Vancouver Lake Watershed Partnership
2008 Annual Report

Overview

Since forming in late 2004, the 22-member Vancouver Lake Watershed Partnership has been committed to improving water quality at Vancouver Lake. The Partnership is dedicated to improving Vancouver Lake through management alternatives that build on sound science, community support, and strong relationships with federal, state, and local entities.

Vancouver Lake is part of a complex system of waterways that has been impacted over the century by alterations to the Columbia River and surrounding lands. The lake is connected to the Columbia River via Lake River and the flushing channel, making it different from typical lakes in that it is affected by both seasonal river stage and twice daily tidal cycles. This complexity makes it all the more important that we understand the system before implementing management actions.

This year marked several large steps forward for the Vancouver Lake Watershed Partnership. In addition to seeing results from large studies conducted on the lake, the Partnership has summarized its history, technical knowledge, and data needs in a document titled *Technical Foundation for Future Management of Vancouver Lake*. This document is now available on the Partnership's website.

A Message from the Partnership's Steering Group

2008 was a very productive year for the Vancouver Lake Watershed Partnership. We now have new information about the lake that will help us identify challenges and opportunities in the years ahead. Accomplishments in 2008 include:

- Additional investigation by the U.S. Army Corps of Engineers to help us better understand how water circulates in the lake.
- New information provided by WSU-Vancouver researchers that gives us a much better picture of the types and distribution of the different kinds of plankton that populate the lake; including cyanobacteria, algae, and zooplankton.
- A comprehensive technical foundation document that summarizes what we currently know—and what we still need to learn—about the lake ecosystem.

What does all this mean for 2009? We believe it means momentum toward our ultimate goals. In the year to come we will continue to learn more about the lake. We are well positioned to involve new scientific partners and seek additional funding from grants. It will be a long journey, but we are on our way.

Peter Capell
Clark County Public Works

Brian Carlson
City of Vancouver

Patty Boyden
Port of Vancouver

A Rewarding Collaboration with the U.S. Army Corps of Engineers

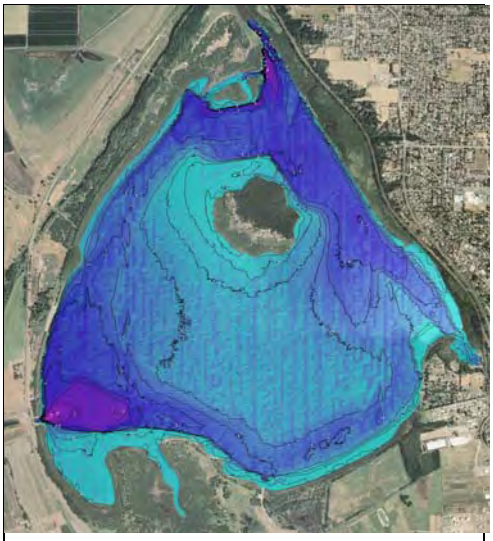
The U.S. Army Corps of Engineers began working with the Vancouver Lake Watershed Partnership more than two years ago as a result of a shared objective: restoration of aquatic habitat.

Initially, the Corps looked into the possibility of a comprehensive General Investigation (GI) study. However because Congress has not authorized new GI studies, the Corps opted to move forward with investigations funded under the Section 536 Program, which is dedicated solely to improving salmonid habitat.

2006 Preliminary investigations for a feasibility study included a site survey for habitat potential and a preliminary restoration plan (PRP).

2007 Findings from the PRP indicated sufficient salmonid habitat potential to continue investigations. A historical literature review was produced—the biological synthesis— in addition to preliminary hydraulic modeling, to see whether flows could be increased to improve habitat.

2008 Findings encouraged further investigation into Vancouver Lake habitat potential. In early 2008 a bathymetric study was conducted to inform more complex hydraulic modeling efforts conducted later in the year.



The image above depicts results from the 2008 bathymetric survey, which measured the depth of the lake. Data were used in Corps modeling efforts.

Hydraulic Study

In 2007 the Corps conducted one-dimensional hydrodynamic modeling of Vancouver Lake to determine whether modifying various lake inputs would affect the hydraulic residence time, or how quickly water is exchanged in the lake. Results from this effort encouraged further modeling of the system to learn more about circulation patterns and the influence of the Columbia River.

The two-dimensional model had three main objectives: (1) establish flow patterns in Vancouver Lake under existing conditions and with enlarged flushing channel culverts, (2) determine general hydrodynamic effects of dredging in Vancouver Lake, and (3) determine the general hydrodynamic effects of removing tide gates from the flushing channel culverts. Conclusions from the study included:

- Velocities in the lake were low under all conditions modeled, with relatively higher velocities near the connection to Lake River and the flushing channel.
- Lake dynamics remain tidally dominated under all conditions modeled.
- Enlarging the flushing channel culverts increases velocities in the lake, specifically along the western and northern shores and adjacent to the dredge disposal island.
- Removing the tide gates has a negligible effect on hydrodynamics under most hydrologic conditions.
- Dredging generally decreases lake dynamics due to increased lake volume.

These images are called velocity vector and contour plots. They have been used to illustrate results from the Corps' two-dimensional hydrodynamic modeling.

The image on the left depicts typical tidal flooding, the right shows typical tidal ebbing under existing conditions.

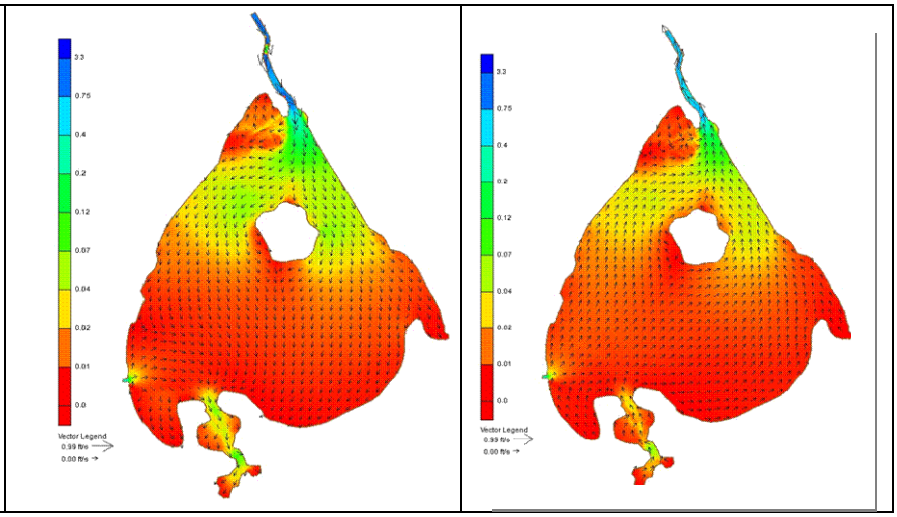
Red = 0.0 - 0.01 ft/s

Orange = 0.01 - 0.02 ft/s

Yellow = 0.02 - 0.04 ft/s

Green = 0.04 - 0.4 ft/s

Blue = 0.4 - 3.3 ft/s



Plankton Assessment by WSU-Vancouver

Beginning in March 2007, the Vancouver Lake Watershed Partnership partnered with Washington State University Vancouver (WSU) to begin to understand the processes that lead to the formation, persistence, and decline of cyanobacteria and other harmful algal blooms in Vancouver Lake. In its first year of research, WSU began to identify and quantify the types of plankton and ranging environmental conditions in Vancouver Lake.

Results from their Year 1 Biological Assessment have provided substantial new information about the spatial and temporal patterns of the physical and biological factors that may be influencing cyanobacteria blooms in Vancouver Lake.

Work in Year 1 (March 2007 to February 2008), focused on three specific objectives:

1. Determine the abundance, distribution, and taxonomic composition of cyanobacteria, algae, and zooplankton in Vancouver Lake over a full annual cycle.
2. Initiate preliminary investigations of the biotic (e.g., grazers) and abiotic (e.g., temperature, nutrients) factors influencing these blooms.
3. Analyze existing data on cyanobacteria blooms in Vancouver Lake for spatial and temporal patterns and trends in abundance, as well as provide a literature review.

Results

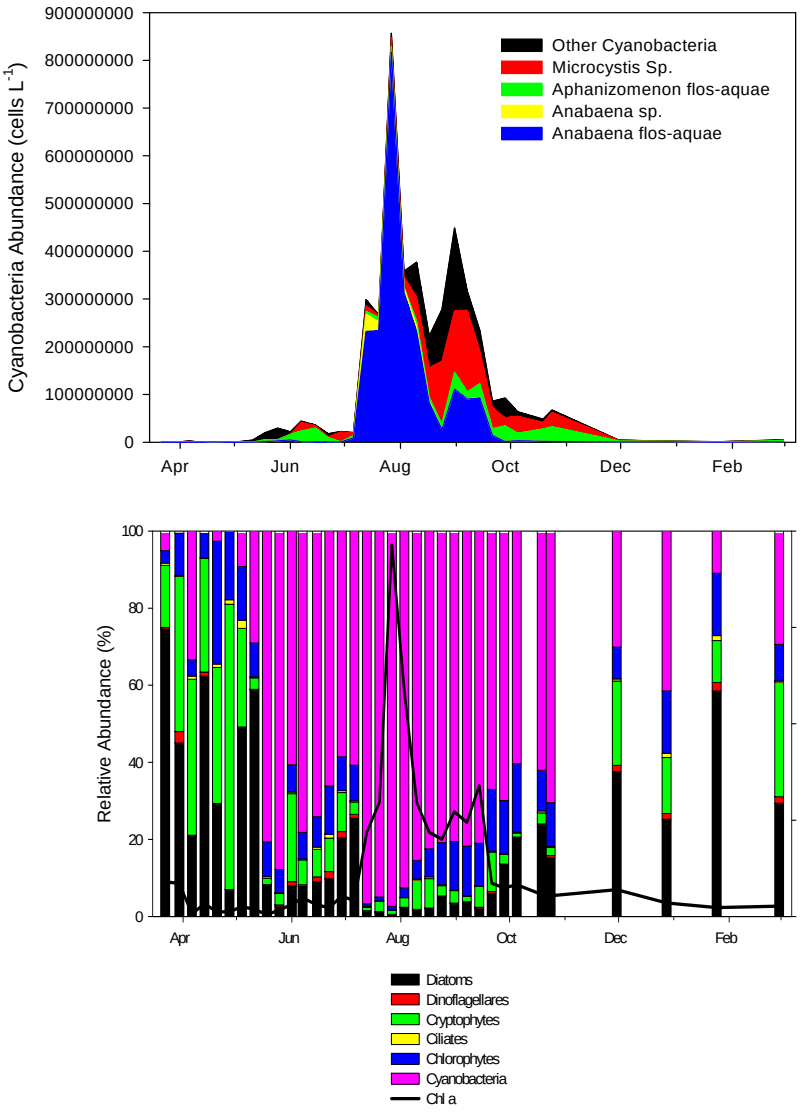
Several significant trends are evident from the data.

First, there is on average little spatial variability in water quality and plankton abundance across Vancouver Lake. During periods of higher flow, such as in winter and early spring, some differences were observed between the flushing channel and the mouth of Burnt Bridge Creek; however, these differences were not consistent. This suggests that samples collected from one station— or at best, a small number of stations— may be sufficient to characterize conditions in the lake as a whole. This has significant implications for planning of future monitoring at Vancouver Lake because sampling costs could possibly be reduced.

The second important trend is the significant seasonal signal in all measured parameters, both physical/chemical and biological. Newer annual data show that many other planktonic groups in addition to cyanobacteria have a similar summer peak in abundance, including potential grazers of cyanobacteria, such as ciliates and copepods.

Lastly, monthly sampling through the late fall, winter, and early spring revealed a substantial increase in nitrate concentration without a comparable increase in other inorganic nutrients. This may be evidence of higher run-off during the rainy season. But it also suggests that conditions for plankton growth are substantially different during the winter and may merit further examination.

The graphs below illustrate sampling results from March 2007 through February 2008. The top graph depicts cyanobacteria species abundance by the number of cells per liter of water and the bottom graph illustrates relative phytoplankton/protozoan abundance as a percent of the total sample.

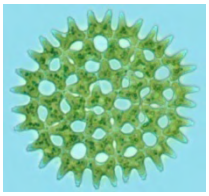


What are Plankton?

Plankton are small drifting organisms that float passively in the water column and are carried from place to place by the current. The word plankton comes from the Greek word *planktos*, which means "wandering" or "drifting". Plankton range in size from tiny microbes, which are invisible to the naked eye, to larger organisms such as jellyfish. Plankton are one of the most abundant life forms on earth and play a crucial role in the food chain. Plankton are divided primarily into two main categories: phytoplankton and zooplankton.

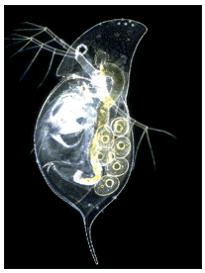
Phytoplankton are "plant" plankton that are generally microscopic and derive energy from the sun through photosynthesis. The presence of chlorophyll often accounts for their green color. This group includes diatoms, dinoflagellates and cyanobacteria.

Zooplankton: are "animal" plankton that feed on phytoplankton and are a food source to organisms higher on the food chain such as fish.



chlorophyte

cyanobacteria



cladocerans

copepod

Vancouver Lake Watershed Partnership's Values

- Meet the community's needs for recreation and development today without compromising the environmental, social and economic needs of future generations (sustainability)
- Have the commitment and support of a range of stakeholders, including decision makers, public, and agencies, by reflecting their needs and values
- Provide for the use and enjoyment of the public through activities—including boating, swimming, fishing, hunting and bird watching —that are based on and are compatible with the natural resources of the watershed
- Provide for the lake to meet water quality standards and habitat that supports diverse populations of native fish, wildlife and plant communities
- Allow for environmental and recreational interests that complement economic development to support a flourishing and prosperous community
- Be based on best available science and be logistically and physically implementable
- Be fundable and fiscally responsible
- Provide a structure for a long-term partnership that can foster ongoing consensus on oversight and implementation, and provide clear accountability to the broader community

The Vancouver Lake Watershed Partnership is the result of efforts by the Port of Vancouver, City of Vancouver Department of Public Works, Vancouver-Clark Parks and Recreation, Clark County Department of Public Works and the Fruit Valley Neighborhood Association in 2004 to bring federal, state, and local public agencies with interest and jurisdiction over Vancouver Lake and its watershed, together with citizen stakeholders.

Citizen Members

Jaquelin Edwards
Nancy Ellifrit
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Jane Van Dyke
Vernon Veysey

Project Management

PC Trask & Associates, Inc.

Agency Members

Washington Department of Natural Resources
Washington Department of Fish & Wildlife
Washington Department of Ecology
Lower Columbia River Estuary Partnership
U.S. Army Corps of Engineers
Port of Vancouver
City of Vancouver Department of Public Works
Vancouver-Clark Parks & Recreation
Clark County Department of Public Works
Fruit Valley Neighborhood Association
Clark County Public Health
Port of Ridgefield
Clark Public Utilities

VANCOUVER LAKE
WATERSHED PARTNERSHIP

For more information please visit the Partnership's website: www.vancouverlakepartnership.org