Lake Windermere Project

Final Report

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About Wildsight

Wildsight works to maintain biodiversity and healthy human communities in Canada's Columbia and Rocky Mountains ecoregion. We are focused on three core areas: The southern Rockies, the upper Columbia River Valley, and the Columbia Mountains.
This ecoregion provides critical genetic connectivity for western North America's wildlife populations. It includes glaciers, rivers and lakes of considerable significance—the "water towers" of western North America.

Wildsight's work focuses on:

- Protecting the high ecological values of our region for the long-term viability of our communities;
- Ensuring that the region continues to be one of the richest ecological areas in the world;
- Strengthening ties with other sector groups, First Nations and industry to ensure that environmental protection is supported by a broad constituency;
- Participating effectively in government and community processes to promote the protection of biodiversity;
- Organizing outreach programs and media campaigns to increase public understanding and support;
- Partnering with environmental organizations from B.C. Canada, the United States and other parts of the world to ensure that local work ties in with provincial, national and international strategies;
- Creating and delivering educational programs to schools and the public;
- Coordinating scientific research programs on endangered species.

Executive Summary

A final report and a lake stewardship manual

This document is a comprehensive report on the five-year Lake Windermere Project.
But it is also a water stewardship manual for use by the Lake Windermere Ambassadors, by lake stewardship groups across the country (through Living Lakes Network Canada), and by groups around the world, through Living Lakes International. As a manual, it will inspire these groups to take on more effective and cooperative water stewardship efforts on behalf of their lakes.

About Lake Windermere

Lake Windermere is located at the headwaters of the Columbia River. The Columbia River provides water to more than 15 million downstream users. Lake Windermere is fed by the

Columbia, which is the fourth largest river basin in North America and is the most dammed river in the world. Lake Windermere is encompassed by the Columbia Wetlands, a widening of the river. At more than 180 kilometres in length, these wetlands are among the longest intact wetland systems in North America.

Widespread public concern

Wildsight conducted a Lake-Use Survey in 2005. The results indicated widespread public concern about the sustainability of Lake Windermere. Respondents expressed a need for information on maintaining septic systems, concerns about boat traffic congestion, aquatic plant growth, shoreline and upland development, loss of native fish populations, water conservation and water quality.

Origins of the Lake Windermere Project

Wildsight developed the Lake Windermere Project in 2005. It was a proactive response to public concern and the demand for an ongoing, comprehensive water stewardship initiative. The aim was to engage both government and the public in the protection and enhancement of the lake and its surrounding watershed.

The project's overall goal was to protect and enhance the quality of Lake Windermere through interagency cooperation, scientific water quality monitoring, and public education and engagement.

Participants and components

Now complete, the five-year Lake Windermere Project did engage all levels of Canadian government, First Nations, and community members. The project was directed by the interests and actions of more than a dozen partners engaged in community water stewardship.

Lake Windermere Project components included:
- Education (community and school based);
- Outreach (water conservation, habitat protection, water stewardship education);
- Science (water quality monitoring, Sensitive Habitat Inventory Mapping);
- Stakeholder engagement and effective partnerships;
- Restoration.

Activities

The Lake Windermere Project coordinated efforts to deliver scientifically-sound education and action-based stewardship to help sustain Lake Windermere.

Between 2005 and 2010, the Lake Windermere Project monitored water quality in accordance with provincial and federal water monitoring protocols. Water quality was monitored at three public beaches, one private beach, three lake stations, three water intakes, and six tributaries. This added to a watershed level understanding of the health of the lake.

The water quality data collected by the Lake Windermere Project was used for three specific purposes.

- To update the provincial Water Quality Objectives for the lake, which were previously written in 1985;
- To develop an attainment water monitoring program;
- To inform the comprehensive Lake Windermere Management Plan, which was completed in early 2011.

Legacy

The Lake Windermere Project has created a valuable resource for area communities. Water monitoring equipment, an extensive library on related studies and knowledge on monitoring protocols are now available to the community.

The Project received widespread recognition for its efforts. It was chosen as a national best-practices example in community based ecological monitoring, won the prestigious Real Estate Foundation of BC Land Award, and received regional and provincial awards recognizing its advancement in conservation in the area. The Project is also being used a model for Lake Winnipeg, an iconic Canadian lake under tremendous pressure resulting from nutrient inputs from surrounding agriculture.

In the final year of the Lake Windermere Project, the components of water quality monitoring, education and outreach were handed over to the community under the direction of the Lake Windermere Ambassadors.

The Lake Windermere Ambassadors are a registered society representing a cross-section of community stakeholders, including local businesses, governments, First Nations, second homeowners, residents, youth and non-government organizations.

These community members share the vision of a healthy Lake Windermere that is managed in a balanced way and that supports recreational and traditional uses, fish and wildlife values, and economic prosperity in the region.

The Lake Windermere Ambassadors are committed to directing future water quality monitoring and stewardship programs based on the findings of the Lake Windermere Project. The Ambassadors will also support the implementation of the *Lake Windermere Management Plan* and the *Lake Windermere Shoreline Management Guidelines for Fish and Wildlife*, documents completed and adopted during the course of the completion of the Lake Windermere Project.

Factors of Success

The Lake Windermere Project was used as a case study that aimed to identify key factors of success in community based ecological monitoring. The Lake Windermere Project successfully overcame commonly recognized challenges, such as obtaining adequate funding, adopting a standardized monitoring protocol, selecting an appropriate monitoring approach, and linking monitoring data with decision-making.

This research found the other key factors included:

- Providing positive feedback to volunteers on their roles, such as a volunteer recognition program
- Using skills assessment to match volunteers with appropriate tasks
- Establishing a method to deliver information to decision-makers to make monitoring data useful
- Obtaining ongoing and adequate funding to support the project
- Involving experts in the design of monitoring initiatives to improve their monitoring effectiveness
- Developing partnerships with stakeholders to enhance capacity and link to decision-makers
- Using monitoring protocols to ensure reliable data is collected
- Training and supervising volunteers to ensure proper monitoring is undertaken
- Avoiding "datakleptomania" – *collecting monitoring data without any real purpose or objective*
- Identifying stakeholders at beginning of process (multi-party approach), assess skills and resources, create communication plan for decision makers.
- Making monitoring information usable and timely for decision-makers
- Building trust with decision makers

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Introduction

Columbia Headwaters: The river and basin

The Columbia River originates in southeastern British Columbia. The glaciers and icefields of the Purcell, Selkirk and Rocky mountains provide source water to the fourth largest river system, by volume, in North America and the most dammed watershed in the world.

The Canadian Columbia Basin is comprised of a series of natural lakes, reservoirs, river channels and wetlands, contributing about 40 per cent of the total runoff to the Columbia River, while encompassing only 15 per cent of the entire basin area[1]. The rivers, lakes and wetlands of this basin are often considered the water towers of western North America.

Columbia Headwaters: The wetlands and lakes

Located in the western trench of the Rocky Mountains, the biologically-diverse Columbia Wetlands connect Lake Windermere and Columbia Lake, and form the headwaters of the Columbia River.

These wetlands, actually a 180-kilometre stretch of the Columbia River, feature a mosaic of aquatic and riparian habitat, open water, river channels, sloughs, marshes, grasslands and shrub and forest communities.

The Columbia Wetlands are among the last intact wetland systems in all of North America. They constitute one of the largest contiguous areas of wetland in Canada and North America, and support a spectacular array of wildlife. They were designated as a “Ramsar Wetland of International Importance” in 2005.

But much of the Columbia River's wetland ecosystems have been lost to damming, draining, dyking and flooding. Therefore, their importance to migratory birds and other wildlife has become even more critical.

The Columbia Wetlands support more than 250 species of birds. Single-day counts have been taken and have revealed approximately 20,000 migrating waterfowl and 1,200 tundra swans. The wetlands are home to the second-largest colony of blue herons in western Canada—more than 300 pairs.

The wetlands also maintain a delicate balance of water temperature and flow, which provides ideal habitat for indigenous fish species to spawn and feed.

[1] Climate Change in the Canadian Columbia Basin. Columbia Basin Trust. 2007.

Fishery collapse

Despite the high-value habitat provided in the Columbia Wetlands, Lake Windermere and Columbia Lake (both connected to the wetlands) recently experienced a collapse in the burbot (*Lota lota*) fishery. Burbot are a top predator; the health of their population is a good indication of the health of an ecosystem as a whole. Studies have shown that the size, health and number of burbot in Windermere and neighbouring Columbia Lake has declined severely. Although studies have not identified a single cause of the burbot fishery collapse, potential causes include increased competition from the invasion of bass, low-spawning adult numbers, loss of habitat, poor ice cover as a result of climate change, decreased food sources, over predation (including overfishing) and the construction of dams.

Wildsight's Columbia Headwaters Legacy Program

Wildsight hosted the 2004 International Living Lakes conference in Invermere, B.C. Many delegates raised concerns about the sustainability of the Columbia Basin watershed. They articulated the need for a comprehensive, community-driven water stewardship initiative. Wildsight developed the Columbia Headwaters Legacy program in response to this need.

The Columbia Headwaters Legacy program is comprised of the new Lake Windermere Project and the Columbia Wetlands program, an already-established Wildsight initiative. The Columbia Wetlands program is still ongoing, working to provide long-term layers of protection for the wetlands and their supporting watersheds.

The Lake Windermere Project, although officially ended, created a lasting legacy of water stewardship in the Columbia Valley. The project delivered unique and engaging public education and activities. At the same time, it carried out one of B.C.'s most advanced, in-depth water quality-monitoring strategies.

The Lake Windermere Project helped the regional community to discover the value of its scarce water resources. It also empowered communities with the tools and information required to safeguard such precious resources.

The Lake Windermere Project

Lake Windermere Project: Goals

The overall goal of the Lake Windermere Project was to: "Ensure the ecological integrity of Lake Windermere and its watershed through science and community stewardship."

To reach this goal, the LWP focused on three objectives:

- To empower key stakeholders and decision-makers with comprehensive, scientific data on Lake Windermere water quality, threats and status;
- To create and strengthen a community ethic of water stewardship surrounding Lake Windermere;
- To encourage the cooperation and active engagement of multiple agencies with community members toward the management of Lake Windermere.

Lake Windermere Project: Outcomes

Outcomes of the multi-year Lake Windermere Project included the following list of delivered, long-term benefits:

- Active participation of full- and part-time residents to protect Lake Windermere and its watershed;
- Cooperation of multiple agencies with respect to lake management;
- Increased awareness of water stewardship issues among children and adults within the community;
- Reflection of the importance of water resources within municipal and provincial government policy and planning;
- Full analysis of water quality status;
- The Lake Windermere Project serves as a template for lake management in the East Kootenay and across B.C. and Canada.

1. Project Partners

The Lake Windermere Project was facilitated by Wildsight, but its success was truly the result of the cooperative efforts of more than a dozen partners.

The partners listed here contributed significant in-kind resources and expertise.

Columbia River Inter-Tribal Fisheries Commission

Representatives provided a vital First Nations perspective to program development and delivery. They provided expert advice pertaining to First Nations historical values and reservation lands.

Fisheries and Oceans Canada

Representatives assisted with fisheries aspects of the program including expert advice pertaining to the burbot fishery collapse, foreshore restoration recommendations, and education information for shoreline property owners.

District of Invermere

Municipal staff members assisted by providing expert advice pertaining to zoning and planning requirements, land ownership issues and other advice as needed. Contribution also included office space, use of a boat and fuel, sampling equipment, shipping assistance and information distribution.

In addition to municipal staff, members of the municipal council, including the mayors of the District of Invermere, were supportive of the Lake Windermere Project and willing to work toward the goal of a sustainable lake.

Interior Health Authority

Health representatives provided expert advice with respect to human health issues arising from high bacteria levels, pesticide use and other recreational water quality concerns. Contributions also included sample shipment, lab analysis costs and bacteriology sampling program design.

Ministry of Environment

Representatives provided field training, annual examination of technique. Expert advice pertained to water quality and quantity measurements, equipment maintenance and educational information. Some sampling equipment was supplied, and some lab analysis costs were covered. Ministry staff completed a full analysis of water quality data collected and developed the *Windermere Lake Water Quality Assessment and Objectives* report based on the data collected by the Lake Windermere Project.

Regional District of East Kootenay

Expert advice was provided pertaining to land ownership, policy issues, and previous studies related to Lake Windermere. The Regional District of East Kootenay provided critical support in the completion of the *2005 Masse and Miller Lake Windermere Water Quality Monitoring Project and Literature Review*. Maps and report printing were provided, as well as meeting organization and facility rental.

East Kootenay Conservation Program

Expert advice was provided pertaining to land use, ecosystem stewardship and conservation on private and crown lands. The Lake Windermere Project was a success story of the program, and was used as model during the establishment of the Columbia Valley Local Conservation Fund.

No Water No Life

Representatives provided a critical connection to organizations working to protect the Columbia River downstream to its outlet. Art exhibitions highlighting some of the work of the Lake Windermere Project, and other organizations in the Basin have also been organized.

Living By Water

Expert advice regarding shoreline restoration project design and implementation, and best management practices for erosion control were provided. Healthy Shoreline Workshop Series content and materials for distribution were also provided.

Waterlution

Experiential learning opportunities were provided, with a focus on educating and inspiring young leaders. Lake Windermere Project staff participated, and assisted with the delivery of, two workshop series hosted by Waterlution.

UK Environment Agency

Representatives shared information resources regarding lessons in lake management planning. Significant contribution was also provided through the establishment of the Lake Windermere Sister Lake Partnership.

Collaborative Partnerships

The Lake Windermere Project became a key member of number of very beneficial collaborative partnerships that have reinvigorated water stewardship in the region.

a. East Kootenay Integrated Lake Management Partnership

There has been an intensification of development proposals in the Kootenay region. In some cases, there is conflicting policy information or direction for different agencies or poor communication between agencies. Interest in coordinating efforts to address local issues, cumulative impacts to aquatic ecosystems, and to establish lake management projects have been expressed by many government and non-government organizations.

In 2006, Fisheries and Oceans Canada invited several stakeholders to a meeting to discuss development pressures around lakes in the East Kootenay.

At the meeting, the various agencies and stakeholders discussed their common concerns, issues and joint responsibilities. They agreed there was great benefit in pulling resources together to address the

issues and concerns in an integrated way, to better protect the lakes and their beneficial uses for drinking water, heritage, recreation and aesthetics.

All participants agreed to join in the effort and the East Kootenay Integrated Lake Management Partnership (EKILMP) was created.

Participants in this initiative include the Regional District of East Kootenay; Fisheries and Oceans Canada; the B.C. Ministry of Environment—Water Stewardship Division, Environmental Protection Division and Environmental Stewardship Division; the B.C. Integrated Land Management Bureau; Transport Canada; District of Invermere; Village of Canal Flats; Interior Health; the Lake Windermere Project; Wasa Lake Land Improvement District; Moyie Community Association; Rosen Lake Ratepayers Association; Jimsmith Lake Community Association; and the Canadian Columbia River Intertribal Fisheries Commission representing the ?A'kisq'nuq First Nation, Shuswap Indian Band and Ktunaxa Land and Resource Council.

The partnership represents an interest in coordinating efforts to address local issues and to establish lake management projects. In 2007, EKILMP produced a *Terms of Reference* approved by all participatory agencies and organizations. Partners agreed that EKILMP's vision is for productive and healthy lake ecosystems in the East Kootenay Region, with balanced land and water uses that support and sustain traditional, environmental, community, recreational and aesthetic values.

The partnership agreed the Sensitive Habitat Inventory Mapping (SHIM) would be its pilot project. The SHIM process involves local communities and provides decision-makers, planners, developers, land-owners and government agencies with the tools required to make sustainable foreshore land use decisions that take into account cumulative impacts to fish and wildlife habitats. Sensitive Habitat Inventory Mapping helps build local expertise and allows communities to take a more active role in planning and management of lake ecosystems.

Lake Windermere's shoreline was selected to be the first digitally-inventoried foreshore in the East Kootenay. Reasons for its selection included high development pressures, the Lake Windermere Project being underway, the lake's high fish and wildlife values, local partner support, and source water issues. The inventory documented land use, riparian habitat changes and existing sensitive fish and wildlife habitats.

The resulting *Lake Windermere Shoreline Management Guidelines for Fish and Wildlife* will guide shoreline activities to protect, conserve, and restore important fish and wildlife habitats. The work on Lake Windermere has been used as a template for developing shoreline management guidelines for nine other lakes across the Kootenays.

Through partnership, information sharing and optimizing available resources, the East Kootenay Integrated Lake Management Partnership has developed integrated, collaborative approaches to watershed monitoring, resulting in lake management that addresses the current and future activities in the watershed in ways that sustain the ecological health, social and economic values of lakes in the East Kootenay.

The Lake Windermere Project served as chair of the East Kootenay Integrated Lake Management Partnership from 2007 to 2009.

a. Pesticide Free Columbia Basin

The Pesticide Free Columbia Basin network is dedicated to the phase-out of non-essential, cosmetic chemical pesticides in the Columbia Basin region of British Columbia. The goal of the network is to work collaboratively to reduce the unnecessary risk of chemical pesticide exposure, thereby creating healthier communities and a healthier environment for all.

The Pesticide Free Columbia Basin network is a continually-expanding coalition of local citizens, businesses and non-government organizations, such as the Canadian Cancer Society and Wildsight. The network includes community coalitions such as Pesticide Free Kimberley, Pesticide Free Cranbrook, Pesticide Free Columbia Valley, and Pesticide Free Rossland, as well as physicians, teachers, local businesses, municipal leaders, parents, athletic coaches, environmentalists and avid gardeners. Together, its partners aim to reduce the cosmetic use of pesticides in communities throughout the Columbia Basin.

Pesticide Free Columbia Basin calls on municipalities, school districts and the provincial government to take action by enacting by-laws, policies and/or legislation that protects citizens from unnecessary exposure to cosmetic pesticides.

During the years of 2006, 2007 and 2008, the Lake Windermere Project provided the public with information on the impacts of pesticide use to freshwater ecosystems, assisted with hosting speaking tours and educational fairs, developed literature, and provided a resource for the community to learn about how to go pesticide free.

As a result of these educational and partnership efforts, the District of Invermere became the first community in the East Kootenay to adopt a cosmetic pesticide bylaw in February 2009, making it the 22nd community in B.C. to pass legislation. The bylaw is considered to be a model for other communities in the Basin, such as Kimberley, Golden, and Fernie.

b. Columbia Basin Watershed Network

In May 2005, Columbia Basin Trust, in collaboration with the Columbia-Kootenay Fisheries Renewal Partnership, the University of British Columbia and Selkirk College, hosted a symposium for groups interested in watershed management in the Columbia Basin.

The symposium led to the creation of the Columbia Basin Watershed Network.

This network assists local watershed groups by providing information and educational resources, and functions as a central meeting point to collaborate on ideas and ultimately function as a larger unified body.

The Lake Windermere Project has served on the network's steering committee, and assisted in the coordination and facilitation of networking, capacity building and information sharing to ensure healthy functioning ecosystems and communities in the Canadian Columbia River Basin.

c. Living Lakes International

Living Lakes is an international network of non-governmental associations with a mission to enhance the protection, restoration and rehabilitation of lakes and wetlands including their watersheds throughout the world.

The network was created in 1998 by Global Nature Fund in Germany and is now a partnership of more than 75 environmental organizations representing 65 lakes and wetlands worldwide.

The partnership focuses on raising awareness, exchanging ideas and advice, and initiating and implementing common projects. A fundamental idea behind Living Lakes is the cooperation and the networking of people and their organisations from all over the world working on water stewardship issues.

Wildsight became the first Canadian member of the network in 2000, for its work to conserve and protect the Columbia Wetlands.

Through its experience as an active member of Living Lakes International, Wildsight joined with the Lake Winnipeg Foundation and, in 2010, established Living Lakes Network Canada.

d. B.C. Lake Stewardship Society

The B.C. Lake Stewardship Society is a registered non-profit society dedicated to the preservation and protection of British Columbia's lakes. The BCLSS is a chapter of the North American Lake Management Society, and its membership includes lakeshore residents, students, environmental professionals, and organizations.

The BCLSS assists in training, education, and technical support to lake stewardship groups. It provided lake monitoring programs, educational materials, and hosted workshops, such as the LakeKeepers Workshop, in partnership with the Lake Windermere Project.

2. Science

The goal of the Lake Windermere Project was to "Ensure the ecological integrity of Lake Windermere and its watershed through science and community stewardship." This section outlines how the Lake Windermere Project employed water monitoring science during its course.

a. Water Quality Objectives

The Lake Windermere Project conducted ongoing monitoring of water quality parameters in accordance with the *2005 Masse & Miller Windermere Lake Water Quality Monitoring Program and Literature Review*[2], which was commissioned by the Regional District of East Kootenay at the request of the Lake Windermere Project.

[2] Masse, Sylvie. 2005. Windermere Lake Water Quality Monitoring Program and Literature Review. Masse & Miller Consulting Ltd. Nelson, BC.

This document provided the Regional District of East Kootenay, Wildsight and stakeholders with a data collection and sampling regime to monitor water quality over the period of the Lake Windermere Project. It discusses past and future sampling locations, sampling frequency, sampling methods, protocols, trends and changes in water quality, and analysis criteria.

> Previous water quality studies of Windermere Lake indicate that there is a trend towards eutrophication of the lake. Water quality data collected during the 1980's showed that the lake was oligotrophic, however, further studies conducted in 1999 showed an increase in nutrients within the lake indicating a mesotrophic status. Potential causes of the increases include foreshore development at the north end of the lake, contamination of septic fields, surface runoff from urbanization, boating and recreational activities on the lake, and operation of nearby golf courses. Further studies are required to identify major causes of changes in water quality in Windermere Lake[2].

To gain a watershed level of understanding of the health of the lake, water quality was monitored at three lake stations and on six tributaries of concern.

The monitoring program included parameters such as: water temperature, pH, conductivity, dissolved oxygen, clarity, turbidity, total suspended solids, hardness, total sulphide, sulphate, total nitrogen, total organic nitrogen, ammonia, total phosphorus, total dissolved phosphorus, orthophosphorus, fecal coliform, E. Coli, general ions, ammonia, nitrate, nitrite, total organic carbon, and total metals.

Standard provincial government protocol was used for ambient water sampling (see Appendix A) and Lake Windermere Project staff were tested annually on their sampling technique.

Monitoring locations included:

- Lake Windermere North Station off Timber Ridge
- Lake Windermere Mid Station off Windermere
- Lake Windermere South Station
- Columbia River at Fairmont
- Windermere Creek
- Abel Creek
- Holland Creek
- Brady Creek
- Goldie Creek
- Kinsmen Public Beach
- Windermere Public Beach
- James Chabot Public Beach
- Tretheway Private Beach
- Parr Utility Water Intake
- Windermere Water Intake
- Timber Ridge Water Intake

Figure 1: Location of lake stations and tributaries[4].

While the frequency and intensity of the program varied by year, based on Ministry of Environment recommendations, the Lake Windermere Project conducted year-round water monitoring between 2005 and 2010. Ministry of Environment staff completed the final analysis of water quality results using data collected between 2006 and 2009.

> **Eutrophication:** "The process by which a body of water acquires a high concentration of nutrients, especially phosphates and nitrates. These typically promote excessive growth of algae. As the algae die and decompose, high levels of organic matter and the decomposing organisms deplete the water of available oxygen, causing the death of other organisms, such as fish. Eutrophication is a natural, slow-aging process for a water body, but human activity greatly speeds up the process[3]."

Lake Windermere Water Quality Findings:

> Windermere Lake is shallow and well-mixed, with a water residence time of approximately 47 days. These factors, combined with the amount of inflow received from the Columbia River, allow Windermere Lake to effectively assimilate nutrients.
>
> The *Water Quality Assessment and Objectives Summary for Windermere Lake*[4] found that water samples collected show there has not been significant change in the water quality of Windermere Lake compared to historical data. In addition, water quality results from the

[3] Art, H.W., 1993, Eutrophication, *in* Art, H.W., ed., A dictionary of ecology and environmental science (1st ed.): New York, New York, Henry Holt and Company, p. 196.

[4] Neufeld, A. 2010. Water quality assessment and objectives for Windermere Lake overview report, first update. Environmental Protection Division, BC Ministry of Environment.

three main lake stations did not display much variation over the three-year monitoring period. It is possible that impacts from non-point sources of pollution may be more evident in near-shore areas.

However, temperature values exceeded the proposed water quality guideline during the summer months (June – September), and elevated concentrations of microbiological indicators were noted at both Athalmer and Invermere beaches. This is likely due to the beaches being located in embayments, the high recreational use of these areas and potential contributions from septic systems along the east shore of the lake.

The proposed objectives are intended to protect the quality of water used for recreation, aquatic life and wildlife, irrigation and livestock watering, and source waters used for drinking. The objectives may be considered as policy guidelines for resource managers to protect water uses in the specified water body.

Changes proposed for the Water Quality Objectives for Windermere Lake include the introduction of objectives for temperature, *E. coli*, total organic carbon, and dissolved oxygen, as well as removing the objectives for fecal coliforms (in lieu of the objective for *E. coli*)[4].

Variable	Original Objectives (1985)		Revised Objectives (2010)	
	Site	Objective	Site	Objective
Turbidity	0200051 0200052 0262793	≤ 1 NTU (average) 5 NTU (maximum)	0200051 0200052 0262793	≤ 1 NTU (average) clear-flow period ≤ 5 NTU (maximum) clear-flow period 5 NTU (95th percentile) turbid-flow period
Phosphorus	0200051 0200052 0262793	≤ 0.010 mg/L (average)	0200051 0200052 0262793	10 µg/L (maximum)
Fecal coliforms	Bathing Beaches	≤ 200 MPN/100 mL (geo. mean) ≤ 400 MPN/100 mL (90th percentile)		
	Near Drinking Water Intakes	≤ 10 MPN/100 mL (90th percentile)		
Temperature			0200051 0200052 0262793	20 °C June (average) 25 °C July (average) 23 °C August (average)
E. coli			Bathing Beaches	≤ 77 CFU/100 mL (geo. mean)
			Drinking Water Intakes	≤ 10 CFU/100 mL (90th percentile)
TOC			Near Drinking Water Intakes	4 mg/L (maximum)
DO			0200051 0200052 0262793	≥ 5 mg/L (instantaneous minimum) ≥ 8 mg/L (average)

Figure 2: Original and revised objectives for Windermere Lake[4].

b. Beach Bacteriology

Between the years 2005 and 2010, the LWP monitored for bacteria at three public beaches and one private beach on Lake Windermere. The Lake Windermere Project monitored fecal coliform levels on

behalf of Interior Health, which has the responsibility to close a public beach if bacteria levels exceed the *Guidelines for Canadian Recreational Water Quality*.

Additional information was collected, for example, weather, number of swimmers, and number of waterfowl (see Appendix B). Monitoring protocols were designed by Interior Health, and the Lake Windermere Project submitted samples to Interior Health for analysis.

Public beaches are monitored for fecal coliform because this type of bacteria is closely associated with the types of microorganisms that can cause human illness.

> About Microorganisms
>
> Microorganisms live naturally in lakes, rivers, streams and hot springs. Microorganisms include viruses, bacteria and single-cell parasites. Although most of these microbes do not cause illness in humans, some do. The illnesses include:
> - Stomach and intestinal diseases
> - Swimmer's Itch and skin infections
> - Eye, ear, nose and throat infections
>
> It is difficult to test for all of the different types of microorganisms that could cause illness. Therefore, water samples are tested for bacteria that are closely associated with those that make a person sick. These are called indicator bacteria. *Escherichia coli* (*E. coli*) and fecal coliforms are bacteria that live in the intestines of warm-blooded animals and help the animals digest food.
>
> *E. coli* and fecal coliforms are indicator bacteria because a water sample that contains these bacteria is also likely to contain other microorganisms that could cause illness.
> Beach water that exceeds a count of 200 fecal coliforms per 100-millilitre sample poses an increased public health risk – particularly for at-risk populations such as the very young, the very old, and people with weakened immunity[5].

c. Canadian Aquatic Biomonitoring Network

Lake Windermere Project contractors are trained in Federal stream monitoring protocols through the Canadian Aquatic Biomonitoring Network (CABIN) program developed by Environment Canada. An in depth water quality and macro invertebrate monitoring program has been established on Windermere Creek through the Columbia Basin Water Monitoring Group, a project of the Columbia Basin Watershed Network. The Columbia Basin Water Monitoring Group consists of representatives from eight water stewardship projects across the Columbia Basin, including: Wildsight, Golden; the Lake Windermere Project; St. Mary Lake Residents Association; Salmo Watershed Streamkeepers

[5] Beach Water Quality Notification Campaign: Information Package for Beach Owners. Prepared by Alliance Communications. 2006.

Society; Slocan River Streamkeepers Society; Joseph Creek Streamkeepers; Arrow Lake Environmental Stewardship Society; and Friends of the Lardeau River.

The Columbia Basin Water Quality Monitoring group CABIN program includes monthly water chemistry monitoring, annual sediment sample testing for metals, annual habitat assessment including macro-invertebrate sampling, and hourly temperature readings during the ice-free months using a HOBO data logger.

Data collected is entered into the Environment Canada CABIN database where reports and trend analysis can be completed.

The Lake Windermere Ambassadors will continue the CABIN program as members of the Columbia Basin Watershed Network.

d. Sensitive Habitat Inventory Mapping and *Shoreline Management Guidelines for Fish and Wildlife*

The Lake Windermere Project, as chair of the East Kootenay Integrated Lake Management Partnership, participated in an important habitat mapping project.

Sensitive Habitat Inventory Mapping (SHIM) is a way to document land use, water quality, fish and wildlife values, and riparian and wetland habitat changes. It also identifies sensitive areas requiring protection.

SHIM results assist managers, planners and communities in land use planning, development of regulations, standards and policies, leading to improved scientific knowledge as the basis for decision-making.

Lake Windermere was chosen as the pilot SHIM project of the East Kootenay Integrated Lake Management Partnership. The two-year SHIM study led to the development of *Shoreline Management Guidelines for Fish and Wildlife* for Lake Windermere.

Due to the increased development pressures on the lake and surrounding area, individual proposals could no longer be adequately evaluated to determine cumulative environmental impacts. As well, there are ongoing local concerns about sustaining water quality on Windermere Lake to support aquatic life, recreation quality, and provide a source of clean drinking water. Due to these concerns—and the *Lake Windermere Water Quality Study* undertaken by the Lake Windermere Project—EKILMP agreed to develop a management plan for Lake Windermere Lake as its first project using the results of the SHIM project.

Since completing the Lake Windermere SHIM process, the partnership has championed SHIM projects through to completion on nine lakes in the East Kootenay region, including Columbia, Wasa, Tie, Rosen, Jimsmith, St. Mary, Moyie, and Monroe Lakes, and similar projects are underway in the West Kootenay region, and now on Lake Winnipeg.

About Sensitive Habitat Inventory Mapping (SHIM) on Lake Windermere

The SHIM process identified areas on Lake Windermere that are essential for the long-term maintenance of fish and/or wildlife values. The partnership identified shoreline areas where low impact development could occur, areas where development with normal constraints could occur and areas where redevelopment with restoration would benefit the long-term health of the lake. Additionally, the partnership recommended specific areas be designated for conservation use, and that no development occur within them. Low impact water access recreation and traditional First Nation uses are permissible in these areas, but permanent structures or alteration of existing habitats is considered to be unacceptable.

The first stage of the SHIM assessment was to complete the Foreshore Inventory Mapping (FIM) project. The Windermere Lake FIM report found that 62% of the shoreline is classified as disturbed[6].

The second component included conducting a fish and wildlife habitat assessment during both summer and fall, and compiling field information to be analyzed for the creation of an aquatic habitat index, which was then used as the basis for the *Shoreline Management Guidelines for Fish and Wildlife*.

The final result is the *Shoreline Management Guidelines*[7] report, which includes shoreline designation maps, a risk rating for potential proposed activities and a flow chart that indicates selected preliminary approval procedures when making development applications. These are provided as tools to assist landowners and developers who want to propose shoreline development. This approach provides a science-based cumulative effects assessment of areas of highest natural value requiring the highest level of on-going protection.

Because of the increasing interest by lake associations to have Sensitive Habitat Inventory Mapping projects completed on their lake, EKILMP developed area requirements to prioritize SHIM projects. These requirements include; heavy development pressures, land use planning underway (i.e. Official Community Plans or zoning process), presence of a motivated community-based group that is willing to become a member of EKILMP, cooperative partners present, source water issues and high fish and wildlife values.

Information generated by the Windermere Lake SHIM process is housed on the Community Mapping Network website (www.cmnbc.ca). This website was created to share and assist communities in B.C. to map sensitive habitats and species distribution.

e. Lake Windermere Management Plan

The foreshore of a lake refers to the area between the high and low water marks. In British Columbia, this area is commonly designated as Crown land, and is held in the public trust. The foreshore is an

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[6] McPherson S and D. Michel. 2007 Windermere Lake Foreshore Inventory and Mapping. Consultant report prepared for the East Kootenay Integrated Lake Management Partnership. Prepared by Interior Reforestation Co. Ltd., Cranbook, BC.

[7] McPherson S. and D. Hlushak and J. Bisset. 2009. Windermere Lake Shoreline Management Guidelines for Fish and Wildlife. Prepared by Interior Reforestation Co. Ltd., Cranbrook, BC with major revisions by EKILMP.

important link between land-based and water-based ecosystems, and provides critical habitat for fish and wildlife.

The management of Lake Windermere's foreshore is a multijurisdictional responsibility and is regulated by local, provincial and federal legislation and regulations. This complex jurisdictional reality makes lake management challenging. As a result, the various local governments came together to create a *Lake Management Plan* for Lake Windermere.

The main goals of the *Lake Windermere Management Plan*[8] are:

- Protect and enhance the environmental health and integrity of the lake;
- Ensure the continuation of diverse and safe recreational opportunities;
- Encourage and support the development of a community that will work together to respect and balance the various interests on the lake;
- Clarify and strengthen responsibilities for management and enforcement.

During the public consultation phase of the planning process, respondents were asked to identify their level of support for a range of potential management options that could be applied to the lake. The following are the six most supported options.

- Continue water quality monitoring and analysis
- Monitor and manage weed growth
- Continue new community sewer systems
- Community sewer required for any new development over five lots
- Public education program
- Enforce requirement for all foreshore works to obtain approval

The resulting plan recognizes the value of the Lake Windermere Project as a resource for the community, including water monitoring equipment and experience, extensive library, and it encourages continued support through the Lake Windermere Ambassadors.

The *Lake Windermere Management Plan* recommends supporting the establishment of a Lake Management Committee, potentially composed of Lake Windermere Ambassadors, other citizens and local government, subject to a *Terms of Reference* and appointment by RDEK and DOI. The committee would coordinate with various levels of government in outreach activities and in the sharing of information.

The Lake Windermere Project used water stewardship as a tool for land management through the promotion of best water use practices in the *Lake Windermere Area Official Community Plan* and the *Lake Windermere Management Plan*. The Lake Windermere Project engaged decision makers and implemented science on the ground in the region.

As a result of the Sensitive Habitat Inventory Mapping project, the *Lake Windermere Water Quality Assessment and Objectives*, and the *Lake Windermere Management Plan*, the East Kootenay Integrated Lake Management Partnership was successful in implementing the *Land Act Section 16*

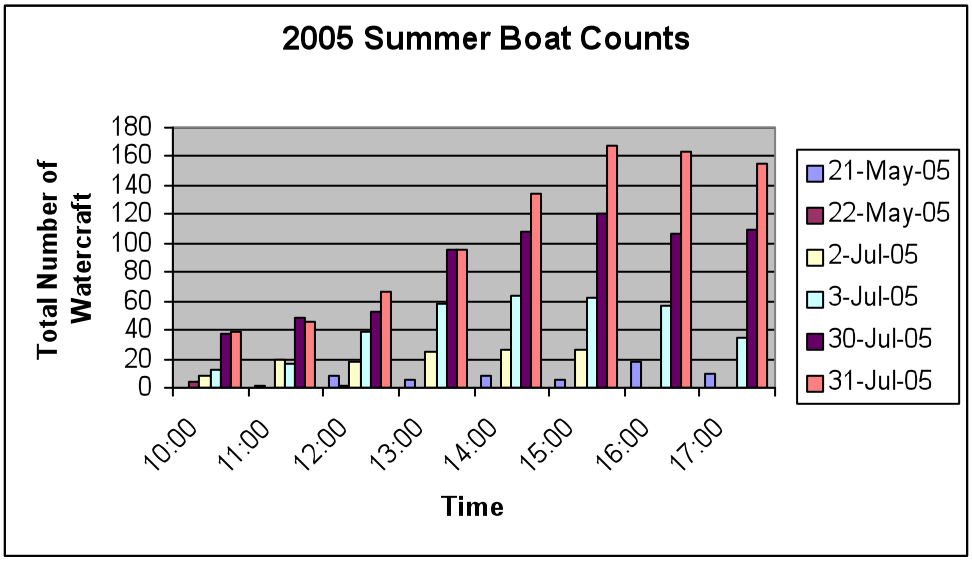
[8] Berris, Catherine. 2011. Lake Windermere Management Plan. Prepared by Catherine Berris Associates Inc.

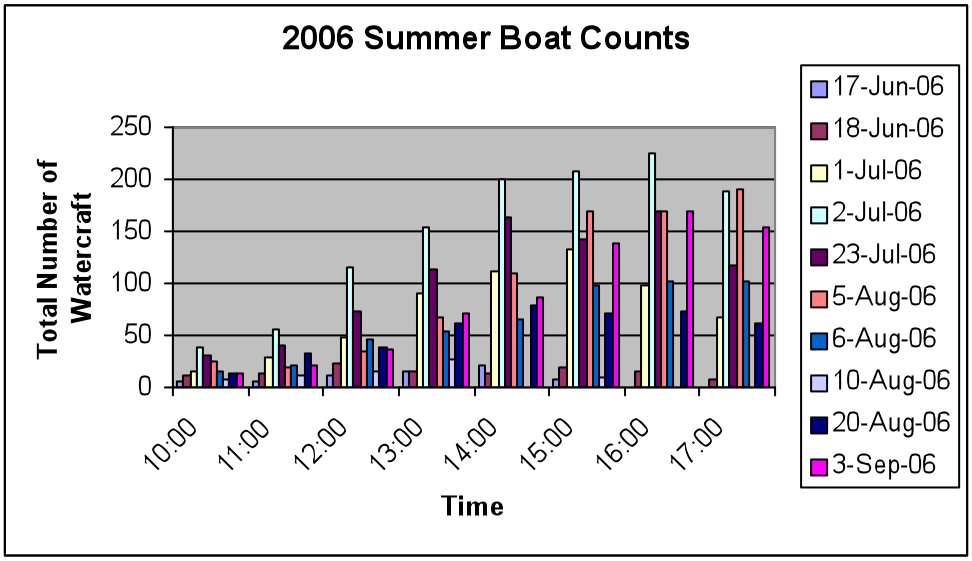
Map Reserve, a moratorium on shoreline development that would allow for the above mentioned projects to be completed.

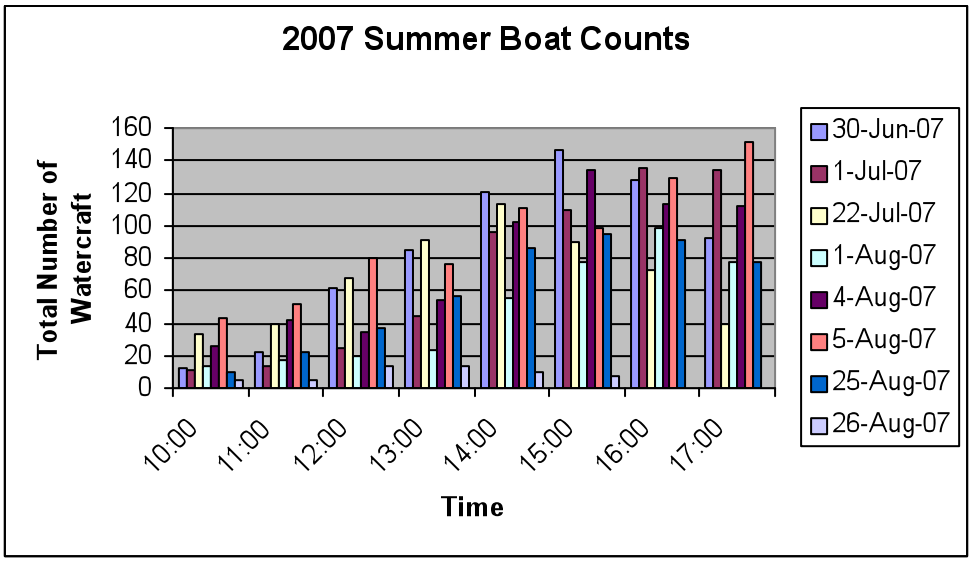
f. Boat Counts

The issue of boat congestion was repeatedly raised during the 2005 *Lake-User Survey*, conducted by the Lake Windermere Project. To gain a greater understanding of the number and nature of boating activity on the lake, the Lake Windermere Project conducted boats counts throughout the summer months of 2005, 2006, 2007 and 2008. The information gathered was used to inform the recreation component of the *Lake Windermere Management Plan*.

A visual inventory of watercraft on Lake Windermere was conducted on select weekends and weekdays between 10:00 am and 5:00 pm to assess the abundance and type of boating occurring on the lake. Volunteers conducted hourly counts of watercraft, identifying the type of boat (i.e. motorboat, canoe, sailboat, and so forth), and whether or not it was towing. An established viewpoint was used, where the entire lake could be seen, and teams of two volunteers used binoculars to count and record the watercraft using the standard protocol (see Appendix C).







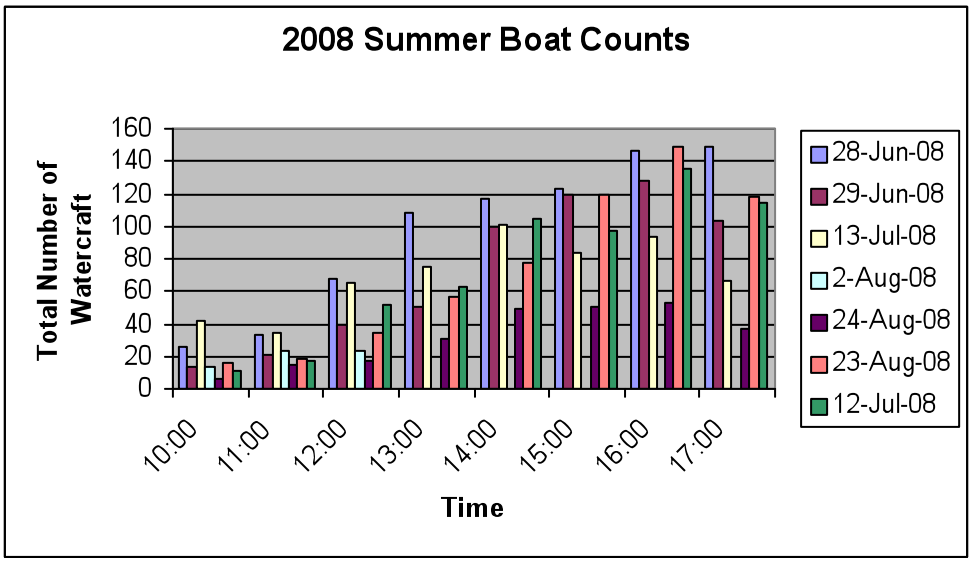


Figure 3: Boat count results.

The vast majority of boats tended to be motorboats. The record number of total boats occurred on July 2, 2006 at 4:00 pm when a total of 225 boats were actively using the lake at one time. Fair weather tended to contribute to the number of boats using the lake.

While the use of a variety of volunteers to conduct boat counts could have lead to inaccurate results, the Lake Windermere Project is reasonably confident in these findings. Local marina and fuel station Shadybrook Resort completed further analysis, correlating boat count numbers with fuel sales, and found that they closely resembled each other.

g. Ice on/Ice off

Scientists are currently studying the natural freezing and thawing cycles of Canadian waters because ice cover is directly affected by climate change. Recording and analyzing ice cycles helps scientists understand how climate change is affecting the environment.

In partnership with the B.C. Lake Stewardship Society, the Lake Windermere Project participated in an ongoing process that documented Lake Windermere's "ice-on" and "ice-off" patterns and ice cycles between 2005 and 2010.

Seasonal differences in the ice cover for lakes and rivers can have a substantial impact on Canada's ecosystems. Changes in the breeding seasons and migration patterns of birds and waterfowl, food supplies for fish and mammals, water temperature along with changes to water chemistry can all occur. Ice cover can also affect national trade, transportation, outdoor recreation and tourism.

The information gathered on Lake Windermere was submitted to the B. C. Lake Stewardship Society and incorporated into their provincial database.

Ice On	
Year	Date
2005	03-Dec
2006	27-Nov
2007	23-Nov
2008	25-Nov
2009	05-Dec
Ice Off	
Year	Date
2006	01-Apr
2007	31-Mar
2008	14-Apr
2009	12-Apr
2010	08-Apr

Figure 4: Ice on/ice off results.

3. Education and Outreach

The Lake Windermere Project wanted to help create community-supported water stewardship. For

community support to increase, education and outreach must be effective and appropriate. The following is an outline of specific education and outreach activities.

a. Door-to-door Outreach Campaign 2005

The goal of the door-to-door outreach campaign was to provide area residents with printed material regarding the project, its goals, and ways to get involved. During the first summer of the Lake Windermere Project, all shoreline properties were visited, as well as the communities of Windermere, Rushmere, Larch Point and Fort Point.

Of the 376 households visited, 98 residents spoke with the Lake Windermere Project staff. Results of these discussions were:

- 31% had heard of the project
- 69% reacted favorably to information and gave positive feedback
- 31% had a neutral reaction to information
- There were no negative encounters

b. 2005 Lake-Use Survey

To collect public input regarding the lake, the Lake Windermere Project distributed 3,733 *Lake Use Surveys* to all households and property owners from Fairmont to Invermere. Conducted as a cold mail drop census, prize incentives were offered to increase response rates, which are typically low for mail-out surveys. A total of 610 households completed and returned their surveys – a 16 per cent response rate.

The majority of respondents listed Calgary as their permanent place of residence, proving the survey an effective method for engaging the area's second-homeowners.

The results indicated a need for public education about maintaining septic systems, water conservation, shoreline protection and legislation, and impacts associated with the use of conventional pesticides.

Recurring themes of concern were:

- watercraft congestion
- impacts of the rapid building-up of the area
- absence of adequate waste treatment on the east side of the lake
- extensive aquatic plant growth
- inadequate public boat launches

The most remarkable finding of the survey was that, not only are communities ready to embrace a stewardship initiative on Lake Windermere, they see the bigger picture and through their commentary are asking for a long-term development strategy for the region.

Findings of the 2005 *Lake Use Survey* were provided to decision-makers, used as a basis for the 2011 *Lake Windermere Management Plan*, and used to direct the public outreach and scientific study components of the Lake Windermere Project.

c. Wild Wonders of Windermere Tour

Wings Over the Rockies is a week-long birding festival held in Invermere at the beginning of May each year. The festival is organized by hundreds of volunteers, and typically attracts at least 1,000 attendees, more than half of which are from outside of the Columbia Valley.

The Lake Windermere Project hosted the popular "Wild Wonders of Windermere" tour d**uring** the Wings Over the Rockies festival.

The tours took participants to some of the most special areas on the lake by pontoon boat. Gaining a new perspective of the lake while viewing various waterfowl, wildlife and other species that rely on Lake Windermere, participants learned how water quality was monitored on the lake and the about the results of five years of study. They viewed examples of healthy shorelines that support fish populations, and portions of Lake Windermere's shoreline that have recently been classified as conservation areas.

d. J.A. Laird Elementary School Leadership Class

The Lake Windermere Project hosted annual field trips for the J.A. Laird Elementary School Leadership Class between 2007 and 2010. This partnership resulted from the efforts of one student, who represented the youth sector on the Lake Windermere Ambassadors, and his idea to host a fundraiser for the LWP. The funds raised were used to purchase educational signage for the three public beaches. The students contributed to the design and content of the signs, which reminds beach goers that the lake is a community drinking water source and to do their part to keep it clean.

Additional field trips included water quality monitoring demonstrations and the Yellow Fish Road Program. Under the guidance of the Lake Windermere Project, students painted yellow fish next to the storm drains in downtown Invermere. These drains lead to the District of Invermere storm sewer system.

Students learned that storm water from downtown Invermere runs down curbs, into storm drains, storm sewers, and finally out of a culvert directly into Lake Windermere. Storm water can carry non-point source pollution, which occurs when water moves across or through affected ground, picking up contaminants and sediments and depositing them in lakes, rivers, wetlands and groundwater. These pollutants can then enter human drinking water sources. They can also affect water quality for all forms of life. Students helped educate the community by passing out information on how to reduce non-point source pollution from entering our waterways.

e. Water Wonders Workshop

The Lake Windermere Project hosted four annual 'Water Wonders Workshops'—interactive, educational water stewardship events that were held at James Chabot Beach alongside the annual Lakeside Event. These events reached over 700 children and adults annually. The goals of the workshop were to increase the community's understanding of the importance of water stewardship, and to inspire admiration and respect for our local water resources.

Water Wonders Workshops featured a number of educational displays and exciting activities including the popular 'Wild About Wetlands' tour, an interactive 'Stream Trailer' that depicts the effects of watershed alterations, 'Water in Africa' an activity that characterizes the importance of global water conservation, and a working 'Water Pollution Model' that demonstrates the impacts of non-point source pollution (see Appendix D)

f. LakeKeepers Workshop

Wildsight's Lake Windermere Project and the BC Lake Stewardship Society hosted a pilot LakeKeepers Workshop at Lake Windermere in 2009. Participants came from Chain Lake, Moyie Lake, Columbia Lake and Lake Lillian, along with others from the Okanagan and elsewhere in the East Kootenay.

The workshop was divided into a classroom component and field component. The topics covered were: forming stewardship groups; basic lake function; sampling protocol; monitoring programs; introduction to aquatic plant ID; healthy riparian area identification; and discussion of the value of aquatic plant communities.

In addition to the classroom component, the first day included a site visit to Lake Lillian to view and identify algae species and discuss methods for setting up a stewardship program on Lake Lillian.

The second day involved hands-on use of the sampling equipment via pontoon boat, discussion of sensitive shoreline habitats, and aquatic plant identification.

The workshop inspired three new stewardship groups to become established – Columbia Lake, Lake Lillian and Moyie Lake.

g. Pacific Streamkeepers Federation workshops

Pacific Streamkeepers Federation workshops provide participants with hands-on field training in stream habitat, water quality and stream invertebrate surveys, streamside planting, and juvenile fish trapping and identification. Skills regarding protocol for stream habitat measurements, sampling invertebrates, fish and taking basic water quality measurements are also gained.

During 2009 and 2010, the Lake Windermere Project delivered this two-day course to area residents who were interested in initiating stream monitoring programs in their communities, or assisting with Lake Windermere Project tributary monitoring program.

With the support of the Columbia Valley Community Foundation, the Lake Windermere Project was able to purchase a complete Streamkeepers Kit, which is now available to community members to borrow. This course has promoted the creation of Streamkeepers groups in the St. Mary Lake and Elk River areas.

h. Regatta – A Celebration of Water / Summerlude Festival

The Lake Windermere Ambassadors organized a regatta and water stewardship event to commemorate the completion of the Lake Windermere Project in 2010. The regatta event also served to finalize the official transition to community-based lake stewardship under the direction of the Lake Windermere Ambassadors. This event took place on the afternoon of Saturday, July 24, 2010. It

featured many activities—everything from swimming and sailing races to sandcastle and boat building contests.

The event also included a "Celebration of Water" exhibit that took place at Pynelogs Cultural Centre on the day of the event. The exhibit highlighted the cultural values of the Lake Windermere watershed, and featured photography, painting and film art mediums. The "Love Your Lake" photo contest was reviewed by our expert panel of judges.

This was an opportunity to educate the community on the importance of the lake as a natural asset, through the delivery of educational water stewardship programs such as a "Non-point source pollution model" and water conservation displays.

More than 500 people celebrated at Lake Windermere's first regatta in over 40 years, Of the 100 people entered in various events many took home prizes.

The event was officially opened by Arlee Romaine, who was a local teenager during the 1964 Regatta, and shared her memories of past regattas. Mayor Gerry Taft closed the event.

> "Lake Windermere is the reason that many of us live here. The condition of our lake is symbolic of the condition our community. The Regatta was an excellent opportunity to celebrate our greatest asset – a source of drinking water, a recreational haven, and a diverse and important ecosystem. If the lake is successful and thriving, both environmentally and recreationally, then our communities will continue to succeed and thrive in a balanced manner."
>
> "The District of Invermere will continue to be a very strong supporter of the Lake Windermere Ambassadors and of continued involvement in our greatest asset – Lake Windermere. We will continue to work with other levels of government, Wildsight, and citizens to ensure that we are successful."
>
> Mayor Gerry Taft

Community awareness and understanding of the value of having a healthy Lake Windermere watershed were increased by the Regatta event and by the transition of lake stewardship to the Lake Windermere Ambassadors.

The Lake Windermere Ambassadors intend to continue hosting this annual event into the future.

i. Educational Article Series

The Lake Windermere Project initiated an educational article series in partnership with the local newspaper to emphasize the importance of a healthy lake ecosystem. A total of 25 educational articles were written and printed in local newspapers and online media outlets. The articles have been made available to any water stewardship organization wishing to reprint them.

Topics included:

- Aquatic plants are not just weeds
- Beach Building – the nitty gritty on sand dumping
- Boat safety for you and the lake
- Boating season is upon us
- Caring for your septic system
- Downtown drains to the lake
- Freshwater – a nonrenewable resource
- Healthy lawn watering practices
- How to create fish heaven
- How to make Lake Windermere more loon friendly
- Invasive weeds in and around the lake
- Keep your lawn and garden off drugs
- Lake Windermere has a twin
- Lakes as indicators of climate change
- Little red fish flock our creeks
- Personal watercrafts and their impacts to the lake environment
- Putting the spotlight on outdoor lighting
- Renovate your retaining wall
- Save your money while saving water
- Spring runoff and sedimentation
- The cost of lake restoration
- The importance of a healthy foreshore
- The scratch on swimmer's itch
- Where have all the ling cod gone?

j. Windermere Lake Sister Lake Partnership

The Lake Windermere Project and another Living Lakes International partner, the UK Environment Agency, established a 'Sister Lake Partnership' with Windermere in England's Lake District. This partnership highlights each region and ecological aspects that draw tourists to the areas.

The 'Sister Lake' Partnership is fully supported locally by the District of Invermere, Regional District of East Kootenay, the Columbia Valley Chamber of Commerce and Wildsight.

The Sister Lake Partnership agreement was signed by Invermere Mayor, Gerry Taft; RDEK Director, Wendy Booth; Ministry of Environment Regional Manager, Wayne Stetski; and Lake Windermere Project Program Manager, Heather Leschied, in Windermere, Cumbria, U.K., on May 18, 2009.

Among the signatories from the UK were: The Right Honourable Lord Clark of Windermere, David Clark; Windermere Mayor Bill Smith; Chairman of the UK Environment Agency, The Right Honourable Lord Smith of Finsbury; Lake District National Park Authority Chairman Bill Jefferson; Area Manager Environment Agency, NW Region, John Collins; MP Westmorland and Lonsdale, Tim Farron; and Windermere Catchment Restoration Program Manager John Pinder.

> The twinning of our respective Windermeres seeks to share the scientific, economic, community, educational, cultural, environmental and heritage values of our lakes and their catchments. Through this sharing, we will develop our own plans and strategies so that a high quality, sustainable Lake Windermere can be passed on to support future generations.

The signing took place during the International Living Lakes Conference: 'Lakes for Living, Lakes for Life', held in Windermere, Cumbria, England. Invermere Mayor, Gerry Taft was invited to deliver a keynote address, "Our Precious Lakes: A Community Asset". Upon signing the official partnership document, the communities of the two lakes agreed to share the scientific, economic, community, educational, cultural, environmental, and heritage values of our lakes and their catchments. Through this sharing, we will develop our own plans and strategies so that a high quality, sustainable Lake Windermere can be passed on to support future generations.

> The story of two Windermeres began in the English Lake District.
>
> But..across the Atlantic Ocean and almost clean across North America to the Rocky Mountains of southeastern British Columbia, there is another Lake Windermere, with it's own story. This Lake Windermere is a little different.
>
> Lake Windermere, Canada is located at the headwaters of the Columbia River, the largest river flowing to the Pacific Ocean in North America. Lake Windermere was formerly named Kootenae Lake by David Thompson, who was the first European to navigate the full length of the mighty Columbia River, and who mapped much of Western Canada.
>
> In 1883, when Gilbert Malcolm Sproat**,** a Scottish-born Canadian businessman stumbled upon the lake, he immediately noticed their similarities. At a length of 17 km, or 11 miles, and width of 1.5 km, or 1 mile, Windermere covers approximately the same area, and has it's own island and neighbouring cottage community of Windermere, complete with it's own White House. Many of the area's early settlers came from England and today, the region still has a strong European population.
>
> Both lakes are so naturally charming, it is no wonder Sproat's intent to link them through their names. If he only knew that one day the threats and opportunities of our two distant Windermeres were being shared for their common good, and his re-naming of the lake had been the catalyst.

k. Volunteers

Volunteers were, and are, a vital element to the success of the Lake Windermere Project and the Lake Windermere Ambassadors.

i. Matching interests and tasks

More than 100 volunteers contributed to the Lake Windermere Project between 2005 and 2010. Upon meeting each new volunteer, Lake Windermere Project staff assessed his or her interests and abilities to best match them with a volunteer opportunity that would fulfill their needs as well as the Lake Windermere Project's needs.

ii. Recognition

To recognize the significant contributions the many volunteers of the Lake Windermere Project provided, an annual "Volunteer of the Year" award was given out in recognition of the individual who contributed the most hours of volunteer time.

The winners of the Volunteer of the Year award went to:
2005 – Murray Kubian
2006 – Lindsay McPherson
2007 – Sara Stewart
2008 – Matt Aitchison
2009 – John Pitcher
2010 – Tammy Stehr

l. Snowflake Festival

The first Lake Windermere Ambassadors Interpretive Skate was hosted during the Snowflake Festival in 2011. Participants of all ages learned about winter limnology, aquatic ecology, water chemistry and physics, unique features of Lake Windermere, wildlife in and around the lake, and potential impacts to the health of the lake. This event provided an opportunity to engage the community in winter lake ecology.

m. Valley Appreciation Day

The Lake Windermere Project hosted an educational table at the annual Valley Appreciation Day, held downtown Invermere in late July. This event typically draws close to 1,000 people who come to purchase local food and art, and learn about local initiatives and opportunities. The Lake Windermere Ambassadors will take on the educational table in coming years.

4. Restoration

Restoration is a crucial component of any lake stewardship effort especially in places like Lake Windermere, where development has been intense and lake habitat has been damaged.

a. Healthy Shoreline Workshop Series

The Lake Windermere Project took part in a 'Healthy Shorelines' workshop series that was presented by award-winning shoreline expert Clive Callaway of Living By Water. The workshops focused on creating and maintaining healthy shorelines. Three separate workshops were organized specifically focusing on local government, residents, and local realtors.

The workshops included information on the value of natural lakefront landscapes, some principles of shoreline restoration and ways to prevent erosion, tips for maintaining a healthy septic system, and guidelines for managing and protecting property investments. The sessions provided valuable information for all community members interested in keeping our water clean for drinking, swimming and fishing.

b. Great Canadian Shoreline Cleanup

Coinciding with the Great Canadian Shoreline Clean Up, the Lake Windermere Project organized and hosted the Lake Windermere Fall Shoreline Cleanup every year between 2006 and 2010. To date, one tonne of garbage was removed with the help of 79 volunteers. The event was supported by the local Sobey's grocery store, the Great Canadian Shoreline Clean Up, CP Rail, the District of Invermere, Regional District of East Kootenay and Waste Management.

c. Implementing Shoreline Management Guidelines

The East Kootenay Integrated Lake Management Partnership has developed a framework that will monitor compliance of the *Shoreline Management Guidelines* established for East Kootenay lakes, including Lake Windermere. This framework includes a project review process, review of compliance with *Best Management Practices*, detailed project assessments, and trend analysis in ecosystem level impacts. The Lake Windermere Ambassadors are committed to implementing the framework and ensuring the *Shoreline Management Guidelines are followed*.

Additionally, the *Shoreline Management Guidelines* can be used a tool when planning for shoreline restoration project. Through the use of the *Aquatic Habitat Index* riparian area restoration programs have been initiated to increase the value of fish and wildlife habitat on Lake Windermere. The program's success will measured on the methodology of the Habitat Value ranking system where shoreline area will be re-ranked considering any resotration improvements made. By increasing usable habitat areas for fish and wildlife the program attempts to increase the population of those species negatively impacted.

5. Fundraising

Fundraising efforts were made each year of the Lake Windermere Project. Along with various grant applications, the Lake Windermere Project developed some unique fundraising programs.

a. Ambassadors decal program

In 2008, the Lake Windermere Project launched the Lake Windermere and Ambassadors decal program, in recognition for the need to expand its funding base. Based on recommendations made

by local residents and business representatives, the program created an opportunity for developers, businesses and community members to contribute financially to the project. The program recognized the level of the individual's and/or business's financial contribution by categorizing Bronze, Silver, Gold or Platinum levels. Each contributor was publicly acknowledged and given a decal to display in the window at their store, home or on their car (see figure 5).

Figure 5: Lake Windermere Ambassadors decal.

b. Partnerships with funders

The Lake Windermere Project recognizes the value of the support it has received from its funders, both in monetary, and in program development advice.

The following organizations, foundations and individuals contributed to the success of the project:

Gurmeet Brar	Bank of Montreal	Ministry of Environment
District of Invermere	Focus Corporation	Real Estate Foundation of BC
Taoya Schaefer & Ian White	Doug Costigan	Regional District of East Kootenay
Bob and Barb Shaunessy	The Invermere Valley Echo	RBC Foundation
J.A. Laird Leadership Class 2008	EarthSoft	TD Friends of the Environment
John Ashby	Doug and Liz McPhee	Unilever Canada Foundation
Larch Point Community Association	The Monkey's Uncle Toy Company	Windermere Lions Club
Cam and Eloise Berry	Ken Hall	Wende Brash c/o Remax Invermere
Ron and Rosemary Clarke	Eagle Ranch	Canada Summer Student
Brian and Sarah Passey	Lush Handmade Cosmetics	Columbia Basin Trust
Windermere Water and Sewer	Kicking Horse Coffee	Columbia Valley Community Foundation
Parr Utilities	Keith McPhail	Environment Canada EcoAction
K2 - SRL Ranch	Edward Johnson	Evergreen Foundation
Kootenay River Runners	Tretheway Beach Society	Habitat Conservation Trust Foundation
Mountain Creek Properties Ltd	Carl Adam	Fitz Flooring Ltd
The Artym Gallery	Gerry Wilkie	Bob Campsall
Max Helmer Construction Ltd	Jim Galloway	Columbia Valley Local Conservation Fund

6. Awards / Recognition

The Lake Windermere Project received awards and recognition for its work in a number of areas.

a. Canadian Cancer Society Community Champion

The Lake Windermere Project was presented with the Kootenay Region Community Champion Award by the Canadian Cancer Society in 2009. The award recognizes excellence in furthering the mission and vision of the Canadian Cancer Society, and was presented to the Project, for its involvement in the Pesticide Free Columbia Basin Coalition, and efforts to establish a cosmetic pesticide bylaw in Invermere.

b. B.C. LiveSmart Community Hero

The Lake Windermere Project was presented with the B.C. LiveSmart Community Hero Award in 2008, on behalf of the Lake Windermere Project. This award recognizes people and projects that are making a difference and support sustainable communities in B.C.

c. "Best Practices"

The Lake Windermere Project was chosen in 2009 as a national "best practices" case study for community-based environmental monitoring as part of a research project funded by the Canadian Environmental Assessment Agency (CEAA) and carried out by N.T. Yap Environmental Systems Analysts.

The research aimed to:
1) Identify cases of successful community-based environmental monitoring activities, and;
2) Identify the enabling conditions and institutional arrangements contributing to their success.

The best-practices information will be compiled into a handbook-style guide to successful community monitoring. This will be used by the CEAA to ensure successful monitoring initiatives are undertaken in the context of *Environmental Impact Assessment Follow-up*.

d. Land Awards

In November 2010, Wildsight won the prestigious Real Estate Foundation of B.C. Land Award for its Lake Windermere Project. The Land Awards recognize 'forward-thinking people and organizations – leaders in creating sustainable communities and making B.C. a better place to live.'

Wildsight's Lake Windermere Project was chosen as a finalist in the Non-Profit category, along with three other nominees, including Atira Women's Resource Society, Simon Fraser University Community Trust, and the Stewardship Centre for B.C. Winners in three categories were announced at the Land Awards Gala on November 18 in Vancouver. At the gala, Robert F. Kennedy Jr. presented the keynote address. Kennedy is one of *Time magazine's* 'Heroes for the Planet.'

Lake stewardship groups across Canada now look to the LWP—and the Ambassadors—as examples to follow in their own efforts to protect freshwater resources. Without the District of Invermere, the Regional District of East Kootenay, and support from provincial, federal and First Nation governments, and all the citizen stewards, it would not have turned into such a community stewardship success story.

7. Next Steps

a. Lake Windermere Ambassadors

The Lake Windermere Project was successfully handed over to the Lake Windermere Ambassadors in 2010.

The Ambassadors are a group of committed citizens representing business, government, First Nations, recreation, second homeowners, local residents, youth and non-government organizations, whose mandate is the protection of the lake in perpetuity.

The Ambassadors are directing future water quality monitoring and stewardship programs based on the findings of the Lake Windermere Project. They encourage the implementation of policies, guidelines, and recommendations of the *Lake Windermere Management Plan* and *Lake Windermere Shoreline Management Guidelines for Fish and Wildlife*, two programs championed by the Lake Windermere Project.

The Lake Windermere Ambassadors received accolades for collaboration initiatives, and are being used as a model for community-based water stewardship by Parks Canada, Living Lakes International partners, and Living Lakes Network Canada members, including the Lake Winnipeg Foundation.

b. Water Governance

Residents of the Upper Columbia River Basin are becoming increasingly concerned about the lack of enforcement of the existing policies, plans, and guidelines that are currently in place, intended to help sustain a functioning watershed. It is recognized that overlapping judiciary responsibilities make watershed management difficult and that capacity of the four levels of government (municipal, provincial, federal, and First Nations) is not likely to increase in the near future.

Using models established across Canada, such as the Okanagan Basin Water Board, Bow River Basin Council, Mackenzie River Basin Board and the Fraser Basin Council, the Lake Windermere Ambassadors will assist in the creation of a watershed-based governance model. This board will provide advice and comment on development proposals and lobby government to enact effective policy that protects our water resources.

The geographical focus will begin around Lake Windermere, where substantial policies exist. Once proven successful, the committee may expand to include regions north and/or south, or upstream and/or downstream.

It is understood that the Lake Windermere Ambassadors are an interim measure while a water governance model is established for the Upper Columbia River. The Ambassadors will need to draw heavily on existing expertise in the water management community, including confirmed support from the University of Waterloo Water Policy and Governance Group and POLIS Project on Ecological Governance.

c. Living Lakes Network Canada

Living Lakes national networks have been developed in China, Italy and Germany, and regional networks have been established for Eastern Europe, Latin America and Eastern Africa. These networks promote cooperation among groups striving to protect their lakes, rivers, wetlands and watersheds, and support projects in the field of eco-tourism, organic agriculture, sustainable fisheries, renewable energy, protection and preservation of biodiversity and community development.

Canada's four levels of government (municipal, provincial, federal and First Nations) play vital roles in the planning, management and regulation of lakes and their watersheds. Equally important are the community-based, grassroots organizations that are often the link between science and governments and whose actions directly influence positive changes in watersheds.

Since 2000, Wildsight has been the Canadian member in the Living Lakes network, representing the Columbia Headwaters and Wetlands. The Lake Winnipeg Foundation, representing the Lake Winnipeg watershed became a member of the Living Lakes Network in 2010.

With Global Nature Fund's help, Wildsight and the Lake Winnipeg Foundation established the Living Lakes Network Canada in 2010 to unite lake associations and environmental Non-Government Organizations throughout the country. All three organizations share the common goal of conserving ecosystems for humans and nature and strive for the protection of lakes, wetlands and other water bodies.

Lake associations in Canada are now invited to join Living Lakes Network Canada, newly established to link academia and science with action-oriented groups, to foster citizen-based water stewardship, and to help understand and appreciate the intimate connections among watershed stewardship, water quality, resource sustainability, climate change and biodiversity. Living Lakes Network Canada is an essential component of a strategic need to take science to the public as a bridge to stewardship actions, and to provide a unique opportunity to apply consistently standardized monitoring protocols for the protection of all freshwaters in Canada.

8. Recommendations

The Lake Windermere Project has created a valuable resource for our community.

An extensive library, water monitoring equipment and local expertise are now locally available. Recommendations for continued stewardship of Lake Windermere include:

- **Continue monitoring water quality** based on the findings of the Lake Windermere Water Quality Assessment and Objectives report. Work with the BC Lake Stewardship Society to compile water quality assessment reports every five years (see figure 3).

- **Continue to engage with water governance experts in Canada** with the goal of establishing a watershed governance board for the Upper Columbia River.

- **Continue to host annual water stewardship education events** such as the Lake Windermere Regatta and Valley Appreciation Day.

- **Continue to engage with the East Kootenay Integrated Lake Management Partnership** as the monitoring, assessment and compliance framework is implemented for Lake Windermere.

- **Continue the educational article series** to further the water stewardship dialogue in our communities.

- **Continue to monitor Windermere Creek** as part of the Canadian Aquatic Biomonitoring Network, a project of the Columbia Basin Water Monitoring Group.

- **Continue to be a model for lake stewardship groups** across the basin through the Columbia Basin Watershed Network, and across Canada through Living Lakes Network Canada.

Parameter	Site	Depth	Frequency and Timing
Turbidity, temperature, conductivity, pH, DO	0330051, 0330052, E262793		Five times (weekly) in 30 days during the turbid-flow period (May 1 – August 15). Five times (weekly) in 30 days during the clear-flow period (August 16 – April 30).
E. coli	Bathing beaches (Athalmer, Invermere and Windermere beaches minimum)		Weekly June 15 – August 31
	Water intakes		Weekly June 15 – August 31
Total and dissolved phosphorus	0330051, 0330052, E262793	Surface and 1 m above the bottom	Monthly (June – August)
TOC	Near water intakes		Monthly (June – August)
Dissolved sulphate	0330051	Surface and 1 m above the bottom	Monthly (June – August)
Total nitrogen, nitrite, nitrate, chloride	0330051, 0330052, E262793	Surface and 1 m above the bottom	Monthly (June – August)

Figure 6: Recommended water monitoring frequency and location[4].

9. Conclusion

Wildsight's water stewardship work focuses on three core themes: science, education and restoration. As a community-based program, the Lake Windermere Project has completed its final stage of scientific data collection and community education, and is now being used to implement tangible, effective policy to protect the area's water resources. These policies are developed to direct foreshore and upland development in a way that protects existing fish and wildlife values, and aims to restore those values in areas that have been degraded.

The methods employed by Wildsight to develop effective protection measures for the Columbia Headwaters region is being used as a template for lake stewardship in BC and with our international partners in the Living Lakes Network. We are pleased to share our knowledge and experience with this innovative approach.

The Lake Windermere Project has successfully built a water stewardship culture in our communities. As our climate changes, the legacy of the Lake Windermere Project ensures an effective water stewardship program is in place, to help adapt and mitigate the impacts on water quality and quantity along the entire Columbia River system.

> "Wildsight has succeeded in changing public consciousness about water resources in the Upper Columbia Basin."
> Robert Sandford
> Chair, Canadian Partnership Initiative, UN Decade of Water for Life

APPENDIX A

LAKE WINDERMERE WATER SAMPLING PROTOCOL

Required Equipment

- Sample bottles + spares of each size/type
- 10 of each ZnOAC and NaOH perservative
- Cooler
- Ice packs
- GPS
- Van Dorn Bottle
- DO meter
- Secchi disk
- Data sheets
- Clothes pins
- Red field kit with: permanent markers, pencils, thermometer, whistles, measuring tape, clock, emergency contacts, spare batteries
- Towel
- Lifejackets
- 2005 Windermere Lake Water Quality Monitoring Program and Literature Review
- Cell phone
- DOI boat safety equipment bin
- Clear measuring cup

Quality Control

1. Trip Blanks **completed prior to going out in the field**
   One 1L sample bottle is rinsed with a small amount of de-ionized water, and filled with de-ionized water before entering the field. The bottle is capped and remains **unopened** throughout the sampling trip. It is submitted to the lab with the field samples.
   - Label blank sample with trip blank, date, time

2. Field Duplicate **completed in the field**
   One 250ml sample bottle duplicate is collected for one of the parameters during each sample event. The particular parameter should be chosen based on lab analysis costs. Add preservative if required. Cap the bottle. Submit to lab with other field samples.
   - Label duplicate sample 1 minute later than regular sample and list depth duplicate was taken

3. Equipment Blanks **completed prior to going out in the field**
   Pour the rinse (de-ionized) water that was used for the last rinsing of the equipment prior to entering the field, into a 1L sample bottle making sure to fill the bottle. Store in the fridge until sampling is complete. Submit to the lab with other field samples.
   - Label equipment blank with the piece of equipment being cleaned, date, time

GPS Locations

- South Station: N 50° 29 37.080
  W 116° 00 59.040
- Mid Station: N 50° 27 37.080
  W 115° 59 53.880
- North Station: N 50° 25 00.5
  W 115° 56 34.2

Descriptions

Weather Conditions: sunny, sun with clouds, overcast, windy
Water Conditions: calm (C), rippled (R), slightly choppy (SC), choppy (CH), choppy with small white caps (CHW)
Colour: clear, green, brown, cloudy

Odour: nil, organic, sulphide

Secchi Disk

1. Lower the secchi disk over the shaded side of the boat.
2. Lower the disk until the black and white pattern is no longer visible. Record the measurement at the surface of the water.
3. Pull the disk up until the black and white pattern appears again and record this distance.
4. If it is difficult to determine distance, place a clothes peg on the line and measure with a measuring tape.
5. Average the two measurements, this is your secchi depth.

Water Collection

Bottles are labeled in the office before entering field with a permanent Sharpee.
Required information:

- Site:_____(ie. North Station)
- EMS ID:_____(corresponds with site)
    a. North Station: 0200052
    b. Mid Station: 0200051
    c. South Station: E262793
    d. Columbia River Inflow: E262680
    e. Windermere Creek Inflow: E231717
- Date:_____
- Time:_____(fill out in field)
- Name:_____(sampler's name)
- TOP/BOTTOM
- Parameter(s):_____(ie. Total sulphide)

Make sure not to touch the inside of the bottle or cap at any time. Bottles do not need to be rinsed as they are prepared by the lab. Set Van Dorn bottle ensuring drain tube is closed. Lower to desired depth. Drop messenger and retrieve sample. Drain the hose fully prior to filling the bottle. Fill appropriate bottle. Sulphide samples are preserved with NaOH and ZnOAC after adding lake water. Store bottles in the cooler with ice packs to be shipped.

Sensor Equipment

- Required parameters: DO, pH, conductivity, temperature
- Take necessary measurements according to manufacturer directions.
- Continuously move probe through water at a rate of ½ foot per second.
- Allow probe to equilibrate at each depth before recording value.

Back at the Office

- Fill in requisition forms.
- PHOTOCOPY requisition forms and add to binder labeled Water Sampling 2006.
- Put requisition forms in Ziploc bag, add to cooler.
- Prepare bottles for shipment. Tape and label cooler. Ship to:

    Maxxam Analytics
    8577 Commerce Court
    Burnaby, BC V5A 4N5
    Attn: Susan Kessler
    (604) 444-4808

- Enter field observations into My Documents/Water Sampling/Summer 200X/Water Quality Field Observations.
- Hole-punch data sheet and put in binder labeled Water Sampling 200X, before requisition forms.
- Store all equipment away in a cool, dry location. Rinse Van Dorn bottle (including hose) with de-ionized water and store in set position for 24 hours, allowing it to dry. Once it dries, close it up and place in the black bag.

APPENDIX B

LAKE WINDERMERE BACTERIOLOGY SAMPLING PROTOCOL

Required Equipment

- Cooler
- Ice packs
- Sampling bottles
- Interior Health requisition forms
- Field kit with: permanent markers, pencils, thermometer, clock
- Elastics, Ziploc bags
- Data sheets

Fecal Coliform Samping

1. Fill out requisition form.
2. Record required field information.
3. Fill in label on bottle.
    - Source: Beach Location
    - Sent by: Kirt Sellers
4. Wade into water to knee depth at a point where bathers would be wading.
5. Wait for the water to be clear of debris that may have been disturbed while wading.
6. Remove cap and avoid touching the inside of the bottle or cap. Submerge it 30cm pushing forward, hold the mouth upward and fill the bottle to the fill line. If bottle is over-filled, tip to allow excess out. Cap it.
7. Fold and wrap requisition form around bottle, with contact info showing, secure with elastic and put in Ziploc bag.
8. Store fecal coliform sample bottles in a cooler with ice until submitted to Interior Health Authority.
9. **Samples must be delivered to Interior Health by 3:00pm on the day of sampling.**
10. When at Interior Health, make sure to ask if there are any results from the beach sampling to be picked up.

E. Coli Sampling

Field sites requiring E. Coli Sampling:

- Kinsmen Beach
- James Chabot Beach
- Windermere Beach

1. Fill in label on bottle. Sample ID = beach location sample is from
2. Record required field information.
3. Wade into water to knee depth, at a point where bathers would be wading.
4. Wait for the water to be clear of debris that may have been disturbed while wading.
5. Remove cap and avoid touching the inside of the bottle or cap. Submerge it 30cm pushing forward, hold the mouth upward and fill the bottle. Cap it.
6. Store bottles in a cooler with ice to be shipped.

Back at the Office

- Fill in requisition form from MOE. Photocopy form and store in binder under Bacteriology 2006 – completed.
- Fill in Chain of Custody Record form from Cantest. Keep pink copy and file in sampling binder under Bacteriology 2006 – completed.
- Seal both requisition forms in a Ziploc bag, add to cooler
- Prepare E. Coli samples for shipment. Tape and Label cooler. Ship to:

  CANTEST
  4606 Canada Way
  Burnaby, BC V5G 1K5
  Attn: Erin Sanford
  (604) 734-7276
- Enter data into spreadsheet My Documents/Water Sampling/Summer 200X/Bacteriology 200X.
- If data sheet is full, hole-punch and put in binder section marked Bacteriology 200X - completed. If it is not yet full, hole punch and store in binder section marked Bacteriology 200X – incomplete forms.
- If Interior Health gave fecal coliform results from previous testing enter into spreadsheet and file in Bacteriology 200X folder.
- If a sample is taken from a new site add a worksheet to the Bacteriology 200X file and enter data.

APPENDIX C

LAKE WINDERMERE BOAT COUNT PROTOCOL

BEFORE YOU HEAD OUT

Required Equipment and Materials:
Available at Lake Windermere Project office. When you pick up the data sheets, we will make arrangements with you to facilitate the return of any equipment and materials used.

- Data recording sheets (one for the north end and one for the south end)
- Clipboard, pencils
- Binoculars

Additional Items to Take Along:

- Sunscreen
- Hat
- Rain Jacket
- Folding Chair / Blanket to sit on
- Book / Knitting / Cards / Music etc (Things to do if you are staying up at the lookout between hourly counts)
- Camera (we encourage counters to bring along their digital camera to capture shots of data recording, boat traffic and general scenery)

HEADING OUT

Viewing Site Location
The viewpoint for boat counting is located on the uphill side of the road up to the Castle Rock subdivision and requires a one-minute climb up a somewhat steep slope to reach it.

Directions:

- Head south on 13th Ave and make the 1st right after Johnston Rd on the edge of town (road to Castle Rock subdivision)
- Pull onto the right shoulder at the 3rd 'Curve Ahead' graphic road sign
- At this point, it is possible to turn around and park on the shoulder of the downhill side of the road
- Look up the embankment and notice the orange flagging tape wrapped around a small tree at the top
- Cross the road over to the sign (watch for construction vehicles!) and follow the most gentle part of the embankment up to the orange flagging tape
- The boat count site is located here on the flat shady portion of the embankment, on the East side of the fence

CONDUCTING BOAT COUNTS

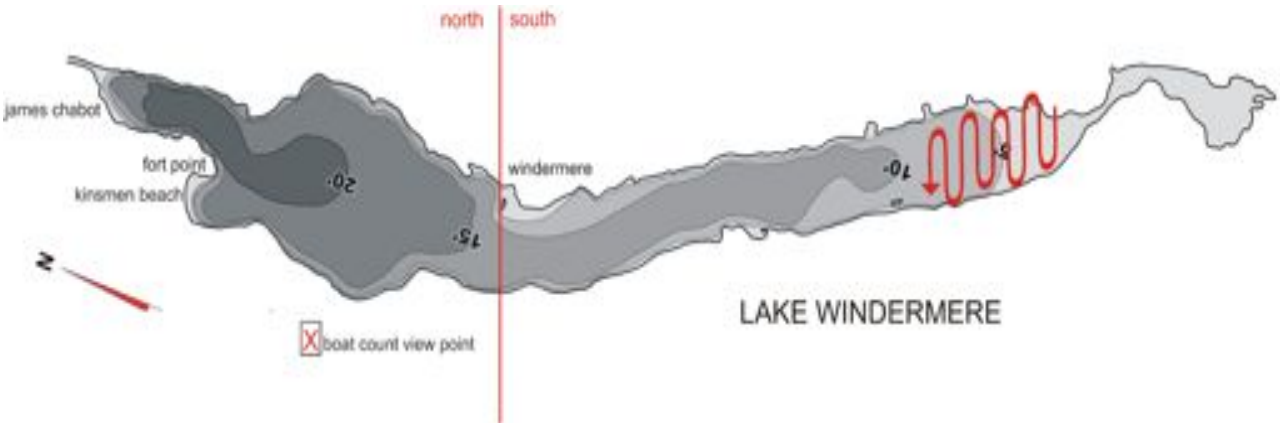
Protocol:

- Two people complete the counts, one person is the 'viewer' and one person is the data 'recorder'
- Counts are completed from 10am through 5pm once on the hour, for a total of 8 counts (ie. 10:00, 11:00, 12:00, etc)
- Before the viewer begins counting boats, a visual sweep is done of the lake to give the viewer an idea of where boats are located and gather bearings before using binoculars
- The viewer begins counting from the south end of the lake by sweeping across the width of the lake toward the north end and verbally indicates to the recorder which type of watercraft is observed (see 'Types of Watercraft' on reverse)

- The recorder tallies the boats in their respective columns and circles 'south end' on the top (example on flip side)
- Without stopping the counting, when the viewer reaches Windermere Island (small stretch of lands that juts out into the lake on east side, approximately half way up the lake) he/she indicates to the recorder that they are switching to the north end of the lake
- The recorder switches to the prepared north end data sheet and starts documenting types of watercraft in the north end
- During the count, the recorder keeps an eye on any new boats emerging from shorelines and treed areas, and during the switch from south to north counting, looks to make sure that boats crossing from the south up into the north are not double counted

Boat counters are welcomed to but NOT required to remain at the viewpoint throughout the 7-hour counting period. Once at the viewpoint, counts take approximately 5-10 minutes to count and tally hourly observations. Please feel free to use the time between counts for your leisure.

Visual Counting Pattern



Types of Watercraft

Non Motorized	Personal Watercraft	Small Aluminum	Motorized	Motorized Towing	Other
Sailboat, Canoe, Kayak, Paddleboat, Catamaran, Rowboats	Jet-ski, Seadoo, Wave Runner	14 ft or less open fishing*-type boats that have small outboard motors (*does not have to be being used to fish from to be counted in this category)	All power boats, wakeboard boats	All power boats, wakeboard boats that are TOWING: Water-skiers Wakeboarders Tubers etc	Windsurfers, Kite Surfers, Houseboats (which are motorized but behave differently)
					

Possible Water Conditions

- Calm
- Ripple
- Choppy
- White caps

WHEN YOU HAVE FINISHED COUNTING FOR THE WEEKEND / DAY

If you are conducting counts on Saturday ONLY (not continuing the following day) arrangements will be made for you to drop off the equipment and materials that Saturday evening for use by other volunteers on the Sunday.

> At the conclusion of a Sunday count, if you did not already do so when you picked up data sheets and equipment, please contact the Lake Windermere Project (LWP) staff to arrange a time to return all equipment and data sheets to the LWP office located at 709-10 St in the old municipal building beside the Town Hall in Invermere. The office number is 341.6898.

If you did not borrow LWP equipment and simply picked up data sheets to use, please feel free to place them in an envelope marked with the date of the count, your name and 'Lake Windermere Project – Boat Count Data' and deposit them in the mail slot at the LWP office at the end of your boat counting day.

Thank you for supporting a healthy Lake Windermere!

APPENDIX D

Nonpoint Source Pollution Model – How does it work?

1. Participants identify physical features and landmarks on a photo or map of the area that is represented by the model. Wetlands, wildlife habitat, including any that have been lost to urban or industrial development are also identified. The location of the Columbia River is noted, along with its tributaries.

2. Participants are invited to view the model and recognize areas of personal interest to them. They are asked if they can find their school or where their home is. Lake Windermere, Columbia Lake, Toby Creek and the Columbia Wetlands are identified.

3. Participants point to as many pollution sources on the model as they can find. An emphasis is placed on nonpoint source pollution to which we all contribute. Organizers/teachers show that waste from urban household toilets and drains is treated in the sewage treatment plant before being released into waterways. It is also pointed out that many harmful substances we pour down household drains, such as laundry detergents, household cleaners and paint and toxic substances that enter our storm drains wash directly into waterways where it can harm fish and other aquatic life. Other pollution sources such as auto exhaust and residues from boat operation are pointed out.

4. Salt and pepper shakers with unsweetened, coloured juice crystals are labeled with various pollutants such as; animal waste, oil & gasoline, chemical pesticides & fertilizers, sewage, heavy metals and chemical cleaners. Participants are encouraged to sprinkle and squirt areas on the model that may be sources of the various pollutants. All pollutants are added to the landfill site.

5. A watering can is used to show how rain plays an important part in moving nonpoint source pollution into waterways. The water mixes with pollutants from everywhere including farms, cities, home gardens, urban streets and highways and ends up in streams, groundwater and Windermere and Columbia Lakes. The lakes then flow into the Columbia Wetlands represented by a bucket at the end of the model, where the water has turned brown. Participants see dramatic evidence of how our everyday activities contribute to pollution.

6. Children are then able to use the arts and crafts station to illustrate their favourite thing about Lake Windermere and write one thing they can do to keep it clean. Some examples are:

    a. Reduce car exhaust: ride your bike, skateboard or walk.
    b. Clean up after your dog or cat.
    c. Don’t pour motor oil, paints, gasoline, antifreeze or other chemicals down household drains, toilets or storm drains.
    d. Build a compost pile for a chemical-free source of fertilizer.
    e. Use alternatives to chemical pesticides.
    f. Use biodegradable, phosphate-free laundry detergent and dish soap.
    g. Help spread the word in the community!

APPENDIX E

lake windermere project
healthy water for healthy communities

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