or critical area, usually by determining the presence of certain characteristics, and determining how well the area is performing those functions. Function assessments can be qualitative or quantitative and may consider social values potentially provided by area. Function assessment methods must be consistent with Best Available Science.

G

"Game fish" means those species of fish that are classified by the Washington Department of Fish and Wildlife as game fish (WAC 232-12-019).

"Geologically hazardous areas" means areas designated in SMC 21A.50that, because of their susceptibility to erosion, sliding, earthquake, or other geological events, pose unacceptable risks to public health and safety and may not be suited to commercial, residential, or industrial development.

“Geologically Unstable” means the relative instability of a shoreform or land form for development purposes over the long term or the intended life of any proposed structure. Soil, slope, ground or surface water, other geologic conditions, vegetation and effects of development are common factors that contribute to instability. Areas characterized by banks

or bluffs composed of unconsolidated alluvial or glacial deposits (till and drift material), severely fractured bedrock, active and substantial erosion, substantially deformed trees and shrubs, or active or inactive earth slides are likely to be considered geologically unstable.

“Geotechnical Report” or ”Geotechnical Analysis” means a scientific study or evaluation conducted by a qualified professional that includes a description of the ground and surface hydrology and geology, the affected land form and its susceptibility to mass wasting, erosion, and other geologic hazards or processes, conclusions and recommendations regarding the effect of the proposed development on geologic conditions, the adequacy of the site to be developed, the impacts of the proposed development, alternative approaches to the proposed development, and measures to mitigate potential site-specific and cumulative geological and hydrological impacts of the proposed development, including the potential adverse impacts to adjacent and down-current properties. Geotechnical reports shall conform to accepted technical standards.

"Gradient" means a degree of inclination, or a rate of ascent or descent, of an inclined part of the earth's surface with respect to the horizontal; the steepness of a slope. It is expressed as a ratio (vertical to horizontal), a fraction (such as meters/ kilometers or feet/miles), a percentage (of horizontal distance), or an angle (in degrees).

“Grading" means the movement or redistribution of the soil, sand, rock, gravel, sediment, or other material on a site in a manner that alters the natural contour of the land.

"Ground water" means all water that exists beneath the land surface or beneath the bed of any stream, lake or reservoir, or other body of surface water within the boundaries of the state, whatever may be the geological formation or structure in which such water stands or flows, percolates or otherwise moves (Chapter 90.44 RCW).

“Growth Management Act” means RCW 36.70A, and 36.70B, as amended.

H

“Hazardous Area” means any shoreline area which is hazardous for intensive human use or structural development due to inherent and/or predictable physical conditions; such as but not limited to geologically hazardous areas, frequently flooded areas, and coastal high hazard areas.

“Hazardous Materials” means any substance containing such elements or compounds which when discharged in any quantity in shorelines present an imminent and/or substantial danger to public health or welfare; including, but not limited to: fish, shellfish, wildlife, water quality, and other shoreline features and property.

“Hazardous substance” means any liquid, solid, gas, or sludge, including any material, substance, product, commodity, or waste, regardless of quantity, that exhibits any of the physical, chemical or biological properties described in WAC 173-303-090 or 173-303-100.

“Historic Site” means those sites that are eligible or listed on the Washington Heritage Register, National Register of Historic Places or any locally developed historic registry formally adopted by the Sammamish City Council.

“Hydric soil” means a soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part. The presence of hydric soil

shall be determined following the methods described in the Washington State Wetland Identification and Delineation Manual (RCW 36.70A.175).

“Hydrologic soil groups” means soils grouped according to their runoff-producing characteristics under similar storm and cover conditions. Properties that influence runoff potential are depth to seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a low permeable layer. Hydrologic soil groups are normally used in equations that estimate runoff from rainfall, but can be used to estimate a rate of water transmission in soil. There are four hydrologic soil groups:

- Low runoff potential and a high rate of infiltration potential;
- Moderate infiltration potential and a moderate rate of runoff potential;
- Slow infiltration potential and a moderate to high rate of runoff potential; and
- High runoff potential and very slow infiltration and water transmission rates.

“Hydrophytic vegetation” means macrophytic plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

“Hyporheic zone” means the saturated zone located beneath and adjacent to streams that contain some proportion of surface water from the surface channel mixed with shallow groundwater. The hyporheic zone serves as a filter for nutrients, as a site for macroinvertebrate production important in fish nutrition and provides other functions related to maintaining water quality.

“Hypolimnion" means the bottom and most dense layer of water in a thermally-stratified lake. It is the layer that lies below the thermocline. Typically the hypolimnion is the coldest layer in the summer and the warmest during winter. It is isolated from surface wind-mixing and is does not receive enough incoming light for photosynthesis to occur.

I

“Impervious surface” means a hard surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development or that causes water to run off the surface in greater quantities or at an increased rate of flow compared to natural conditions prior to development. Common impervious surfaces may include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled macadam or other surfaces which similarly impede the natural infiltration of storm water. Impervious surfaces do not include surface created through proven low impact development techniques.

“Infiltration” means the downward entry of water into the immediate surface of soil.

“Invasive species" means a species that is 1) non-native (or alien) to King County and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, and other organisms (e.g., microbes). Human actions are the primary means of invasive species introductions.

L

“Lake” means a body of standing water in a depression of land or expanded part of a stream, of twenty acres or greater in total area. A lake is bounded by the OHWM, or where a stream

enters the lake, the extension of the lake's OHWM within the stream. Wetland areas occurring within the standing water of a lake are to be included in the acreage calculation of a lake.

"Landslide" means a general term covering a wide variety of mass movement landforms and processes involving the downslope transport, under gravitational influence of soil and rock material en masse; included are debris flows, debris avalanches, earthflows, mudflows, slumps, mudslides, rock slides, and rock falls.

“Landslide hazard areas” means areas that, due to a combination of site conditions like slope inclination and relative soil permeability are susceptible to mass wasting.

“Launch Ramp” means an inclined slab, set of pads, rails, planks, or graded slope used for launching boats with trailers or occasionally by hand.

“Levee” means a natural or artificial embankment on the bank of a stream for the purpose of keeping floodwaters from inundating adjacent land. Some levees have revetments on their sides.

“Lot” means land described by final plat, short plat or metes and bounds description and is established pursuant to applicable state and local regulations in effect at the date a legal instrument creating the lot is recorded at the County auditor’s office.

M

"Maintenance and repair" means work required to keep existing improvements in their existing operational state. This does not include any modification that changes the character, scope, or size of the original structure, facility, utility or improved area.

“Marsh” means a low flat wetland area on which the vegetation consists mainly of herbaceous plants such as cattails, bulrushes, tules, sedges, skunk cabbage or other hydrophytic plants. Shallow water usually stands on a marsh, at least during part of the year.

“Mass wasting” means downslope movement of soil and rock material by gravity. This includes soil creep, erosion, and various types of landslides, not including bed load associated with natural stream sediment transport dynamics.

"Mean annual flow" means the average flow of a river, or stream (measured in cubic feet per second) from measurements taken throughout the year. If available, flow data for the previous ten (10) years should be used in determining mean annual flow.

“Mesotrophic” is a lake classification describing middle-aged bodies of water; between oligotrophic (young) and eutrophic (old) classifications. A body of water having a moderate amount of dissolved nutrients.

"Mitigation" means individual actions that may include a combination of the following measures, listed in order of preference:

- Avoiding an impact altogether by not taking a certain action or parts of actions;
- Minimizing impacts by limiting the degree or magnitude of an action and its implementation;

- Rectifying impacts by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating an impact over time by preservation and maintenance operations during the life of the action;
- Compensating for an impact by replacing or providing substitute resources or environments; and
- Monitoring the mitigation and taking remedial action when necessary.

“Monitoring” means evaluating the impacts of development proposals over time on the biological, hydrological, pedological, and geological elements of such systems and/or assessing the performance of required mitigation measures throughout the collection and analysis of data by various methods for the purpose of understanding and documenting changes in natural ecosystems and features, and includes gathering baseline data.

N

"Native vegetation" means plant species that are indigenous to the King County and the local area.

“No net loss” means the maintenance of the aggregate total of the City’s shoreline ecological functions. The no net loss standard requires that the impacts of shoreline development and/or use, whether permitted or exempt, be identified and mitigated such that there are no resulting adverse impacts on ecological functions or processes. Each project shall be evaluated based on its ability to meet the no net loss goal.

O

“Oil” means petroleum or any petroleum product in liquid, semi-liquid, or gaseous form including but not limited to crude oil, fuel oil, sludge, oil refuse and oil mixed with wastes other than dredging spoil.

“Oligotrophic” means lacking in plant nutrients and having a large amount of dissolved oxygen throughout.

“Open Space” means any parcel or area of land or water not covered by structures, hard surfacing, parking areas and other impervious surfaces except for pedestrian or bicycle pathways, and set aside/dedicated, for active or passive recreation, visual enjoyment or critical area buffers.

“Ordinary High Water Mark” or “OHWM” on all lakes and streams means that mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that condition exists on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with approved development; provided that, in any area where the OHWM cannot be found, the OHWM adjoining fresh water shall be the line of mean high water. For braided streams, the OHWM is found on the banks forming the outer limits of the depression within which the braiding occurs.

P

"Pond" means an open body of water, generally equal to or greater than 6.6 feet deep, that persists throughout the year and occurs in a depression of land or expanded part of a stream and has less than thirty percent (30%) aerial coverage by trees, shrubs, or persistent emergent vegetation. Ponds are generally smaller than lakes

"Pool / riffle" means an area of stream or river habitat, in which a pool is where water flows through the channel without any change in surface gradient and a riffle is where water flows through the channel at a higher velocity with a moderate gradient.

"Potable" means water that is suitable for drinking by the public (Chapter 246-290 WAC).

"Preservation" means actions taken to ensure the permanent protection of existing, ecologically important areas that the City has deemed worthy of long term protection.

"Priority habitat" means a habitat type with unique or significant value to one or more species. An area classified and mapped as priority habitat must have one or more of the following attributes: Comparatively high fish or wildlife density; comparatively high fish or wildlife species diversity; fish spawning habitat; important wildlife habitat; important fish or wildlife seasonal range; important fish or wildlife movement corridor; rearing and foraging habitat; refuge; limited availability; high vulnerability to habitat alteration; unique or dependent species; or shellfish bed. A priority habitat may be described by a unique vegetation type or by a dominant plant species that is of primary importance to fish and wildlife (such as oak woodlands or eelgrass meadows). A priority habitat may also be described by a successional stage (such as, old growth and mature forests). Alternatively, a priority habitat may consist of a specific habitat element (such as talus slopes, caves, snags) of key value to fish and wildlife. A priority habitat may contain priority and/or non-priority fish and wildlife (WAC 173-26-020(24)).

"Priority species" means wildlife species of concern due to their population status and their sensitivity to habitat alteration, as defined by the Washington Department of Fish and Wildlife.

"Public Access" means the public's right to get to and use the State's public waters, the water/land interface and associated shoreline area. It includes physical access that is either lateral (areas paralleling the shore) or perpendicular (an easement or public corridor to the shore), and/or visual access facilitated by scenic roads and overlooks, viewing towers and other public sites or facilities.

R

"Reach" means a segment of shoreline and associated planning area that is mapped and described as a unit (for purposes of inventorying conditions) due to homogenous characteristics that include land use and/or natural environment characteristics.

"Recharge" means the process involved in the absorption and addition of water from the unsaturated zone to ground water.

"Recreation" means an experience or activity in which an individual engages for personal enjoyment and satisfaction. Most shore-based recreation outdoor recreation such as: fishing, hunting, clamming, beach combing, and rock climbing; various forms of boating, swimming, hiking, bicycling, horseback riding, camping, picnicking, watching or recording activities

such as photography, painting, bird watching or viewing of water or shorelines, nature study and related activities.

"Recreational Development" means the modification of the natural or existing environment to accommodate recreation. This includes clearing land, earth modifications, structures and other facilities such as parks, camps, camping clubs, launch ramps, golf courses, viewpoints, trails, public access facilities, public parks and athletic fields, hunting blinds, wildlife enhancement (wildlife ponds are considered excavation), and other low intensity use outdoor recreation areas. Recreational homes and related subdivisions of land are considered residential; resorts, motels, hotels, recreational vehicle parks, intensive commercial outdoor or indoor recreation and other commercial enterprises are considered commercial.

"Re-establishment" means measures taken to intentionally restore an altered or damaged natural feature or process including:

- Active steps taken to restore damaged wetlands, streams, protected habitat, and/or their buffers to the functioning condition that existed prior to an unauthorized alteration;
- Actions performed to re-establish structural and functional characteristics of the critical area that have been lost by alteration, past management activities, or other events; and
- Restoration can include restoration of wetland functions and values on a site where wetlands previous existed, but are no longer present due to lack of water or hydric soils.

"Rehabilitation" means a type of restoration action intended to repair natural or historic functions and processes. Activities could involve breaching a dike to reconnect wetlands to a floodplain or other activities that restore the natural water regime.

"Renovation" means to restore to an earlier condition as by repairing or remodeling. Renovation shall include any interior changes to the building and those exterior changes that do not substantially change the character of the existing structure.

"Repair or maintenance" mean an activity that restores the character, scope, size, and design of a serviceable area, structure, or land use to its previously authorized and undamaged condition. Activities that change the character, size, or scope of a project beyond the original design and drain, dredge, fill, flood, or otherwise alter critical areas are not included in this definition.

"Resident fish" means a fish species that completes all stages of its life cycle within freshwater and frequently within a local area.

"Residential Development" means buildings, earth modifications, subdivision and use of land primarily for human residence; including, but not limited to: single family and multifamily dwellings, mobile homes and mobile home parks, boarding homes, family daycare homes, adult family homes, retirement and convalescent homes, together with accessory uses common to normal residential use. Camping sites or clubs, recreational vehicle parks, motels, hotels and other transient housing are not included in this definition.

"Restore", "Restoration" or "Ecological Restoration" means the re-establishment or upgrading of impaired ecological shoreline processes or functions. This may be accomplished through measures including, but not limited to, revegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre- European settlement conditions. "Restoration" also means any activity that ensures watershed processes are reinstated.

"Rip Rap" means dense, hard, angular rock free from cracks or other defects conductive to weathering used for revetments or other shore stabilization or flood control.

"Riparian corridor or Riparian zone" mean the area adjacent to a water body (stream, lake or marine water) that contains vegetation that influences the aquatic ecosystem, near-shore area and/or and fish and wildlife habitat by providing shade, fine or large woody material, nutrients, organic debris, sediment filtration, and terrestrial insects (prey production). Riparian areas include those portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems (i.e., zone of influence). Riparian zones provide important wildlife habitat. They provide sites for foraging, breeding and nesting; cover to escape predators or weather; and corridors that connect different parts of a watershed for dispersal and migration.

"Riparian vegetation" means vegetation that tolerates and/or requires moist conditions and periodic free flowing water thus creating a transitional zone between aquatic and terrestrial habitats which provides cover, shade and food sources for aquatic and terrestrial insects for fish species. Riparian vegetation and their root systems stabilizes stream banks, attenuates high water flows, provides wildlife habitat and travel corridors, and provides a source of limbs and other woody debris to terrestrial and aquatic ecosystems, which, in turn, stabilize stream beds.

S

"Shoreline Modification" means any human activity that changes the structure, hydrology, habitat, and/or functions of a shoreline. Bulkheads, piers, docks, shoreline stabilization systems, berms, and dikes are all examples of shoreline modifications

"Shoreline Stabilization" are structural or non-structural modifications to the existing shoreline intended to reduce or prevent erosion of uplands or beaches. They are generally located parallel to the shoreline at or near the OHWM. Other construction classified as shore defense works include groins, jetties and breakwaters, which are intended to influence wave action, currents and/or the natural transport of sediments along the shoreline.

"Shorelands or Shoreland areas" mean those lands extending landward for 200 feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward 200 feet from such floodways; and all wetlands and river deltas associated with the streams, lakes and tidal waters which are subject to the provisions of Chapter 90.58 RCW.

"Shorelines" are all of the water areas of the state as defined in RCW 90.58.030, including reservoirs and their associated shorelands, together with the lands underlying them except:

- Shorelines of statewide significance;

- Shorelines on segments of streams upstream of a point where the mean annual flow is twenty cubic feet per second (20 cfs) or less and the wetlands associated with such upstream segments; and
- Shorelines on lakes less than twenty (20) acres in size and wetlands associated with such small lakes.

"Shoreline Administrator" means the Director of Community Development or staff member designated by the Director to perform the review functions required in this program.

“Shoreline Jurisdiction” means all shorelines of the state and shorelands.

“Shoreline Permit” means a shoreline substantial development permit, a shoreline conditional use, or a shoreline variance, or any combination thereof issued by Whatcom County pursuant to RCW 90.58.

“Shorelines of Statewide Significance” means those lakes, whether natural, artificial, or a combination thereof, with a surface acreage of 1,000 acres or more measured at the ordinary high water mark including Lake Sammamish.

“Shorelines of the State” means the total of all “Shorelines” and “Shorelines of Statewide Significance” within the State.

“Single family development” means the development of a single family residence permanently installed and served with utilities on a lot of record.

“Site” means any parcel or combination of contiguous parcels, or right-of-way or combination of contiguous rights-of-way under the applicant’s/proponent’s ownership or control where the proposed project impacts an environmentally critical area.

"Slope" means:

- Gradient.
- The inclined surface of any part of the earth's surface, delineated by establishing its toe and top and measured by averaging the inclination over at least 10 feet of vertical relief.

"Soil" means all unconsolidated materials above bedrock described in the Soil Conservation Service Classification System or by the Unified Soils Classification System.

"Streams" are those areas where surface waters produce a defined channel or bed. A defined channel or bed is an area that demonstrates clear evidence of the annual passage of water and includes, but is not limited to, bedrock channels, gravel beds, sand and silt beds, and defined channel swales. The channel or bed need not contain water year round. This definition includes drainage ditches or other artificial water courses where natural streams existed prior to human alteration, and/or the waterway is used by anadromous or resident salmonid or other fish populations.

“Structure” means a permanent or temporary building or edifice of any kind, or any piece of work artificially built up or composed of parts joined together in some definite matter whether installed on, above, or below the surface of the ground or water, except for vessels (after International Building Code).

“Substantially Degrade” means to cause significant ecological impact.

“Substrate” means the underlying bed layer that makes up the bottom of a lake or stream, frequently composed of rock, gravel, sand, organic material, or a combination of these materials.

“Swamp” means a wetland that is often inundated and composed of woody vegetation.

T

“Threatened” means listed and protected under the US Endangered Species Act, indicating that the described species is likely to become endangered in the foreseeable future.

"Toe" means the lowest part of a slope or cliff; the downslope end of an alluvial fan, landslide, etc.

"Top" means the top of a slope; or in this chapter it may be used as the highest point of contact above a landslide hazard area.

“Total Maximum Daily Load” or “TMDL” is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.

“Transportation” means roads and railways, related bridges and culverts, fills, embankments, causeways, parking areas, truck terminals and rail switchyards, sidings, spurs, and air fields; not included are recreational trails, highway rest areas, ship terminals, seaplane moorages, nor logging roads; they are included respectively under Recreation, Piers and Docks, Residential, and Forest Practices.

“Trophic” of or relating to nutrition; “Trohpic level” means the position that an organism occupies in a food chain.

U

“Unavoidable” means adverse impacts that remain after all appropriate avoidance and minimization measures have been implemented.

“Unbuildable Land” means land that is not suitable for use as building sites or for impervious road, parking or storage areas, because of inherent hazards to structures or human activity thereon. Such lands may include, but are not limited to: some geologically hazardous areas, critical aquifer recharge areas, and frequently flooded areas.

“Upland” means dry lands landward of OHWM.

"Utilities" means all lines and facilities used to distribute, collect, transmit, or control electrical power, natural gas, petroleum products, information (telecommunications), water, and sewage.

“Utility Development” includes but is not limited to facilities for distributing, processing, or storage of water, sewage, solid waste, storm drainage, electrical energy including electronic communications, and their administrative structures, as well as pipelines for petroleum products, and fire fighting facilities.

V

"Vegetative Stabilization" means planting of vegetation to retain soil and retard erosion, reduce wave action, and retain bottom materials. It also means utilization of temporary structures or netting to enable plants to establish themselves in unstable areas.

W

"Water Body" means a body of still or flowing water, fresh or marine, bounded by the OHWM.

"Water Quality" means the characteristics of water, including flow or amount and related, physical, chemical, aesthetic, recreation-related, and biological characteristics.

"Watershed" means a geographic region within which water drains into a particular river, stream or body of water.

"Weir" means a structure in a stream or river for measuring or regulating stream flow.

"Wet season" means the period generally between November 1 and March 30 of most years when soils are wet and prone to instability. The specific beginning and end of the wet season can vary from year to year depending on weather conditions.

"Wetlands" means areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands do not include those artificial wetlands intentionally created for non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass lines swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate the conversion of wetlands.

"Wetland buffer" means a designated area contiguous or adjacent to a wetland that is required for the continued maintenance, function, and ecological stability of the wetland.

"Wetland class" means the general appearance of the wetland based on the dominant vegetative life form or the physiography and composition of the substrate. The uppermost layer of vegetation that possesses an aerial coverage of thirty percent (30%) or greater of the wetland constitutes a wetland class. Multiple classes can exist in a single wetland. Types of wetland classes include forest, scrub/shrub, emergent, and open water.

"Wetland edge" means the boundary of a wetland as delineated based on the definitions contained in this chapter.

"Wetland enhancement" See " mitigation."

"Wetland mitigation bank" means a site where wetlands and buffers are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources.

"Windthrow" means a natural process by which trees are uprooted or sustain severe trunk damage by the wind.