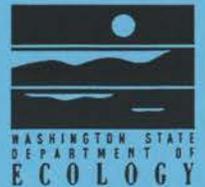
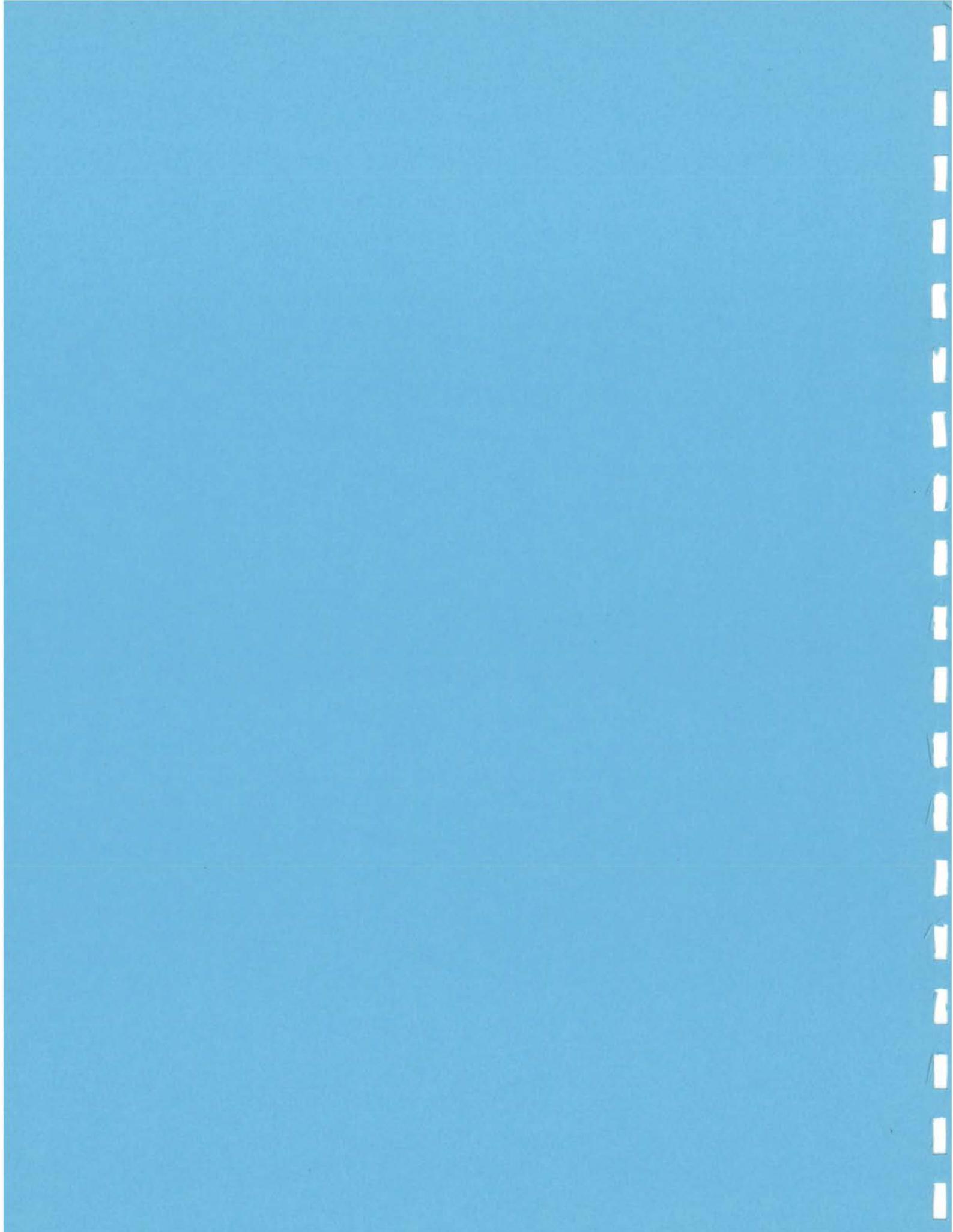


Lake Kilarney Integrated Aquatic Plant Management Plan

March 1997

ENVIROVISION





**LAKE KILLARNEY
INTEGRATED AQUATIC PLANT MANAGEMENT PLAN**

March 1997

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Prepared for:

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and Lake Killarney Improvement Association

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State agency staff also attended meetings and provided technical guidance. These included Kathy Hamel, Washington State Dept. of Ecology (WDOE), Bob Pfeifer, Washington State Dept. of Fish & Wildlife (WDFW), and Mary Kautz (WDOE).

Last, Resource Management Inc. performed aquatic plant surveys, provided mapping and graphics support and most important, provided assistance with selection of alternatives and detailed application and cost information.

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PROJECT OVERVIEW

Lake Killarney is located in south King County near the City of Federal Way, Washington. It is a small lake (37 acres) that is quite shallow (maximum water depth of approximately 15 feet or 4.5 meters). It is moderately productive in terms of phosphorus concentrations and has been rated as mesotrophic. No streams flow into Lake Killarney; a wetland located along the northern boundary likely serves as a water source during certain periods of the year. Otherwise, groundwater and precipitation/runoff are the only sources of incoming water. A surface outflow exits the lake to the south and forms an unnamed tributary, that flows eventually into Hylebos Creek. Currently, the lake has a small public access site owned by the Washington State Department of Fish and Wildlife. The City of Federal Way has recently purchased 10.8 acres of land on Lake Killarney that has been dedicated for development of a passive park.

Aquatic plants, especially Eurasian Watermilfoil (*Myriophyllum spicatum*) and White Water Lily (*Nymphaea odorata*), first became a problem in the lake in the mid-1970s. Lake residents' concerns about the plant populations resulted in establishing the Lake Killarney Improvement Association (LKIA) whose main function has been to collect funds for completing herbicide applications of the lake to control both aquatic macrophytes and algae. Herbicides were first applied to the lake in 1979. Since 1987, the LKIA (through a licensed applicator) has applied either Sonar® for control of submersed plants, or Rodeo® for control of waterlilies in addition to annual and sometimes twice annual applications of copper sulfate to control algae. More recently, Purple Loosestrife has colonized nearshore areas and lake residents have organized annual events for gathering volunteers to handpull and remove the plants from the shoreline.

In 1993, lake residents and King County Surface Water Management (KCSWM) joined together to apply for a grant to develop a more integrated plan for providing long-term control of aquatic plants that does not rely entirely on chemical controls for treating problem plant populations. KCSWM was awarded a grant for development of an Integrated Aquatic Vegetation Management Plan (IAVMP). This report provides a description of the aquatic plant control plan developed for the lake and summarizes the steps taken in development of the plan.

The basic recommendations selected for aquatic plant control in Lake Killarney are:

- Stock sterile (non-reproducing) Grass Carp in the lake to consume submerged plants.
- Use herbicides once every three years to control the extent of the existing floating-leaved plant beds (Watershield and Water Lily).
- Provide some hand or small boat operated cutting tools to give lakeside residents the ability to maintain their nearshore area.

- Continue with annual Purple Loosestrife removal events either until all of the plants are removed, or until the population expands to a point where it is necessary to use chemicals to eradicate the population.
- Set up an Aquatic Plant Advisory Committee for the lake whose function is to make decisions about controls needed (e.g. Loosestrife approach) and goals attainment.

PUBLIC INVOLVEMENT

Public involvement for this project has included steering committee meetings, public meetings, volunteer Purple Loosestrife removal events, and production of a handbook. Each is described below.

The Lake Killarney Steering Committee was set up in March 1995 to guide the development of an Integrated Aquatic Plant Management Plan for Lake Killarney. Nine meetings have been held in a 19-month period, from March 1995 to October 1996. During this time, the steering committee completed the problem statement, identified and developed management goals, organized the public meeting, coordinated two Purple Loosestrife removal events, and selected aquatic plant control alternatives.

The following are members of the steering committee: Joanne Davis and Bob Storer of King County Surface Water Management; Paul Desjardin, Bonnie Anderson, Gerri Baldwin, Gary Bullard, Jerry Cloud, Rod Danz, Dennis Dunn, Kjell Feroy, Norman Fiess, Dee Gordon, Linda Irwin, Kory Keath, Craig Rice, Mike Stevenson, and John Wilcox of the Lake Killarney Improvement Association; Jon Jainga and Dave Renstrom of the City of Federal Way; Vicki Kirchner of World Vision; Gary Hyde of Lake Geneva; and Lynn Claudon of Weyerhaeuser.

A public meeting sponsored by the King County Surface Water Management Division and the Lake Killarney Steering Committee was held on August 24, 1995. The purpose of this meeting was to provide background information about Lake Killarney, present the problem statement and management goals drafted by the steering committee, and seek comments and questions from the public. A second public meeting is planned to present the draft plan and invite comments from the public.

Over 50 volunteers worked together on June 24, 1995 to pull up invasive Purple Loosestrife from the shores of Lake Killarney. More than 100 bags were filled with the noxious weed. A second event was held in the spring of 1996. According to some of the volunteers, there was much less plant matter removed in 1996 compared to 1995. However, it was unclear whether this was due to a decrease in the number of plants or a decrease in the size of the plants removed.

Members of the "Lake Killarney Improvement Association" also produced a handbook describing how to conduct an aquatic plant survey, for use by other lake communities. A copy of this manual is included as Appendix C.

LAKE AND WATERSHED CHARACTERISTICS

Watershed Characteristics

Lake Killarney and its watershed are located in the southernmost portion of King County. A part of the watershed, including a substantial section of shoreline, lies within the boundaries of the City of Federal Way. The 203 acre watershed drains a gently sloping topographic area. The lake and associated wetlands form the headwaters of an intermittently flowing stream that becomes Hylebos Creek. Hylebos Creek flows south and west into the Hylebos Waterway in the City of Tacoma, which discharges to Commencement Bay. While the majority of this part of south King County and northern Pierce County is already developed as commercial/residential, Lake Killarney and its watershed are still relatively wooded and the residential areas are largely single-family homes on larger suburban size lots.

The Lake Killarney watershed is considered part of the East Branch of the Hylebos Basin. Since the 1950s, population growth in the Hylebos Basin planning area has outpaced most other communities in King County. The fact that several state highways are located in the area has stimulated a high growth rate and the current land-use pattern (King County Surface Water Management, 1991). Fortunately for the lake, most of the development, especially commercial development, has occurred west of the lake. The land use information for 1987 indicated that approximately 50% of the shoreline was contained in rural/undeveloped land use. The remaining 50% was in high density single-family use.

Predictions of full build-out conditions continue to show commercial development occurring to the west of the lake (King County Surface Water Management, 1991). However, the rural/undeveloped land is expected to become either high density single-family or multi-family homes except where purchase has occurred of 10 and 11 acre tracts by World Vision Corporation and the City of Federal Way, respectively. These tracts are located in the area that was designated as multi-family.

Significant changes in land use can be expected in the project area in the near future because the watershed is comparatively undeveloped for the area. Fortunately, a large percentage of the shoreline area itself is already owned and protected by corporations and the City of Federal Way. It has been estimated that almost 30% of the shoreline is contained within these public/corporate parcels that are not likely to be developed any further. Wetlands in the watershed are primarily limited to the perimeter wetland that surrounds the northern half of Lake Killarney.

Lake Characteristics

Lake Killarney is a 37 acre lake located in southern King County, Washington. About one third of the shoreline lies within the City of Federal Way, and the majority lies within unincorporated King County (Figure 1). The lake is quite shallow with a mean and

maximum depth of 2.5 m (8.2 ft.) and 4.5 m (14.8 ft.), respectively. There is no distinct surface water inflow to Lake Killarney. Runoff from the watershed enters the lake primarily through stormwater drains (Storer, B. Personal Communication). The wetland located along the north shore likely acts as both a source and sink of water depending upon the season and groundwater conditions. The lake is divided into two distinct basins, the north basin is smaller and shallower (average depth of 4 feet), as compared to the south basin (average depth 6 feet). The total volume of water in the lake has been estimated at 187 ac-ft, the majority of this (161 ac-ft or 86%) is held within the south basin. Physical characteristics of Lake Killarney are summarized in Table 1.

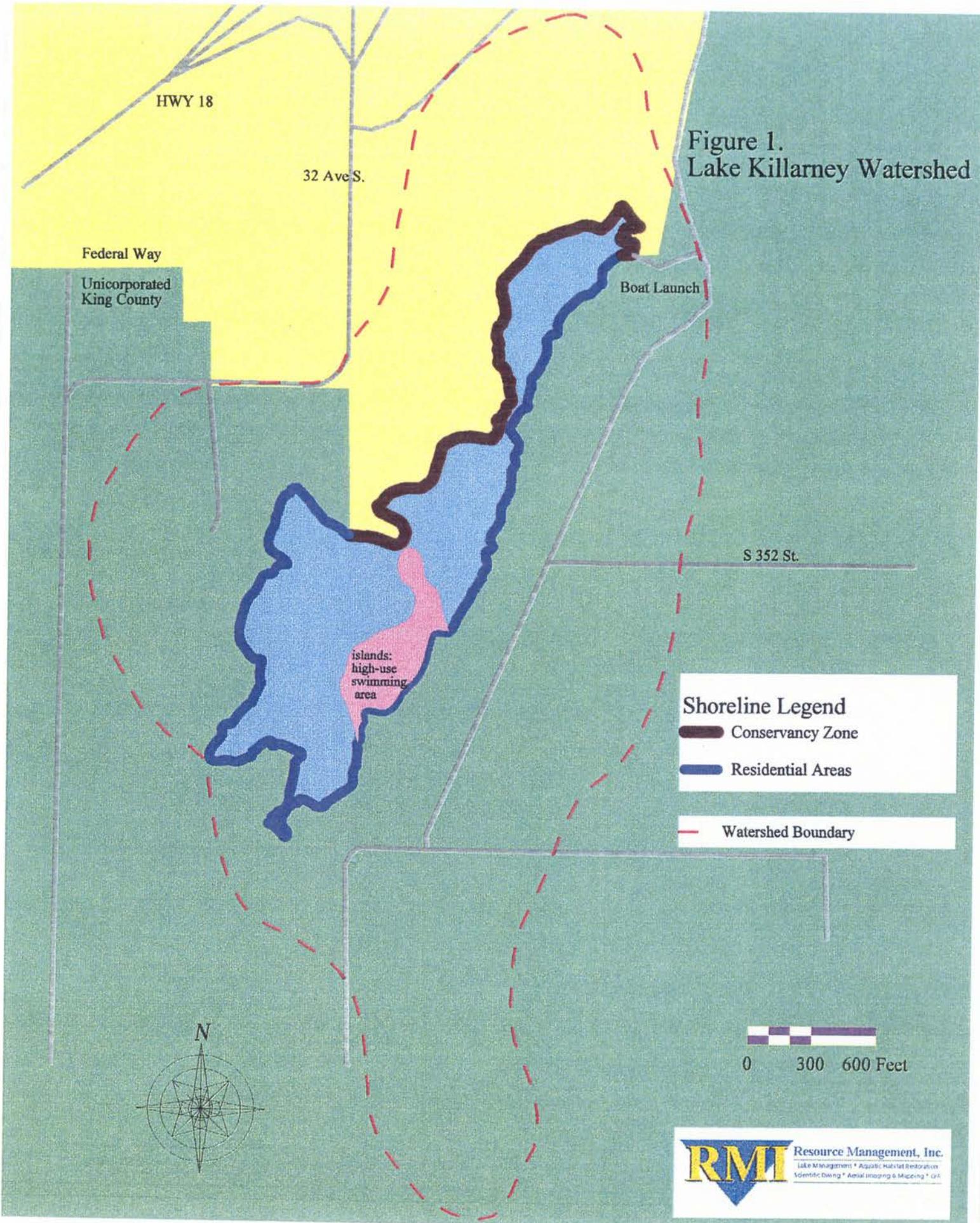
Outflow from the lake generally occurs only during the wet season (November through June). The lake outlet is in the southwestern corner of the lake through a small concrete culvert.

Currently public access is provided by a small boat launch owned by the Washington Department of Fish and Wildlife (WDFW). The City of Federal Way has recently purchased 10.82 acres of land and is in the process of forming a plan for its development as a passive recreational use park.

Table 1. Physical characteristics of Lake Killarney and its watershed.

Characteristic	English Units	Metric Units
Watershed area	203 acres	82.2 hectares
Surface area	37 acres	15.0 hectares
Lake volume	187 ac-ft	
Maximum depth	14.8 feet	4.5 meters
Mean depth	8.2 feet	2.5 meters
Shoreline length	10,305 feet	3,141 meters

Figure 1.
Lake Killarney Watershed



Federal Way
Unincorporated
King County

HWY 18

32 Ave S.

Boat Launch

S 352 St.

islands:
high-use
swimming
area

Shoreline Legend

 Conservancy Zone

 Residential Areas

 Watershed Boundary

0 300 600 Feet

Water Quality

The former Municipality of Metropolitan Seattle (Metro) began monitoring Lake Killarney in 1989. The most recent complete data sets are contained in the King County Lake Volunteer Monitoring Report 1993-1995. These were used to create the data summary in Table 2. The lake is characterized by high phosphorus concentrations, high chlorophyll levels, and low transparency. Summer period total phosphorus concentrations have ranged from February - October total phosphorous concentrations have ranged from 25-50 ug/L.

The waters of Lake Killarney are naturally highly colored due to the effects of the wetland that comprises the northern shoreline. Summer period transparency, as measured by Secchi disk depth, averaged just over two meters (Table 2). The low transparencies measured are a result of the colored nature of the water in addition to the effects caused by algae blooms.

The most common way lakes are classified is by their trophic state, which defines a lake in relation to the degree of biological productivity. Lakes with low nutrients, low algae levels, and clear water are classified as nutrient poor or "oligotrophic". Lakes with high nutrients, high algae levels, and low water clarity are classified as nutrient rich or "eutrophic". "Mesotrophic" lakes have water quality characteristics between these two classifications. "Eutrophication" is the term used to describe the process of lake aging, where lakes progress from oligotrophic to eutrophic conditions. Although eutrophication is a natural process that occurs slowly over time, it can be greatly accelerated by human activities in a watershed. Classifying a lake based on trophic level indicators is a useful way to describe gross changes in a lakes' water quality over time.

Total phosphorus, chlorophyll *a*, and transparency are the three water quality parameters most often used to rate the overall trophic condition of a lake. Threshold values for trophic state used to determine the overall condition of small lakes monitored in King County are presented in Table 2, along with a summary of the Lake Killarney data.

Table 2. Trophic State Classification.

Trophic State ⁽¹⁾	Total Phosphorus (µg/L)	Chlorophyll <i>a</i> (µg/L)	Transparency (meters)
Oligotrophic	< 10	< 4	> 5
Mesotrophic	10-20	4 - 10	2-5
Eutrophic	>20	>10	<2
Killarney (Range) ⁽²⁾	25-50	0.5-12.0	2.0-3.0
Mean (# of years)	36 (n=2)	5.1 (n=2)	2.7 (n=2)

⁽¹⁾ Source: Vollenweider, R.A. 1970.

⁽²⁾ Range shown is range of arithmetic means from spring, summer, and fall sampling during the years 1994 and 1995.

Based on the measured values of phosphorus, chlorophyll *a*, and transparency, Lake Killarney can be classified as mesotrophic or moderately nutrient enriched in terms of chlorophyll and transparency data, but eutrophic or enriched in terms of phosphorus concentrations.

There are only a few stormwater discharges to Lake Killarney (B. Storer, Personal Communication, 9 July 1996), thus the primary external source of phosphorus and other nutrients appears to be surface runoff from adjacent properties and input from the wetland. Failing septic systems are also a suspected source of pollutants such as nutrients and bacteria to Lake Killarney. Septic type odors have been occasionally reported by lake residents.

In the past the lake has experienced frequent, heavy algae blooms. Copper sulfate has often been applied to the lake at least once and sometimes twice during the summer to control these blooms. Given the high phosphorus concentrations measured in the lake, algae blooms can be expected to continue, especially if large aquatic plant populations are retained at their current low level.

Sediment samples were collected from Lake Killarney in July of 1995 and analyzed for total phosphorus (TP), copper, and total nitrogen (TKN). It is not the purpose of this report to perform a detailed analysis of these results. The main concern in terms of future herbicide or copper sulfate applications is with the copper concentrations. Copper concentrations ranged from 57 to 355 mg/Kg in the top 2 centimeters of sediment to 25 to 292 mg/Kg in the sediments located from 2 to 12 centimeters below the surface. The average concentration was 145 mg/Kg. Sixty percent of the samples (12 out of a total of 20) had concentrations that exceeded the "severe effect level" (the concentration which caused detrimental affect to the majority of sediment-dwelling organisms) of 110 mg/Kg set by the Ontario Ministry (Persuad, D. 1991), and 85% exceeded the level considered to represent heavily polluted conditions (>75 mg/Kg) by the USEPA (USEPA, 1977).

These elevated copper concentrations indicate accumulation from the many copper sulfate treatments of the lake. The sediment concentrations can be expected to continue to increase with continued use of copper sulfate. In addition to the probable impact this will have on sediment-dwelling organisms, it may also cause disposal problems in the future if sediments need to be removed.

Fish and Wildlife Community

Lake Killarney is managed by the Washington Department of Fish and Wildlife (WDFW) as a trout and warm-water fishery. The existing warm water fishery consists of Largemouth Bass (*Micropterus salmoides*), Yellow Perch (*Perca flavescens*), Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ictalurus melas*), and Black Crappie (*Pomoxis nigromaculatus*). This fishery is augmented by stocking with trout. Since at least 1954 WDFW has been stocking approximately 2,000 catchable size Rainbow Trout (*Salmo gairdneri*) in the lake each spring. Currently, WDFW is reviewing its management strategy for this lake and is considering managing it as a warm-water fishery only (Pfeifer, R. 1996, Personal Communication).