

CITY OF SAMMAMISH

Cumulative Impacts Analysis

Prepared for:
The City of Sammamish
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EXECUTIVE SUMMARY

The City of Sammamish is updating its Shoreline Master Program (SMP) (known as Title 25 of the Sammamish Municipal Code) to comply with the Washington State Shoreline Management Act of 1972¹ and the state's shoreline guidelines². As part of this effort, the City is required to evaluate the cumulative impacts of "reasonably foreseeable" future development to verify that the proposed policies and regulations for managing its shorelines are adequate to ensure 'no net loss' of shoreline functions. The Cumulative Impact Analysis provides a planning-level assessment of the effects on the shoreline environment resulting from activities and development under the proposed update of the Sammamish Shoreline Master Program (SMP).

As directed by the state guidelines, the City prepared this Cumulative Impacts Analysis to consider and evaluate³:

1. Current circumstances affecting the shorelines and relevant natural processes (Chapters 2 and 3 of this report);
2. Reasonably foreseeable future development and use of the shoreline (Chapters 4 and 5); and
3. Beneficial effects of established or proposed plans and programs under other local, state, and federal laws (Chapter 6).

The analysis conducted for this report includes detailed evaluation of the potential effects of subdivision of property and effects caused by unregulated activities, developments that are exempt from a shoreline substantial development permit, and residential bulkheads, residential piers, and runoff from newly developed properties.

The Sammamish shorelines are largely developed with residential uses. There are limited opportunities for new development within the 200-foot shoreline jurisdiction. Therefore, major changes in development patterns or use are unlikely. Much of the foreseeable development activity will be redevelopment of existing structures.

For all foreseeable development, the Sammamish SMP includes standards and procedures for evaluating the effects of specific development actions on a case-by-case basis before individual shoreline development projects are approved. To achieve no net loss, the SMP requires each project to avoid impacts, but where that is not possible, to minimize them, then replacing damaged resources through mitigation efforts. The proposed development standards and mitigation requirements will ensure that new residential development, as it occurs over time, will not affect shoreline resources.

The report demonstrates that commonly occurring shoreline activities and developments within the City will not result in a net loss of ecological functions compared to 'baseline' or today's

¹ Revised Code of Washington (RCW) 90.58

² Washington Administrative Code (WAC) 173-26, Part III

³ WAC 173-26-186(8)(d)

conditions (see Chapter 7 for additional detail)⁴. The Sammamish SMP has been developed in accordance with the state shoreline guidelines and is consistent with the shoreline management goals and policies established by the Shoreline Management Act. The SMP proposes new shoreline environment designations and development standards for shoreline modifications and uses and establishes strong protections for shoreline functions and processes. The standards restrict activities that would cause adverse impacts to the shoreline environment, require mitigation for allowable impacts, encourage other low impact development (LID) strategies, and provide incentives to restore existing shoreline resources where they would benefit from improvements.

Based on the assessment of these factors, it is anticipated that the individual development actions taken over time in accordance with the proposed update of the Sammamish SMP are not likely to result in a net loss of shoreline ecological functions from existing baseline conditions.

⁴ For this planning-level assessment, the baseline conditions are the conditions that are generally identified and described in the City's Final Shoreline Inventory and Characterization Report (ESA Adolfson, June 2007).

1.0 INTRODUCTION

The City of Sammamish is updating its Shoreline Master Program (SMP) (Currently King County's 1979 Shoreline Master Program also known as Title 25 of the Sammamish Municipal Code [SMC]) to comply with the Washington State Shoreline Management Act of 1972⁵ (SMA or the Act) and the state's shoreline guidelines⁶ (the guidelines), which were adopted in 2003. As part of this effort, the City is required to evaluate the cumulative impacts of reasonably foreseeable future development to verify that proposed policies and regulations for shoreline management are adequate to ensure 'no net loss' of shoreline functions.

1.1 Shoreline Guideline Requirements

According to the shoreline guidelines, the City is required to evaluate and consider cumulative impacts of reasonably foreseeable future development on the shorelines of the state as follows⁷:

“To ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly allocate the burden of addressing cumulative impacts among development opportunities. Evaluation of such cumulative impacts should consider: (i) current circumstances affecting the shorelines and relevant natural processes; (ii) reasonably foreseeable future development and use of the shoreline; and (iii) beneficial effects of any established regulatory programs under other local, state, and federal laws.”

In addition, the guidelines require evaluation of the effects caused by:

- Unregulated activities,
- Developments that are exempt from a shoreline substantial development permit, and
- Residential bulkheads, residential piers, and runoff from newly developed properties.

The guidelines also require that particular attention be paid to platting or subdividing property and installation of infrastructure that could establish a pattern for future shoreline development.

1.1.1 Planning Versus Project Level Assessments

According to the guidelines, the assessment of cumulative impacts occurs at both the planning stage (when the master program is being developed) and at the time individual development proposals are reviewed. The guidelines suggest that impacts of 'commonly occurring and planned development' be assessed at the planning stage “without reliance on an individualized cumulative impacts analysis.” In contrast, developments that have un-anticipatable or uncommon impacts, which cannot be reasonably identified at the time of SMP development should be evaluated via the shoreline substantial development permit or conditional use permit processes to

⁵ Revised Code of Washington (RCW) 90.58

⁶ Washington Administrative Code (WAC) 173-26, Part III

⁷ WAC 173-26-186(8)(d)

ensure that all impacts are addressed and that there is no net loss of ecological function after mitigation.⁸

1.2 Document Purpose and Scope

This report provides a planning level assessment of the potential cumulative impacts that would result from shoreline use and development under the proposed Sammamish SMP (Published SMP Internal Review Draft II, dated December 2009), which was approved by the Sammamish City Council in October 2009. This analysis is revised from preliminary cumulative impacts analysis that occurred in December 2008 during the final stages of the Planning Commission SMP review process. This report is prepared as a requirement of the City's grant from the Department of Ecology (SMA Grant No. G0600310).

This assessment is limited to cumulative impacts of reasonably foreseeable future development in areas subject to SMA jurisdiction. For the City of Sammamish, shorelines of the state include approximately 7 linear miles of the Lake Sammamish shoreline within the City limits, 2.2 linear miles of the Pine Lake shoreline (entirely within the City), and 2.6 linear miles of the Beaver Lake shoreline (encompassing three connected bodies of water that collectively form Beaver Lake, also entirely within the City). A reach of the upper Patterson Creek shoreline is within the City's potential annexation area (PAA); however annexation of the Patterson Creek shoreline area is not being considered at the time of publication, so it is not included in this analysis of cumulative effects⁹.

Chapter 2 of this report details the current circumstances affecting the City's lake shorelines. This is supplemented by a summary of existing shoreline conditions in Chapter 3. Proposed SMP policies and regulations that will affect how future shoreline development will occur are described in Chapter 4. Chapter 5 identifies potential adverse effects of reasonably foreseeable future development and describes how the proposed SMP mitigates those effects. Chapter 6 details additional beneficial effects of existing programs for ensuring avoidance and minimization of shoreline impacts and requiring that unavoidable impacts are offset. The final chapter (Chapter 7) documents that the development standards and mitigation requirements of the proposed SMP, together with other City, State, and Federal programs, ensure that future development will not cause a net loss of shoreline functions.

The objective of this report is to demonstrate that commonly occurring shoreline uses and developments within the City will not result in a net loss of ecological functions compared to 'baseline' conditions. For this planning-level assessment, the baseline conditions are the conditions that are generally identified and described in the City's Final Shoreline Inventory and Characterization Report (ESA Adolfson, June 2007).

The Sammamish SMP includes standards and procedures for evaluating the effects of specific development actions on a case-by-case basis before individual shoreline development projects are approved. These project-level analyses will allow site-scale factors to be included in the assessment of baseline conditions to supplement the inventory information available for the City

⁸ WAC 173-26-201(3)(d)(iii)

⁹ The creek is under the jurisdiction of the King County SMP until annexation occurs.

as a whole. To achieve no net loss, the SMP requires each project to mitigate impacts by avoiding, then minimizing adverse effects, then replacing damaged resources through compensatory mitigation efforts.

2.0 CIRCUMSTANCES EFFECTING SHORELINES AND RELEVANT NATURAL PROCESSES

The Sammamish shorelines are influenced by human actions and natural processes. Lake Sammamish, Pine Lake and Beaver Lake are part of the East Lake Sammamish (ELS) basin, which encompasses most of the City of Sammamish as well as areas west and south of the City. This is one of the fastest growing areas in King County with a population that increased 157 percent during the 1980s (King County, 1994). In 2005, the City's population was estimated to be 38,640, having experienced a 2.5 percent cumulative annual growth rate since 2000. During that same timeframe King County grew at only 0.8 percent (Sammamish Town Center Planning White Paper Growth Scenarios Task Force Discussion Draft April 26, 2006). Population increases have amplified development pressures on the shorelines and throughout the City, altering the natural processes that shape and control shoreline functions. This section briefly describes the key circumstances and natural processes affecting Sammamish's shorelines.

2.1 Key Circumstances

2.1.1 Basin-wide Circumstances

Across the ELS basin estimates of changes in percent impervious surface indicate that the total impervious area increased from 6.3 to 16.2 percent between 1991 and 2001, with an additional 10 percent increase expected by 2011 (Anchor Environmental, 2004). The increase in impervious surface corresponds with a 33 percent decrease in forest cover (from 39 to 26 percent cover across the ELS basin) for the same 10 year period (1991 to 2001) (Anchor Environmental, 2004). These changes in land use and land cover have affected the ways that water, sediments, nutrients, organic materials, and fish and wildlife species move throughout the basin as discussed in Section 2.2 below.

2.1.2 Reach-scale Circumstances

In addition to being affected by basin-wide changes in land cover, impervious surface, and population, Sammamish's shoreline are affected by actions taken directly on the shoreline (these are referred to as reach-scale changes). The general circumstances affecting the shorelines in Sammamish include the following:

Circumstances common to the Lake Sammamish, Pine Lake and Beaver Lake shorelines:

- Residential uses (primarily single family), park/public recreational uses, and transportation and utility uses are the only land uses present in the shoreline planning area. There are no industrial uses (including ports), commercial uses or mixed-use developments and none are expected in the foreseeable future.
- The majority of the existing platted lots in private ownership contain a single family residence and the percent of undeveloped or vacant lots is very low (approximately 18 percent vacant along Lake Sammamish shoreline and approximately 5 percent vacant on both the Pine and Beaver Lake shorelines).
- Single-family development has modified the shoreline environment. Field surveys have not been conducted to document and confirm shoreline conditions on a parcel-by-parcel basis but aerial photography shows a general trend toward shoreline modification. The majority of parcels on Lake Sammamish have a bulkhead or some other form of

‘hardened’ or ‘armored’ shore as well as a dock. On most privately owned lots, residential landscaping has displaced natural nearshore vegetation. The northern Lake Sammamish shoreline is an exception in that it retains more natural vegetation than the southern and central shoreline areas (but there are pockets of native cover all along the lakeshore especially near stream mouths and wetlands). There are also substantial pockets of native vegetation on the Pine and Beaver Lake shorelines, but most residences retain a sizeable percentage of their lake frontage as lawn.

- The existing lots were created between 40 and 70 years ago and there is limited ability to substantially alter the general development patterns.
- Land values have increased dramatically in recent years increasing development pressure on the remaining undeveloped lots and putting tremendous redevelopment pressure on many other lots.

Circumstances affecting only Lake Sammamish:

- Many existing lots were established with lot areas far smaller than would be permitted under the City’s development code (SMC 21A), and resultant development has occurred at higher densities than would be permitted under zoning.
- Publically owned lots along the shoreline are mostly undeveloped and are located on the northern end of the City limits (the proposed ‘Sammamish Landing’ public park area); the only improved public access provided within the shoreline area is the East Lake Sammamish Trail, which provides views of the lake but no direct physical access to the water and Lake Sammamish State Park just south of the City limits.
- Restoring and protecting the north end of Lake Sammamish is identified as one of the near-term actions in the WRIA 8 Chinook Salmon Conservation Plan (WRIA 8, 2005). However, the limited amount of undeveloped publically owned shoreline, as well as undeveloped or underdeveloped privately owned shoreline, may limit opportunities for restoration adjacent to the shoreline.

Circumstances affecting only Pine and Beaver Lakes:

- Municipal sewer is sparsely available (except along the southern and western side of Pine Lake and the east side of Beaver Lake); existing (and new) developments (will) rely mainly on on-site septic systems for the foreseeable future. This could create challenges in terms of protecting water quality although existing basin plans have not identified on-site septic systems as a major source of nutrients and bacteria (Tetra Tech, Inc. 2006; and King County, 2007).
- Lot sizes are relatively large (typical lots sizes are between 20,000 and 50,000 square feet) and most homes are set back from the shore at least 40 to 60 feet. This means that the amount of vegetative cover as a percentage of the lot size is somewhat higher than on Lake Sammamish.

2.2 Relevant Natural Processes

This section describes how the basin-wide and reach-scale circumstances noted above have affected natural processes and shoreline conditions within the City of Sammamish.

2.2.1 Surface Water Flow

Growth and development have increased the amount and extent of impervious surface, which has altered the intensity, timing, and duration of peak flows in many tributary streams. The short-circuiting of natural drainage pathways that occurs when flows are concentrated on the surface rather than allowed to percolate into the soil 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 mouths 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 provide important water storage and nutrient cycling functions (CH2M Hill, 2001).

2.2.2 Water Quality

Basin-wide circumstances have led to water quality degradation throughout the wetlands, streams, and lakes of the ELS basin. Some of the specific causes of water quality degradation include increased phosphorus from fertilizers, phosphate-bearing detergents, septic tank leachate, animal waste, and over-release of natural phosphorus compounds due to development-derived erosion. Phosphorus is the primary nutrient of concern and threatens the nutrient status of Lake Sammamish, Pine Lake and Beaver Lake. Use of fertilizers for lawn maintenance along the lakeshores and throughout the watershed could trigger algal blooms during the summer months when the lakes are highly stratified. Fertilizers can also decrease dissolve oxygen levels, which can further alter the nutrient status of the lakes. High nutrient levels can have adverse effects on the recreational and aesthetic qualities of the lakes.

Contamination from fecal coliform is also a concern. There are several possible sources of fecal coliform including animal waste (pets and/or waterfowl) and failing/leaky septic systems, but it is not known which, if any, of these sources contributes fecal coliform to surface waters in Sammamish. Pine and Beaver Lakes may be at increased risk for coliform contamination because of the high percentage of homes on septic systems within these two watersheds and because alteration of vegetation in the shoreline area contributes to increased waterfowl use. Although areas of intact woody vegetation occur across significant areas of the Pine and Beaver Lake shorelines, there are also many residential lots where lawns closely approach the lake shore. Migratory and non-migratory geese and ducks commonly feed on succulent grasses in areas where lawns are adjacent to ponds and lakes. Given historical and recent fecal coliform levels, and ongoing land uses and wildlife patterns that have been identified as potential sources, fecal coliform contamination will continue to be a concern on these lakes.

On Pine and Beaver Lakes, shoreline development has displaced some of the natural vegetation that shelters the lakes from wind effects. When trees and shrubs along the lakeshore are removed the lakes are more susceptible to wind mixing, which can release phosphorus trapped near the bottom of the lakes to the surface layers causing algal blooms. Both the Pine Lake and Beaver Lake management plans note the potential for water quality degradation due to wind mixing, and the pathway for this threat is vegetation removal.

2.2.3 Habitat Disconnection and Loss of Primary Productivity

Development throughout the City has fragmented habitat making it more difficult for some fish and wildlife to move from the lakeshores to other areas that they require for life stage functions. Although many of the important habitats within the City are linked by stream riparian corridors,

these corridors are at risk of degradation/fragmentation caused by roads and development encroachment. Lake Sammamish, Pine Lake and Beaver Lake are all ringed by residential development and arterial roadways, which means that fish and wildlife that use these shorelines may become more isolated or limited in terms of movement and dispersal.

Within the Pine Lake and Beaver Lake shoreline areas, there are higher levels of forest and vegetated cover than on the Lake Sammamish shoreline. The intact patches of forest provide some habitat continuity to areas surrounding the small lakes, although residential and arterial roadways (setback from the shoreline edge between 75 and 800 feet) interrupt habitat corridors to some degree.

The proliferation of residential docks, piers, and bulkheads along the lakeshores also reduces the quality and availability of habitat for fish and wildlife species. This is most pronounced on the Lake Sammamish shore where bulkhead construction has reduced the amount of nearshore vegetation¹⁰ and displaced shallow-water migratory habitat and spawning and foraging 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, Pine Lake and Beaver Lake that are not subject to intense wind-driven waves or tidal action, these effects tend to be localized, but they can still have adverse implications for aquatic habitat (Kahler, 2000)¹¹.

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). 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 the lakes is not known and it is expected that most new docks will be constructed using alternative, less harmful materials.

2.2.4 Processes Affected by Private and Public Recreational Uses

Recreational use of the City's lake shorelines creates additional challenges for maintaining ecological functions. Potential impacts on all lakes include noise and light (glare) impacts to fish and wildlife and spreading exotic species of plants and plankton. Additional potential impacts to Lake Sammamish, where motorized water craft are allowed, include increased wave energy and shoreline erosion, direct physical injury due to contact with people and watercraft, re-suspension

¹⁰ There are reaches of the Lake Sammamish shoreline within City jurisdiction in which a vegetated buffer remains intact. The longest contiguous reach of with a vegetated buffer is located at the north of end of the City's Lake Sammamish shoreline (approximately 3,000 linear feet of shoreline in City and private ownership; 50 to 100 foot-wide deciduous forest buffer). Likewise, reaches of the Pine and Beaver Lake shoreline have intact buffers. In addition, residential structures in the small lake shoreline areas are further setback from OHWM and vegetated buffers are far more common on residential lots.

¹¹ Lake Sammamish is a 'low energy' aquatic environment compared to most marine environments or lakes with greater fetch. Lakes have small waves created by wind action and limited in size by lake surface area and do not have the tidal cycles or currents associated with marine environments.

of contaminated sediments and/or increased turbidity caused by propeller scour, and possible introduction of chemical pollutants from boat emissions.

3.0 GENERAL SHORELINE CONDITIONS

This chapter outlines general conditions along each of the City's SMA-regulated shorelines. Patterns of existing and planned land use and development are described along with habitat and water quality conditions. More detailed information on shoreline conditions is included in the Reach Inventory and Analysis of the *Shoreline Inventory and Characterization Report* (ESA Adolfson, 2007).

3.1 Lake Sammamish

Land use and development patterns are very uniform along the Lake Sammamish shoreline. The entire shoreline is zoned for urban residential development at a density of 4 dwelling units per acre (R4 zoning). According to the zoning code, R4 zoned lands are "predominantly environmentally unconstrained and are served at the time of development, by adequate public sewers, water supply, streets, and other needed public facilities and services." The existing pattern of residential development was established between 1925 and 1950, with parcel size ranging from less than 1,000 square feet (SF) to 10,000 SF. A typical Lake Sammamish shoreline parcel is approximately 7,000 SF.

As would be expected from underlying zoning, moderate-density single-family residential encompasses 87 percent the Shoreline Planning Area (SPA), with the remaining area designated as Public/Institutional use (park land)¹², transportation uses associated with East Lake Sammamish Parkway, residential access roads, and the East Lake Sammamish Trail (Figure 1). A recent study of total impervious surface by land use type indicates that the entire Lake Sammamish SPA is approximately 44 percent impervious (ESA Adolfson, 2007; OEHHA, 2007).

According to King County Assessor's data, approximately 70 of the 416 parcels within the SPA were listed as 'vacant' in 2007 (Table 1; City of Sammamish, 2007). Some of these 'vacant' parcels are owned by individuals or community groups and are used as private recreational properties. Across the entire shoreline, the overwhelming majority of the lots have a bulkhead or some form of 'hardened' shoreline and a dock.

The City is currently in the planning stages of developing publically owned properties at the north end of the lake for public recreational use. The area, to be known as Sammamish Landing, stretches across 3,000 linear feet of wooded shoreline. The property is not currently open to the public. Potential park elements could include a swimming beach, public dock or pier, picnic areas, fishing access, restrooms, parking, and access to the East Lake Sammamish Trail.

¹² The SPA encompasses the land within 200 feet of the mapped edges of Lake Sammamish, Pine Lake, and Beaver Lake; all floodways and 100-year floodplains currently mapped by the Federal Emergency Management Agency (FEMA) that are associated with the lakes; and all mapped wetlands that lie adjacent and contiguous to the areas above. On Lake Sammamish, the mapping of the FEMA 100-year floodplain is determined from a base flood elevation (BFE) of 33 feet NGVD 29. See Section 6.1 of this analysis for more information about management of flood plains in Sammamish.

Figure 1. Typical Lake Sammamish Land Use and Shoreline Modification Patterns on Lake Sammamish (Weber Point Vicinity)



Purple lines depict the approximate landward extent of shoreline jurisdiction (exclusive of associated wetlands).

Table 1. General Land Use Characteristics of Shoreline Properties on Lake Sammamish, Pine Lake, and Beaver Lake

Lake	Total Number of Parcels	Vacant Parcels		Docks ¹³		Shoreline Parks and Open Spaces
		Number	% of total	Number	% of total	
Lake Sammamish	421	77	18%	368	87%	No existing parks, however planned park at north end of lake; East Lake Sammamish Trail runs parallel to the lakeshore
Pine Lake	147	8	5%	111	75%	Pine Lake Park: park on east side of lake w/ 450 ft. of recently restored shoreline
Beaver Lake	125	8	6%	91	73%	NE Beaver Lake: Preserve open space w/ 1800 ft. of natural shoreline; SW: Park w/ 2100 ft. of minimally modified shoreline

Scientists who have studied Lake Sammamish have found that the lake has a mesotrophic (as opposed to eutrophic) state, meaning it has moderate levels of biological activity, moderate water clarity, moderate algal growth, and moderate phosphorus concentrations. The trophic status is very important because it can affect ecological health and habitat quality (e.g. dissolved oxygen levels), aesthetics (algal blooms), and recreational use. If the trophic status were to change from mesotrophic to eutrophic, a number of adverse effects would be likely including:

- Noxious algae (scums, blue-greens, taste and odor, visual);
- Loss of open water due to excessive macrophyte growth;
- Loss of clarity;
- Loss of habitat for fish and fish food (low dissolved oxygen)
- Smothering eggs and bugs (excessive organic matter production)
- Odors due to "toxic" gases (ammonia, hydrogen sulfide) in bottom water;

There are seasonal variations in transparency or water clarity within Lake Sammamish. Two main factors reduce transparency in lakes, including Lake Sammamish: 1) fine sediment suspended in stormwater runoff (often described as turbidity) – a phenomenon occurring primarily during the winter, and 2) growth of algae or phytoplankton, which reduces water clarity and water quality during summer. In Lake Sammamish, the average reduction in clarity from turbidity during winter currently exceeds the average reduction in clarity caused by summer increases in algae growth. This, however, is not a static condition; increased nutrient loading in the future could result in lower water clarity during the summer than during the winter.

¹³ Existing dock counts are based on analysis of 2007 oblique shoreline photos; 2006 aerial photos and field verification by Maren VanNostrand, City of Sammamish (refined from initial numbers presented in the June 2007 Inventory and Characterization Report). Vacant parcel analysis conducted by City of Sammamish staff, 2007.

Although Lake Sammamish currently meets water quality standards for phosphorus, the lake is at risk for several other water quality parameters. Currently, Lake Sammamish is on Ecology's 303(d) list, as a Category 5 waterbody for ammonia N, dissolved oxygen, and fecal coliform¹⁴ (Ecology 303(d) water quality data are available at <http://www.ecy.wa.gov/programs/wq/303d/index.html>).

Lake Sammamish provides important habitat to numerous native and non-native species of fish. Five species of salmonids use the lake's open water habitat along with its tributaries for migration, spawning, and rearing. These species include Chinook, coho and sockeye/kokanee salmon, as well as steelhead/rainbow trout and coastal cutthroat trout. Invasive warmwater species of fish include both large and smallmouth bass, yellow perch, black crappie, pumpkinseed sunfish, and brown bullhead. These non-native species, particularly adult perch and bass, are known to be predators of juvenile salmon and their young will also compete with salmon for food in shallow water habitats (WRIA 8, 2005).

As detailed in the June 2007 Shoreline Inventory and Characterization report, the Lake Sammamish shoreline also provides habitat to several avian predator species, including bald eagles, osprey, and red-tail hawks, as well as other avian species including mergansers, cormorants, mallards, grebes, American coots, Canadian geese, gulls, swifts, and great blue and green herons. Some of the best habitat areas are at the north end of the lake where the shoreline is less heavily developed and where relatively large patches of native vegetation remain intact (Watershed Company, 2000). Purple martins nest along the north end of the shoreline.

3.2 Pine Lake

Land use and development patterns are relatively uniform along the Pine Lake shoreline. Low-density single-family residential represents 96 percent of existing land use within the SPA. The existing pattern of residential development was established between 1940 and 1960, with some additional platting and short subdivision in subsequent decades. The land is zoned R4. Parcel sizes in the SPA range from 10,000 SF to 150,000 SF with a typical Pine Lake shoreline parcel being 20,000 SF to 50,000 SF in size. Of the 147 parcels in the SPA, approximately five percent (eight parcels) were listed as 'vacant' in a 2007 analysis of Assessor's data (Table 1, Figure 2; City of Sammamish, 2007). Across the entire shoreline, bulkheads and private use docks associated with residential development are very common. One park, Pine Lake Park, provides public access to the water. It occupies a 19-acre site on the eastern side of the lake and makes up approximately four percent of the Pine Lake SPA (City of Sammamish, 2004). Pine Lake Park is owned and operated by the City of Sammamish and has approximately 550 linear feet of shoreline. There is a large 1.84 acre private open space tract on the west side of Pine Lake as part of the Pine Brook Meadows Subdivision. Current zoning and anticipated future land use is consistently low-density single-family residential throughout the Pine Lake SPA¹⁵.

¹⁴ Category 5 refers to polluted waters that require establishment of a total maximum daily load (TMDL).

¹⁵ Both the City's Zoning Map and Comprehensive Land Use Map indicate R4 (4 residential units per acre) surrounding the Pine Lake shoreline, with publically owned parcels designated as Public/Institutional by the Comprehensive Land Use Map. Areas to the west of the lake, potentially within the SPA, are designated R1.

Moderate-density single-family residential development represents more than 96 percent of existing land use within the Pine Lake SPA, with the remaining area in public ownership and designated for Public/Institutional use (park land¹⁶) and transportation uses (adjacent arterials and residential streets). A recent study of total impervious surface estimated by land use indicates that the entire Pine Lake SPA is approximately 39 percent impervious (ESA Adolphson, 2007; OEHHA, 2007).

Figure 2. Existing Land Use and Shoreline Modification Patterns on Pine Lake



Pine Lake has had a history of water quality problems (high phosphorus and algal blooms) dating back several decades. In the 1970s, Pine Lake was considered to have the poorest water quality of any Puget Sound lowland lake (Tetra Tech, 2006). Studies by Metro in the late 1970s and early 1980s determined that a substantial percentage of the soluble phosphorus entering the lake was attributable to runoff from an adjacent wetland. The flow from that wetland was diverted to the lake outlet in 1988 and water quality conditions are noticeably improved since that time.

The state's 2004 water quality assessment lists Pine Lake as a Category 5 water for total phosphorus. The 303(d) listing cites data from Welch (2002) indicating that summer total phosphorus concentrations in the upper layers of Pine Lake remained high following the diversion of flow from the adjacent wetland in 1988. This is attributed to an estimated 56 percent increase in watershed development. Other problems cited in the 303(d) listing are blue-green algae, turbidity, dissolved oxygen, tributary nutrient inputs, and low transparency. The lake is currently also listed as a Category 5 water for fecal coliform. Pine Lake Creek is listed as a 303(d) Category 5 water for dissolved oxygen and fecal coliform.

A potential cause for water quality concerns on Pine Lake is the number of on-site septic systems within the lake SPA (Figure 3). These systems, which are used for wastewater treatment on 85 percent of the properties within the SPA, could affect water quality conditions if not properly functioning or if not maintained. Existing septic systems that provide substandard treatment or are otherwise failing are a potential source of fecal coliform as is animal waste from pets and waterfowl. However, it is not known whether or to what extent these sources actually contribute fecal coliform into the lake.

¹⁶ Pine Lake Park is the only park providing public access to Pine Lake. It occupies a 19-acre site on the eastern side of the lake. Access to the shoreline is also available via public street ends along the southern lobe of Pine Lake and along 29th street.

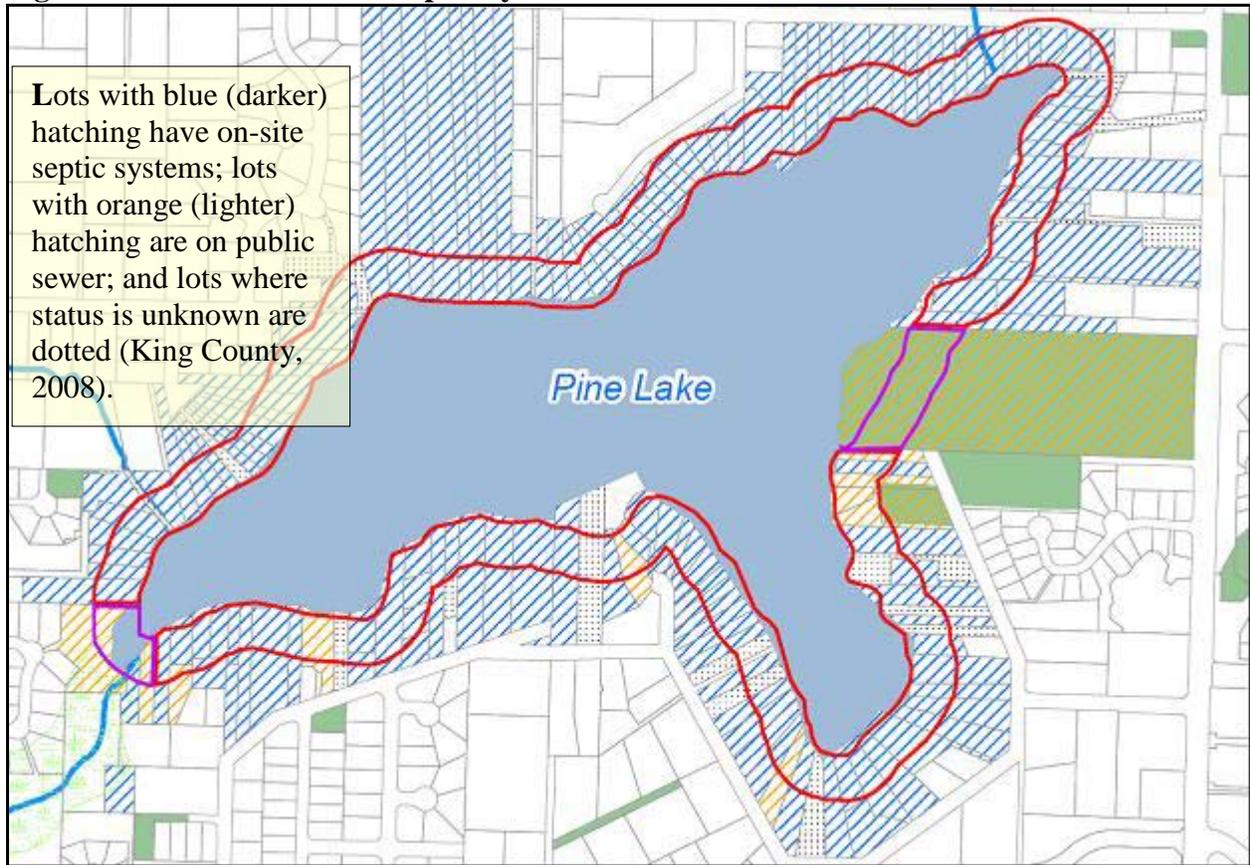
Pine Lake contains several non-native species of fish including largemouth bass, yellow perch, brown trout, and black crappie. Pine Lake is also stocked with rainbow trout (WDFW, 2006) and also likely supports a small population of native coastal cutthroat trout. According to the ELS Basin Plan (King County, 1994), WRIA 8 Known Freshwater Distribution Mapping (King County, 2001), and WDFW SalmonScape mapping (accessed December 2008), there is no anadromous fish use in Pine Lake. Anadromous fish do however use Pine Lake Creek, with coho and coastal cutthroat use mapped in the lower portion of the stream according to the ELS Basin Plan and WRIA 8 Known Freshwater Distribution Mapping. It is possible that populations of anadromous salmonids historically utilized Pine Lake, as Williams et al., 1975 only mapped natural, and passable, fish passage barriers along Pine Lake Creek.

Large concentrations of waterfowl, including Canadian geese, ruddy ducks and mallards, are also present within the vicinity of Pine Lake, and raptors such as bald eagles, ospreys and red-tailed hawks are routinely seen in the area (WDFW, 2006; King County, 2005). City staff have reported great blue herons at Pine Lake (Susan Cezar, personal communication 2006).

Pine Lake Creek, which is the primary outflow of the lake, is a salmonid-bearing stream with anadromous fish use up to river mile 0.60. Excellent pool/riffle habitat occurs throughout the stream, particularly where the stream falls from the plateau to Lake Sammamish.

A large, high quality wetland is located on the southwestern shore of Pine Lake, just south of the outlet to Pine Lake Creek (54 acres in size, documented as Wetland ELS 30 by King County, 1994). Several narrow wetlands are also present along the northern and southeastern shorelines; these wetlands are connected to the regulated shoreline and are therefore assumed to be 'associated' wetlands.

Figure 3. Lots with On-Site Septic Systems within the Pine Lake SPA



3.3 Beaver Lake

Low-density single-family residential represents 85 percent of existing land use within the Beaver Lake SPA. The remaining area is publically owned park land. The existing pattern of residential development was established between 1940 and 1960, with some additional platting and short subdivision in subsequent decades. Parcel sizes in the SPA are similar to those in the Pine Lake SPA and are typically between 20,000 SF and 50,000 SF. Of the 125 parcels in the SPA, approximately six percent (eight parcels) were listed as ‘vacant’ in 2007 (Table 1, Figure 4; City of Sammamish, 2007).

As with Lake Sammamish and Pine Lake, private use docks associated with residential parcels are very common, however the shoreline is less armored than the Pine Lake shoreline (an informal field survey showed that approximately one-third of the parcels have bulkheads). Public access to the Beaver Lake shoreline is provided at three locations: Beaver Lake Park, Beaver Lake Preserve, and a WDFW-owned boat launch. Approximately 15 percent of the shoreline planning area is developed in parks or designated as open space. Current zoning and anticipated

future land use is consistently low- to moderate-density single-family residential throughout the Beaver Lake SPA¹⁷.

As would be expected from underlying zoning, moderate-density single-family residential represents 85 percent of existing land use within the SPA, with the remaining area in public ownership and designated in the Comprehensive Plan for Public/Institutional use (park land¹⁸) and transportation land uses associated with portions of adjacent arterials and residential streets. A recent study of total impervious surface estimated by land use indicates that the entire Beaver Lake SPA is approximately 35 percent impervious (ESA Adolfson, 2007; OEHHA, 2007).

Figure 4. Existing Land Use and Shoreline Modification Patterns on Beaver Lake



Phosphorus is the limiting nutrient in Beaver Lake and is therefore a key factor in managing the water quality. According to the recently updated Beaver Lake Management Plan, phosphorus levels in the lake have remained at similar levels over the last decade (King County, 2007). Currently, Beaver Lake is on Ecology's 2004 303(d) list as a Category 2 "waters of concern" for total phosphorus. Basin models show build-out will likely lead to increased phosphorus levels in coming years with greater impacts such as increased algae bloom frequency and diminished water clarity (King County, 2007).

Dissolved oxygen levels in Beaver Lake generally remain good in the dense bottom layers of the lake through June before finally dropping off to their lowest values in October. Fecal coliform counts at Beaver Lake also continue to be low, averaging less than 10 CFU/100 ml (King, County, 2000).

¹⁷ Both the City's Zoning Map and Comprehensive Land Use Map indicate R4 (4 residential units per acre) surrounding the Beaver Lake shoreline, with publically owned parcels designated as Public/Institutional by the Comprehensive Land Use Map.

¹⁸ Public access to the Beaver Lake shoreline is provided at three locations: Beaver Lake Park, Beaver Lake Preserve, and a WDFW-owned boat launch area. Beaver Lake Park is 83 acres in size and is within the shoreline planning area on the southwest shore of the lake. Beaver Lake Preserve is 54 acres in size and is located on the northeast side of the lake. The WDFW manages a public boat launch area directly across the lake from Beaver Lake Park. Only non-motorized boats or those with electric motors are allowed.

As with Pine Lake, the number and density of on-site septic systems within the Beaver Lake SPA is a potential water quality concern (Figure 5). These systems, which are used for wastewater treatment on 87 percent of the properties within the SPA, could affect water quality conditions if not properly function or if not maintained. Existing septic systems that provide substandard treatment or are otherwise failing are a potential source of fecal coliform as is animal waste from pets and waterfowl. However, it is not known whether or to what extent these sources actually contribute fecal coliform into the lake.

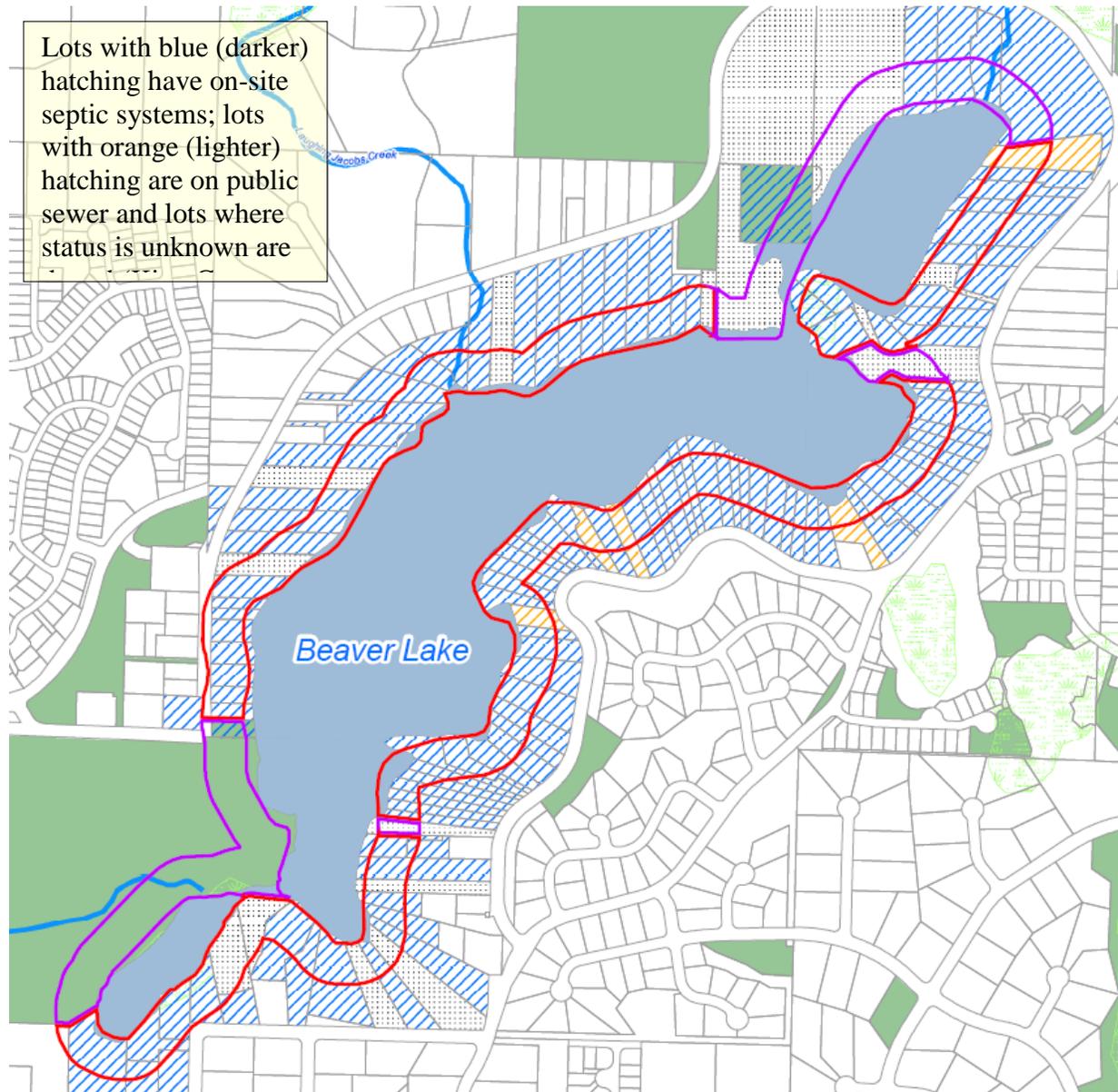
Beaver Lake contains several non-native species of fish including largemouth bass, yellow perch, brown trout, and black crappie. Beaver Lake is also stocked with rainbow trout (WDFW, 2006) and supports a small population of native coastal cutthroat trout. According to the ELS Basin Plan (King County, 1994), WRIA 8 Known Freshwater Distribution Mapping (King County, 2001), and WDFW SalmonScape mapping (accessed December 2008), there is no anadromous fish use in Beaver Lake. Anadromous fish use is known downstream of Beaver Lake in Laughing Jacobs Creek, with coho and coastal cutthroat use mapped in the lower portion of the stream according to the ELS Basin Plan and WRIA 8 Known Freshwater Distribution Mapping. Historical mapping of anadromous fish use also shows a fish passage barrier along the lower portion of the stream (Williams et al., 1975).

Significant concentrations of waterfowl, including Canadian geese, ruddy ducks and mallards, are also present within the vicinity of Pine Lake, and raptors such as bald eagles, ospreys and red-tailed hawks are routinely seen in the area (WDFW, 2006; King County, 2004).

Additionally, the open water and shoreline habitat of Beaver Lake provides habitat for various species of frogs, salamanders and newts. Deer are also observed along the lakeshore.

The Hazel Wolf Wetland Preserve, located to the north of Beaver Lake and the adjoining Beaver Lake Preserve provides additional habitat for a variety of mammals, birds, reptiles and amphibians.

Figure 5. Lots with On-site Septic Systems within the Beaver Lake SPA



4.0 OVERVIEW OF PROPOSED SMP POLICIES AND REGULATIONS

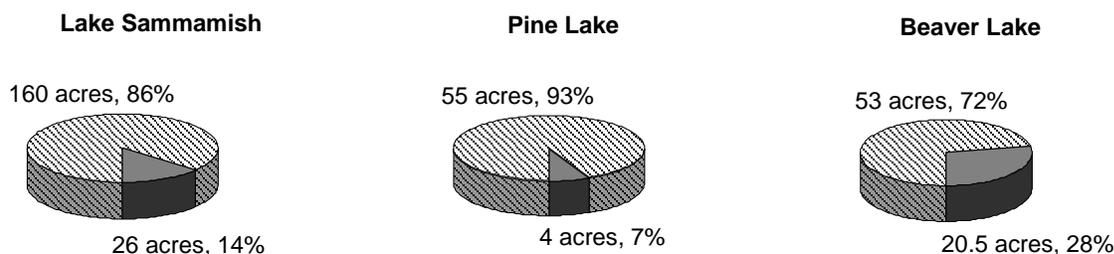
The Lake Sammamish, Pine Lake and Beaver Lake shorelines are planned, platted, and developed primarily for single family residential uses and waterfront parks. Proposed updates to the City's SMP will not have a significant change on the general land use pattern. However, the proposed SMP will protect shoreline functions and values and accommodate preferred shoreline uses such as single family residential development and public water-oriented recreational development in a number of ways. These are described below.

4.1 Shoreline Environment Designations

The proposed SMP includes two shoreline environment designations: 'Shoreline Residential' for areas of the City that are characterized by single-family residences or planned as such; and 'Urban Conservancy' for waterfront parks/open spaces and residential areas that maintain a high level of ecological function (Figure 6). These designations apply to the 'shorelands' (the areas landward of the ordinary high water mark) and the adjacent waters (areas waterward of the ordinary high water mark). The SMP does not use an Aquatic designation for the areas waterward of the ordinary high water mark; however the Urban Conservancy and Shoreline Residential policies and regulations cover all of the anticipated in- or over-water uses/activities that would occur waterward of the OHWM, so there are no gaps in coverage. The proposed environment designations are consistent with both the existing land use pattern and the Comprehensive Plan land use designations. This new environment designation system is consistent with the shoreline guidelines (WAC 173-26-211) and applies designation criteria and management policies consistently across areas with similar land use and ecological characteristics.

The proposed environment designations establish designation boundaries that are different from the Conservancy and Rural designation boundaries of the previous SMP. Although there is not an exact relationship between the previous environment designations and the Urban Conservancy and Shoreline Residential designations, the changes do have some implications on anticipated development. These issues are primarily associated with the shift of approximately 60 lots from Conservancy to the Shoreline Residential. This shift was determined to be necessary to reflect existing land use patterns (including permitted development that had occurred under the previous SMP) and anticipated and desired land use patterns. Potential implications of this change relate to dock spacing, shoreline setbacks, and residential subdivision. An analysis of each of these potential shoreline and land use changes is provided within applicable sections of this report.

Figure 6. Approximate Percentages of the Lake Sammamish, Pine Lake, and Beaver Lake Shorelines Designated Shoreline Residential (striped) and Urban Conservancy (solid)¹⁹.



4.2 Development Standards and Use Regulations

The proposed SMP includes development regulations that prevent and/or mitigate impacts of new development. Property owners proposing new shoreline use or development must mitigate adverse environmental impacts in accordance with measures listed in SMC 25.06.020(10). Mitigation measures must be implemented according to the standard mitigation sequence of first avoiding, then minimizing, then compensating for impacts or providing replacement resources.

To protect water quality, the SMP requires shoreline developments to limit the amount of clearing and grading to the minimum necessary to accommodate the allowed use/development and to incorporate all known, available, and reasonable methods of preventing, controlling, and treating stormwater to protect and maintain surface and ground water quantity and quality. Best management practices (BMPs) for controlling erosion and sedimentation and preventing pollutants from entering shoreline waterbodies must be implemented for all new uses/developments. The SMP also contains minimum criteria that must be met before properties can be subdivided. Subdivision may only occur on those lots with a minimum width of 50 feet at or near the OHWM. In addition, all created lots must have a minimum size of 12,500 square feet as calculated only using lot areas landward of the OHWM. These regulations are in addition to the City's land use (SMC 21A) and subdivision (SMC 19) regulations and the King County Department of Health (septic siting requirements).

Other aspects of the proposed SMP that will prevent cumulative impacts from occurring are summarized below.

4.2.1 Critical Area Regulations Incorporated

The SMP integrates significant components of the City's critical areas regulations (SMC 21A.50) which were adopted in 2005. Standards for protection of geologic hazard areas, streams, wetlands, critical aquifer recharge areas, and fish and wildlife habitat conservation areas will apply within shoreline jurisdiction. Standards for protection of fish and wildlife habitat conservation areas allows habitat conservation areas to be altered only if the proposed alterations

¹⁹ Acreages and percentages reported in Figure 6 reflect designations as of August 2009; final City Council review of shoreline environment designations was completed in October 2009.

do not reduce the quantitative and qualitative functions and values of the habitat (after mitigation is factored in). Mitigation standards specified within SMC 21A.50 are integrated and will apply throughout shoreline jurisdiction. The critical area regulations also establish special management overlay districts to protect water quality in Pine Lake and Beaver Lake – standards for these special management districts are integrated within the SMP for those areas within shoreline jurisdiction. Section 5.3.1 of this report describes other beneficial effects of the City’s critical areas regulations.

The buffers on Lake Sammamish and building setbacks on Pine and Beaver lakes established by the critical areas regulations are replaced by specific shoreline setback and enhancement standards in the SMP. Section 4.2.2 of this report details the SMP shoreline setback and enhancement area requirements that will replace the Lake Sammamish buffer and Pine and Beaver Lake building setback requirements of SMC 21A.50. As detailed in Section 4.2.2 below, the shoreline setback standards of the SMP are consistent with the ecological protections provided by SMC 21A.50. Additional components of SMC 21A.50 (and other referenced portions of SMC 21A) repealed by the SMP are limited to permit review criteria, allowed uses, nonconforming use standards, and other administrative procedures. For these components of the critical areas regulations, the regulatory standards established by the SMP will apply.

4.2.2 Shoreline Setback, Enhancement, and Vegetation Conservation Standards

The SMP establishes a 45-foot standard shoreline setback (plus a five foot building setback) for Lake Sammamish, Pine Lake, and Beaver Lake. This means that all new non-water oriented development on all three lakes must observe the 45-foot standard shoreline setback unless specifically allowed by SMC 25.06.020(7). Allowances for developments and uses of the setback include: accessory uses and structures including decks under eighteen (18) inches and impervious ground surfaces; docks, floats, and shoreline stabilization; public access structures, picnic tables, boat launches, docks, floats, and shoreline stabilization structure; transportation facilities; and utility facilities. Additional allowances are provided for structural modifications to legally established homes within the shoreline setback. There are no allowances for waterward expansion of such structures within the shoreline setback area (except on Lake Sammamish, where such expansion could be feasible if shoreline setback reduction strategies are implemented). Lateral and landward modifications expanding the footprint in the shoreline setback by 200 square feet are allowed and modifications expanding the footprint 201 to 1000 square feet within the shoreline setback are allowed with mitigation which may include establishment of a vegetation enhancement area. Additions previously allowed in the CAO laterally and landward are further limited to the “shadow” area behind and landward of the existing structure unless setback reduction provisions are utilized (Lake Sammamish) with mitigation. For Pine and Beaver lakes no setback reductions are permitted, resulting in additions allowed only in the “shadow” area of the setback. See SMC 25.06.020(8) for details on developments, activities, and uses that are allowed within the shoreline setback. In addition to the shoreline setback, an additional five foot-wide building setback is established from the landward edge of the shoreline setback. Allowances for development within the five foot-wide building setback are specified by SMC 25.06.020(6).

The SMP establishes a 15-foot vegetation enhancement area for Lake Sammamish. The vegetation enhancement area is established as the first 15 feet of the shoreline setback, as measured landward from the OHWM. Specific development activities, including construction or expansion of shoreline stabilization structures necessitate that the property owner establish and

maintain this area with native vegetation to improve ecological functions. In addition, expansion of residential structures by more than 200 square feet within the shoreline setback or reduction of the shoreline setback under the criteria provided by SMC 25.06.020(10) may necessitate implementation of the vegetation enhancement area requirements. As specified by SMC 25.06.020 (9), the vegetation enhancement area shall be planted and maintained with at least seventy-five percent (75%) of the vegetation consisting of native trees, shrubs, and groundcover, where up to twenty-five percent (25%) of the vegetation may be composed of non-native or ornamental plantings.

The SMP regulations allow the Lake Sammamish shoreline setback to be reduced in all shoreline environments without a shoreline variance when an applicant takes specific measures to restore the shoreline. This offers a way for property owners to reduce the shoreline setback without a shoreline variance and in effect creates an incentive for property owners to improve shoreline functions, including habitat, by removing bulkheads, restoring shorelines and planting native shoreline vegetation. Consistent with other components of the shoreline setback and enhancement standards of the SMP, the system of setback reduction and required compensatory restoration measures are consistent with previously established critical areas standards. The restoration measures included within the SMP were analyzed to ensure that the reduced shoreline setback width would result in a high functioning lake riparian area. Allowances for shoreline setback reduction and required restoration measures are shown in Table 2.

The SMP setback system described above maintains ecological protections currently provided by the City's critical areas regulations (SMC 21A.50). Changes to the system are intended to integrate the overall system of shoreline setbacks throughout the City and clarify restrictions on allowed setback area uses as expressed as a concern by shoreline property owners. The SMP revises the regulatory terminology to consistently use 'shoreline setback' for Lake Sammamish as well as Pine and Beaver Lakes. This change reflects the longstanding allowances for use of the shoreland area (uses allowed by SMC 21A.50 and the previous SMP as well as the proposed SMP) and addresses property owner concerns over perceived land use restrictions. The overall minimum Lake Sammamish shoreline setback for structures is maintained, and standards for shoreline setback are revised from the criteria of SMC 21A.50 to enhance overall ecological function of the shoreline setback area and the entire shoreline jurisdiction (for example, incentivizing reductions in impervious surfaces throughout a shoreline property).

Table 2. Lake Sammamish Shoreline Setback Reduction Allowances and Restoration Incentives per SMC 25.06.020(10).

Reduction	Number of feet the standard Lake Sammamish shoreline setback may be reduced	Reduction Criteria
		Reductions may be cumulative, but in no case shall the resulting shoreline setback be less than fifteen (15) feet*. Planting in accordance with VEA requirements.
1	15 feet	<p>(a) For removal of an existing bulkhead located at, below, or within five feet landward of the lake's ordinary high water mark (OHWM) and subsequent restoration of the shoreline to a natural or seminatural state, including the restoration of topography, soil composition, and vegetation; or,</p> <p>(b) For restoration of the shoreline to a natural or seminatural state if no bulkhead is present, but other existing unnatural shoreline contours are present; or,</p> <p>(c) For preservation of the existing natural shoreline conditions if no bulkhead or other unnatural shoreline features are present.</p>
2	10 feet	For establishment of a 15-foot vegetation enhancement area along the shoreline.
3	10 feet	For establishment of at least a 5 foot width of native vegetation along the entire waterward side of a modified bulkhead, including the use of small gravel or rock fill, as part of an Army Corps of Engineer approved plan and in compliance with all WDFW and other appropriate agency regulations.
4	5-10 feet	Reduction of 5 feet for impervious surface coverage 10 percent less than city standard and 10 feet for impervious surface coverage 20 percent less than the city standard as allowed by SMC 25.07.080(2)(b) or (c).
5	5 feet	For limiting lawn area to no greater than 20 percent of the shoreline jurisdiction area.
6	1-10 feet	For every 50 square feet of native planting area added landward of, and adjacent to, the VEA, 1 foot reduction (up to 10 feet maximum reduction).
7	5 feet	For preservation of existing native vegetation or restoration of native vegetation, as necessary, in a minimum 5 foot wide nearshore area below the lake's ordinary high water mark (OHWM).

Reduction	Number of feet the standard Lake Sammamish shoreline setback may be reduced	Reduction Criteria Reductions may be cumulative, but in no case shall the resulting shoreline setback be less than fifteen (15) feet*. Planting in accordance with VEA requirements.
8	5 feet	For preparation of, and agreement to adhere to, a written shoreline vegetation management plan that includes appropriate limitations on the use of fertilizer, herbicides, and pesticides as needed to protect lake water quality.

* Plus the five (5) foot building setback (SMC 25.06.020)

Although property owners are allowed limited additions to existing structures within the setback or may reduce the setback width on Lake Sammamish, the effects are offset by the beneficial actions that property owners take to enhance nearshore/shoreline vegetation and/or remove hard armoring. By creating an incentive for property owners to “soften” bulkheads and incorporate fish-friendly, natural shorelines and restore the riparian areas immediately landward of the shoreline, the overall condition of the shoreline is expected to improve compared to current conditions.

On highly developed shorelines in developed basins, like the Lake Sammamish shoreline and the East Lake Sammamish Basin, actions outside of shoreline jurisdiction can have as much or potentially greater impacts on shoreline functions than buffer width and wide buffers may not be that advantageous in terms of maintaining water quality and habitat. However, vegetation enhancement and bulkhead removal at the water’s edge can have positive effects on water quality and habitat by creating shade, providing organic inputs, removing impediments to migration, and opening up spawning habitat (see the Sammamish Shoreline Inventory and Characterization Report, and Chapter 2 of this report, for further discussion). As a result of required setback reduction actions, the net adverse effect of the reduced setback width is negligible.

To ensure that the shoreline setback reduction allowances for the Lake Sammamish shoreline result in long term restoration and enhancement of the lake’s riparian area, the City should implement an effective monitoring and tracking effort to assess the effects of shoreline setback reduction over time. The SMP explicitly requires that all reduction measures be installed, monitored, maintained and inspected according to the mitigation provisions in the critical areas regulations (SMC 25.06.020(10)(b)). Due to the additional sensitivity that is inherent to narrow setbacks (reduced riparian width) of the Lake Sammamish shoreline, and the greater emphasis that is placed on shoreline and riparian restoration in these areas, additional implementation guidelines that will ensure that cumulative impacts do not accrue as a result of setback reduction are appropriate.

Since adoption of the critical area regulations in 2005, approximately 15 development proposals have used the buffer reduction allowances provided in the CAO (personal communication with K. Curry, November 2008). A small portion of these have been approved and the restoration is complete. The remainder are still in the design, permitting, and/or construction phases. According to city staff, the reduced buffer allowance has been used for new residential development on previously vacant lots, for complete tear-downs and rebuilds, for residential additions, and as a means to retroactively mitigate code-violations in accordance with City code-enforcement actions.

The SMP maintains currently required 45-foot shoreline setbacks (plus a five foot building setback) on Pine and Beaver Lakes. New development outside of the previously identified allowances must occur outside the shoreline setback unless a shoreline variance is granted. The SMP provides new provisions that encourage protection of vegetation within the shoreline setback area. In addition to the requirements for the shoreline enhancement area, the SMP includes the requirement that 80 percent of significant trees must be maintained.

Further, the SMP requires that vegetation clearing be limited to the minimum necessary to accommodate approved shoreline uses and developments. Consistent with the provisions of the integrated critical areas regulations, activities that include vegetation clearing will require a vegetation management plan. These plans will require removal of noxious weeds and/or non-native invasive species as necessary to facilitate establishment of a stable community of native plants (SMC 21A.50.160).

For all three lakes, the proposed SMP shoreline setback, vegetation enhancement, and vegetation retention standards will, over time, improve overall canopy and root mass within shoreline jurisdiction. This standard will enhance the City's ability to retain remaining forest cover, help offset previous losses of forest cover due to clearing throughout the ELS basin, and improve overall surface water and water quality conditions over time.

4.2.3 Limits on Bulkheads and Shoreline Modifications

The SMP restricts construction of new bulkheads and expansion of existing bulkheads on residential properties to those situations where 'soft-shore' or bio-stabilization approaches are deemed infeasible. Bulkheads are only allowed when there is evidence from a geotechnical engineer that the existing primary structure is in imminent danger of damage caused by wind or waves and not by improper drainage, vegetation removal, or other upland conditions, for projects whose primary purpose is remediating hazardous substances pursuant to RCW 70.105, or to ensure shoreline access for substantial numbers of people. The City may require mitigation for impacts associated with bulkhead construction. Furthermore, the SMP prohibits bulkheads on lots that have no structures and requires that subdivisions be designed to preclude the need for future stabilization. These protections should prevent future loss of nearshore habitat and other adverse effects caused by hardened shorelines. The criteria required to obtain approval for new or expanded bulkheads will require detailed review by City permitting staff and ensure that proposals are consistent with the SMP goal of ensuring no net loss of ecological functions (SMC 25.07.070(1), (3), and (4)).

Other potential shoreline modifications such as residential docks and piers are also regulated by the proposed SMP. Dock length is limited to 85 feet or the length necessary to reach a depth of 8 feet. In addition, the SMP includes limitations on overall dock area (Table 3). This is especially

important on Lake Sammamish, where these structures can displace migratory habitat for juvenile salmon and create habitat for salmon predators.

Table 3. Maximum Dock Area Allowed for Docks Accessory to Residential Uses

	Lake Sammamish Maximum dock size (square feet)	Pine and Beaver Lakes Maximum dock size (square feet)
Use by 1 residential lot	600 SF	600 SF
Use by 2 to 9 residential lots	800 SF	700 SF
Use by more than 9 residential lots	1000 SF	700 SF

In addition to limits on length and square footage, the SMP requires that all new docks and overwater structures be designed and built using WDFW approved materials and methods. The City will verify that applicants apply for required federal (Army Corps) and /or state (WDFW) permits during permitting / consistency review. For Lake Sammamish, state/federal agencies require open grating to allow for light penetration, an important consideration in lakes that contain resident and anadromous salmonids.

The SMP allows for one canopy per residential dock on the Lake Sammamish shoreline; canopies must be made of translucent materials. Boat canopies permitted under the SMP would not create any additional overwater shading (beyond what is covered by the dock itself).

The SMP restricts circumstances where fill waterward of the ordinary high water mark would be allowed with a shoreline Substantial Development Permit, limited to the following activities:

- Public sponsored ecological restoration or enhancement projects;
- City-approved restoration and mitigation projects that involve bulkhead removal, shoreline vegetation enhancement and/or shoreline restoration;
- Bio-engineered shoreline stabilization projects, including bio-engineered shoreline stabilization associated with private residential developments;
- Publically sponsored non-restoration projects that provide public access or improve access to the shoreline for a substantial number of people;
- Construction of public docks for public water-dependent recreational use, provided that the filling and/or excavation are limited to the minimum needed to accommodate the public dock;
- Expansion or alteration of public transportation facilities currently located in the shoreline where there is no reasonable alternative;
- When associated with a permitted or conditional use and as required by state or federal agencies.

Fill waterward of the OHWM for any other purpose requires a Shoreline Conditional Use Permit, which will necessitate assessment of potential cumulative impacts associated with the Shoreline CUP at the time of permit review.

4.2.4 Implementation of SMP Goals and Policies During City-wide Planning Efforts

The SMP includes goals and policies that will require the City to consider basin-wide conditions during updates to and implementation of programs that apply throughout the City. Examples of Citywide regulatory programs include land use and development standards (SMC Title 21A), including critical areas regulations (SMC Chapter 21A.50), and surface water management standards (SMC Chapter 15.05). The following SMP goals and policies will inform updates to these and other regulatory programs, as well as future basin planning efforts.

SMP Goals (SMC 25.03.020 - Conservation Goals):

- (6) Implement policies that can help reverse impacts caused by existing or past development activities that adversely affect ecological or shoreline functions such as untreated stormwater discharges.
- (7) Manage the City's programs, services, and operational infrastructure in a manner that does not contribute to the degradation of ecological or shoreline functions.
- (8) Achieve no net loss of ecological functions of Sammamish shorelines.

SMP Policies (SMC 25.04.010 – General Policies):

- (5)(c) Restoration and Enhancement Policies – Restoration should be integrated with and should support other natural resource management efforts in King County, Water Resource Inventory Area 8, and in the greater Puget Sound region.
- (8)(b) Site Planning Policies – Low Impact Development (LID) stormwater management practices are encouraged where site conditions allow in order to minimize impervious surface area and surface runoff in accordance with the Low Impact Development: Technical Guidance Manual for Puget Sound, by Puget Sound Action Team and WSU 2005, SMC 21A.85 and the city's adopted stormwater management policies and regulations.
- (8)(c) Site Planning Policies – Where geologic conditions are conducive to infiltration, the City encourages infiltration systems for stormwater that mimic the natural infiltration and ground water interflow processes as long as the infiltration will not create or exacerbate slope instability or degrade water quality.
- (10)(e) Water Quality, Stormwater and Nonpoint Pollution – Point and non-point source pollution should be managed on a comprehensive, basin-wide basis to protect water quality and support the efforts of shoreline property owners to maintain shoreline ecological functions.

4.2.5 Other Beneficial Effects

The SMP requires that all exterior lighting shall not shine directly onto the water in order to minimize impacts on adjacent shoreline uses and fish and wildlife habitat (SMC 25.06.020(4)).

Minimization measures shall include full cut off devices (light shields) such that glare or direct illumination onto the lake is minimized.

5.0 PERMIT TRENDS AND REASONABLY FORESEEABLE FUTURE DEVELOPMENT

In Sammamish, the only uses that presently occur within shoreline jurisdiction are residential uses (primarily single family), park or public recreational uses (on public park lands), and transportation and utility uses. Future development is likely to maintain these uses, with no industrial, commercial or mixed uses expected in the foreseeable future.

5.1 Permit Trends²⁰

Within the City's shoreline areas, residential development occurred earlier than in much of the rest of the City. Land use and development pattern of the Lake Sammamish shoreline area was largely established between 1925 and 1950, and the patterns of the two smaller lakes established between 1940 and 1960.

Development patterns in non-shoreline areas of the City largely began in the 1970s, when rural farms were first subdivided and platted for residential and commercial development. This pattern has continued since Sammamish was incorporated as in August 1999, with privately owned forest lands, as well as rural farms, subdivided and platted for development.

5.1.1 Lake Sammamish

Since 2005, the City has reviewed and approved approximately 30 building permits for new single-family residences on Lake Sammamish and an additional 25 building permits for re-development of existing residences. In addition, the City has approved 6 new docks and improvements/modifications to approximately 22 existing docks on Lake Sammamish during that timeframe. No subdivision activities have occurred within the Lake Sammamish shoreline area since 2005. (City of Sammamish, 2008b)

City staff have also observed a trend on Lake Sammamish where development and redevelopment on small parcels (less than ~4,000 square feet) results in very high percentages of impervious surface (~ 75 percent in many cases), requires variances from side yard and shoreline setback requirements, and builds to the maximum height of 35 feet. Development of single-family residences on these lots has in many cases replaced private recreational land uses. Development on small lots also tends to require shoreline variances. Since 2005, the City has approved a total of seven shoreline variances for residential development. These were most likely all for developments on Lake Sammamish (although this could not be confirmed), where lot dimensions made it difficult to meet the setback requirements of the existing SMP.

5.1.2 Pine and Beaver Lakes

Since 2005 a similar pattern of development has occurred on the City's smaller lakes. On each of the small lakes, the City has reviewed and approved approximately 10 building permits for new

²⁰ The permit trend information provided in this section is approximate and is from queries of the City's building and land use permit tracking database as well as from communication from City staff. The specific numbers provided are approximate due to the challenges and time constraints of gathering exact information; as such, the permit information provided is intended to detail the general trends in land use and development permitting at each of the three lakes since 2005.

single-family residences and an additional 10 building permits for re-development of existing residences. In addition, a total of approximately 10 building permits have been approved for modifications to existing docks or construction of new docks. (City of Sammamish, 2008b)

Only one short subdivision has occurred since 2005 on Beaver Lake. No short plats or other subdivision activities have occurred within the Pine Lake shoreline area since 2005.

5.2 Future Development and Potential Effects on Shorelines

Anticipated future development activities and its effects on shoreline ecological functions are described below and summarized in Tables 4 through 8.

5.2.1 Lake Sammamish

Residential Uses

Residential uses are well established on the Lake Sammamish shoreline. According to an analysis of shoreline conditions and lots completed by the City in 2000 and with aerial photography from 2006, there appeared to be 77 vacant lots on the Lake Sammamish shoreline in 2006. This would indicate a ~23 percent decrease from the 99 vacant lots identified in 2000 (e.g., 22 homes were built on vacant lots between 2000 and 2006). Additional residential development is expected on the remaining vacant lots over the next several years. Assuming the rate of development holds somewhat steady (22 lots over six years), the 77 remaining undeveloped lots would be developed in about 20 years—with short term development occurring at a potentially slower rate if the current mortgage crisis and shrinking economic conditions continue. However, not all of the remaining vacant lots are likely to be developed because some will be too small to accommodate a residence given the shoreline and building setback requirements and impervious surface thresholds proposed in the new SMP—even if a variance is granted.

As discussed previously, the SMP could allow for development to occur closer to the Lake Sammamish shoreline (with use of the reduced shoreline setback provisions) than was allowable under the Conservancy standards of the City's previous SMP. Integration of the setback reduction system into all areas of the Lake Sammamish shoreline allows for consistent application of the setback system, and provides a normalized system of incentives on those lots where setback reduction is necessary.

By creating an incentive for property owners to “soften” bulkheads and incorporate natural shorelines and restore the riparian areas immediately landward of shoreline jurisdiction, the overall condition of the shoreline is expected to improve compared to current conditions. In the highly developed ELS Basin, where improvements to many watershed-scale functions can not be effectively addressed within the shoreline area, vegetation enhancement and bulkhead removal at the water's edge can have positive effects on water quality and habitat by creating shade, providing organic inputs, removing impediments to migration, and opening up spawning habitat. As a result of one or more required reduction actions (specified in Table 2), the net adverse effect of the reduced setback width is negligible.

Table 4. Summary of foreseeable single family residential uses and development, potential effects, and regulatory offsets – Lake Sammamish

Foreseeable Shoreline Use/ Development	Single-family residential development, redevelopment and/or expansion		
Areas and Percent of Shoreline Affected	<p>Could affect parcels on 86% of the lake shore (166 acres across 7 linear miles of shoreline). Approximately 77 existing lots are vacant and could be developed. The remaining parcels could be redeveloped or existing homes expanded. Approximately 13% of total lots (~55 lots) currently have no dock and a similar percentage of lots have no shoreline modification (i.e. bulkheads).</p>		
Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
Vegetation removal associated with new development / redevelopment.	<p>Reduces shoreline habitat complexity and quality for terrestrial and aquatic wildlife.</p> <p>Reduces perching and nesting habitat for raptors and other birds.</p> <p>Reduces organic inputs to the lake, which affects food resources for fish and wildlife.</p> <p>Reduces beneficial shading/cover of shallow water habitat.</p> <p>Displacement by maintained lawns increases potential for fertilizer use, which could increase phosphorus levels in the lake.</p> <p>Construction activity generates sediments which can introduce phosphorous to the lake.</p>	New developments must observe a 45 foot shoreline setback, reducible to minimum of 15 feet if specific shoreline enhancement requirements are met. Both setbacks are subject to an additional 5 foot building setback. Preservation of shoreline vegetation and shoreline enhancement (for several intensive development activities) are required within the 15 feet landward of the OHWM on Lake Sammamish (SMC 25.06.020)).	Shoreline restoration plan identifies opportunities for vegetation enhancement.

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Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
Additional impervious surface coverage associated with new development.	<p>Reduces infiltration and increases runoff to the lake.</p> <p>Reduces habitat complexity and quality.</p> <p>Reduces connectivity between shoreline environment and adjacent open space corridors.</p>	<p>Impervious surface limits are consistent throughout the City with the exception that Shoreline Residential impervious surface limitations cannot be increased for lots less than 9,076 square feet and that Urban Conservancy impervious surface is limited to 40%. Impervious surfaces limited to a maximum of 55% in all residential use areas (SMC 21A.25.030A).</p> <p>Reduction of impervious surfaces incentivized through allowances for reducing the shoreline setback. Policies and standards are intended to encourage use of Low Impact Development (LID) techniques to reduce the amount of effective impervious area.</p>	Shoreline restoration plan identifies opportunities for LID.
New shoreline stabilization (e.g., bulkheads).	<p>Separates uplands from aquatic environments.</p> <p>Displaces shallow water migratory habitat for juvenile salmonids.</p> <p>Displaces potential shallow water spawning habitat.</p>	<p>Approval requirements for new hard shoreline stabilization are more stringent – Bulkheads and other types of armoring are only allowed when ‘soft shore’ alternatives are proven to be infeasible and when existing primary residential structures are in immediate danger. (SMC 25.07.070).</p> <p>Bio-stabilization is the preferred stabilization approach and must be used whenever feasible (SMC 25.07.070)</p> <p>WDFW HPA requirements and Corps of Engineers’ Clean Water Act permits may also limit impacts to the nearshore environment.</p>	Shoreline restoration plan identifies opportunities for bulkhead removal.
Replacement of existing shoreline stabilization (e.g., bulkheads).	See above.	<p>Replacement of existing bulkheads must not further impact shoreline environment; bio-stabilization as an alternative is encouraged (SMC 25.07.070)</p> <p>WDFW HPA requirements and Corps Clean Water Act permit may also limit impacts to the nearshore environment.</p>	Shoreline restoration plan identifies opportunities for bulkhead removal.

Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
New residential docks, floats and lifts.	Creates shallow water habitat for salmon predators. Displaces shallow water habitat; obstructs migrating salmonids. Disturbs substrate during construction.	Dock length and location are limited – New docks are limited in length to 80 feet or the length needed to reach a depth of 8 feet. Maximum dock coverage (square footage) specified for private residential docks. Docks and floats must be constructed of approved (non- toxic) materials. Each residential lot is limited to no more than one dock and one float (additional dock permitted for joint use docks utilized by more than 9 residential lots, however only when an existing launch ramp exists). Size of floats is limited to 150 square feet. Outside of docks, floats, and lifts, and no other overwater structures area allowed. (SMC 25.07.050) WDFW HPA requirements and Corps Clean Water Act permit requirements also prevent adverse impacts.	Shoreline restoration plan identifies opportunities for reducing effects of overwater structures.
Replacement or repair of existing residential docks and floats.	Potential harmful chemicals (e.g. treated wood), which could degrade water quality. Over time effects would be positive as treated materials are replaced with non-toxic materials.	Program requires replacement of all new structures in contact with the water to use approved materials when docks are repaired or replaced (SMC25.06.050). WDFW HPA requirements and Corps Clean Water Act permit requirements also prevent adverse impacts.	Shoreline restoration plan identifies opportunities for reducing effects of overwater structures.
Private launch ramps and rails.	N/A	New private launch ramps and rails are prohibited. Existing launch ramps and rails may be maintained consistent with the provisions allowed under the proposed nonconformance regulations (SMC 25.08.100).	
Continued use and additions to existing non-conforming residences.	Narrow vegetated buffers – degraded shoreline habitat. High levels of impervious surface – reduced infiltration, habitat value and connectivity	Proposed regulations allow for continued use of non-conforming structures, but shoreline enhancement may be required for expansions (over 200 square feet) of existing structures within the shoreline setback. Impervious surface is further limited in areas of high ecologic function (Urban Conservancy). If fire, flood, or other natural disasters result in damage, including complete and total damage, the property owner may rebuild to the same footprint if permits to rebuild are submitted and construction is initiated within a timely manner. (See SMC 25.08.100(1) for details).	

Table 4. Summary of foreseeable public recreational uses and development, potential effects, and regulatory offsets – Lake Sammamish

Foreseeable Shoreline Use/ Development	Park Development & Public Recreational Use.
Areas and Percent of Shoreline Affected	Sammamish Landing Park encompasses about 3000 linear ft (~15%) of the lake shore. Improvements to the undeveloped public park area are currently in planning stages, however development could include construction of a swim beach, a new public dock, a hand boat launch, and water-oriented structures and trails within the shoreline buffer area.

Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
Removal of vegetation.	<p>Reduces shoreline habitat complexity and quality for terrestrial and aquatic wildlife.</p> <p>Reduces perching and nesting habitat for raptors and other birds.</p> <p>Reduces organic inputs to the lake, which affects food resources for fish and wildlife.</p> <p>Reduces beneficial shading/cover of shallow water habitat.</p> <p>Displacement by maintained lawn increases potential for fertilizer use, which could increase phosphorus levels in the lake.</p> <p>Construction activity generates sediments which can introduce phosphorous to the lake.</p>	<p>New developments must observe a 45 foot shoreline setback, reducible to minimum of 15 feet if specific shoreline enhancement requirements are met. Both setbacks are subject to an additional 5 foot building setback. Preservation of shoreline vegetation and shoreline enhancement (for many development activities) required within the 15 feet landward of the OHWM on Lake Sammamish (SMC 25.06.020)).</p> <p>Water-related recreation development may be allowed within the shoreline enhancement area and shoreline setback.</p> <p>Project-level SEPA review would disclose specific impacts and mitigation would be required consistent with SMP 25.06.020 and SMC 21A.50.</p>	Shoreline restoration plan identifies opportunities for vegetation enhancement.
Construction of a new public dock(s).	<p>Creates habitat for salmon predators.</p> <p>Displaces shallow water habitat; obstructs migrating salmonids.</p> <p>Disturbs substrate during construction.</p>	<p>Dock size is limited to 3,000 square feet. Public floats are limited to 150 square feet.</p> <p>Docks and floats must be constructed of approved (non- toxic) materials.</p> <p>Outside of docks, floats, and lifts, and no other overwater structures are allowed (SMP 25.07.060).</p> <p>WDFW HPA requirements and Corps Clean Water Act permit requirements also prevent adverse impacts.</p> <p>Project-level SEPA review would disclose specific impacts and mitigation would be required.</p>	Shoreline restoration plan identifies opportunities for removing overwater structures.

Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
Increase in impervious surface (due to parking and buildings).	<p>Reduces infiltration and increases runoff to the lake.</p> <p>Reduces habitat complexity and quality.</p> <p>Reduces connectivity between shoreline environment and adjacent open space corridors.</p>	<p>Impervious surface limits are consistent throughout the City with the exception that Shoreline Residential impervious surface limitations cannot be increased for lots less than 9,076 square feet and that Urban Conservancy impervious surface is limited to 40%. Impervious surfaces limited to a maximum of 55% in all shoreline residential areas (SMC 21A.25.030A).</p> <p>Addition reduction of impervious surfaces incentivized through allowances for reducing the shoreline setback width. Policies and standards are intended to encourage use of Low Impact Development (LID) techniques to reduce the amount of effective impervious area.</p> <p>Project-level SEPA review would disclose specific impacts and mitigation would be required.</p>	
New shoreline stabilization (e.g., bulkheads).	<p>Separates uplands from aquatic environments.</p> <p>Displaces shallow water migratory habitat for juvenile salmonids.</p> <p>Displaces potential shallow water spawning habitat.</p>	<p>Approval requirements for new hard shoreline stabilization are more stringent – Bulkheads and other types of armoring are only allowed when ‘soft shore’ alternatives are proven to be infeasible and when existing primary residential structures are in immediate danger. (SMC 25.07.070).</p> <p>Bio-stabilization is the preferred stabilization approach and must be used whenever feasible (SMC 25.07.070)</p> <p>WDFW HPA requirements and Corps of Engineers’ Clean Water Act permits may also limit impacts to the nearshore environment.</p>	
Swimming beach	<p>Addition of a swimming beach could have positive ecological benefit by creating potential spawning habitat for salmonids. Spawning would mostly occur during time of low beach use by people.</p>		

Table 5. Summary of foreseeable single-family residential uses and development, potential effects, and regulatory offsets – Pine and Beaver Lakes

Foreseeable Shoreline Use/ Development	Single-family residential development, redevelopment and expansion		
Areas and Percent of Shoreline Affected	Pine Lake – 96.5% (114 acres across 2 linear miles of shoreline) Beaver Lake – 85% (52 acres across 2.2 linear miles of shoreline) Approximately 5 existing lots are vacant on Pine Lake and 6 are vacant on Beaver Lake and could be developed. The remaining parcels could be redeveloped or existing homes expanded. Approximately 25% of total Pine Lake lots (~35 lots) and 28% of Beaver Lake lots (~35 lots) currently have no dock, and a similar percentage of lots have no shoreline modification (i.e., bulkheads).		
Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
Vegetation removal associated with new development and redevelopment, including subdivision of existing large residential lots.	Reduces shoreline habitat complexity and quality for terrestrial and aquatic wildlife. Reduces perching and nesting habitat for raptors and other birds. Reduces organic inputs to the lake, which affects food resources for fish and wildlife. Increases potential for wind mixing, which can increase available phosphorus. Displacement by maintained lawns increases potential for fertilizer use, which could increase phosphorus levels in the lake. Construction activity generates sediments which can introduce phosphorous to the lake.	New developments must observe a 45 foot shoreline setback, plus a 5 foot building setback Preservation of shoreline vegetation and shoreline enhancement (for many development activities) required on Lake Sammamish within the 15 feet landward of the OHWM. Tree retention is required – Minimum 80% significant trees must be retained on Pine and Beaver Lakes throughout shoreline jurisdiction. Subdivision only allowed for large residential lots meeting size and shoreline width thresholds. Subdivision regulations require use of joint docks, minimizing the impact of additional intensive shoreline use. (SMC 25.06.020)	Shoreline restoration plan identifies opportunities for vegetation enhancement.
Additional impervious surface coverage associated with	Reduces infiltration and increases runoff to the lake. Reduces habitat complexity and	Impervious surface limits are consistent throughout the City with the exception that Shoreline Residential impervious surface limitations cannot be increased for lots less than 9,076 square feet and that Urban Conservancy impervious surface is limited to 40%. Impervious surfaces limited to a maximum of 55% in all residential use areas	Shoreline restoration plan identifies opportunities for

Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
new development, including new development created by subdivision of residential lots.	quality. Reduces connectivity between shoreline environment and adjacent open space corridors.	(SMC 21A.25.030A). Additional reduction of impervious surfaces incentivized through allowances for reducing the shoreline setback width. Policies and standards are intended to encourage use of Low Impact Development (LID) techniques to reduce the amount of effective impervious area.	LID.
New shoreline stabilization (e.g., bulkheads).	Separates uplands from aquatic environments. Displaces shallow water habitat for wildlife.	Approval requirements for new hard shoreline stabilization are more stringent – Bulkheads and other types of armoring are only allowed when ‘soft shore’ alternatives are proven to be infeasible and when existing primary residential structures are in immediate danger. (SMC 25.07.070). Bio-stabilization is the preferred stabilization approach and must be used whenever feasible (SMC 25.07.070) WDFW HPA requirements and Corps of Engineers’ Clean Water Act permits may also limit impacts to the nearshore environment.	Shoreline restoration plan identifies opportunities for bulkhead removal.
Replacement of existing shoreline stabilization (e.g., bulkheads).	See above.	Replacement of existing bulkheads must not further impact shoreline environment; bio-stabilization as an alternative is encouraged (SMC 25.07.070) WDFW HPA requirements and Corps Clean Water Act permit may also limit impacts to the nearshore environment.	Shoreline restoration plan identifies opportunities for bulkhead removal.
New residential docks and floats.	Displaces shallow water habitat. Disturbs substrate during construction.	Dock length and location are limited – New docks are limited in length to 80 feet or the length needed to reach a depth of 8 feet. Maximum dock coverage (square footage) specified for private residential docks. Docks and floats must be constructed of approved (non- toxic) materials. Each residential lot is limited to no more than one dock and one float. Size of floats is limited to 150 square feet. Outside of docks and floats, no other overwater structures area allowed. (SMC 25.07.050) WDFW HPA requirements and Corps Clean Water Act permit requirements also prevent adverse impacts.	Shoreline restoration plan identifies opportunities for reducing effects of overwater structures.
Replacement or repair of	Potential harmful chemicals (e.g. treated wood), which could	Program requires replacement using approved materials when docks are repaired or	Shoreline restoration plan

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Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
overwater structures.	degrade water quality. Over time effects would be positive as treated materials are replaced with non-toxic materials.	replaced (proposed SMC 25.09.020). WDFW HPA requirements and Corps Clean Water Act permit requirements also prevent adverse impacts.	identifies opportunities for reducing effects of overwater structures.
Private launch ramps and rails	N/A	New launch ramps and rails are prohibited.	
Continued use and addition to existing non-conforming structures.	Narrow vegetated buffers – degraded shoreline habitat. High levels of impervious surface – reduced infiltration, habitat value and connectivity	Proposed regulations allow for continued use of non-conforming structures, but shoreline enhancement may be required for ((over 200 square feet)) voluntary expansions of existing structures within the shoreline setback. Impervious surface is further limited in areas of high ecologic function (Urban Conservancy). If fire, flood, or other natural disasters result in damage, including complete and total damage, the property owner may rebuild to the same footprint if permits to rebuild are submitted and construction is initiated within a timely manner. (See SMC 25.08.100(1) for details).	

Table 6. Summary of foreseeable public recreational uses and development, potential effects, and regulatory offsets – Pine and Beaver Lakes

Foreseeable Shoreline Use/ Development	Park Development and Public Recreational Use		
Areas and Percent of Shoreline Affected	<p>Pine Lake – No additional park development is anticipated in the near future.</p> <p>Beaver Lake – Park improvements to the existing beach and a new public dock, would affect approximately 5 percent of the park's lake shoreline.</p> <p>Beaver Lake Preserve – Improvements to the open space could include some modification to the shoreline (for hand boat launch and/or other shoreline access locations) and additional trails within the shoreline buffer.</p>		
Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
<p>Potential additional recreational use development within shoreline buffer (improvements to existing beach area) and a new dock at Beaver Lake Park.</p> <p>Potential additional recreational use development within shoreline buffer (primarily trails) and a hand-held watercraft launch and/or viewing platforms along shoreline in Beaver Lake Preserve.</p>	<p>Improvements could displace some native vegetation or cause small increases in impervious surface.</p>	<p>New developments must observe a 45 shoreline setback plus a 5 foot building setback. Preservation of shoreline vegetation and shoreline enhancement (for many development activities) required within the 15 feet landward of the OHWM (SMC 25.06.020).</p> <p>Tree retention is required – Minimum 80% significant trees throughout Pine and Beaver Lakes shoreline jurisdiction must be retained.</p> <p>Water-related recreation development may be allowed within the shoreline enhancement area and shoreline setback.</p> <p>Project-level SEPA review would disclose specific impacts and mitigation would be required consistent with SMP 25.06.020 and SMC 21A.50.</p>	

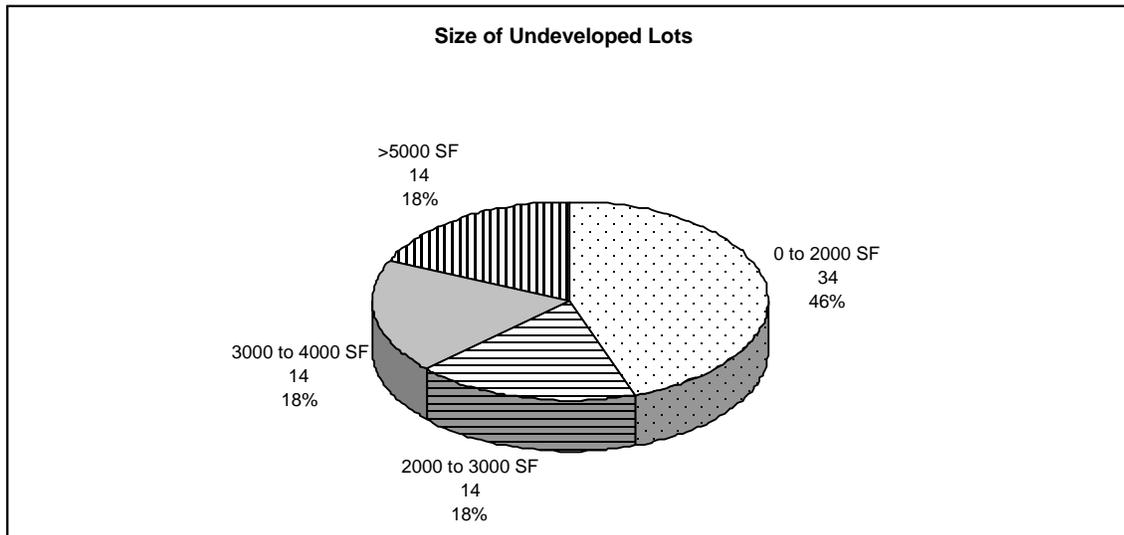
Table 7. Summary of foreseeable residential subdivision, potential effects, and regulatory offsets – Lake Sammamish, Pine Lake, and Beaver Lake

Foreseeable Shoreline Use/ Development	Residential Subdivision		
Areas and Percent of Shoreline Affected	Given underlying zoning and existing lot sizes, there very minimal potential for residential subdivision on the Lake Sammamish shoreline. Given underlying zoning and without consideration of other constraints, subdivision could occur on approximately existing 46 lots on Pine Lake and 69 lots on Beaver Lake.		
Shoreline Conditions Anticipated to Change	Potential Impacts to Shoreline Ecological Functions & Processes	Proposed SMP and Other Regulatory Offsets (Regulatory Citation)	Non-Regulatory Offsets
Additional residential density within the lake basins (however limited additional density within the shoreline planning area).	Increased development density could increase potential for water quality impacts associated with on-site septic systems, pet use, waterfowl use, and/or use of fertilizers by residences.	Vegetation enhancement areas may be required on Lake Sammamish– New developments must observe a 45 foot shoreline setback plus a 5 foot building setback, (proposed SMC 25.08.010). Tree retention is required – Minimum 80% significant trees throughout shoreline jurisdiction on Pine Lake and Beaver Lakes must be retained (proposed SMC 25.06.020(11)). Proposed SMP allows subdivision on lots a minimum of 50 feet wide, and specifies that all created lots must have a minimum area of 12,500 square feet. Additional density would be consistent with underlying zoning and only allowed if all other site conditions would allow (SMC 25.07.080(8)). <i>Washington State Department of Health / King County Department of Health Standards would mitigate water quality impacts associated with on-site septic systems.</i>	

On Lake Sammamish, approximately 100 of the 571 existing shoreline parcels are less than 4,000 SF in size. Of these, 62 percent do not have a residential structure or were recorded as vacant in 2007. Forty eight of these small vacant lots are less than 3,000 SF in size and 34 are less than 2,000 SF in size (Figure 7). Single-family residential development would be very difficult on lots of this size so many are likely to remain undeveloped. Development of residential structures on all vacant lots that can support such development would occur according to the standards of the new program which control pollution and prevent damage to the environment as required by the shoreline guidelines.

It is very unlikely that any of the lots on Lake Sammamish would be subdivided since most are relatively small or are already developed. No subdivisions have occurred on the Lake Sammamish shoreline since 2005 and none are anticipated within the next seven years. Of parcels potentially available for subdivision under minimum standards detailed by the City's general subdivision regulations, all but one of the shoreline lots are under public ownership. As a result, cumulative effects associated with subdivision or platting are not anticipated on Lake Sammamish.

Figure 7. Number and Percent of Small Lots on Lake Sammamish



As noted previously, approximately 87 percent of the residential lots on Lake Sammamish currently have a private dock. If allowed, new docks would need to conform to the standards of the SMP as well as state and federal regulations (see Chapter 6 for more information).

Given the prevalence of residential docks on the Lake Sammamish shoreline and the significant number of shoreline lots under public ownership on the north end of the lake where they are less common, the City does not anticipate a significant increase in the number of docks in the foreseeable future. If new docks are approved, or if existing docks are replaced, WDFW approved non-toxic materials and methods must be used to prevent additional water quality and habitat impacts. In addition, the length of a new dock will be limited to 80 feet or the length

needed to reach a depth of 8 feet., and the total area of all new docks would be limited by the square footage maximums included in the program.

The elimination of the minimum 200 foot dock spacing for the Conservancy environment will not have a significant impact on the shoreline. On Lake Sammamish, removing this provision allows for a maximum of 11 additional docks. Maintaining this standard would impose a significant use restriction on very few shoreline property owners. In comparison to the net ecological benefits achieved through application of pier and dock maximum length, overwater area, materials, and construction methods standards, the benefit of maintaining the minimum 200 foot dock spacing standard was determined to be ineffective.

An analysis of the provisions controlling overall dock size, including consideration of effective overwater coverage consistent with decking material, suggests that over time the proposed regulations will lead to a net reduction in over water coverage on Lake Sammamish. As detailed be Table 1, there were 368 residential docks on Lake Sammamish in 2008 with a total effective overwater coverage of approximately 184,000 square feet (500 square foot dock average). If all remaining residential shoreline parcels without docks (43 parcels) were to add docks consistent with SMP regulations, the total effective overwater coverage would increase to approximately 193,000 square feet. Although this assumes a per dock total area of 525 square feet²¹, the effective overwater coverage of new docks is conservatively estimated at 40 percent of the total area²². New docks will have a far lower effective overwater coverage than existing docks (210 square feet versus 500 square feet based on average dock sizes currently seen on Lake Sammamish).

As docks are replaced under the provisions of the new SMP, the replacement docks will further reduce the overwater coverage on Lake Sammamish. If one percent of existing docks on the lake shoreline are replaced with new docks on an annual basis, the total effective overwater coverage of all docks would reduce by approximately 1,000 square feet every year. As such, even with construction of new docks on parcels without existing docks, it is anticipated that replacement of existing docks with WDFW approved materials and methods will lead to a net reduction in overwater dock shading over time under the SMP.

A majority of existing lots also have a bulkhead or some other form of hard armoring. The opportunity for allowing new bulkheads under the SMP is reduced since they are prohibited unless there is documentation by a licensed engineer that they are needed to protect an existing structure from wind or wave damage. As a result, there is not likely to be a significant increase in the number or extent of new bulkheads on Lake Sammamish.

Park and Public Recreational Uses

²¹ The SMP allows a maximum overwater area of 600 square feet for individual residential docks. However, existing docks on Lake Sammamish are more typically 500 square feet and the Army Corps specifies a limit of 480 square feet under RGP 3. The estimated average of 525 square feet is intended to provide a conservative estimate of actual anticipated dock construction.

²² The Army Corps Regional General Permit 3 standards require use of grating for 100 percent of decking material on piers and ramps on Lake Sammamish. Although permits for individual docks may be approved with different decking requirements, assuming 40 percent actual deck shading when grating is used is a conservative estimate.

On Lake Sammamish the City is currently in the planning stages of developing the publically owned properties at the north end of the lake for public recreational use. As detailed in Section 3.1, the area is commonly called Sammamish Landing and stretches across 3,000 linear feet of wooded shoreline. The property is not currently open to the public. Potential park improvements could include a swimming beach, public dock or pier, picnic areas, fishing access, restrooms, parking, and access to the East Lake Sammamish Trail. Areas under current public ownership (either Sammamish or the City of Redmond²³) total 5.57 acres, of which approximately 3 acres are shoreline lots.

The City is currently engaged in a master planning process for the park. The master planning goals for the park are to provide public access to Lake Sammamish, to enhance and protect the environmentally sensitive shoreline areas, and to generate support and interest in the park.

Development of the proposed Sammamish Landing Park for active recreational purposes will substantially increase the level of public shoreline access (consistent with the goals of the Shoreline Management Act) but also involve some modification of the shoreline environment. However, effects will be limited to a small percentage of the total shoreline (~8 percent of the area with the City's jurisdiction).

Although it is not possible to fully assess potential impacts until design plans are developed, potential impacts could occur as a result of the following:

- Construction of a swimming beach – This might require the import of fill and/or grading above and possibly below the ordinary high water mark. This could have a positive ecological effect of creating some shallow water beach habitat which is mostly absent on the east shore of Lake Sammamish.
- Potential development of a new public dock(s) – This would require pile driving and create some additional overwater shading. The dock might also require some a small amount of armoring at its connection to the shore. The nature and extent of the impacts to the nearshore area would depend on the specific size, location and design of the dock(s). There are currently two (2) existing docks on the property.
- Construction of restrooms, parking, and other standard amenities – This would also likely necessitate some vegetation clearing and removal of mature trees. These improvements are expected to be constructed outside the Shoreline Jurisdiction on parcels to the east of East Lake Sammamish Parkway. Impacts could be offset through use of LID measures and compliance with existing stormwater standards and health regulations for waste water treatment.
- Use of the beach, public dock, and other areas by people and pets – This would produce noise and potentially cause other impacts to the lake environment. Impacts could be offset through public education, signage, and by providing pet waste disposal facilities and other measures.

Overall, the standards of the proposed SMP including provisions of SMC 21A.50 will require that park development and use be designed to avoid and minimize adverse impacts. Unavoidable

²³ Four shoreline lots are currently in City ownership and three additional shoreline lots are to be transferred to Sammamish from the City of Redmond.

impacts will be offset through compensatory mitigation to ensure no net loss of shoreline functions. The level and type of impact will determine the level and type of compensatory mitigation required. The SMP will require that a mitigation plan be prepared and implemented specifically to protect critical areas (Lake Sammamish, associated wetlands, and streams) and buffers and compensate for alterations to vegetation, shallow water habitat, water quality and other functions.

Park development will be subject to a project-level review under the State Environmental Policy Act (SEPA). The SEPA review will identify and disclose potential impacts and mitigation required to prevent significant adverse effects. The proposed SMP, however, does provide a policy and regulatory framework that will guide planning efforts for the park and ensure that all impacts to the Lake Sammamish shoreline are mitigated to meet the no net loss requirement. Specifically, the proposed SMP (SMC 25.07.090) will:

- Allow only public water-oriented recreational development to occur in shoreline jurisdiction;
- Require that proposed development is consistent with the Environmentally Critical Areas regulations established in SMC 21A.50 and incorporated by SMP 25.01.070. These standards include establishment of a 45 shoreline buffer on Lake Sammamish (with reduction only available when specified shoreline enhancement actions are implemented);
- Only allow public docks and/or piers and water-oriented structures (limited in footprint area and height) within the required shoreline enhancement area without a shoreline variance;
- Limit the types of uses and developments allowed within the shoreline setback, as specified by SMC 25.06.020(7);
- Require that park landscaping utilize City approved plant species and that native and self-sustaining vegetation is incorporated;
- Require that unavoidable impacts to the Lake Sammamish shoreline environment be permitted by a mitigation plan meeting the requirements of the proposed SMP and SMC 21A.50; and
- Require compliance with other state and federal regulations including the Department of Fish and Wildlife and Corps of Engineers permit requirements for docks and other activities below the ordinary high water line.

The East Lake Sammamish Trail is the only other public recreational facility within the Lake Sammamish shoreline area. The trail corridor is largely developed, with no significant changes to the corridor width, alignment, or design anticipated. As no other public properties exist, no additional park or public recreational uses are anticipated in the Lake Sammamish shoreline area.

Transportation and Utility Uses

Within the Lake Sammamish shoreline area, no new transportation and or utility uses are currently anticipated. East Lake Sammamish Parkway and East Lake Sammamish Trail are the primary transportation facilities passing within the shoreline area. These corridors, along with several other residential access roadways within the shoreline area, support permitted uses. Changes to East Lake Sammamish Parkway are occurring in phases and will be primarily limited to safety improvements, stormwater and drainage improvements, and routine maintenance. These

would tend to improve conditions by bringing the roadway up to current standards for stormwater treatment and flow control, environmental mitigation (e.g., culvert replacement) and traffic/ circulation, so the net effect on shoreline functions would be positive. Major roadway expansion or relocation is not anticipated.

Existing utility facilities are all within established rights-of-way and consist of typical urban utilities (water, sewer, electric, natural gas). No major new utility facilities or significant expansions to existing utility facilities are anticipated.

Other Uses

No other uses are anticipated to occur within the Lake Sammamish shoreline area according to the existing development regulations and Comprehensive Plan designations.

5.2.2 Pine Lake and Beaver Lake

Residential Uses

Residential development and use is well established on the Pine and Beaver Lake shorelines. Although no quantitative analysis has been completed, a review of aerial photography from 2006 shows that there are very few vacant lots on the Pine and Beaver Lake shorelines (King County, 2006). As such, cumulative adverse effects of future residential development are not expected to be significant.

Pine and Beaver Lakes are characterized by large lots; much larger than those of Lake Sammamish. Pine Lake has an average lot size of approximately 30,000 square feet, and Beaver Lake has an average lot size of approximately 52,500 square feet. Given the lot size and the densities allowed under the City's development regulations, many parcels on the Pine and Beaver Lake shorelines could be subdivided. The proposed SMP allows lots within shoreline jurisdiction to be subdivided if the lot width is 50 feet or more, provided that the resulting parcels have a minimum area of 12,500 square feet and meet the Washington State Department of Health standards for on-site septic systems (assuming municipal stormwater hookup is unavailable). In addition, all applicable requirements of the City's subdivisions regulations (SMC Title 19) would apply.

The allowance for subdivisions in the Conservancy environment will not have a significant impact on the Pine and Beaver Lake shorelines. According to analysis by City staff, the allowance will create three additional lots that have subdivision potential. As such, it was determined that maintaining this restriction would impose a significant restriction on very few shoreline property owners. Alternatively, the SMP includes provisions, as described in this analysis, that ensure that any subdivision that occurs will not significantly impact the shoreline environment, and will provide mitigation for impacts that are unavoidable.

An analysis of parcel widths indicates that more than 142 parcels on Pine Lake and 110 parcels along the Beaver Lake shoreline have widths greater than 50 feet (Table 9). Under the current program, the minimum lot width for subdivision is 80 feet; approximately 50 percent of the 252 total lots meeting the 50 foot criteria also exceed the 80 foot threshold. On Pine Lake, fewer than half (40 percent) of the 142 lots would meet the minimum lot size requirement for subdivision into two lots and roughly 9 percent would be large enough to subdivide into more than four lots.

On Beaver Lake, the percentages are somewhat higher: approximately 64 percent would be dividable into two lots and 10 percent would be dividable into more than four lots.

Table 8. Parcels that Meet the Minimum Requirements for Subdivision on Pine Lake and Beaver Lake

	Pine Lake	Beaver Lake
Parcels with minimum lot width of 50 ft	142	110
Parcels greater than 25,000 square feet (potential for subdivision into at least 2 parcels)	56	70
Parcels greater than 62,500 square feet (potential for subdivision into more than 4 parcels)	13	11

Most of the lots on Pine and Beaver Lakes are long and narrow with the long axis oriented perpendicular to the shore. If these lots are subdivided, most of the new lots would be well landward of the ordinary high water mark and some would be outside of shoreline jurisdiction. This is due to the existing development pattern on these lots, where existing single family residential structures are located closest to the shoreline. As a result it is not anticipated that subdivision would result in significant numbers of additional shoreline modification or docks (new docks would likely replace docks associated with a single residential lot with shared/community docks). Requirements for subdivision further verify that the intensity of use would not significantly increase even as limited subdivision occurs. The SMP requires that subdivision not occur when it necessitates the need for new bulkheads or similar shoreline stabilization structures (SMC 25.07.070(9)). The SMP also specifies that all lots created through a subdivision be allowed one shared use dock; this provision will ensure that as limited residential subdivision occurs, additional overwater structures and other shoreline modifications will not be allowed. Provisions are included that require the lot width circle to touch the OHWM for the shoreline fronting lot, reducing the potential for divisions at the OHWM. Furthermore, development in the shoreline zone would need to meet the vegetation retention standards for significant trees (80 percent of the significant trees within shoreline jurisdiction must be retained), which would mitigate other potentially adverse effects.

Although subdivision has the potential to increase in the number of residential lots within and immediately adjacent to the Pine and Beaver Lake shoreline areas, previous subdivision trends suggest that significant levels of subdivision will not occur within the foreseeable future. Since 2005, one short-plat subdivision has occurred on Beaver Lake and no subdivisions have occurred on Pine Lake (City of Sammamish, 2008). This is despite that fact that many lots are eligible for subdivision under the existing regulations.

Since the large majority of the residence on Pine and Beaver Lakes are on septic systems as opposed to municipal sewer (see Sections 3.2 and 3.3 for details), there is a potential that

subdivision would have water quality impacts due to the addition of on-site septic systems²⁴. According to the Pine Lake and Beaver Lake management plans, both lakes are susceptible to fecal coliform contamination and nutrient loading, which can be exacerbated by leaky or failing septic systems (Tetra Tech Inc., 2006 and King County, 2007). However, new subdivisions would be required to meet Health Department standards for on-site septic until public sewer is made available and the City would need to carefully evaluate potential water quality impacts before approving additional subdivisions.

Considering the historically low trends toward subdivision on these lakes, the fact that most of the new lots would be outside of shoreline jurisdiction, the low numbers of additional bulkheads or docks that would be expected, and the implementation of the vegetation retention requirements, the impact of additional subdivision on Pine and Beaver Lakes likely would not be significant.

Approximately 75 percent of the residential lots on both Pine and Beaver Lakes currently have a private dock. Given the existing proliferation of docks, and high levels of shoreline modification, the City does not anticipate a significant increase in the number of docks or degree of shoreline modification in the foreseeable future. When new docks are constructed or existing docks replaced, the applicant is required to use approved, non-toxic materials to prevent additional water quality impacts. The SMP limits the length of new docks to 80 feet or the length needed to reach a depth of 8 feet. In addition, the maximum square footage of new docks is also limited (as specified previously).

The elimination of the minimum 200 foot dock spacing provision for the Conservancy environment will not have a significant impact on the shoreline. On Pine and Beaver Lakes, removing the provision allows for a maximum of 2 additional docks. Maintaining this standard would impose a significant use restriction on only two shoreline property owners. In comparison to the net ecological benefits achieved through application of pier and dock maximum length, overwater area, materials, and construction methods standards, the benefit of maintaining the minimum 200 foot dock spacing standard was determined to be ineffective.

New bulkheads are only allowed when there is documentation by a licensed engineer that they are needed to protect an existing residence from damage caused by wind and waves. Shore erosion caused by wind and waves is not a major or widespread concern on Pine and Beaver Lakes, so there is not likely to be a significant increase in the number or extent of new bulkheads on Pine or Beaver Lakes.

Park and Public Recreational Uses

Public access is provided to Pine Lake via Pine Lake Park. The City recently completed a park improvement project, which includes replacing the public dock, maintaining and restoration and improving the beach, and other activities that will be permitted under the existing SMP. Once these improvements are in place, additional shoreline modifications at Pine Lake Park are not expected in the foreseeable future.

²⁴ There is non conclusive evidence that septic systems are contaminating Pine or Beaver, yet septic systems are noted as a potential source of fecal coliform and nutrient loading in studies that have determined this relationship along other shorelines in Washington and elsewhere in the US.

Beaver Lake Park, a WDFW operated boat ramp, and Beaver Lake Preserve provide public access to Beaver Lake. Beaver Lake Park is developed for a combination of active and passive recreation activities, with approximately 25 percent of the shoreline armored and other areas used as beach. The City Parks Department has expressed that future construction of a dock and beach improvements are possible, although no timeline has been set. Beaver Lake Preserve is largely undeveloped, the Parks Department has developed a Master Plan for this area. Preliminary development activities being considered for the Preserve include trails, a hand-held watercraft launch, and/or viewing platforms.

Additional development of public shoreline areas on Beaver Lake for active recreation could modify the lake's shoreline. Potential development of a boat float for non-motorized craft (Beaver Lake Preserve) and/or improvements to the existing Beaver Lake Park swim beach could require the import of fill material, and the potential for grading near the water's edge. Development of a new public dock (at Beaver Lake Park) would require pile driving and could create some additional overwater shading. The proposed SMP, including the provisions of SMC 21A.50, will require that all shoreline modifications and water-oriented uses be designed to avoid and minimize impacts to the shoreline and mitigation will be required for any un-avoidable impacts. Cumulative impacts associated with ongoing shoreline access and recreational use on the Beaver Lake shoreline are not anticipated in the foreseeable future.

Transportation and Utility Uses

Within the Pine and Beaver Lake shoreline areas, no significant new transportation uses are currently anticipated. By and large, existing transportation infrastructure is located outside of shoreline jurisdiction, behind the private residential lots and parks properties, which front the lakes. Projects that have occurred in recent years within or adjacent to the Pine Lake and Beaver Lake shoreline areas have been focused on improvements to multi-modal circulation through additions of bike lanes and separated sidewalks, bus transit service-related improvements, and roadway circulation, as well as general facility upkeep. Projects that have recently been completed or are underway and/or that are in planning stages have included improvements to 212th Avenue and 224th Avenue SE and along SE 32nd Street, 216th Avenue SE, SE 28th Street, 222nd Place SE, and SE 30th Street in the area to the south of Pine Lake (South Pine Lake Route), construction of a Park and Ride facility along 228th Avenue to the east of Pine Lake, and widening / bike lane / sidewalk improvements to SE 20th Street.

Future improvements to roadways in shoreline jurisdiction are anticipated, but will be limited to improvement efforts similar in purpose to those mentioned above, including multi-modal improvements, re-surfacing, and limited road widening projects. The City's 2009-2014 Six Year Transportation Improvement Program allocates approximately 6.5 million dollars over the period for improvements to non-motorized transportation infrastructure and 2.1 million dollars for the overlay program, which supports general road maintenance and rehabilitation. No major capitol projects are identified that would occur specifically within the Pine and Beaver Lake shoreline areas. In general, transportation projects would tend to have positive benefits in terms of providing better stormwater treatment and flow control according to the newest standards, providing environmental mitigation (e.g., culvert improvements), and enhancing circulation. Significant adverse cumulative impacts are not expected.

Anticipated utility improvements within the Pine and Beaver Lake shoreline areas include upgrades to and extensions of the municipal sewer system. Recent projects have extended sewer

service to areas around Pine and Beaver Lake, and although no additional projects are currently planned, it is anticipated the similar projects will occur in the future. No other major utility uses and/or projects are anticipated.

Other Uses

No other uses are anticipated to occur within the Pine Lake and Beaver Lake shoreline areas according to the existing development regulations and Comprehensive Plan mapping.

6.0 ASSESSMENT OF ESTABLISHED PROGRAMS

There are several City, state, and federal programs and regulations which work in concert with the SMP to accommodate residential and recreational uses while ensuring that ecological impacts are minimized. The following regulatory programs will continue to support the overall goals and policies of the City's SMP and have beneficial effects on shoreline functions and processes.

6.1 City Programs

6.1.1 Sammamish Municipal Code

Various sections of the SMC regulate development in a way that benefits the shoreline environments of Lake Sammamish, Pine Lake and Beaver Lake. Regulations are focused on surface water management, flood damage prevention, clearing and grading activities, land use and development standards including management of environmentally critical areas, and low impact development techniques.

Title 15: Title 15 includes the Surface Water Management (SMC 15.05) and Flood Damage Prevention (SMC 15.10) regulations. Surface Water Management regulations adopt, by reference, Title 9 –Surface Water Management of the King County Code (KCC). KCC Title 9 regulates surface water management for development projects meeting any of the following criteria:

- Result in 2,000 square feet or more of new impervious surface;
- Involve 7,000 square feet or more of land disturbing activity;
- Involve modification to drainage pipes and ditches that are 12 inches or greater in size/depth;
- Located in or adjacent to a flood hazard area as defined in K.C.C. chapter 21A.24;
- Located within a critical drainage area (defined by KCC Title 9); or
- Involve redevelopment activities over specific monetary and area based thresholds, as specified by KCC Title 9.

For the large majority of the development and redevelopment projects within the City's shoreline areas, it is anticipated that Small Project Review as detailed by KCC Title 9 would apply. Under Small Project Review, development projects must meet surface water management requirements specified in the King County Surface Water Design Manual (manual adopted by King County, and by reference the City, in 2005 in order to implement and guide the regulations of KCC Title 9). Requirements include: flow control best management practices, erosion and sediment control measures and drainage plan submittal requirements.

Flood Damage Prevention (SMC 15.10) regulations provide specifications for development, redevelopment, and modifications to existing uses and structures within "all areas of special flood hazard", which are specified as areas so mapped by the Federal Emergency Management Administration (FEMA) on flood rate insurance maps (FIRMs) (SMC 15.10.050 and 15.10.060). FEMA also frequently establish base flood elevations (BFE) for lakes and rivers, identifying the

elevation of the 100-year floodplain (special flood hazard area). The BFE for Lake Sammamish is 33 feet above sea level (National Geodetic Vertical Datum [NGVD] 1929)²⁵. In all situations where the extent of the special flood hazard area as mapped differs from the area determined by the BFE flood elevation, the area established by the BFE is regulated by SMC 15.10. Regulations require standards for development of residential structures within some flood hazard areas, and also prohibit construction in certain areas of highest flood risk. Flood hazard areas are depicted for site planning purposes by the City on Environmentally Sensitive Areas mapping (available online at: <http://www.ci.sammamish.wa.us/Maps.aspx>).

Title 16: Clearing and grading standards for all areas within City limits are specified by SMC 16.15 (Clearing and Grading). These regulations set standards for clearing and removal of vegetation, excavation, grading, and earthwork construction including cuts and fills, gravel pits, and dumping operations in order to protect public health, safety, and welfare. Specifically relating to the shoreline environment and other sensitive aquatic and wetland areas, SMC 16.15 protect resources through minimization of adverse stormwater, water quality, and habitat loss impacts related to the removal of vegetation and alteration of landforms. As specified under the code, all proposed clearing and grading activities must provide plans specifying compliance with standards and obtain a Clearing and Grading Permit.

In addition to the SMC Title 16 requirements detailed above, certain construction projects may require additional permitting in order to meet federal Clean Water Act requirements, as administered by the Department of Ecology under the Construction Stormwater General Permit program. Typically, only sites or phased construction projects that will ultimately disturb more than one acre of land and that discharge stormwater from the site into state surface waters or drainage systems are required to meet these requirements. The Department of Ecology, however, may require a permit for any construction activity that is determined to be a significant contributor of pollutants to waters of the state. In order to acquire this permit and remain compliant with permit requirements, a project-specific Stormwater Pollution Prevention Plan (SWPPP) must be prepared (Ecology 2006).

Title 21A: Title 21A establishes development standards for the entire City, including standards for Environmentally Critical Areas (Chapter 21A.50) and Low Impact Development (Ordinance O2008-236 – adopted as SMC 21A.85).

The critical area regulations (referred to as SMC 21A.50) protect streams, wetlands, geologic and soil hazards areas, critical aquifer recharge areas, as well as lake shorelines. The regulations of SMC 21A.50 establish required buffers around critical areas. Regulations additionally establish permitted uses within critical areas and associated buffers. Permitted uses are generally limited to: ecological restoration, public and private trails (buffers only), certain utilities (heavily restricted within critical areas), essential public facilities, and certain water-dependent and water-enjoyment related uses (lakes and lake buffers only).

During project specific site planning, SMC 21A.50 requires that development applicants must consider and implement the following sequential measures, which appear in order of preference,

²⁵ Lake elevations are generally given in one of two datum: NAVD 88 or NGVD 29. The difference between the NGVD 29 and NAVD 88 datum in the vicinity of Bellevue is +3.585 feet (Watershed Company, 2004).

in regards to environmentally critical areas: avoidance, minimization, and mitigation (SMC 21A.50.135). When mitigation is necessary to compensate for permitted critical areas impacts, it must be planned for, implemented, monitored, and maintained in a fashion consistent with SMC 21A.50 requirements. Mitigation is required to be in-kind and sufficient to maintain critical area and buffer functions, and to prevent risk from a hazard posed by a critical area (SMC 21A.50.140). Mitigation must be developed with goals, objectives, and performance standards, and must use best available science.

In addition to buffer and use regulations for areas immediately surrounding environmentally critical areas, SMC 21A.50 includes requirements for development within the Pine Lake and Beaver Lake watersheds. Standards were developed to maintain and improve water quality within the lakes, and specifically regulate surface water to minimize phosphorus levels. Lake monitoring efforts and basin plans have documented water quality concerns within both Pine and Beaver Lakes and have identified surface water runoff from construction sites and developed areas as a primary source. Standards for new development over specific size thresholds specified by SMC 21A.50.355 require design of stormwater facilities that will remove a minimum of 80% of all development-resultant phosphorus. SMC 21A.50.355 includes techniques, including infiltration, retention of forested areas, and use of sand filters, through which this standard may be achieved.

Low Impact Development (LID) approaches are encouraged to be implemented throughout the City via the LID regulations recently adopted as SMC 21A.85. As specified by SMC 21A.85, LID is an approach to land use planning and project design that seeks to:

- Increase the ability of a developed site to effectively emulate pre-development hydrologic conditions.
- Minimize overland stormwater runoff from a developed site.
- Maximize the retention and incorporation of trees, native vegetation, understory plants, and native soils and minimize the need for soil disturbance and site conversion from vegetated to non-vegetated surfaces.

SMC 21A.85 encourages the incorporation of LID planning and design approaches into project development by providing incentives tied to LID. The incentivized LID techniques are not intended to replace existing state and local standards for management of stormwater; alternatively, SMC 21A.85 seeks to guide and encourage the use of acceptable and beneficial alternative techniques wherever feasible. By providing incentives to minimize stormwater runoff and retain vegetation, SMC 21A.85 provides a framework through which desired land uses and developments can occur while minimizing environmental impacts. The benefit of SMC 21A.85 are highlighted in areas where natural resources, such as shorelines, minimize the land footprint available for development activity.

6.1.2 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. SWCP policies direct the City to consider:

- Collaborating with King County and other Lake Sammamish basin jurisdictions to come up with a regional approach for managing stormwater;
- Establishing a program to identify and restore degraded aquatic habitats;
- Creating educational programs for the Lake Sammamish, Bear Creek, and Issaquah Creek Basins;
- Encouraging construction of taller and narrower buildings and homes, which would reduce the "footprint" of impervious surfaces;
- Planning for increasing development in the city through consideration of encouraging smaller lot sizes and allowing accessory dwelling units in designated areas; and
- Promoting infiltration, pervious pavement, and other LID techniques wherever feasible.

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 LID strategies.

6.1.3 Management of Pine Lake Water Quality

The recently prepared Management Plan for Pine Lake Water Quality (Tetra Tech Inc., March 2009) describes conditions in the Pine Lake sub-basin 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.

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 sub-basin. The report suggests that

these actions will reduce the amount of phosphorus and other polluting agents entering Pine Lake and associated basin surface waters.

6.1.4 Beaver Lake Management Plan

The City, in collaboration with King County and sub-basin residents, first prepared a Management Plan for Beaver Lake in 1994. This plan was updated in 2000 and most recently in late 2007, and includes a number of management recommendations aimed at achieving water quality and habitat goals identified in the plan. The plan focuses on five key focus areas: wetland and resource land preservation, future land development guidelines, ongoing stormwater management, shoreline and watershed actions, and monitoring. Each focus area has corresponding management recommendations. This plan has previously guided land acquisition efforts within the Beaver Lake basin, most recently in 2007 when the City acquired a 17-acre property that created a contiguous corridor of open space between the lake and the County's Soaring Eagle Park.

Management recommendations from the plan, along with those from the Pine Lake Management Plan, were incorporated into the critical areas regulations (SMC 21A.50). Specifically, development standards applicable to the entire Beaver Lake and Pine Lake basins were incorporated into the regulations, with the specific intent of encouraging LID techniques within the basins and ultimately improving lake water quality and functions.

6.1.5 City of Sammamish Shoreline Restoration Plan

During the current SMP Update Process, the City developed a Shoreline Restoration Plan that is intended to provide recommendations for restoring the shorelines of Lake Sammamish, Pine Lake and Beaver Lake as well as developing a framework under which shoreline restoration can be successfully achieved (ESA Adolfson, 2008). 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 SMP jurisdictional lakes. As required by the state guidelines established in WAC 173-26-201, the Restoration Plan includes the following key elements of the shoreline restoration planning process:

- Identification of degraded areas, impaired ecological functions, and sites with potential for ecological restoration.
- Identification of 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 and watershed planning efforts [WRIA habitat/recovery plans]).
- Identification of additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs.
- Establishment of overall goals and priorities for restoration of degraded areas and impaired ecological functions.
- Identification of timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals.
- Establishment of 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).

As components of the plan are implemented voluntarily or as mitigation for development impacts, the City expects to see a gain in shoreline ecological functions, which will offset some of the effects of past and expected future development.

6.2 Key State and Federal Regulations

In addition to local regulations, a number of state and federal agencies have regulatory jurisdiction over resources in the City's shoreline jurisdiction. As with local requirements, state and federal regulations apply throughout the City and significantly reduce the potential for cumulative impacts to shorelines. The major state and federal regulations affecting shoreline-related resources include, but are not limited to:

- **Endangered Species Act (ESA):** The federal ESA addresses the protection and recovery of federally listed species. Depending on the listed species, the ESA is administered by either the National Oceanic and Atmospheric Administration Fisheries or the United States Fish and Wildlife Service.
- **Lake Sammamish, along with the lower portion of many of the tributaries streams,** provides significant migration, spawning, and rearing habitat to five species. These species include Chinook, coho and sockeye/kokanee salmon, as well as steelhead/rainbow trout and coastal cutthroat trout. Of these species, Chinook salmon are listed as threatened throughout the WRIA 8 watershed. The WRIA 8 Technical Committee designated the lakeshore area as a "Tier 1" evaluation area for migrating and rearing Chinook salmon populations (WRIA 8, 2005). In addition, the lake's resident kokanee population has been determined to be genetically distinct. In 2007, Trout Unlimited and other groups and agencies petitioned the US Fish and Wildlife Service (USFWS) to review the listing status for the kokanee population. The USFWS responded in May of 2008 by requesting public comment and undertaking review of the Trout Unlimited petition. USFWS review is expected to be complete by early 2009, after which the Lake Sammamish kokanee population Federal listing status could change. (KCDNRP 2008)
- **Clean Water Act (CWA):** The federal CWA requires states to set standards for the protection of water quality. It also regulates excavation and dredging in waters of the U.S., including lakes, streams, and wetlands. Certain activities affecting lake shorelines, including fill in shoreline waters (highly limited by proposed SMP) and/or wetlands or work in the adjacent streams may require a permit from the U.S. Army Corps of Engineers (Corps) and/or Washington State Department of Ecology under Section 404 and Section 401 of the CWA, respectively. Construction of bulkheads, launching ramps, beaches, and shoreline restoration projects all have the potential to require permits under Section 404 and Section 401.
- **Rivers and Harbors Act Section 10:** The federal Rivers and Harbors Act requires any project that creates an obstruction or alteration in, over, or under navigable U.S. waters to be permitted. Permits are reviewed and approved by the Corps, and are required for construction, and some maintenance, of docks, piers, pilings, bulkheads, and certain other in-water and over-water structures. On Lake Sammamish, the Corps has set standards for dock construction (including piles) under Region General Permit 3. Projects may meet

Section 10 requirements by following the standards of Region General Permit 3, or may submit an alternative design for review by Corps regulatory staff. In all cases, Corps standards for Section 10 approval will dictate construction techniques, materials, and size and bulk allowed for construction of docks, piers, shoreline armoring, and other in-water / over-water structures. The Corps also required mitigation for adverse effects caused by these construction activities.

- Hydraulic Project Approval (HPA): The Washington Department of Fish and Wildlife regulates activities that use, divert, obstruct, or change the natural flow of the beds or banks of waters of the state and may affect fish habitat. Projects in the shoreline jurisdiction requiring construction below the ordinary high water mark of Lake Sammamish, Pine Lake, and Beaver Lake as well as other lakes and streams in the City could require an HPA. These projects would include construction of docks, bulkheads, culverts, and other in-water structures. Projects creating new impervious surface that could substantially increase stormwater runoff to waters of the state may also require approval.
- National Pollutant Discharge Elimination System (NPDES): Ecology regulates activities that result in wastewater discharges to surface water from industrial facilities or municipal wastewater treatment plants. NPDES permits are also required for stormwater discharges from industrial facilities, construction sites of one or more acres, and municipal stormwater systems that serve populations of 100,000 or more.

7.0 SMP PROVISIONS AND NO NET LOSS

The Sammamish SMP has been developed in accordance with the state shoreline guidelines (WAC 173-26) and is consistent with the shoreline management goals and policies established by the Shoreline Management Act. The SMP proposes new shoreline environment designations and development standards for shoreline modifications and uses and establishes strong protections for shoreline functions and processes. The system of environment designations is consistent with the established land use pattern, as well as the land use vision in the City's comprehensive plan and other long-range planning documents. The updated development standards are largely consistent with available scientific information on protecting aquatic areas. The standards restrict activities that would cause adverse impacts to the shoreline environment, encourage other LID strategies, and create restoration incentives.

The Sammamish shorelines are largely developed in residential uses. There are limited opportunities for new development within shoreline jurisdiction. Therefore, major changes in development patterns or use are unlikely. Much of the foreseeable development activity will be redevelopment of existing structures. The proposed development standards and mitigation requirements will ensure that new residential structures and appurtenances will not cumulatively affect shoreline ecology. The SMP protections will be enhanced and strengthened as a result of the other local, state and federal regulations that apply to shoreline use and development. The City will seek to implement the Shoreline Restoration Plan, which identifies opportunities to improve or restore ecological functions that have been impaired as a result of past development activities.

Additional development will occur, but over time the net effect of the SMP, other regulations, and voluntary restoration efforts will prevent a net loss of shoreline ecological functions from existing baseline conditions.

Based on assessment of these factors, the cumulative actions taken over time in accordance with the proposed SMP are not likely to result in a net loss of shoreline ecological functions from existing baseline conditions.

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