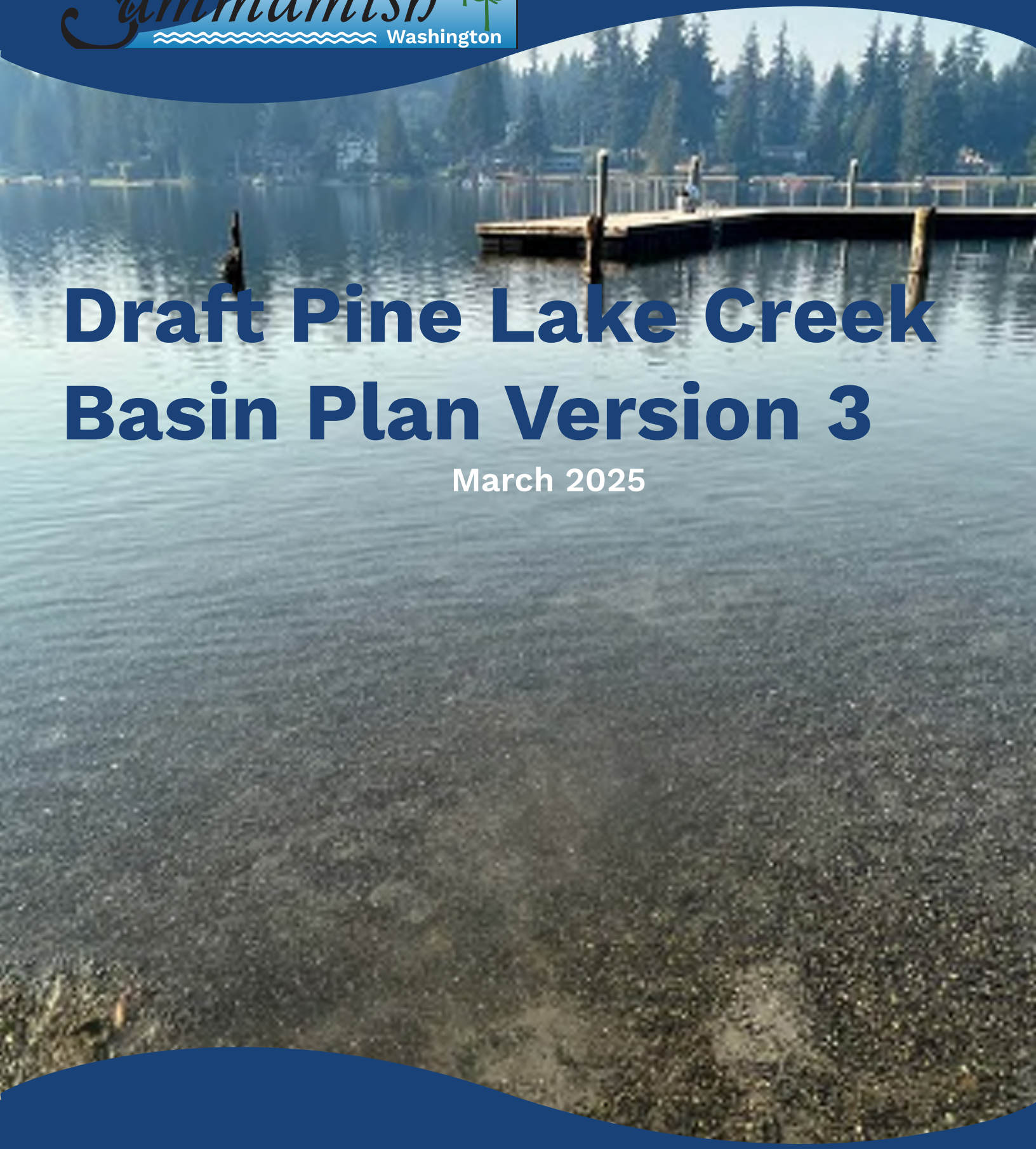
City of Sammamish Washington



Draft Pine Lake Creek Basin Plan Version 3

March 2025

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1 Introduction

Purpose and Background

Basin planning was identified as a key priority in the City of Sammamish (City) 2016 Storm and Surface Water Comprehensive Plan (Windward, 2016). At that time, the City had already updated Inglewood and Thompson Basin Plans (2011) that were included in King County's original East Lake Sammamish Basin Plan and Nonpoint Action Plan (King County 1994). The Zackuse Basin Plan was completed in 2019 and Laughing Jacobs was completed in 2022. This plan, the Pine Lake Creek Basin Plan, is the fifth and one of the last large basins with a primary creek system in the city to be evaluated. The remaining basins to be updated include Beaver Lake (not included in Laughing Jacobs Basin Plan), and the Monohon and Panhandle basins, which both include multiple small tributaries that flow directly to Lake Sammamish from the plateau. Figure 1-1 shows the location of the basins and which ones have completed basin plans.

2016 Storm &Surface Water Management Comprehensive Plan Goal G.2: Use drainage basin planning to allocate limited resources to address priority problems and opportunities.

What is a basin plan?
A drainage basin (also referred to as a watershed or catchment) is a logical geographic area to assess surface and stormwater conditions because it defines the geographic limits of direct influence and impacts. This basin plan focuses on surface and stormwater related conditions and solutions specific to the Pine Lake Creek drainage basin.

The basin plans thus far have been instrumental in helping the City allocate its resources to develop and prioritize policies, projects, and strategies that protect water quality and habitat within its watersheds. The Washington State Department of Ecology has also begun requiring permittees under its Western Washington Phase II Municipal Stormwater Permit to develop Stormwater Management Action Plans within priority watersheds. Basin Planning can be used to meet the requirements of the SMAP or to facilitate the process of identifying actionable projects and strategies within a smaller area of the watershed (or basin).

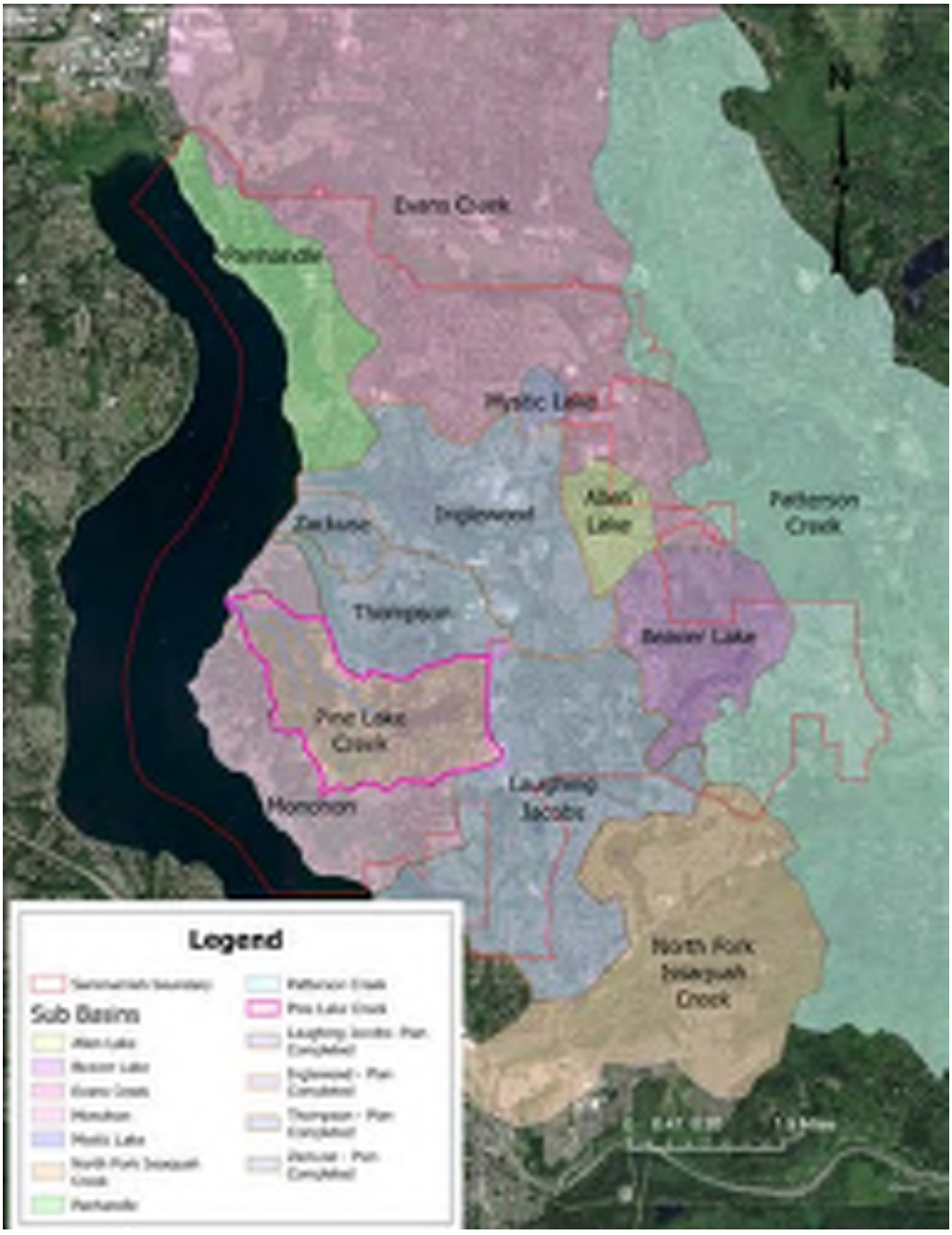


Figure 1-1. Vicinity Location

Pine Lake Creek Basin Overview

The Pine Lake Creek basin is located in the southwest part of Sammamish in the East Lake Sammamish Basin, Watershed Resources Inventory Area (WRIA) 8. Pine Lake, located on the plateau, is its central hydrologic feature and the headwaters of Pine Lake Creek. The basin encompasses 1,200 acres, with the lake and adjacent Pine Lake Park covering 105 acres in the upland part of the basin. Pine Lake Creek (~ 1.86 miles), which flows out of Pine Lake, is the primary stream feature. Pine Lake Creek historically supported a substantial Lake Sammamish kokanee run and is one of four primary Lake Sammamish kokanee spawning streams within the city. A secondary stream, Kanim Creek (~1.31 miles) enters Pine Lake Creek from the south just east of East Lake Sammamish Parkway. There are multiple large mapped wetlands, including one sensitive sphagnum bog, in the basin, totaling approximately 155 acres. Additionally, there are areas that may be classified as wetlands that are not mapped and not included in the reported acreage. Land use in the Pine Lake Creek Basin is almost all residential.

> *This plan identifies and prioritizes projects and actions to address surface water issues in the Pine Lake Creek Basin.*

SE 24th St. and 212th Ave SE on a rainy day

Basin Plan Objectives

Past development has affected kokanee runs as well as reduced water quality, flooding and erosion in the Pine Lake Creek basin. This plan characterizes the existing conditions in the basin and identifies and prioritizes strategies, projects, and actions that address flooding, erosion, water quality, and ecological problems and that reflect the city and community's priorities.

The Vision for Sammamish *is a vibrant community blessed with a well-preserved natural environment, a family-friendly culture, and unrivaled connectivity to everything northwest Washington has to offer.* Additionally, the vision *is to expand the city's possibilities to the fullest. To do so, we focus on the cornerstones of health communities; people, prosperity, and planet. We look to achieve an equitable social environment, viable economic development, and livable natural and built environments. These will help our city continue to grow and thrive.*

This plan reflects a livable built and natural environment. Specific community interests and priorities were sought during plan development through engagement opportunities with interested residents and stakeholders in the community. Input received was incorporated into final projects and strategies.

The chapters in this plan include:

1. Introduction
2. Methodology
3. Stakeholder Involvement and Community Outreach
4. Existing Basin Conditions
5. Surface Water Issues
6. Basin Plan Actions
7. Implementation Strategies
8. References

2 Methodology

Plan Development

The development of the Pine Lake Creek Basin Plan involved 1) reviewing previous documentation and data, 2) assessing existing conditions based on new and existing data, observations, and analysis, and 3) identifying and prioritizing strategies, projects and actions for the future considering existing conditions and observed or modeled trends.

Data Review

Several documents and sources of data were reviewed to relate previously identified basin issues to existing observations. Projects and strategies recommended in previous reports — but net yet implemented — were also reviewed for continued relevance. Table 2-1 lists the existing sources that were used to support plan development.

Table 2-1. Sources of information used in Basin Plan development

Data Source	How was the information used?
East Lake Sammamish Basin and Nonpoint Action Plan, December 1994, King County Surface Water Management	Background information and preliminary list of issues and recommended projects.
Technical Memorandum, Kanim Creek Tributary Analysis, 12/31/2019, Altaterra Consulting	Description of Kanim Creek tributary drainage, channel and slope conditions in vicinity of Loree Estates neighborhood.
Urban Forest Management Plan, Adopted November 4, 2019, City of Sammamish	Background information on percent tree canopy and types of forest cover in Pine Lake Creek Basin.
Draft Ecological Survey of Lake Sammamish Kokanee, 2016, Lake Sammamish Kokanee Work Group Technical Workshop, 17 November 2016	Background on Lake Sammamish Kokanee life-history, estimated habitat in Pine Lake Creek, and management priorities.

Table 2-1. Sources of information used in Basin Plan development

Data Source	How was the information used?
Storm and Surface Water Management Comprehensive Plan, December 2016, City of Sammamish	Overview of Surface Water Goals, Projects, and Pine Lake Creek Characteristics.
Lake Sammamish Kokanee-Supplementation Technical Working Group, June 15, 2016	Background information on supplementation results in Lake Sammamish streams.
City of Sammamish Public Works Stormwater CIP Priority Criteria, Presentation to City Council Study Session, June 12, 2018	Summary of CIP prioritization methodology.
City of Sammamish, Washington, Resolution NO. R2018-804	Resolution and descriptive methodology for prioritizing stormwater capital improvement projects.
King County Lake Stewardship Program: 2022 Monitoring Update, July 2023	Pine Lake 2022 Water Quality Data summary and trends.
City of Sammamish Retrofit Strategy and Guidance Manual, March 2021	Identification of potential retrofit projects and strategies in the Pine Lake Creek Basin.
Email correspondence from King County re. Lake Sammamish Kokanee Surveys	Historical data on Kokanee redds and escapement in Pine Lake Creek.
City of Sammamish Geographic Information System Data, various dates.	Geospatial stormwater system data (infrastructure), critical areas data (wetlands, streams, steep slopes), etc. to inform analysis and use in maps.

Data Development

Several different types of data were collected over the course of the plan development. Site visits were conducted to observe stormwater outfalls, stream conditions, stormwater facility conditions, and the Pine Lake outfall/weir. Additionally, water quality samples were obtained at least three times from locations in upper and lower Pine Lake and Kanim creeks.

Stream and Aquatic Habitat Conditions

Stream and aquatic habitat conditions were observed in Pine Lake and Kanim creeks by teams of stream professionals (i.e., geomorphologists, fish ecologists, and hydrologists) to assess existing physical and biological conditions for fish and other aquatic species. The stream report is provided in Appendix A, and a summary of conditions is provided in Chapter 4.

Water Quality Sampling

Water quality sampling was conducted to update existing water quality conditions. Water quality samples were collected in spring and summer of 2023 at five locations in the Pine Lake Creek Basin:

- Pine Lake Creek Outlet
- Lower Pine Lake Creek
- Lower Kanim Creek
- Upper Pine Lake Creek
- Upper Kanim Creek

> *Water quality data collected for this project provided an update of current conditions in Pine Lake and Kanim creeks.*

Water quality samples were submitted for laboratory analysis of the following parameters:

- Fecal coliform
- E. coli
- Total phosphorus
- Nitrate + nitrite

- Total Kjeldahl nitrogen
- Total Suspended Solids (TSS)

Additionally, in-situ (in-stream) water quality was tested for pH, conductivity, turbidity, and temperature using a water quality sonde (or meter). Flow measurements were also made during sampling visits if there was enough flow to do so. A full description of the methodology and results of water quality sampling is provided in Appendix B. Results of water quality sampling are described in Chapter 4.

Hydrologic Modeling

Hydrologic modeling of the Pine Lake Creek Basin was conducted to assess and compare existing and potential future flow conditions in Pine Lake Creek and Kanim Creek, the two streams that receive flow from land surfaces in the basin. Future conditions considered potential development (according to parcel zoning, development regulations, critical areas, and other factors that determine allowable development) and projected changes in precipitation. Modeling was conducted using the Hydrologic Simulation Program – Fortran (HSPF) software. Modeling methodology is described in Appendix C. Results of the modeling are described in Chapter 4.

Collecting data in Pine Lake Creek

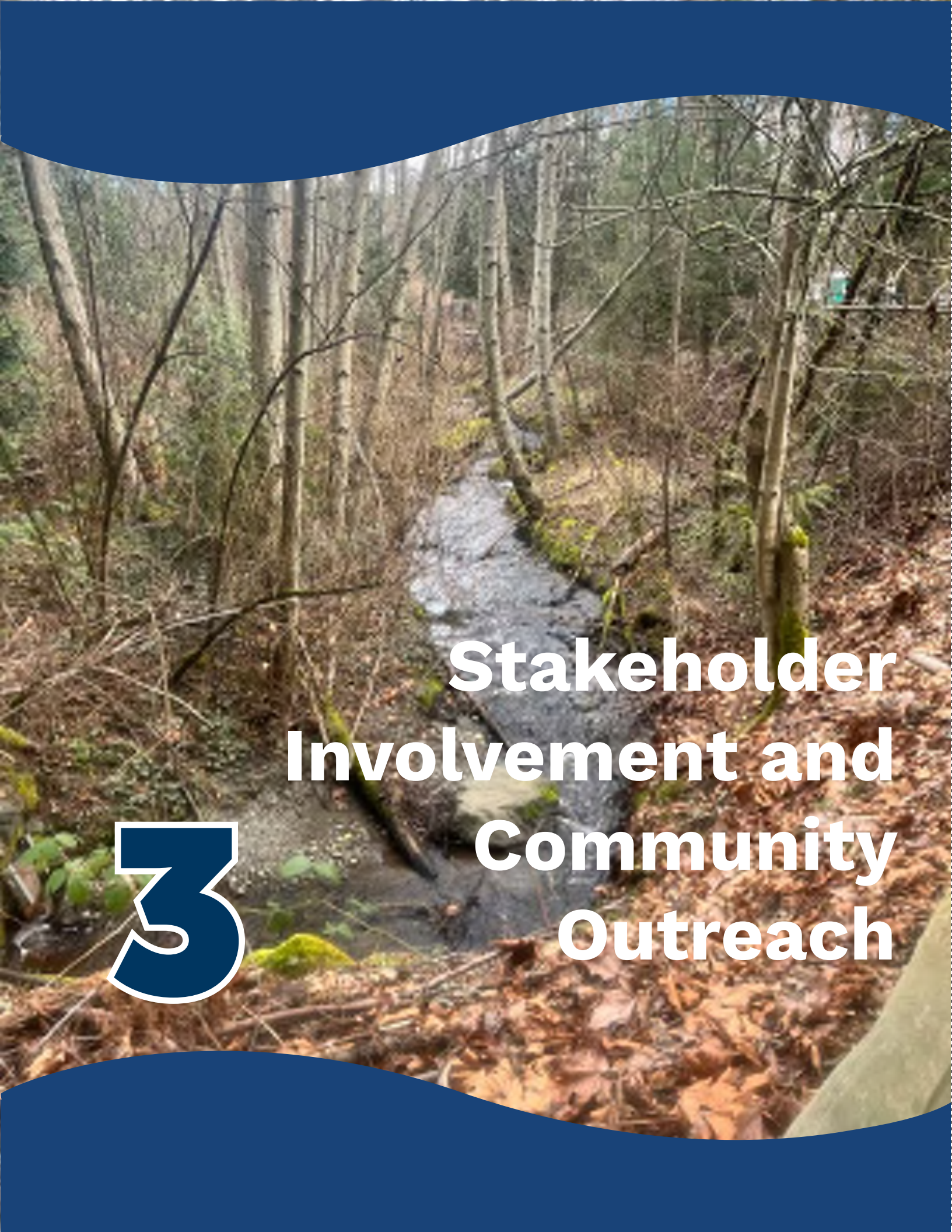
Data Use

The data reviewed and collected were evaluated to identify current issues and predict future conditions (i.e., hydrologic modeling) to support identification of projects and strategies for long-term preservation and improvement of surface water conditions in the basin.

Strategy Development

The planning team identified problems and issues to be considered in the Basin Plan through review of previous documentation, site visits and stream walks, data collection, and input from stakeholders and the community (Chapter 3).

Potential actions were classified as either capital or programmatic projects and initially prioritized using the city's adopted CIP prioritization methodology. Input from city staff and the community was considered in refinement of the final recommendations. Details on the prioritization methodology are provided in Chapter 8.



3

Stakeholder Involvement and Community Outreach

Community Participation in the Planning Process

A variety of tools were used to inform and engage stakeholders and the broader community about the Pine Lake Creek basin planning effort and to solicit input on priorities and values that are important to the community. The city hosted a web page that provided an overview of the project, contact information and links to relevant documents and information (Figure 3-1 shows a screenshot of the project page on the city's website).

Two public stakeholder group meetings were held at City Hall in July and December

Figure 3-1. Screenshot of City Webpage

2023, to gather information and perspectives from participants with identified interest in Pine Lake and/or in the streams and overall basin. Community open houses were

held at City Hall in September 2023 and March 2024 (Figure 3-2). Summaries of the stakeholder and open house events are provided in Appendix D.

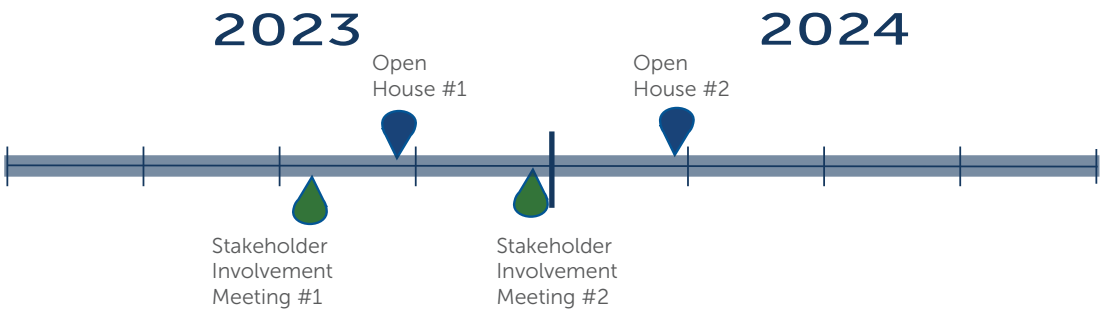


Figure 3-2. Community Outreach Events and Timeline

Stakeholder Input

Stakeholder discussions were held to solicit feedback from individuals with specific interest and or knowledge of the Pine Lake Creek Basin. Four stakeholder discussions were held on two different days with two separate sessions occurring sequentially for participants to discuss Pine Lake or the overall basin. Attendees were invited to attend one or both sessions, depending on their interests.

Eight people attended two different stakeholder groups to discuss basin/stream issues or lake issues in July and December 2023.

Potential stakeholders were identified by the city and planning team by brainstorming specific interests and points of view that may be interested in the plan, including residents, property owners, non-profit groups, environmental interests, and groups working on similar issues in the area.

The first stakeholder event in July 2023 focused on identifying issues, concerns, and opportunities for improvement in the basin.

Issues identified by the stakeholders included the following:

- Less biodiversity in the streams (i.e., abundance and type of insects)
- Changing water flow rates, levels, and temperature
- Fewer salmon fry
- Lack of access to streams and creeks
- Occasional poor water quality in the lake (including high temperatures)
- Invasive species in the lake (plants and animals)
- Variable lake water levels
- Need to make some repairs on the lake weir

Stakeholder suggestions included:

- Education for lakefront homeowners for how to deal with invasives and protect water quality
- Enforcement of existing codes and policies
- Thoughtful regional detention plan versus lot-by-lot detention to manage flows
- Ensure access to streams for monitoring

The second stakeholder event in December 2023 was geared toward soliciting input on projects and strategies identified by the planning team.

The key input provided by the stakeholders during the sessions included:

- The basin plan should consider solutions that benefit multiple fish species that depend on Pine Lake Creek, not just kokanee salmon.
- Solutions should consider land use planning and how to balance continual growth and development with protecting the environment.
- The Basin Plan will need the collective efforts of all stakeholders and collaboration between city departments to be successful.
- There were mixed opinions on whether a lake management district

framework is a good fit for Pine Lake.

- Impacts of septic systems to Pine Lake water quality and the costs of connecting sewer for lakeside homeowners should be considered.
- Education programs for people who recreate or live on the lake could be a cost-effective strategy to implement while the city considers larger, more costly projects.

Open House Input

The city hosted two in-person open houses in September 2023 and March 2024 to inform and gather input from the community on the Pine Lake Creek Basin Plan. Specific feedback is provided in Appendix D.

In the September 2023 Open House, the community corroborated much of what the planning team heard from the stakeholder sessions. Residents shared their knowledge of specific lake issues, including studies, vegetation management, algae blooms, weir maintenance, lake level fluctuations, and sediment buildup. Many in the community were seeking solutions for the on-going lake issues, including education for homeowners, and safe aquatic weed control options.

Open House #1

Preliminary projects and strategies were presented to the community at the March 2024 Open House. Strategies and Actions were grouped into the following categories:

- Protection-Oriented Strategies

- Education-Oriented Strategies
- Potential Stormwater Projects
    - Pine Lake (Upper Basin)
    - Pine Lake (Lower Basin)
    - Kanim Creek

The preliminary projects and strategies presented to the community are described in Chapter 8 and projects with strong community support are identified.

Open House #1

4 Existing Basin Conditions

Land Surface Characteristics

The basin characteristics that have the greatest effect on surface water flow and quality are land cover (i.e., the type of natural or constructed material that makes up the land surface), topography (i.e., how flat or steep the land surface is), and geology (i.e., whether the rocks and soil can soak up water or if they erode easily). Climatic conditions, including when and how much rain falls on the basin, are the other big factor.

Land Cover

The land cover in the basin consists of surfaces covered with vegetation that may or may not have been modified by people and the built landscape with roads and building structures.

Forest cover

The City's Urban Forest Management Plan, adopted in November 2019, describes the forest composition and coverage of Sammamish's urban forest (City of Sammamish, 2019). The Pine Lake Creek Basin has one of the largest contiguous areas of tree canopy in Sammamish, with approximately 49% tree canopy, of which 50% is coniferous. One of the city's urban forest goal's is to maintain overall canopy cover (Urban Forest Goal #UA1). Figure 4-1 is a screenshot from the Urban Forest Management Plan (City of Sammamish, 2019) that shows the tree canopy in Pine Lake Creek Basin. Tree canopy helps keep water temperatures cooler, provides wood recruitment to channels, and promotes ecological activity good for fish and wildlife.

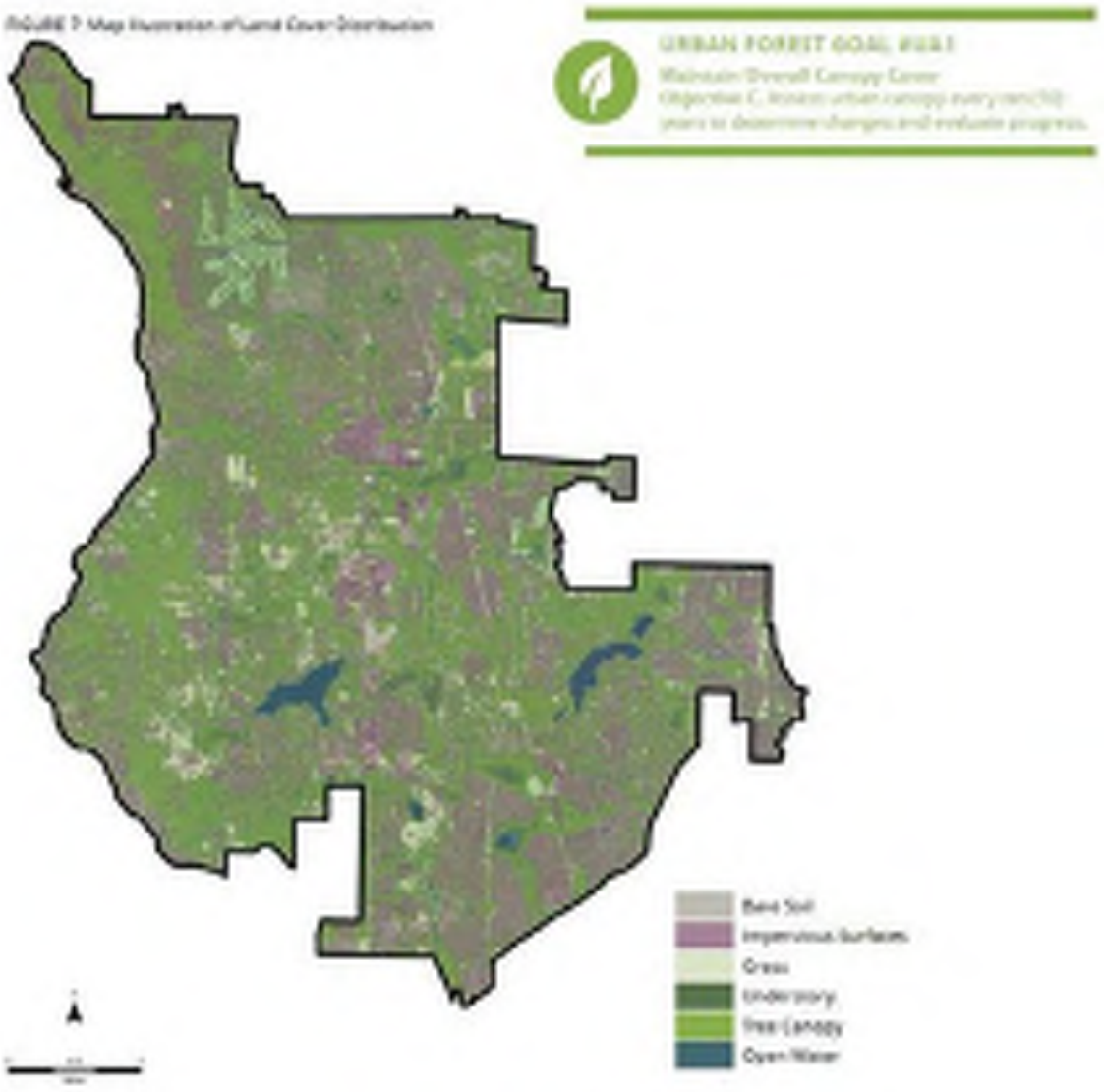


Figure 4-1. Screenshot of 2019 Urban Forestry Management Plan showing tree canopy

Built Landscape

The built landscape in the Pine Lake Creek Basin is the result of 2024 and historical Sammamish zoning, development regulations, and economic factors. Figure 4-2

Over 90% of the Pine Lake Creek Basin is classified as single family residential. The city owns 25 parcels in the basin, including Pine Lake Creek Park and parcels occupied by stormwater facilities. Only one city-owned parcel near the headwaters of Kanim Creek is open space.

shows the current zoning in the basin. Over 92% of the basin is zoned R-1 (1 dwelling unit per acre) or R-4 (4 dwelling units per acre). There is a very small percentage of the basin that fronts SE 228th Street zoned at higher levels of multi-family and commercial levels, and a few pockets of R-6 zoning. In addition to the zoning, there are areas that are unlikely to be developed to the maximum extent in the zoning classification due to the presence of environmentally critical areas, such as forested steep slopes and wetlands. The lack of dense development in some areas of the basin, particularly in the stream corridors, provides for healthier forests and riparian areas that are beneficial for surface water resources. Although the city owns over 25 parcels in the basin, only one is in the undeveloped riparian corridor. The parcel contains Kanim Creek, downstream of SE 19th Street.

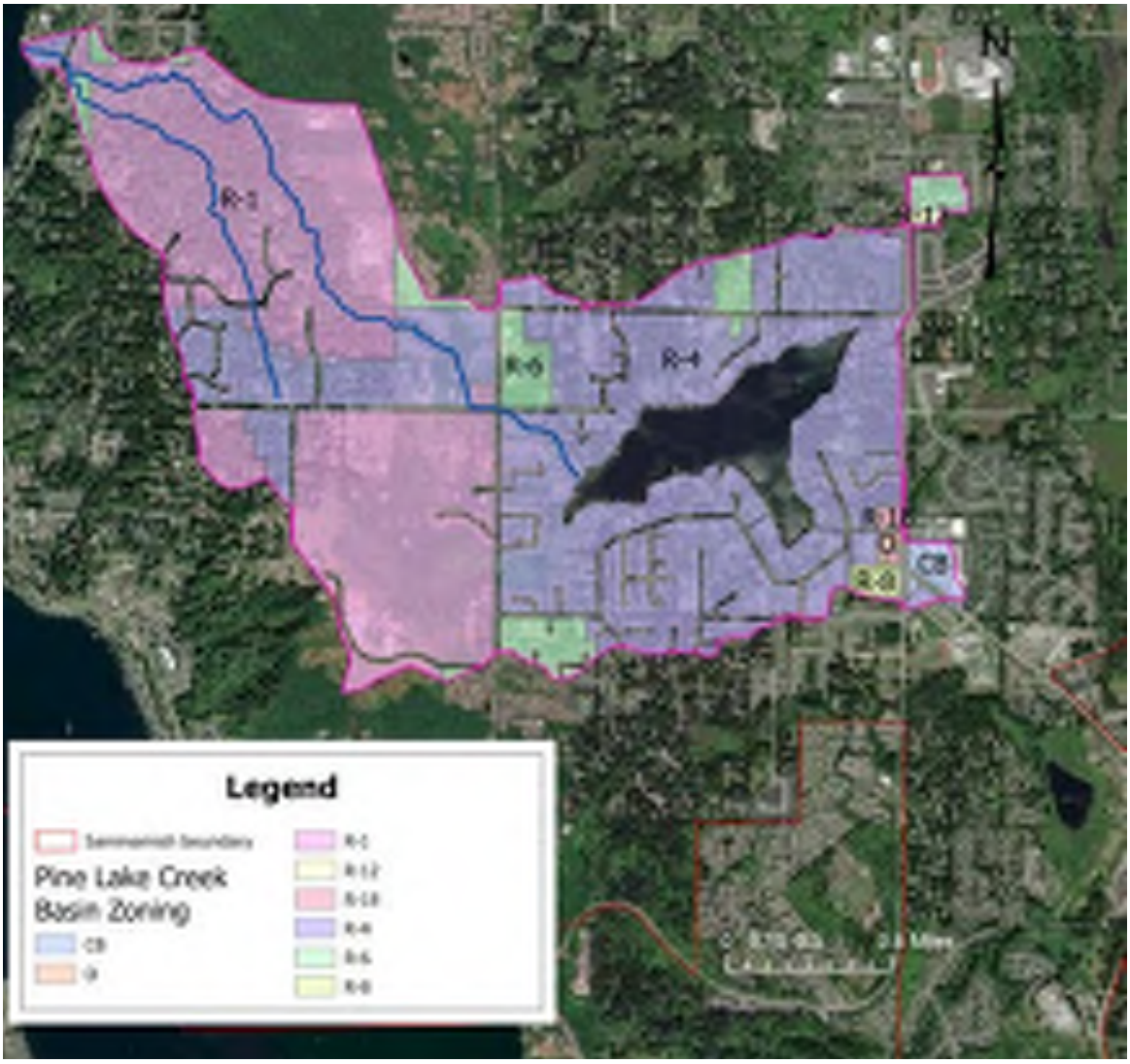


Figure 4-2. Pine Lake Creek Zoning

Topography

Topography in the Pine Lake Creek Basin is typical of the east shore of Lake Sammamish. The high point in Pine Lake Creek Basin is to the east of SE 228th Street at 576 feet above mean sea level. The basin drops over 500 feet to Lake Sammamish at the mouth of Pine Lake Creek. Almost 400 feet of the elevation drop occurs west of 212th where the plateau is cut by deep ravines carrying Pine Lake and Kanim creeks to just east of East Lake Sammamish Parkway where the overall grade of the basin is more gentle. The topographic conditions of the basin were formed long ago during glacial times and the underlying geologic conditions continue to play a role in topographic features and how surface water flows across the landscape.

Geology and Geomorphology

The surface geology of the Pine Lake Creek basin is shown in Figure 4-3. The dominant geologic unit is glacial till, a hard mix of silt, sand, gravel, and boulders that has been compacted by thousands of feet of ice. The glacial till is underlain by highly erodible sandy outwash deposits, which are exposed in the ravines and contribute to landslides. Other mapped features include:

- Wetlands, which are typically peaty;
- Loamy soil deposits on top of the till;
- Alluvium and alluvial fan deposits near the lake formed by streams;
- Mass wasting from slope failures;
- Older glacial deposits that are typically fine-grained;
- Very low permeability clay beneath the sandy outwash; and
- Recessional outwash deposited on top of the glacial till.

These geologic units contribute to the stream and hillslope geomorphic conditions present in the Pine Lake Creek basin and also impact the potential for stormwater infiltration. A more thorough description of the local geology is provided in the Preliminary Stormwater Feasibility Evaluation memorandum in Appendix E.

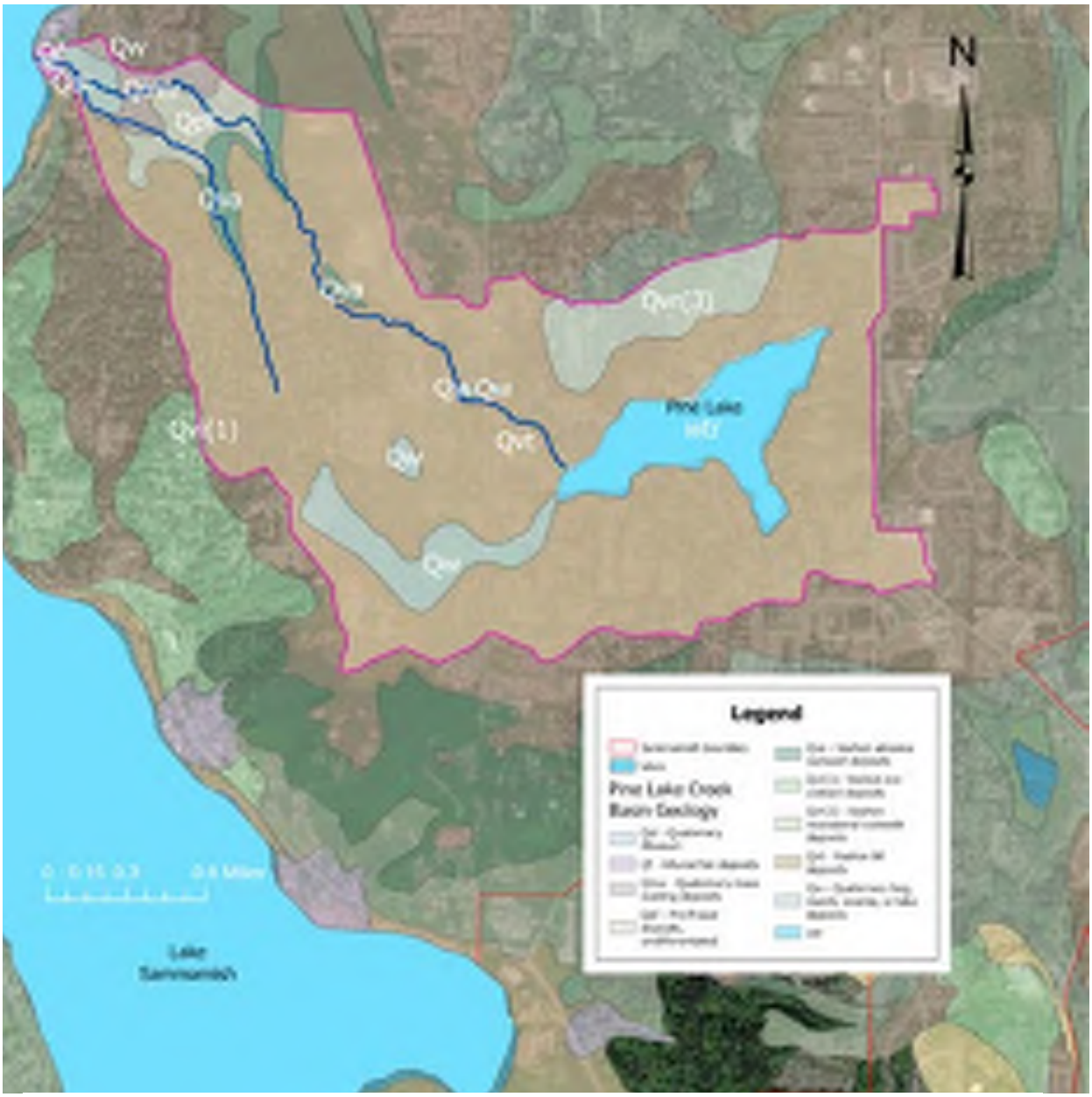


Figure 4-3. Pine Lake Creek Surficial Geology

Infiltration Analysis

A desk-top infiltration feasibility analysis was conducted to develop a shallow infiltration feasibility map for the purpose of identifying areas expected to have high, medium, and low capacity for shallow infiltration. This

> *The best potential for shallow infiltration appears to be in the zone of recessional outwash (Qvr(3)) , north of Pine Lake.*

guided further investigation of areas potentially suitable for stormwwater management using infiltration. Factors that were considered in the infiltration analysis included geologic hazard areas, steep slopes, and soil permeability. The resulting maps of shallow infiltration feasibility are shown in Appendix E. In general, the best potential for shallow infiltration was in zones of recessional outwash on the plateau, north of Pine Lake. This area is less impacted by steep slopes or landslide hazard areas than some of the other zones of higher soil permeability. Other areas in the basin may also be suitable for shallow infiltration.

Stream Geomorphology

Stream and hillslope conditions adjacent to the stream channels were observed during site visits. In the Kanim Creek Basin, unstable slopes were observed in the sandy advance outwash deposits on the ravine walls. Active landslides were observed, as well as likely historical slide areas apparent on LiDAR (light detection and ranging) imagery, a remote sensing method used to identify relative elevations. Sand deposits from these unstable slopes were observed on the valley floor, with the stream channel cutting through the material in a braided fashion before re-forming a single-thread channel. Stream channel erosion (downcutting) was observed in the upper reaches of Kanim Creek. In the lower reaches, the stream enters a large wetland complex and transitions to a multi-thread channel prior to connecting with Pine Lake Creek.

Kanim Creek Landslide

There were areas of bank erosion and downcutting observed in Pine Lake Creek as well, but the stream channel form appeared to be relatively stable in free-flowing areas throughout the upper basin. The exceptions were in the upper reaches downstream of

Pine Lake where flow was confined to roadside ditches.

A description of the stream geomorphology is provided in the stream assessment report in Appendix A.

Climate and Hydrology

The City of Sammamish, like most of the Pacific Northwest and Puget Sound Region, experiences relatively short, warm summers, and cold, wet winters. Temperatures typically range from 37°F to 78°F. Average rainfall is around 58 inches per year, and average snowfall is around 3 inches per year. Detailed meteorological data from nearby rain gauges were used in conjunction with geologic, topographic (LiDAR), drainage utility maps, and land cover data to develop a hydrologic model to estimate flows throughout the Pine Lake Creek basin under existing and future development and future climate conditions. Results of the modeling are in the Pine Lake Creek Basin Plan Hydrologic Modeling Report, Appendix C.

Flow Conditions

Flow in both Pine Lake and Kanim creeks is seasonal. Both streams go dry in the upper reaches during the summer and fall. The point of year-round flow in each stream is not clear and may vary from year to year, but the lower reaches almost always have flow due to groundwater input.

> *The upper reaches of Pine Lake and Kanim creeks are dry in the summer months. Year-round flow is present in approximately the lower third of the stream system.*

Daily flows at the mouth of Pine Lake Creek average under 5 cfs. Existing storm flows range from 15 cfs for a typical annual peak (occurs on average about once per year) to 127 cfs for the 100-year flow (occurs on average once every 100 years). Kanim Creek contributes approximately 25 to 30% of the flow reaching the mouth of Pine Lake Creek.

Modeling and Results

Hydrologic modeling was conducted to evaluate potential flow changes due to future development and climate change. The modeling results indicate that, if the basin is fully developed under current stormwater standards, future peak flows and durations are not expected to increase. In general, the potential impact of development on flow is managed by flow control regulations and the limited amount of the basin that remains available for development.

Impacts on current flow due to development is considered limited in this basin; however, higher flows and flooding can be expected due to projected climate change.

Projected future climate would increase the duration of high flows and flood peaks, especially for larger storm events (higher return intervals). Selected modeling results are shown in the hydrologic modeling report, Appendix C.

Water Quality

Water quality in Pine Lake, Pine Lake Creek and Kanim Creek were assessed by reviewing existing water quality documentation from King County and the Department of Ecology and by collecting supplemental water quality data for this project.

Pine Lake

The city contracts with King County to conduct routine water quality monitoring at Pine Lake as part of the County's Lake Stewardship Program. The 2022 Annual Lake Monitoring Report (King County, 2022) determined that water quality in Pine Lake has been improving since 1996. Nitrogen and chlorophyll concentrations have been decreasing and water has been clearer. No toxic algal blooms occurred in 2022. King County recommended continuing to monitor for future problems and staying alert for toxic

Water quality in Pine Lake is improving over time (King County 2022). Water quality data collected in the streams for this study show relatively good condition with some parameters of potential concerrn.

algae blooms (Washington State Toxic Algae Program).

Pine Lake is listed on Ecology's 303 (d)/305(b) list in the State's Water Quality Assessment (Water Quality Atlas Ecology) for total phosphorus (Category 1- meets tested standards for clean water) and fecal coliform bacteria (Category 2- water of concern).

Pine Lake and Kanim Creeks

Supplemental water quality and flow data was collected for this project to understand existing water quality conditions in the creeks at five locations. Figure 4-4 show the locations of the water quality monitoring stations. As is typical in western Washington streams, flow data show that flow in both creeks is higher during the winter and gradually decreases through the summer dry seasons. The water quality results show signs of relatively good health (turbidity, nitrogen, TSS, and pH) and some of potential concern (dissolved oxygen and fecal coliform). The limited water quality results showed consistency at each sampling site at different flows and seasons.

Kanim Creek Monitoring Location

Figure 4-4. Water Quality Monitoring Locations

Stormwater Infrastructure

Stormwater infrastructure in the Pine Lake Creek Basin consists of conveyance structures (ditches, pipes, culverts, and outfalls), and stormwater treatment facilities (ponds, vaults, and pipes that detain and store water for slower release to streams and wetlands. These facilities also are designed to collect sediment that contains pollutants from roadways and other sources. Sediment at City-owned facilities is collected and disposed of by city maintenance crews during facility cleaning. Privately-owned facilities are responsible for maintenance of their facilities.

Stormwater Treatment Facilities

Figure 4-5 shows a map of the stormwater treatment facilities in the Pine Lake Creek basin. The city owns and maintains stormwater facilities that it constructs on public right-of-way or on land acquired for the purpose of providing stormwater treatment. Additionally, the city acquires ownership and maintenance responsibilities for stormwater treatment facilities that are constructed in residential subdivisions after the bonding period has ended and the final development has been approved. Property owners are responsible for maintenance of privately-owned stormwater facilities serving commercial businesses and entities such as churches, schools and water districts. Table 4-1 summarizes the number of facilities by maintenance responsibility (private or public) and general purpose in the Pine Lake Creek basin.

Stormwater Facility #DS0011 in Pine Lake Creek Basin

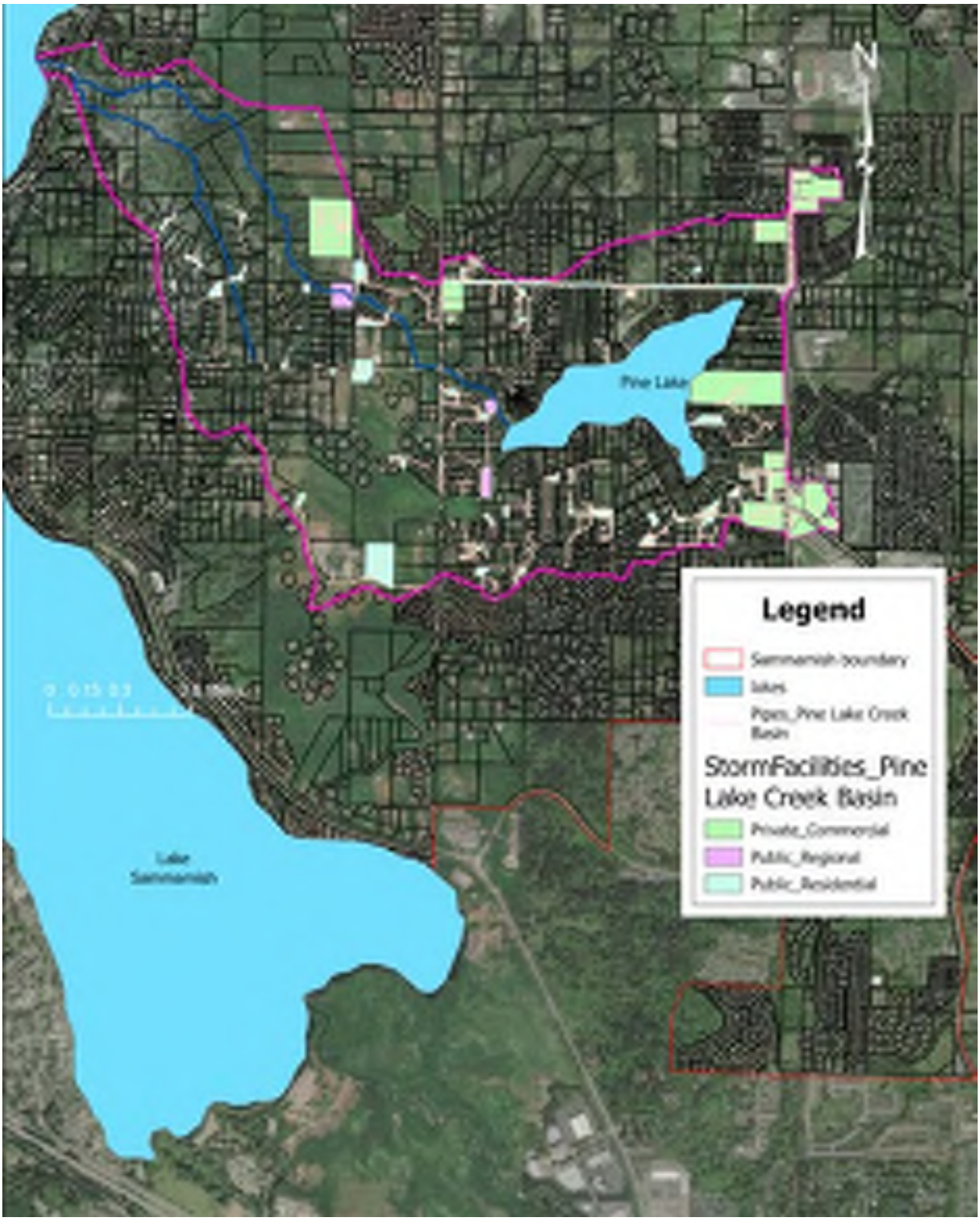


Figure 4-5. Pine Lake Creek Basin Stormwater Facilities

Table 4-1. Summary of Types and Numbers of Stormwater Facilities

Type	Number of Facilities
Private Commercial	21
Public Regional	5
Public Residential	44

The location and functionality of the existing stormwater facilities helps to identify gaps in stormwater treatment and opportunities to improve water quality and flow control. Many of the existing facilities in the Pine Lake Creek basin are undersized and use out-dated stormwater treatment techniques that don't meet current standards. The out-dated facilities are primarily located in the Kanim Creek sub-basin, which was developed in the 1970s and 1980s. These facilities, such as detention ponds, vaults, detention tanks could be improved to provide additional water quality treatment and/or flow control. The City of Sammamish Retrofit Strategy and Guidance Manual (AHBL and NHC, March 2021) provided the initial framework for identification of potential gaps and existing stormwater facilities that could be improved and retrofitted. A description of this process is included in Section 6.

> *Current stormwater treatment facilities are lacking in the southwest part of the Pine Lake Creek Basin near Kanim Creek.*

Conveyance System

The stormwater conveyance system in the Pine Lake Creek basin consists of pipes and roadside ditches connected by culverts. In many ways, the Pine Lake Creek basin retains some of its rural character in that there are few curb and gutter systems that would typically connect to underground stormwater pipes. Rather, stormwater is primarily conveyed in open roadside ditches, though some newer neighborhoods have curb and gutter draining to underground pipe systems.

Where stormwater pipes do exist, they are typically constructed to convey stormwater runoff to stormwater facilities. There are approximately 11 miles of city-owned

stormwater conveyance pipes in the Pine Lake Creek Basin and 7 miles of stormwater pipes that are on private roads or private property.

Existing (and especially older) conveyance systems, similar to existing stormwater treatment facilities, provide an opportunity for improvement for water quality treatment and/or flow control.

Typical Stormwater Ditch (204th Ave SE)

Fish Use and Habitat

The City continues to prioritize projects that support and improve habitat for Lake Samammish Kokanee salmon. Pine Lake Creek is one of four tributaries in Sammamish that historically supported a substantial kokanee salmon run. The City participates in the Lake Sammamish Kokanee Work Group, which is a consortium of local governments, nonprofit organizations, scientists, and interested individuals working toward improvements to benefit kokanee salmon. In the group's 2016 Ecological Survey of Lake Sammamish Kokanee, they estimated that there are approximately 2,178 feet of current habitat in Pine Lake Creek versus 3,792 feet of historic habitat and 2,170 feet of historic habitat in Kanim Creek. The stream survey (Appendix A) describes current habitat conditions for kokanee salmon in the lower reaches.

Kokanee spawning surveys are conducted in Pine Lake Creek annually by organizations including Trout Unlimited and King County, both members of the Lake Sammamish Kokanee Working Group. Table 4-2 show the number of redds (spawning beds) observed in Pine Lake Creek and the estimated number of returning spawning salmon each year that surveys were conducted. According to WDFW's SalmonScape web application (WDFW, 2024), presence of Kokanee salmon is documented in the lower 1.4 miles of the Pine Lake Creek stream system upstream of Lake Sammamish. Other salmonids with documented presence include winter Steelhead (in Pine Lake and Kanim creeks) and Coho (in Pine Lake and Kanim creeks).

Table 4-2. Summary of Kokanee Spawning in Pine Lake Creek (2007 through 2020)

Year of observation	Number of redds observed	Estimated number of spawning salmon
2007	Not detected	29
2008	Not detected	0
2009	Not detected	0
2010	Not detected	14
2011	Not detected	3
2012	Not detected	36
2013	Not detected	485
2014	Not detected	Not detected
2015	Not detected	Not detected
2016	6	104
2017	2	4
2018	0	0
2019	0	0
2020	0	0

Source: Email correspondence between James Bower, King County and Mary Wictor, Sammamish Resident, July 21, 2020 (provided by Mary Wictor).

Fish Passage Barriers

Nine stream culverts and one weir (Pine Lake weir) were evaluated by the Washington State Department of Fish and Wildlife for fish passage in 2012 or 2019 (WDFW, 2024). Only one of the culvert crossings was identified as a complete barrier to fish passage. The complete barrier is on Kanim Creek at SE 19th Street, approximately 3,800 feet upstream of the confluence with Pine Lake Creek. The others were identified as either no barrier or a partial barrier during certain flows. Fish passage barriers are described in the stream

> *There is only one fully impassable fish barrier in the Pine Lake Creek Basin (on Kanim Creek at SE 19th Street).*

report, Appendix A. Figure 4-6 shows the stream crossings in Pine Lake Creek Basin and the percent passable according to WDFW's latest evaluations.

Stream Habitat

The limiting factor for stream habitat is the availability of year-round flow in the upper reaches of the basin.

Much of the stream corridor in the Pine Lake Creek basin was observed during stream walks conducted for this plan. Below the confluence of Pine Lake and Kanim creeks, engineered pools and riffles provide habitat for anadromous fish. Although there are several culvert crossings in this reach, none of them are fully impassable. Flow is year-round in this section of the channel, and patches of good spawning gravel were observed upstream of East Lake Sammamish Parkway for returning kokanee salmon. Upstream of the Kanim Creek confluence, Pine Lake Creek enters a steeper ravine section. The channel dries out during the summer months but remains good for salmon habitat during the wet season. There were areas of bank erosion in this section of stream corridor that could benefit from habitat restoration including input of large woody material to create additional pool habitat.

Immediately upstream of the confluence with Pine Lake Creek, Kanim Creek flows through a large wetland, The wetland provides good habitat for aquatic organisms, birds, and other wildlife, moderating flows, and capturing sediment from upstream erosion.

The ravine sections of both streams are heavily forested. The stream report is provided in Appendix A.

Wetlands

There are several large wetlands in the Pine Lake Creek basin including one sphagnum bog, as shown in Figure 4-7. Water quality data collected for this project indicates the streams have relatively good water quality. Wetlands filter pollutants from urban development, including road runoff, and could be a factor in the results.

Figure 4-6. Pine Lake Creek Basin Stream Crossings and Estimated Percent Passable for Fish according to WDFW

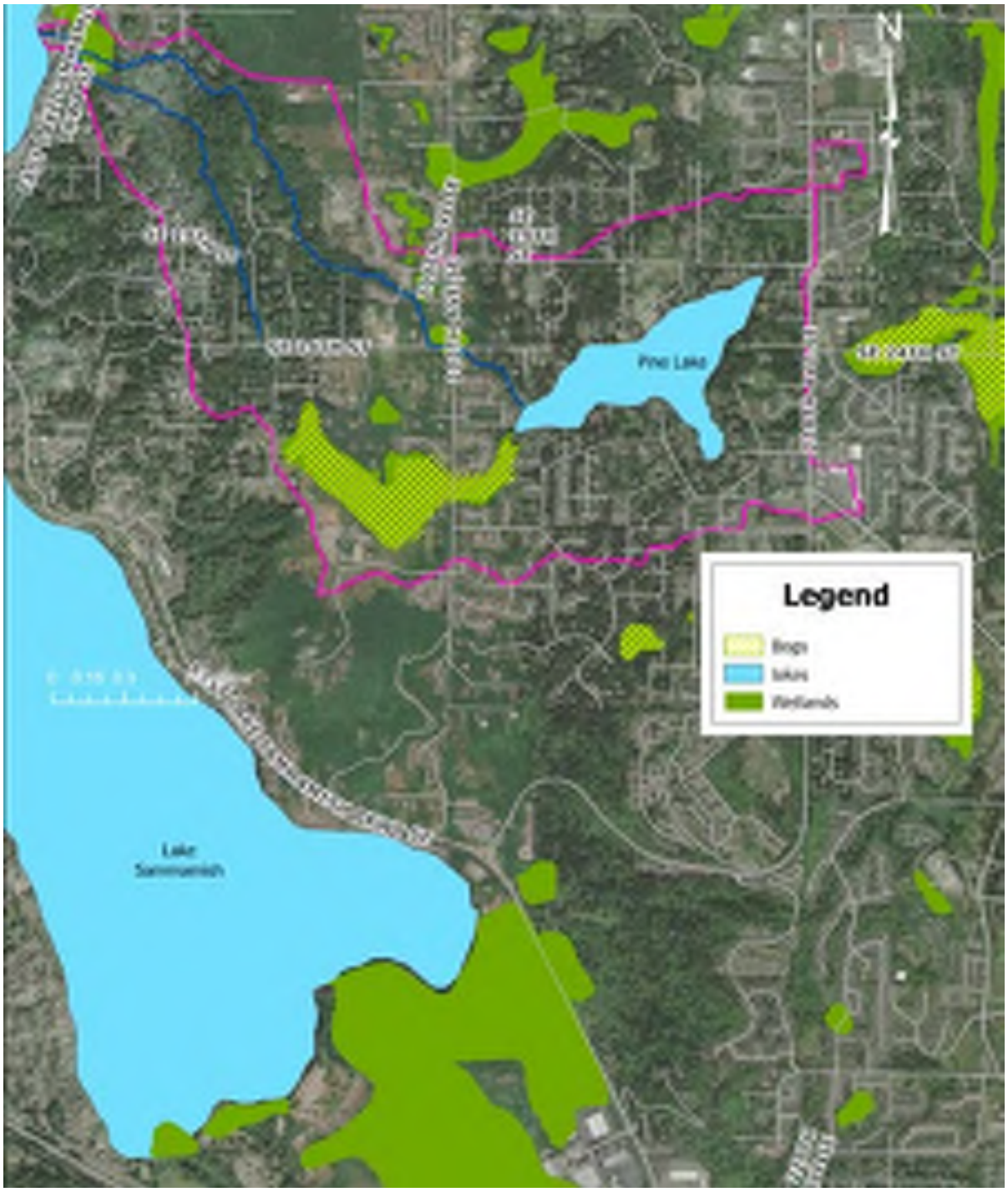


Figure 4-7. Locations of Wetlands and Bogs in Pine Lake Creek Basin and vicinity.

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5 Surface Water Issues

Identification of Surface Water Issues

Surface water issues in the Pine Lake Creek basin were identified through direct observation; input from city staff, stakeholders, and community members; and evaluation of documentation and data. The issues were characterized by location (i.e., Pine Lake Creek, Kanim Creek, or Pine Lake), and type (i.e., habitat, water quality, maintenance or operations). The approach for developing solutions to be included in the Basin Plan is described in Chapter 8.

Favorable Basin Attributes

Before describing issues that were identified, it's important to recognize that there are several basin attributes that are contributing to a fairly well functioning ecosystem. These attributes, including forest cover, wetlands, limited development in the stream corridor, and stormwater outfall maintenance, should be preserved. Additionally, there is only one complete fish passage barrier, so stream access for anadromous and resident salmonids is adequate. Water quality in Pine Lake has improved since 1996 (King County, 2022), and water quality in Pine Lake and Kanim creeks is fairly good for the parameters that were evaluated during this plan.

> *Forest cover in riparian stream corridors and large functioning wetlands should be preserved in the Pine Lake Creek Basin.*

As described in Section 4, tree canopy is around 49% in the basin, including approximately 50% coniferous and the forest cover is contiguous adjacent to the ravine section of both Pine Lake and Kanim creeks. There are large wetlands at the headwaters and near the mouth that help attenuate flow. Additionally, most of the stormwater outfalls that discharge to the stream channels are in good condition and not causing erosion in their immediate vicinities.

Opportunities for Improvement

Hydrologic improvements are needed in the upper basin. Stream channel conditions in Kanim Creek show evidence of erosive stormwater flows. The upper ravines are dry

in the summer months, which is not conducive for aquatic habitat; however, it is not clear whether changing the outlet weir configuration and management at Pine Lake would change this condition in PIne Lake Creek. The weir is informally managed by residents and owned by WDFW; the city does not have jurisdiction or responsibility for it's management.

Additionally, there is a need and a desire for better education for residents on the lake and elsewhere in the basin on how to be caretakers of their land in an way that supports the long-term health of the basin and aquatic and terrestrial organisms that live there.

Figure 7-1 show the general location and types of issues identified by stakeholders and the public. Figure 7-2 shows the general location and issues that were observed in the field.

Figure 7-1. General locations and types of issues reported by stakeholders and the community.

Stream Issues

The primary issues that were identified in the streams include flow (both streams), erosion and sedimentation (Kanim Creek), lack of or outdated stormwater facilities, recreational access, and biodiversity and habitat-related concerns.

In the upper basin, stream flow is intermittent, with channels going dry in the summer months. There are no reported locations of persistent flooding or drainage-related issues that impact roads or the built environment. Two road sections—SE 24th Street

Figure 7-2. General locations and types of issues observed.

where it crosses Kanim Creek, and 212th Avenue SE where it crosses Pine Lake Creek—were reported to have where flat, slow-moving water in wetland-like conditions on both sides of the road, causing the culverts to become submerged during high water. Climate change could result in higher peak flows and storm volumes in the winter months that could result in future flooding (see Hydrology Report, Appendix C).

Data and observations indicate active and historic landslides in upper Kanim Creek, and the channel is deeply incised. Stormwater flows to this section of stream are likely contributing to the observed channel incision. The stormwater facilities designed to detain flow upstream of the ravine are out-dated and/or may not be functioning as intended. Eroded material from the channel itself and from hillslopes is being temporarily stored in the Kanim Creek floodplain in a flatter section in the ravine. The stream continues to re-work this sediment and move the material downstream, although the large wetland complex at the confluence of Pine Lake and Kanim creeks serve as a repository for much of this material. Extensive erosion or channel incision was not observed in Pine Lake Creek, except for localized bank erosion upstream of the confluence.

Stormwater flows to Kanim Creek where stormwater facilities are out-dated, may be contributing to erosion observed in the channel.

Many of the stormwater facilities constructed in the basin were built prior to modern design criteria focused on reducing peak flows and high-flow durations while also providing water quality treatment. Out-dated facilities could be retrofitted to improve water quality treatment and flow control to prevent stream channel erosion.

Stakeholder groups reported a lack of access to the stream channels for recreation and monitoring purposes. The stream corridors are forested and most are within private property, with a few exceptions.

The Kokanee Working Group described historic habitat for Lake Sammamish Kokanee in the lower third of Pine Lake Creek. Pine Lake Creek was observed to be degraded with few pools, eroded banks, and few pieces of large wood in a reach with year-round flow that could support Kokanee salmon and other aquatic species. The wetland characteristics in the lower reach of Kanim Creek likely supports a variety of aquatic organisms, but do not provide sufficient riffles and gravel for spawning.

Lake Issues

Lake issues were primarily reported by lake-side residents and included water quality, algae, invasive plant and animal species management, and lake levels.

Water quality has been monitored by King County and volunteer lake monitors for

several years. In general, lake water quality has improved, however, there is still more work to be done. One of the primary issues is the presence of invasive vegetation and non-native aquatic organisms. Residents have tried various methods of vegetation control, including underwater tarps, chemical treatments, and physical removal. There has not been a coordinated invasive vegetation removal effort in the lake; it has been ad hoc, based on the efforts of lakeside property owners.

> *Lakeside residents reported water quality, invasive vegetation, algae, and variable lake levels as issues they are concerned about.*

The Pine Lake water level is controlled by the weir at the downstream (northwest) end of the lake. This weir is owned by WDFW, and managed by residents to keep the lake at a level that provides summer recreation opportunities for residents and Pine Lake Park users and releases water at a rate that prevents shoreline flooding in the winter.

Pine Lake weir

6 Basin Plan Actions

Solution Development

Basin plan actions were developed for the issues identified by direct observation, staff, stakeholder, and community input, review of previously identified projects and strategies, and review of the city's retrofit strategy and gaps in basin stormwater treatment. An initial list of capital and programmatic projects (i.e., actions that don't involve construction) were consolidated and prioritized using the city's stormwater capital improvement project prioritization methodology (City of Sammamish 2018). Workshops were held with the consultant team and city staff to further refine the list of actions to address current city priorities. A refined list of ideas was presented to the public during the March 2024 Open House for community input.

All of the candidate projects and programs are expected to advance the community's broader vision and goals. As part of their effort, the team evaluated each concept for consistency with the Sammamish Comprehensive Plan policies. The concepts were also assessed for alignment with the Storm and Surface Water Comprehensive Plan, the Stormwater Capital Imrpvoement Plan, and the city's biennium budget.

Capital Project Identification

Thirteen capital projects were initially identified: nine in the Pine Lake Creek sub-basin, and the remaining four in the Kanim Creek sub-basin. Table 8-1 shows the initial project list, general location, targeted issue, and final status in the plan.

Table 8-1. Initial Capital Project List

Project Description	General Location	Issue Addressed	Status
Stream and riparian habitat restoration	Mouth of Pine Lake Creek	Kokanee habitat	Eliminated from current list due to private property. Retain for potential future project.

Table 8-1. Initial Capital Project List

Project Description	General Location	Issue Addressed	Status
Culvert replacement at Shore Lane	Upstream of mouth of Pine Lake Creek	Fish passage	Eliminated from current list due to private property. Retain for potential future project.
Culvert replacement	Pine Lake Creek at East Lake Sammamish Parkway	Fish passage	Eliminated, mostly passable.
Stream and riparian restoration	Vicinity of Pine Lake/ Kanim confluence	Kokanee habitat	Eliminated from current list due to private property. Retain for potential future project.
Stream and riparian restoration	Pine Lake Creek in vicinity of Ashton Woods development	Kokanee habitat	Eliminated from current list due to private property. Retain for potential future project.

Table 8-1. Initial Capital Project List

Project Description	General Location	Issue Addressed	Status
Removal of sediment under bridge	Pine Lake Creek at 210th Pl SE	Source of sediment, water quality issues	Eliminated, low priority.
Detention pond retrofit (Facility #D92928)	Crossings at Pine Lake near SE 210th St.	Flow control and water quality	Included in plan.
Wetland restoration and maintenance	SE 24th St and 212th Ave SE	Potential flooding and wetland connection.	Eliminated, not a significant issue.
Flood reduction	3000 block of 212th Ave SE (Wetland #30)	Road flooding	Eliminated, not a significant issue.
Culvert/fish barrier removal	Lower Kanim Creek	Fish passage.	Eliminated, culvert is fish passable and is on private property.
Re-route Loree Estates Outfall	Upper Kanim Creek near 200th Ave SE	Landsliding and erosion.	Project is already on 2025-2030 CIP and is being addressed by the city.

Table 8-1. Initial Capital Project List

Project Description	General Location	Issue Addressed	Status
Loree Estates Detention and Water Quality Improvement	Upper Kanim Creek near 198th Pl SE	Stormwater flow control, water quality, and maintenance access.	Included in plan.
Loree Estates Stormwater LID Pilot Project	Upper Kanim Creek near 203rd Ave SE	Stormwater flow control and water quality.	Included in plan.
Sammamish Woods Stormwater Facility Retrofit (#D92924)	SE 205th Pl and SE 19th St	Flow control and water quality, and maintenance access.	Included in plan.

As shown in Table 8-1, several of the initial identified capital projects were eliminated from further consideration during initial screening. Most of the identified potential stream and riparian restoration projects are located on privately owned land and would require easements, acquisition, and/or cooperation with landowners to implement construction-oriented projects. While these restoration projects were eliminated from this plan, grants may be available to support private stream and lakeside homeowners to implement sustainable practices that support healthy ecosystems through the Washington State Recreation and Conservation Office.

Following elimination of projects on private property, the initial project list was reduced to eight projects. This group of projects was evaluated and ranked using the city's criteria described below to further narrow the list. Some of the other projects that were eliminated from further consideration after the initial ranking and review were projects that would not result in significant improvements or where issues were determined to be less significant than originally thought. If these locations become more problematic in the future, proposed improvements could be revisited for future

capital project consideration. Locations where projects may be re-considered in the future include:

- Roadway flooding at the 3000 block of 212th Ave SE
- Intersection of SE 24th St and 212th Ave SE (riparian and/or wetland restoration)

The project ranking results and full list of initial projects is included in Appendix F.

> *Issues identified on parcels not owned by the City were eliminated from further project consideration. In the future, these projects may warrant re-visiting if willing landowners or partnerships can be established.*

Project Ranking Methodology

The city's 2018 Resolution No. R2018-804, "A Resolution of the City of Sammamish, Washington, Identifying a Methodology for Prioritizing Stormwater Capital Improvement Project," was used as the basis for ranking and refining the initial list of capital improvement projects. Criteria used to rank the projects included environmental benefit, facility and maintenance improvement, safety, population benefited, and whether the proposed project was a time-sensitive opportunity.

Capital Project Recommendations

Four new projects are recommended for inclusion in the city's capital improvement plan (Table 8-2 and Figure 8-2). Project summary sheets for the recommended capital projects are provided in Appendix F.

> *There was good community support for stormwater projects that use existing facilities and City right-of-way.*

All but one are in the Kanim Creek sub-basin, where stormwater runoff has contributed to landsliding and significant erosion. The focus of all recommended capital projects is stormwater flow control and water quality treatment through retrofit of existing stormwater facilities and/or addition of new elements to existing infrastructure. All four projects will help control flows and improve water quality treatment. The Kanim Creek projects will help reduce erosive

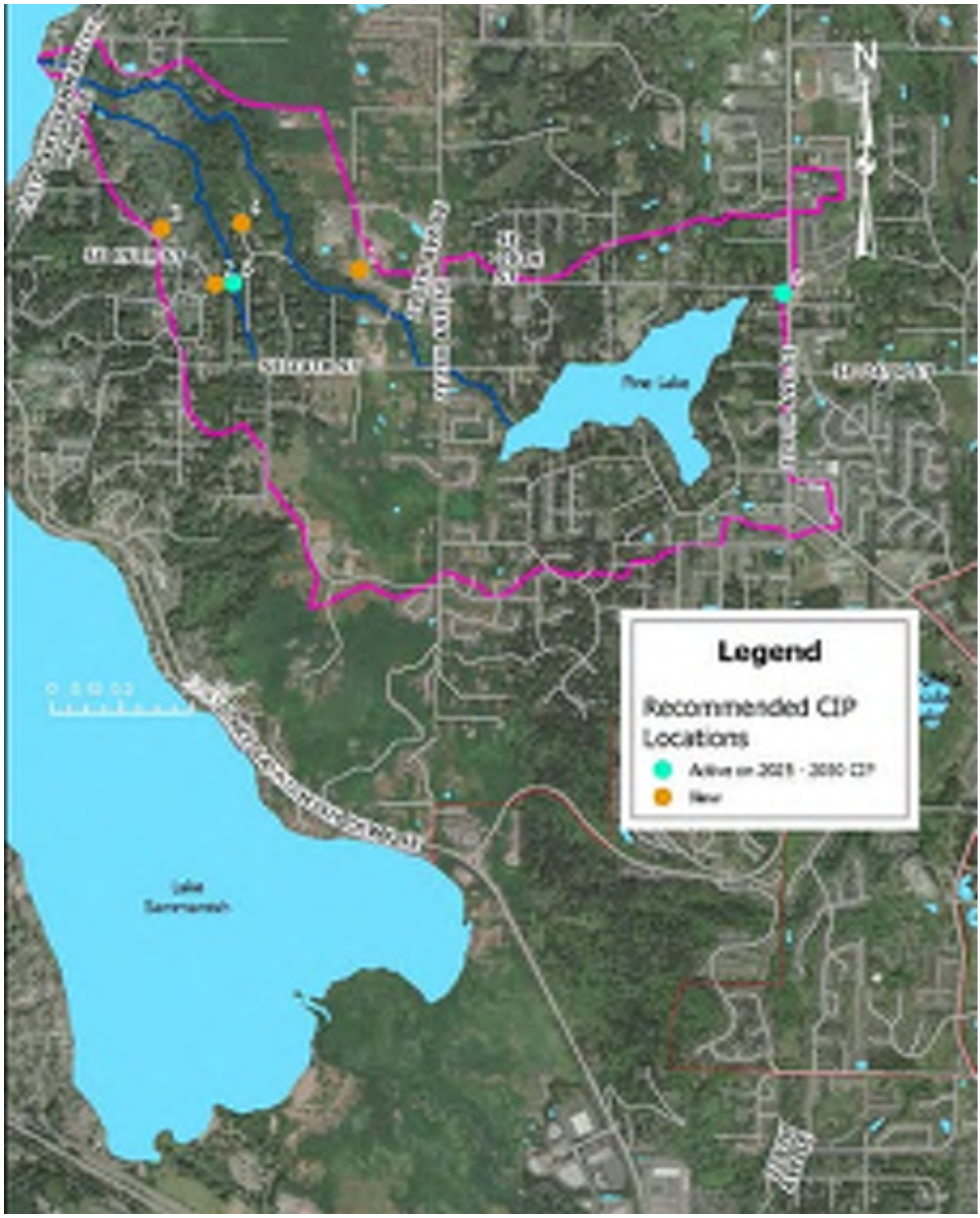


Figure 8-1. Locations of Recommended CIPs.

flows in the erosion-sensitive upper reach. Two additional projects in the Pine Lake Creek Basin are already on the stormwater CIP. These projects are also shown on Table 8-2 and Figure 8-2 as projects CIP-5 and CIP-6. Recommended projects could help fulfill NPDES Phase II Permit Requirements for controlling or reducing stormwater discharges from existing development, otherwise known as Stormwater Management for Existing Development (SMED). Sammamish is required to implement an equivalent of 10.9 acres of stormwater facility retrofits or tailored stormwater management actions by March 31, 2028.

Table 8-2. Recommended Project List and Estimated Costs

CIP #	Project Description	Sub-basin	Status	Estimated Cost (2024 dollars)
CIP-1	Crossings at Pine Lake Detention pond retrofit (Facility #D92928)	Pine Lake Creek	**New**	$774,000
CIP-2	Sammamish Woods Stormwater Facility Retrofit (#D92924)	Kanim Creek	**New**	$3,000,000
CIP-3	Loree Estates Detention and Water Quality Improvement at SE 198th Street	Kanim Creek	**New**	$168,000
CIP-4	Loree Estates Stormwater LID Pilot Project at 203rd Ave SE	Kanim Creek	**New**	$100,600
CIP-5	Loree Estates Outfall Diversion	Kanim Creek	**Active on CIP**	$467,120
CIP-6	228th Ave SE and SE 20th St Stormwater Retrofit (#DS0011)	Pine Lake Creek	**Active on CIP**	$205,502

Recommended Strategies

Programmatic projects do not involve construction; these are actions that involve education and outreach, maintenance and operations, policies, or strategies to improve overall basin conditions at non-specific locations. Table 8-3 lists the initial programmatic projects considered for the Pine Lake Creek Basin.

Table 8-3. Initial Programmatic Project List

Project Description	General Location	Issue Addressed	Status
Sustainable riparian landscaping recognition program	Entire basin	Water quality, general ecological health	Included in plan. Strong community support.
Sewer connection support program	Pine Lake	Water quality	Eliminated, not considered feasible.
Regional detention plan	Kanim Creek priority/ city-wide	Water quality, erosion, flow	Eliminated, can be addressed city-wide
Stream access/ open space trails	Entire basin	Recreation, monitoring opportunities	Eliminated. Not enough benefit for surface and stormwater.
Facilitate formation of Pine Lake Management District	Pine Lake	Multiple lake specific issues including water quality and vegetation management.	Eliminated. City can facilitate if residents initiate process.

Table 8-3. Initial Programmatic Project List

Project Description	General Location	Issue Addressed	Status
Targeted education for lakeside residents.	Pine Lake	Multiple lake-specific issues including water quality and vegetation management.	Included in plan. Strong community support for this project.
Native growth protection area (NGPA) easements for preservation.	Forested ravines and wetlands.	Preservation of functioning ecosystems.	Eliminated, critical areas serve the same function.
Property acquisition fund	Entire basin (city-wide)	Preservation of functioning ecosystems and acquisition for new projects.	Included in plan. Existing fund, however, need to evaluate criteria for how and where to apply fund.
Bog education program	Entire basin (city-wide)	Preservation through education.	Included in plan. Community interest in ecological education.
Kokanee supplementation program	Lower basin (both creeks)	Increase Kokanee population	Eliminated. Mixed results in the past.

The programmatic projects were initially considered using the same criteria as the

capital projects, however, these criteria were not suitable for ranking due to the different considerations and benefits than capital projects. The programmatic projects were instead evaluated through a lens of implementation feasibility and overall support from the community based on feedback at the open house held in March 2024.

Strategies Not Recommended in the Basin Plan

Several programmatic projects that were eliminated from this plan may be more desirable in the future when opportunities and funding outside of the Surface Water Utility become available or there is support from the community.

Lakeside residents and other community members discussed septic systems and the need for connection to sanitary sewer to prevent water quality issues in Pine Lake. Failing septic systems can impact water quality, and a programmatic action to support connection of residents to a mainline sewer in the vicinity of Pine Lake was considered, however the city lacks jurisdiction over spectic systems and sewer improvements. It was determined that this voluntary program would be impractical to implement without any guarantee of water quality improvement in the lake. Residents who are interested in connecting to sanitary sewer are able to pursue that without city help. Concerns about failing septic systems can be reported to the King County Health Department for inspection.

A regional detention plan was discussed and eliminated from this plan, as several capital projects were recommended for implementation in the Kanim Creek basin to address stormwater flow control and no opportunities were identified for regional detention.

Stakeholder groups provided feedback that the community has minimal access to the riparian areas, stream channels, and open space that the city owns in the Pine Lake Creek basin for passive recreation or monitoring of stream health. A programmatic project to address access was considered and eliminated. Much of the land is privately owned and there is not a clear surface water benefit for the city to provide formal access to stream channels in Pine Lake Creek basin. This idea and project could be considered through the Parks department as part of their trail corridor planning, and is better addressed by city departments other than Stormwater. The City's Parks, Recreation, and Open Space Plan provides more information.

During this planning process, there was not general consensus or a clear desire from the Pine Lake community, including lakeside residents, to form a lake management

district to address water quality and manage aquatic weeds and non-native organisms in the lake. Residents had mixed feelings about lake management districts with some in support and others adamantly against. To be successful, a lake management district would need majority support from lakeside residents and land-owners to make decisions and implement district decisions. For this reason, facilitation of a lake management district was eliminated from the programmatic actions. If a resident-led group comes forward with interest in forming a district, the city would support such an endeavor and participate as one of the lakefront owners (Pine Lake Park).

Programmatic projects that are not recommended in this Plan may be revisited in the future or taken up by another City department for implementation. Elimination does not mean these projects aren't important, rather they are not well aligned with the Surface Water Program or not deemed to be feasible at this time.

A kokanee supplementation program is not recommended in this plan due to staff concerns about mixed results in the past.

Native Growth Protection Area (NGPA) easements were eliminated from consideration because the city's critical areas code may provide the same level of protection as an NGPA easement would.

The sustainable riparian landscaping recognition program was eliminated from further consideration at this time because the City would not have the staff resources to implement it.

Recommended Programmatic Actions

The final recommended programmatic project actions include education and outreach, policy, and preservation elements. Table 8-4 lists the final recommended programmatic actions. Program summary sheets are provided in Appendix G.

Table 8-4. Recommended Programmatic Actions

Action Number	Project Description	Type of Action	Estimated Cost (2024 dollars)
P-1	Targeted education for lake-side residents.	Education/ voluntary community action	$57,000 (one-time)
P-2	Property acquisition fund	Policy/land use and preservation	$18,400 (one-time)
P-3	Bog education program	Education	$32,200 (annual)
		Total Cost	**$75,400 (one-time)** **$32,200 (annual)**

There was strong community support for Action #1. Residents described a desire for information on best practices for living on the lake and protecting water quality while dealing with nuisance vegetation. Collective efforts lakeside homeowners will help maintain the positive water quality trends in Pine Lake.

The city already has a program for property acquisition and a fund for this purpose. The fund can be used to acquire properties that meet the fund criteria. There are properties within the Pine Lake Creek basin that could be considered for acquisition should they become available that would further protection and improvement of surface water functions in the basin.

Sammamish has some large unique sphagnum bogs of which many residents are likely unaware. A bog education program that highlights these unique Sammamish ecological features, their history, and their functionality in a healthy ecosystem, will help serve their long-term protection.

Pine Lake

7 Implementation Strategies

Basin Plan Implementation

The capital projects and programmatic actions identified in this plan are recommended for incorporation in the City's Stormwater Capital Improvement Plan. Table 9-1 shows how projects are recommended for implementation, including which funding mechanisms may be appropriate.

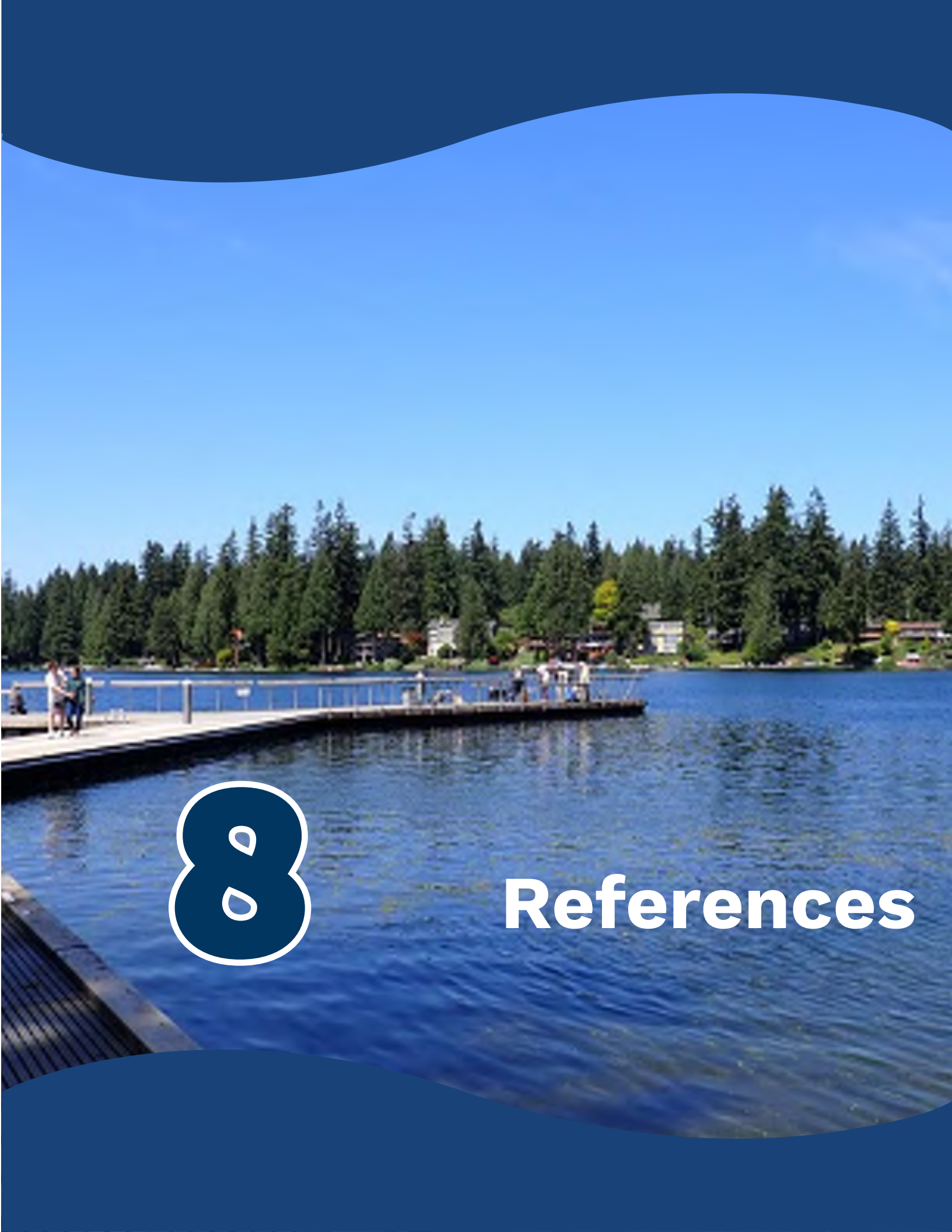
Table 9-1. Recommended Project Implementation

Project	Project Description	Stormwater Program	Estimated Cost (2024 dollars)	Timeline
CIP-1	Detention pond retrofit (Facility #D92928)	SW-300: Storm Facility Retrofit	$774,000 (retrofit for this facility included in 2025 - 2030 CIP at $430K)	**2030**
CIP-2	Stormwater Facility Retrofit (#D92924)	SW-300: Storm Facility Retrofit	$3,000,000	**2034**
CIP-3	Loree Estates Detention and Water Quality Improvement at SE 198th Street	SW-300: Storm Facility Retrofit	$168,000	**2030**
CIP-4	Loree Estates Stormwater LID Pilot Project at 203rd Ave SE	SW-500: Projects $50K - $300K	$100,600	**2030**

Table 9-1. Recommended Project Implementation

Project	Project Description	Stormwater Program	Estimated Cost (2024 dollars)	Timeline
CIP-5	Loree Estates Outfall Diversion	SW-500: Projects $50K - $300K	**$467,120**	**2025 - 2030 CIP**
CIP-6	228th Ave SE and SE 20th St Stormwater Retrofit (#DS0011)	SW-300: Storm Facility Retrofit	**$205,502**	**2025-2030 CIP**
P-1	Targeted education for lake-side residents.	SW-500: Projects $50K - $300K	$57,000	**2026**
P-2	Property acquisition fund	SW-609 (existing fund)	$18,400	**2026**
P-3	Bog education program	SW-600 (combine with Queen's bog bioretention CIP)	$32,200	**2026**

An estimated schedule for project implementation is shown in Table 9-1. It is recommended that the projects identified in this plan be re-ranked against the existing CIP projects during the next budget cycle to determine if any of the capital projects in the Pine Lake Creek Basin should move ahead of previously identified projects. Based on the findings in this plan, none of the recommended projects are critically needed at this time. One of the projects was previously identified for retrofit (CIP-1), however, the revised cost estimate in this plan is higher than what is reported in the Stormwater Capital Improvement Plan. The listed project should be updated with a current cost estimate.



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