

A CITY of BELLINGHAM GUIDE to the LAKE WHATCOM WATERSHED

S T E W A R D S O F T H E



Lake

SPRING 2007



*This report is dedicated to the memory of Bellingham City Council member **Joan Beardsley**, who helped initiate its creation before her death on March 12, 2007. Joan was a long-time Bellingham resident, a much-loved and respected educator, and a thoughtful, engaged community leader. May her passion for the environment and public service continue to inspire us all.*

Lake Whatcom is the source of drinking water to some 95,000 people in Whatcom County, including the 82,000 served by the City of Bellingham. The health of this tremendously important resource is declining, and at a pace that is faster than expected.

Local governments are working hard to study the lake and make wise decisions about its future. We have made Lake Whatcom protection efforts a top priority for 2007, and will consider rigorous steps to protect our lake. These steps will include protecting more undeveloped land in the watershed, improving stormwater treatment, and helping watershed residents become better stewards of the lake.

Protecting Lake Whatcom is our responsibility, not one we should leave to our children or grandchildren. There is no magic wand, there's just us. We know the lake is changing, and for each day, each month, each year we delay, it will take another day or month or year to bring our lake back to health. Let's get the job done.

Tim Douglas
Mayor of Bellingham



Nootka rose
(*Rosa nutkana*) is native to Washington.

S T E W A R D S O F T H E

Lake

Why is the City publishing this report?

Lake Whatcom, precious community treasure and drinking water reservoir, spans several jurisdictional boundaries — the City of Bellingham, Whatcom County and the Lake Whatcom Water and Sewer District.

Human activities along the shores and on the surface of Lake Whatcom have a profound impact on the lake, and these three jurisdictions have teamed up over the years to study, to manage, and to protect it. This partnership is essential to the long-term health of the lake and we appreciate the dedication of our agency partners and the citizens they represent.

Yet the City of Bellingham has a special responsibility to Lake Whatcom. Our city has for decades hosted dense population

on its northwestern shoreline. Our city thrives on the drinking water we draw from the lake and are responsible for delivering to 82,000 residents. And our city prides itself as a national leader in environmental stewardship and innovation.

As the health of Lake Whatcom declines, city residents have a special responsibility to preserve this resource. City officials are calling on Bellingham residents for support of continuing and new government programs, and changes in individual actions, to protect the lake.

This report is designed to help you understand the challenges we face as we work together to preserve and enhance Lake Whatcom.

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E N H A N C E L A K E W H A T C O M

How has Lake Whatcom changed?

Lakes change slowly. Only in the past decade or so has the quality of the water in Lake Whatcom started to change noticeably, in response to more than a century of development on its shores.

The Washington State Department of Ecology was concerned enough about algae growth in Lake Whatcom, in 1998, to place the lake on the state list of water bodies

that fail to meet water quality standards. That listing, required under the federal Clean Water Act, triggered a mandatory water quality improvement plan. (For details, see pages 14-17.)

Lake Whatcom was listed because of low levels of dissolved oxygen, which are the result of an explosion of algae growth. Phosphorus carried into the lake by stormwater runoff is the primary cause of the algal growth and low levels

of dissolved oxygen.

Phosphorus flows into the lake from sources including stream bank erosion; exposed soil from construction, landscaping and logging; lawn fertilizers; leaves and grass clippings; pesticides; pet and wildlife droppings; failing septic systems; sewage spills and leaking sewer pipes; and phosphorus-based soaps, detergents and chemicals.

Since 2004, the growth of algae and the drop in dissolved

oxygen have become even more dramatic, and more widespread. All four of the major algae groups have increased, but the most striking increase has occurred in cyanophyta, known as blue-green algae (although cyanophyta are actually bacteria).

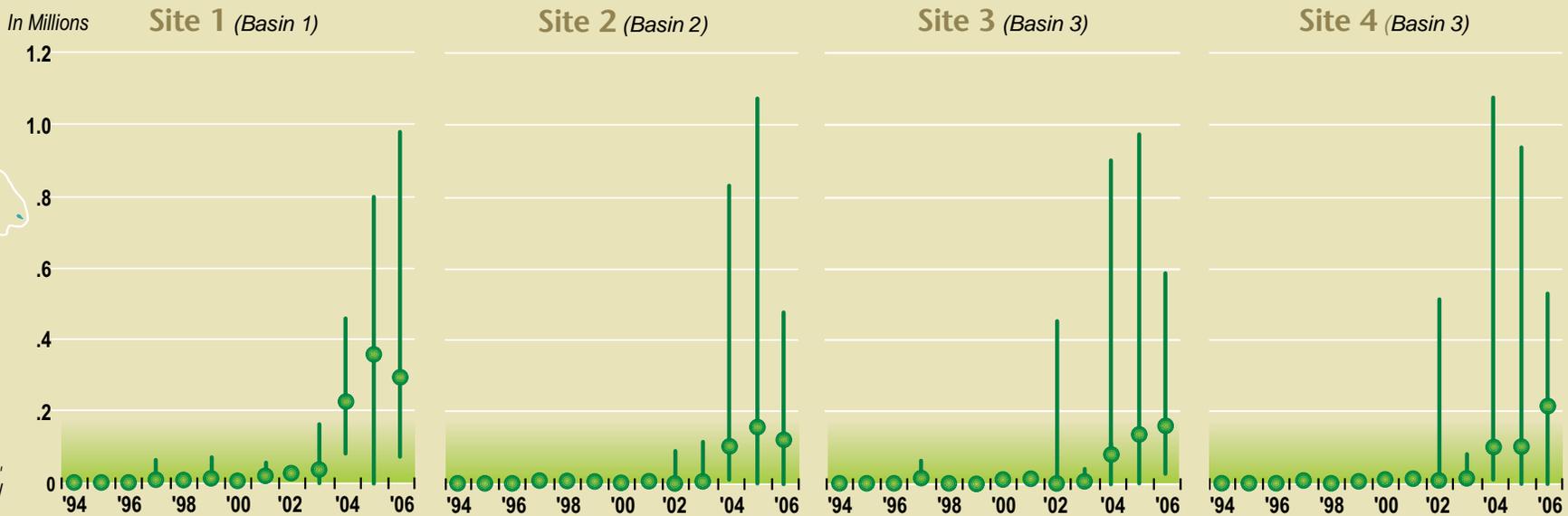
The changes started adjacent to the most urbanized parts of Lake Whatcom, the Silver Beach and Geneva neighborhoods, and have

spread past the intake pipe for Bellingham's water supply in Basin 2, past Sudden Valley, and all the way to the south end of the lake.

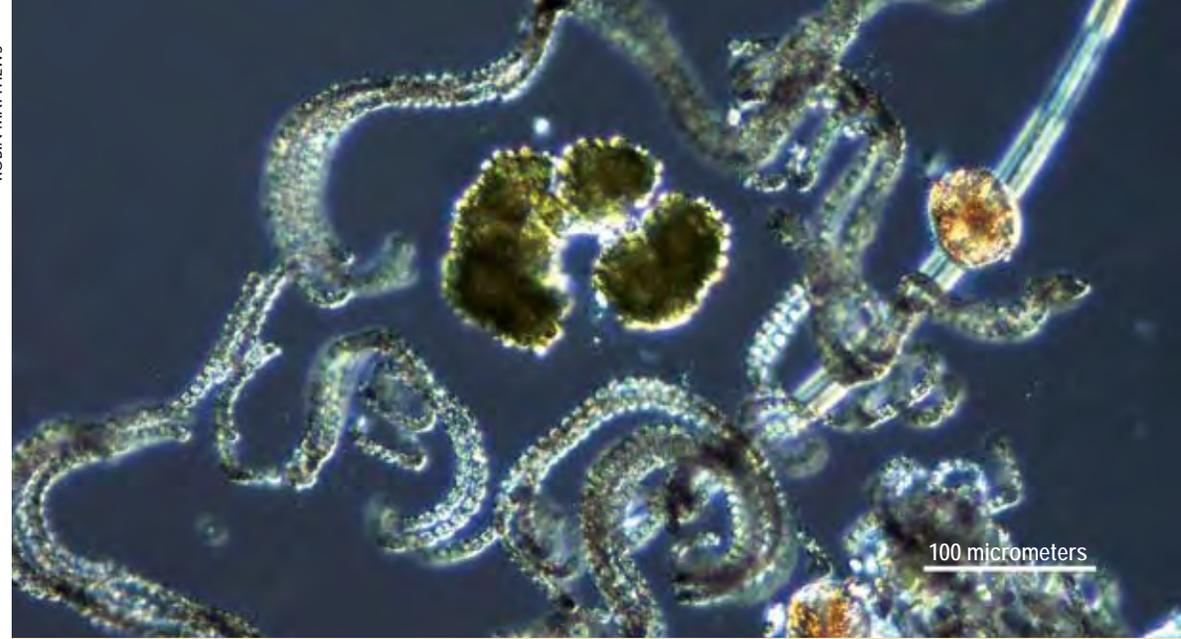
Lakes change slowly. We aren't yet seeing the full effects of the phosphorus we're allowing to flow into the lake today. The full effects of today's phosphorus loading — on dissolved oxygen levels and algae growth — won't be seen for years to come.

WATER QUALITY HAS DECLINED THROUGHOUT THE LAKE AND

Summer Algae Density Bars show range of sample counts of cyanophyta (blue-green algae), per liter, May through October. Dots show medians (half of samples were higher, half lower).



Source: Dr. Robin Matthews, Institute for Watershed Studies, Western Washington University



Human behavior changes slowly, too, sometimes as slowly as lakes.

It's hard to change our habits — what we build, the sort of yards we plant, how we get around town, how we care for our pets, how we clean our cars, what kind of boats we use.

But Lake Whatcom is changing. If we want to slow or halt the lake's changes, we will have to quicken the pace of our own.

What's wrong with algae?

Decaying algae deplete oxygen supplies needed by fish and other aquatic life. Algae also cause water to taste and smell bad, and can cause health problems.

WHAT DO I NEED TO KNOW ABOUT ALGAE, DISSOLVED OXYGEN AND PHOSPHORUS?

When too much phosphorus is introduced into a water body like Lake Whatcom, some plant species, such as algae, experience explosive growth. Overgrowth of algae can cloud water, blocking sunlight from other plants and aquatic life, killing them or limiting their growth.

When algae die, they sink to the bottom of the lake and begin to decompose. Bacteria feed on the decomposing algae and consume oxygen in the water. The bacteria deplete the supply of dissolved oxygen needed by fish and plants. In addition, dead algae create more nutrients that fertilize

even more algae growth, accelerating the depletion of oxygen in the lake.

Low oxygen levels cause sediments on the bottom of the lake to release mercury, which is then absorbed by fish, and phosphorus, which stimulates the growth of even more algae.

Phosphorus is a naturally occurring nutrient, found in water, soil and air. It helps stimulate plant growth and is essential for animal and plant life. You may recognize it as a common ingredient in fertilizer.

But there can be too much of a good thing. Naturally balanced levels of phosphorus promote

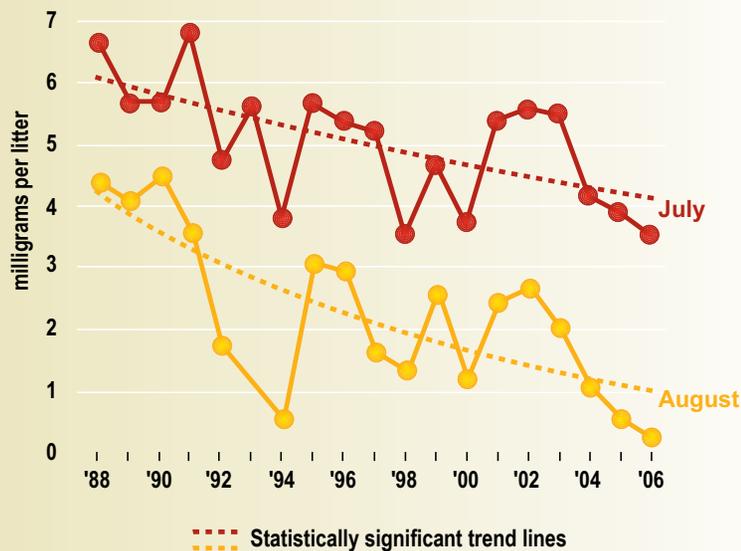
natural levels of growth. Human activities are increasing phosphorus levels in the lake. Scientists can't tell us which activities are loading the most phosphorus into Lake Whatcom, but we know sources include:

- Stream erosion.
- Exposed soil from construction, landscaping and logging.
- Lawn fertilizers.
- Leaves and grass clippings.
- Pesticides.
- Pet and wildlife droppings.
- Failing septic systems.
- Sewage spills and leaking sewer pipes.
- Phosphorus-based soaps, detergents and chemicals.

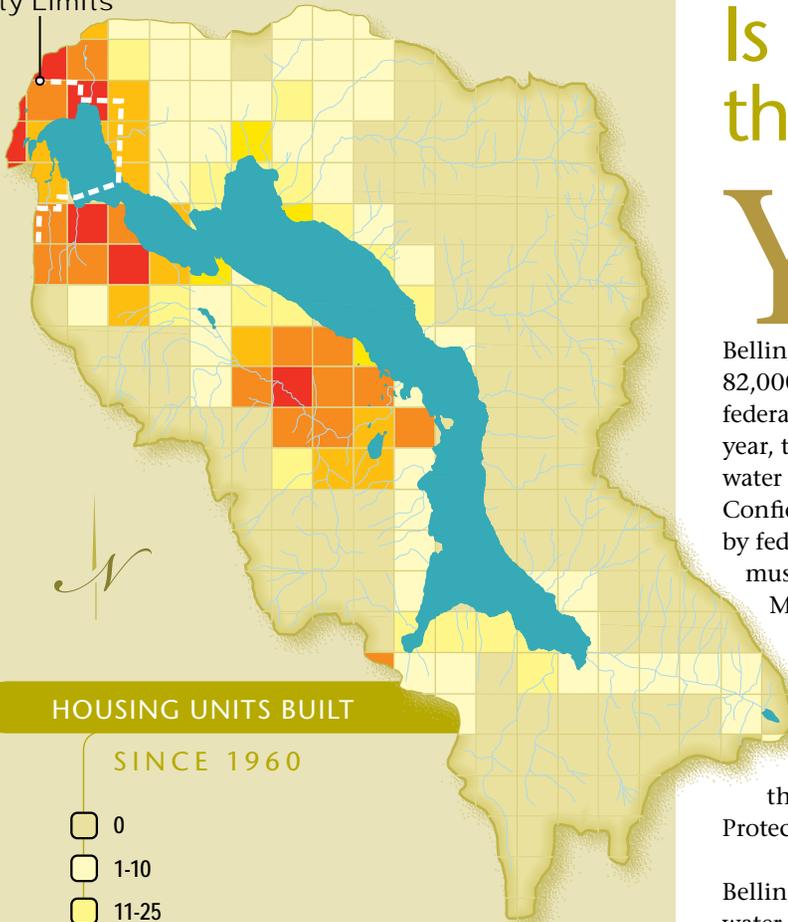
IS GETTING WORSE

Dissolved Oxygen in July and August

Dissolved oxygen, measured at Site 1 at a depth of 12 meters, in milligrams per liter of water.



Bellingham
City Limits



HOUSING UNITS BUILT

SINCE 1960

- 0
- 1-10
- 11-25
- 26-50
- 51-100
- 101-250
- 251-500

For a long period of time, the overall quality of the water in Lake Whatcom appeared to be impervious to our impacts on its shores. This period is over.

Is our drinking water safe, even though the pollution is getting worse?

Yes. Bellingham has great drinking water.

The drinking water the City of Bellingham pipes to about 82,000 people far exceeds federal safety standards. Every year, the City mails to every water customer a Consumer Confidence Report, as required by federal law. That report must include Water Quality Monitoring Results, which is a table showing how the treated water that reaches your home compares to maximum levels of contaminants set by the U.S. Environmental Protection Agency.

Bellingham also meets a higher water quality standard, set by the Partnership for Safe Water, an alliance that includes American Water Works Association and the U.S. Environmental Protection Agency. Bellingham voluntarily joined the Partnership. This higher standard limits the concentration of particles larger than two microns left in our drinking water after treatment.

Bellingham's drinking water is safe, but algae growth in Lake Whatcom is making our water less appealing and is requiring more expensive treatment to keep it safe.

Taste and smell

Our drinking water usually tastes great; in fact, it has even won awards for taste. Some customers tell us the water tastes different in warmer months. In late summer, when algae growth is at the highest in Lake Whatcom, algae and tiny fungi can give off non-toxic but smelly chemicals that can cause unpleasant tastes and odors in our drinking water. Also in late summer, our drinking water might smell like chlorine, even though the City has not changed the level of chlorination in decades. The chlorine smell is caused by a reaction between the chlorine used in treatment and algae in our source water.

Health

The more algae there are in our source water, the more the algae react with chlorine during treatment. This reaction causes byproducts, including trihalomethanes (often called THMs), which increase cancer risk. The level of THMs in Bellingham's drinking water has never approached the Maximum Contamination Level set by the U.S. Environmental Protection

Agency — 80 parts per billion. But late summer levels started rising around 1998. The highest detected sample — 49 parts per billion — was collected in 2004.

Switching to a different disinfectant is not the solution, because alternatives to chlorine may also create harmful byproducts and can't fully substitute for chlorine. Instead, in April 2005 the water treatment plant added a new treatment chemical to the pre-filtration process.

Adding a different polymer boosted the power of the coagulants, so organic matter would form larger clumps and the plant's filters would catch more organic matter before chlorine is added to the water. By lowering the concentration of algae leaving the filtration step of treatment, we lowered the amount of chlorination byproducts.

September levels of THMs tend to be highest, but by 2006 the September averages had dropped below every September average since 1997.



However, this approach of using a polymer to boost coagulation has its limits, and if algae density in the lake continues to increase, THM levels are likely to increase again.

Expense

If algae and other organic matter in the source water continue to increase, Bellingham will be compelled to upgrade our treatment system.

Our in-line filtration plant was built in 1968. It has since been computerized and improved in many ways. In 2007, the original clay underdrains will be replaced with stainless steel, to allow more room for additional filter materials.

Our current filters remove particles larger than 2 microns. Of those, the City's target is to leave no more than 20 particles per milliliter of water (which matches the target of Partnership for Safe Water).

Newer systems, employing different treatment techniques, are capable of removing much smaller particles and reducing

the amount of organic material left in the water. Examples include membrane filtration, in which less organic matter is present when chlorine is added, so less THM is produced.

Another approach is to use alternative disinfection methods such as ultraviolet light or ozone, which reduce the amount of chlorine necessary, thereby reducing the amount of chlorine byproducts, including THMs.

The cost of upgrading our drinking water treatment system to handle smaller particles is estimated in the millions of dollars, depending on the technology selected.

Water treatment professionals talk about the three-legged stool that supports high-quality drinking water: Protect source water, optimize treatment and take care of the distribution system. The money we spend to clean up Lake Whatcom, our source water, can postpone or reduce the cost of upgrading our system for treating drinking water.

LOWER THM LEVELS

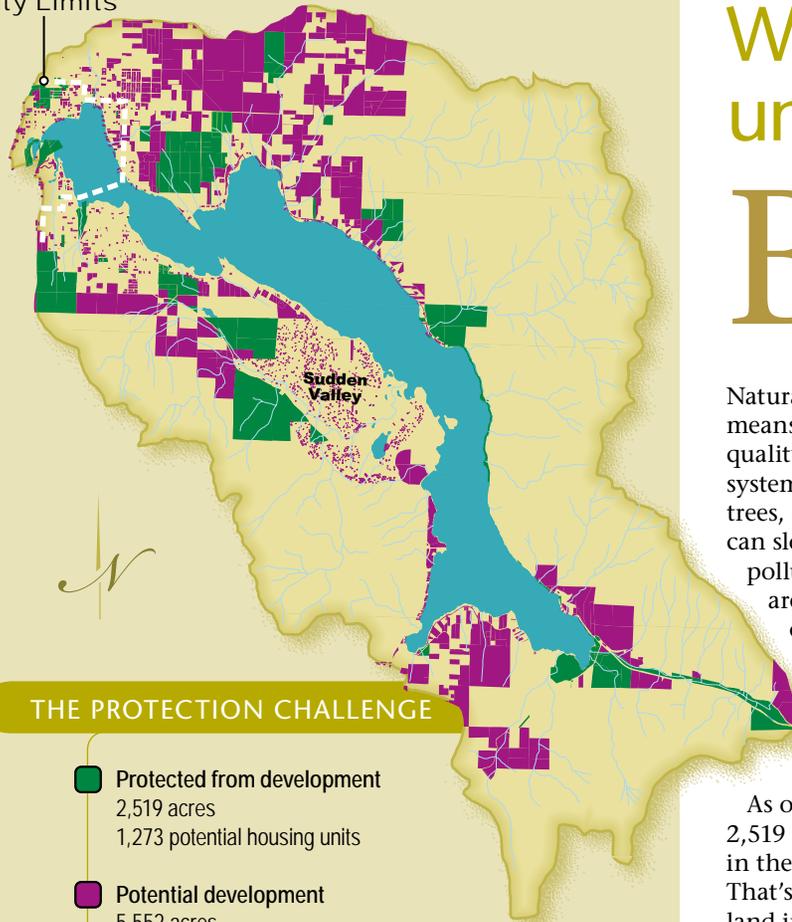


Adding a new polymer to the City's method of treating drinking water, in 2005, is thought to be how an upward trend in disinfection byproducts was reversed.

September average levels of trihalomethanes (THMs). The federal limit is 80 parts per billion.

Source: City of Bellingham Department of Public Works

Bellingham City Limits



THE PROTECTION CHALLENGE

- Protected from development
2,519 acres
1,273 potential housing units
- Potential development
5,552 acres
3,208 potential housing units

Development of the watershed creates a four-fold challenge, from:

1. Land disturbance
2. Loss of forest cover
3. Urbanization and increased impervious surfaces
4. Contaminants from daily activities

Why is the City of Bellingham buying undeveloped land in the watershed?

Because science indicates that preventing property from being developed is the best way to protect Lake Whatcom.

Natural forest cover is the best means of protecting water quality. This finely balanced system, with its canopy of trees, shrubs and groundcover, can slow rainwater and filter pollutants. Because forests are essential in providing a continuous supply of clean water, control of the land is one very effective way to achieve beneficial, enduring results.

As of March 1, 2007, a total of 2,519 acres have been protected in the Lake Whatcom Watershed. That's about 31 percent of the land in the watershed that's zoned for development but remains undeveloped, or about 8 percent of the total land in the watershed.

This has been accomplished through the efforts and financial contributions of the City of Bellingham, Whatcom County, Sudden Valley Community Association, Lake Whatcom Water and Sewer District, Whatcom Land Trust, Washington State Department of Natural Resources and generous

individuals. It is estimated that these protections are preventing the construction of 1,273 houses in the watershed.

But enormous challenges remain:

- Under current zoning, about 3,208 more single-family houses could be built in the watershed, on 5,552 acres of undeveloped land. At the current rate of construction — about 270 homes per year — the remaining developable land in

the watershed will be fully built out in about 12 years.

- Although 2,519 acres are protected, some of these parcels are not permanently protected from development.

Bellingham's Lake Whatcom Watershed Property Acquisition Program has played a major leadership and financial role in the partnerships that have been forged to protect watershed land.

How watershed land is protected from development

Protected by	Acres
City of Bellingham Lake Whatcom Watershed Property Acquisition Program ownership	773
City of Bellingham Lake Whatcom Watershed Property Acquisition Program and Whatcom County joint ownership (Whatcom Land Trust conservation easements on all 405 acres)	405
City of Bellingham ownership for parks, greenbelts, stormwater detention, drinking water facilities, etc.	259
City of Bellingham conservation easements with private entities	104
Whatcom County ownership	318
Washington State Department of Natural Resources ownership, with Whatcom County management plan	139
Whatcom Land Trust ownership, with Whatcom County easement and management plan on 212 acres	349
Whatcom Land Trust private conservation easements	75
Sudden Valley Community Association ownership through joint purchase and donation by City of Bellingham, Whatcom County and Lake Whatcom Water and Sewer District	60
Sudden Valley Community Association ownership	37
TOTAL	2,519



Progress Report: City of Bellingham Lake Whatcom Watershed Property Acquisition Program

The City of Bellingham began a program to purchase land in the Lake Whatcom Watershed in 2001, in order to protect our drinking water source. The program is financed by water usage fees. A single-family residence pays \$5 a month, which is included in City water bills.

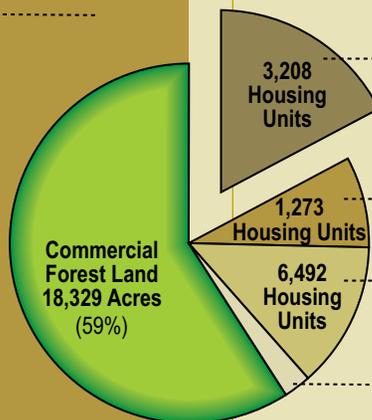
As of March 1, 2007, the program has been involved in buying approximately 1,178 acres of land, with purchase prices totaling about \$16 million dollars. Whatcom County, Whatcom Land Trust and generous landowners assisted in these protections. The program was also involved with partners in protecting an additional 164 acres, through conservation easements and covenants.

Altogether, this program has participated in the protection of 1,342 watershed acres. This acreage is about 53 percent of the protected land in the Lake Whatcom Watershed.

HOW CAN I HELP?

- Respect the natural features of watershed properties.
- Donate or sell your Lake Whatcom Watershed property to a protection program, or place a conservation easement on your land.
- Sell or transfer development rights to other properties outside the watershed.

TOTAL Land Area
31,127 Acres



LAND IN THE WATERSHED

How it's used now, what's protected and what could be built

Potential Development
5,552 Acres (18%)

The land inside the entire Lake Whatcom Watershed equals 31,127 acres and includes 4,007 developed acres. Under current zoning, about 5,552 more acres could be developed. This development would add about 3,208 single-family houses.

Protected Land
2,519 Acres (8%)

of Bellingham, its partners and generous individuals have protected 2,519 acres from development, through land acquisitions, conservation easements and covenants.

Developed Land
4,007 Acres (13%)

The efforts and financial contributions of the City

It is estimated that these protections are preventing construction of about 1,273 housing units in the watershed.

Right of Way
720 Acres (2%)

What else is government doing?

Reducing the pollution entering Lake Whatcom and protecting our drinking water need the combined efforts of government — from the local to the national level — and the people who live in, work in or visit the watershed.

Bellingham City officials have made protecting and enhancing Lake Whatcom their top priority, and expect to consider rigorous actions during 2007 and beyond to ensure this vital resource is preserved.

The City of Bellingham, Whatcom County and the Lake Whatcom Water and Sewer District have a long-standing partnership to protect Lake Whatcom through the Lake Whatcom Management Program.

Key local efforts to date include:

- Conducting ongoing lake and tributary testing.
- Protecting watershed land from development through purchases, conservation easements and lake-friendly management of properties.
- Lake-friendly zoning.
- Permit rules that encourage low impact development.
- Stormwater treatment.
- Upgrading and extending sewer systems.
- Regulation of construction, boating, septic systems and fertilizer use.
- Watershed protection education.
- Programs that help residents install lake-friendly landscaping.

State and federal efforts include:

- Financial and technical support for local programs.
- Lake-friendly management of logging.
- Environmental legislation.
- Enforcement of environmental, health and habitat laws.

HOW CAN I HELP?

We can't depend on government actions alone to protect Lake Whatcom. We will only solve the pollution problems of Lake Whatcom through the actions of the thousands of people who live in, work in, visit or drink water from the watershed.

It might be easier if there were some big villain dumping bucketsful of toxic waste into the lake — but there's no big villain here. The lake is overloaded with contaminants because a little here and a little there adds up to a lot.

Lake-friendly practices are suggested on various pages of this report, as well as on web sites of the City of Bellingham and our partners in the stewardship of Lake Whatcom. Are the lists too long? Just follow four guidelines:

- **Direct as much rain water as possible toward soil.** If we can direct phosphorus into the ground, it will be used by microorganisms and won't end up polluting the lake. Direct rainwater toward soil by directing downspouts toward vegetated areas, or installing rain barrels. Build walkways or driveways with materials that let water seep through. Keep and maintain healthy trees and shrubs on your watershed property — they help soak up water. Consider protecting undeveloped watershed land to ensure it will never be built on.
- **Obey environmental laws.** Phosphorus-containing fertilizers are prohibited in the Lake Whatcom Watershed, with limited exceptions. On construction sites, follow erosion control rules to prevent muddy runoff, and don't leave any dirt exposed when prohibited by wet-season laws. Obey septic tank inspection laws. Follow boating rules. Don't pump contaminated bilge water. Don't use empty land as a dump.
- **Keep contaminants out of the lake.** The stormwater treatment system is spotty, so whatever spills in the watershed — including detergent and motor oil — may wash into the lake. If you use a motorboat, refill oil and gas away from the water and be prepared to mop up spills. Don't wash your car on a street or driveway. Maintain cars and boats, so they don't leak.
- **Tread lightly in the watershed.** Leave your car at home by walking, riding a bike or taking the bus. Paddles, oars and sails are better choices for the lake than boat engines. For motorized boats, choose the cleanest engines possible, and practice preventive maintenance. In the woods, stay on trails to protect vegetation. Clean up after your pet, even in your own yard. Learn how to discourage geese from living on shoreline property. Learn other stewardship solutions from the web site of the Lake Whatcom Management Program, www.lakewhatcom.wsu.edu.

Why does Silver Beach have special development rules?

To protect Lake Whatcom and its tributaries.

The rules limit the size of new construction near Lake Whatcom, and limit the time of year when land can be cleared or left bare.

If you clear a piece of land, it can yield up to 1,000 times as much sediment as it did before being cleared, so limiting major excavation to the drier times of the year is effective in preventing phosphorus-laden soil from reaching Lake Whatcom. Too much phosphorus flowing into Lake Whatcom is causing algae to grow, which lowers the quality of our drinking water.

Most of Bellingham's Silver Beach Neighborhood is in the Lake Whatcom Watershed, which means that when it rains, stormwater flows toward ditches or creeks that empty into Lake Whatcom. When stormwater flows across bare land on a construction site or impervious surfaces like asphalt driveways, the water picks up phosphorus and other pollutants.

The more that vegetated areas remain on each newly developed lot, as well as existing lots, the more stormwater will

continue to be captured by trees and absorbed into the ground, instead of adding to the stormwater flowing into Lake Whatcom. Impervious surfaces — most concrete and asphalt, as well as roofs of houses, garages and sheds — prevent water from being absorbed into the ground underneath. So limiting the size of the footprint of new construction is an effective way to limit its impact on Lake Whatcom.

What is the Silver Beach Ordinance?

- A law adopted by Bellingham City Council in January 2001.
- The rules apply to all of the Silver Beach Neighborhood, except for a small portion where stormwater doesn't flow into Lake Whatcom.
- Construction rules limit the amount of exposed dirt from excavation or land clearing to 500 square feet during the wettest time of the year, from Oct. 1 to April 30. Large excavations not completed

by Oct. 1 must be covered to prevent muddy runoff.

- The maximum fine for construction violations is \$1,500 per day.
- Footprint rules limit how much of a lot can be covered with impervious surfaces, such as pavement or roof, and pervious systems, such as uncovered decks and masonry pavers. The limit for each is typically 15 percent of a lot or 2,000 square feet, whichever is greater. However, lots smaller than the zoned minimum size are restricted to 15 percent.
- Permission to exceed the footprint limits may be granted if native vegetation is retained or planted, or by agreeing to keep another watershed lot undeveloped.



Why are some boat engines restricted on Lake Whatcom?

Benzene is a harmful compound found in gasoline. The U.S. Environmental Protection Agency considers benzene at any level a risk to human health. Other scientific studies have shown petroleum pollution harms aquatic life.

City of Bellingham water monitoring has detected benzene at extremely low levels in its treated drinking water and in untreated Lake Whatcom water.

Studies conducted by the E.P.A. indicate carbureted two-stroke engines discharge 25 to 30 percent of their fuel, unburned, into the water when operated at full throttle. These engines are

responsible for a disproportionate loss of fuel discharged into water bodies compared with other engine types.

For motorized watercraft, better choices are four-stroke engines and direct fuel injection two-stroke engines. They use less gasoline and less oil, and they reduce fumes and noise. Better yet, use boats powered by your muscles or the wind.

To protect the health of everyone who depends on Lake Whatcom for drinking water, Bellingham City Council and Whatcom County Council have restricted the use of carbureted two-stroke boat engines.

The operation of all carbureted two-stroke engines is prohibited on the portion of Lake Whatcom inside Bellingham City limits (except those meeting 2006 or later Environmental Protection Agency emission standards). On the rest of Lake Whatcom, restrictions will take effect in 2009 and 2013.

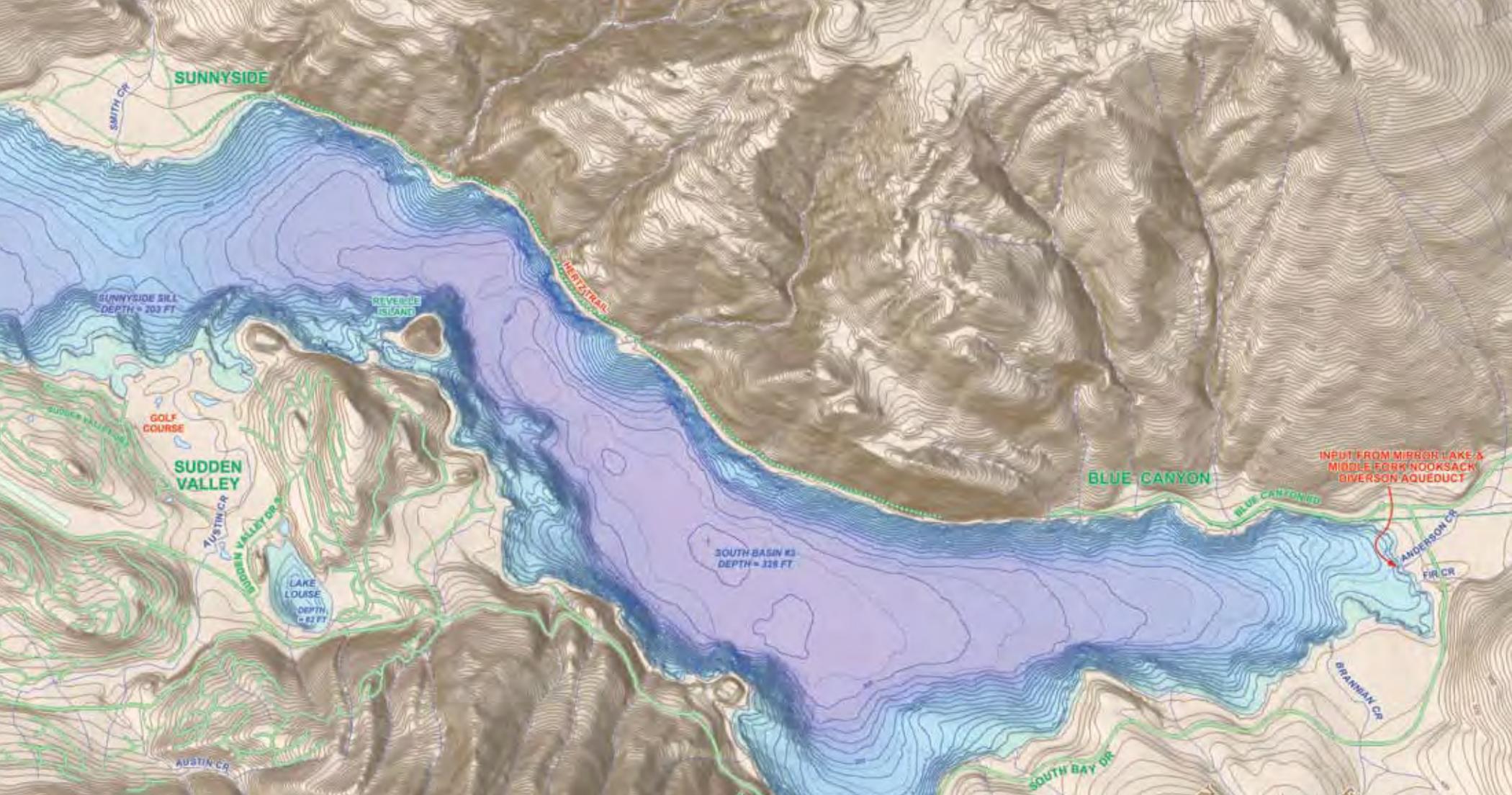
— City of Bellingham Ordinance 2005-06-045
— Whatcom County Ordinance 2004-042



Lake Whatcom

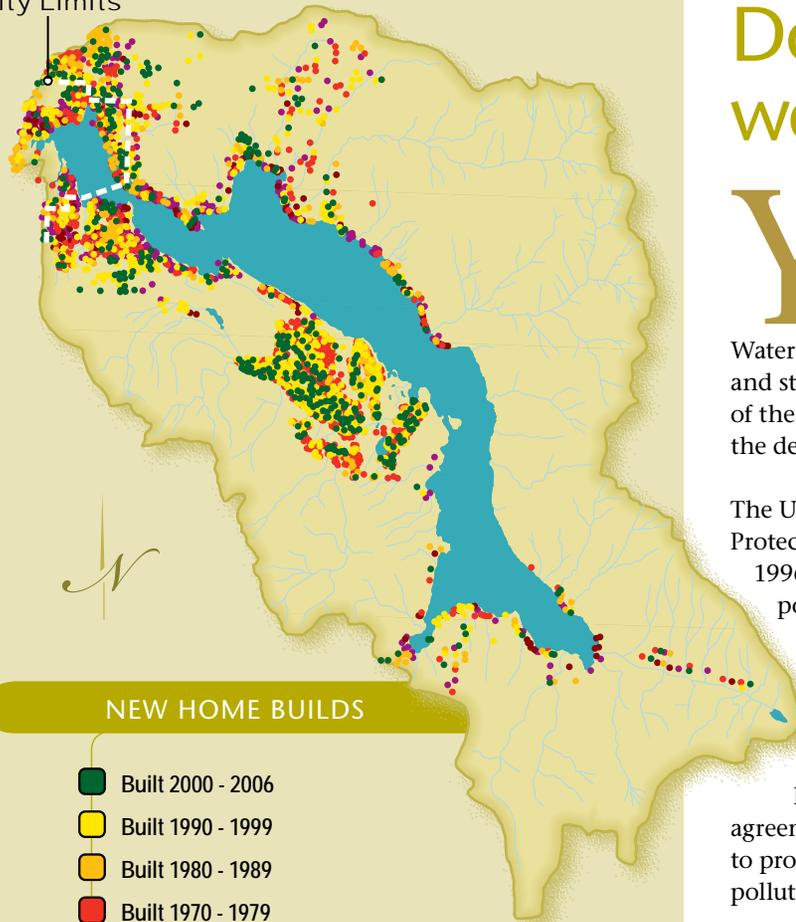
Lake Whatcom Facts, 2007:

- The drinking water source for about 95,000 residents of Whatcom County, about half the county's population.
- The City of Bellingham withdraws water from Basin 2 through a 1,200-foot wooden pipeline that leads to Whatcom Falls Park.
- The Lake provides drinking water for the City of Bellingham system, Lake Whatcom Water and Sewer District, several smaller water districts and associations, and a few hundred homes that draw water directly from the lake.
- Holds about 250 billion gallons of water.
- About 10 miles long and just over a mile wide at widest point.
- Lake surface about 5,000 acres, with 8 percent inside Bellingham.
- About 30 miles of shoreline.
- Average elevation 314 feet above sea level.



- About 36 tributaries (many not year-round) flow into the lake, augmented by water diverted from the Middle Fork of the Nooksack River.
- Drains naturally into Bellingham Bay via Whatcom Creek.
- Lake Whatcom Watershed about 56 square miles (36,000 acres), with about 3 percent inside Bellingham.
- About 15,000 people live in the Lake Whatcom Watershed, in about 6,500 homes (as of March 2007).
- The legal maximum lake level was established by Whatcom County Superior Court in 1953. The City of Bellingham controls lake level by a control dam at the head of Whatcom Creek.

Bellingham
City Limits



NEW HOME BUILDS

- Built 2000 - 2006
- Built 1990 - 1999
- Built 1980 - 1989
- Built 1970 - 1979
- Built 1960 - 1969
- Built Before 1960

Do federal and state laws require we clean up Lake Whatcom?

Yes. Cleaning up Lake Whatcom has become more than just a good idea. It is required by the federal Clean Water Act — adopted in 1972 — and state laws. Implementation of these laws has been slow, but the delays are about to end.

The U.S. Environmental Protection Agency was sued in 1996 because Washington's polluted waters were not being cleaned up fast enough. As a result of that lawsuit, the E.P.A. and the Washington State Department of Ecology entered into an agreement that requires Ecology to produce plans to clean up polluted waters on a schedule.

Ecology expects to complete, probably in 2008, a plan that will limit the amount of phosphorus that can be discharged into Lake Whatcom from its tributary creeks and ditches that collect stormwater.

In 1998, Ecology listed Lake Whatcom among the state's water bodies that failed to meet water quality standards. This list is called the 303(d) list, because

the process is described in that section of the Clean Water Act. Lake Whatcom was listed because of low levels of dissolved oxygen.

Based on that listing, Ecology began working on a mandatory water quality improvement plan aimed at returning the lake to natural levels of dissolved oxygen. The plan will limit the amount of phosphorus flowing into the lake, because phosphorus is the primary cause of Lake Whatcom's low levels of dissolved oxygen. Ecology will set the phosphorus goals. The City of Bellingham and



Have your car washed commercially, because the wastewater will be treated. If you must wash it yourself, do it on the lawn or gravel, where wastewater will seep into the ground. And don't use phosphorus-containing detergent.

Whatcom County will then have to operate programs and/or set regulations to meet those goals. In other words, Ecology will require results, and local governments will determine how to achieve those results. The requirements will include timelines for year-by-year actions.

The overall goal will be that no more phosphorus is discharged into the lake than would be discharged under natural conditions — without human impact. The target level selected by Ecology is the phosphorus discharge from Smith Creek, which flows mostly through commercial forest land on the north shore of Lake Whatcom and is the cleanest of the Lake's tributaries.

Ecology has a new tool to ensure compliance. The goals are now included in permit requirements for stormwater systems in urban areas.

Under Federal rules that went into effect in February 2007, a stricter discharge standard now applies to any stormwater conveyance (including roadside ditches) owned or operated by



Pick up pet waste, even in your own yard.

Bellingham or Whatcom County, whether they are inside Bellingham, in Bellingham's Urban Growth Areas or in any urbanized area in the watershed (including Sudden Valley). These components of the public stormwater system flowing into Lake Whatcom are now designated as "point sources" of pollution (the longtime designation for specific sources of pollution, for example

factories). These stormwater conveyances must for the first time obtain discharge permits from Ecology that will limit phosphorus discharges.

For "non-point sources," the standard of compliance remains less strict: a reasonable assurance the pollution reductions will be made. Non-point sources include stormwater that enters the lake or a tributary without ever entering a stormwater system owned or maintained by a city or a county. This stormwater can originate from any location, including a private driveway, a store parking lot, or a stormwater ditch owned by Sudden Valley Community Association (because it is private).

Achieving the targets Ecology will set to reduce the amount of phosphorus entering Lake Whatcom will require action not only by governments but by the people who live in, work in or visit the Lake Whatcom Watershed.

ANNA THORNTON



PHOSPHORUS IS THE CULPRIT

Based on studies conducted by various scientists, Washington State Department of Ecology has already determined:

- The dissolved oxygen problem is caused by increases in phosphorus entering Lake Whatcom with stormwater.
- There are few choices for removing phosphorus once it is in the water.
- The greatest increases in phosphorus-loading to the lake come from the most developed areas.
- Some of the increase is because in developed areas precipitation carrying contaminants enters streams that flow directly to the lake without getting filtered through phosphorus-removing soil.
- Some of the increase is because stormwater reaches creeks faster in developed areas, causing erosion.
- It's necessary to lower the amount of phosphorus entering Lake Whatcom, so the sooner we start doing so, the better.



MICHAEL HILLES

Joan Vandersypen, a scientist with the Institute for Watershed Studies at Western Washington University, programs an automatic sampling pump to collect a sample every 90 minutes from a stormwater treatment system, in August 2001.

What is a TMDL?

The letters stand for Total Maximum Daily Load. A TMDL is a mandatory water quality improvement plan. The “load” in TMDL refers to the amount of a pollutant a water body can receive without violating state water quality standards. A TMDL is a plan, an amount of pollution, a document and a process that involves public comment.

All TMDLs have five main parts:

- An identification of the type, amount, and sources of water pollution in a particular water body or segment.
- An allocation showing how much pollution each source will be allowed to discharge.
- A strategy to meet these allocations.
- A determination of how much the pollution needs to be reduced or eliminated to achieve clean water.
- A monitoring plan to make sure the water is getting cleaner as the TMDL is implemented.

What is the Lake Whatcom TMDL?

During the summer of 2007, the Department of Ecology is expected to release a Total Maximum Daily Load study for Lake Whatcom. This study will include a scientific model that will determine where pollution needs to be reduced, and by how much, in order for the lake to have sufficient dissolved oxygen.

After public comment, based on this study Ecology will develop a TMDL report, which will identify where pollution needs to be reduced and by how much. After E.P.A. approval and more public participation, an implementation plan will be readied.

The Lake Whatcom TMDL will determine the amount of phosphorus that can be loaded, or discharged, into the lake without lowering the oxygen levels below natural levels.

Natural levels are estimated by modeling oxygen levels in the lake when natural levels of phosphorus are present — that is, the levels of phosphorus prior to human activity.

Once that maximum load is determined, Ecology will allocate portions of the load to 23 geographic areas of the watershed, so the sum of the loads doesn't exceed the maximum allowed.

Within each geographic area, known as a sub-watershed, allocations of the allowed amount of phosphorus will be further divided into how much phosphorus can be discharged from the Bellingham stormwater system, from the Whatcom County stormwater system, from

commercial forestry, and from non-point sources such as the homes and other development surrounding particular creeks. The required reductions in phosphorus won't be measured directly, because it's too variable, but by a yet-to-be-determined surrogate.

The TMDL will set the goals for how much needs to be done, and where. The City and Whatcom County will be required to set regulations and/or operate programs to meet those goals.

Future development levels will affect what will be required in already developed areas

The scientific model that will be the basis of the TMDL allocations will calculate the amount of phosphorus loading in three ways:

- Under natural conditions.
- Under conditions in 2002, when water samples were collected.
- Projected as if the entire watershed is built out in the same way developed areas have been built until now.



Don't use fertilizer that contains phosphorus.

Direct rainwater into the ground, where phosphorus can be absorbed and used by plants, instead of letting it flow directly into stormwater ditches, creeks or Lake Whatcom.

*Read more about
lake-friendly practices at:
www.lakewhatcom.wsu.edu*

Much more phosphorus is discharged from developed areas than from natural areas. So if the more than 3,000 additional homes allowed under current zoning are built, they will add significantly to the amount of phosphorus that is loaded into the lake.

To the extent the City and the County prevent future residential development — by property acquisitions, zoning changes, incentives or other regulations — less effort will be needed to reduce phosphorus loading and preserve the health of the lake.

We're not starting from scratch

The City of Bellingham has already put into effect many programs and regulations that will satisfy goals Ecology is expected to include in the Lake Whatcom TMDL, although some of these programs and regulations might need to be expanded or improved. Examples are:

- Protecting watershed land from development.
- Teaching residents lake-friendly gardening techniques.
- Banning fertilizers containing phosphorus.
- Educating pet owners to pick up animal waste.



*Carpool, bus, bike or walk to
reduce pollution from motor
vehicles.*

- Offering incentives to decrease motor vehicle use.
- Refitting stormwater treatment systems with new technology that targets phosphorus.
- Street sweeping.

CITY OF BELLINGHAM



IT'S THE LAW

- *Whatcom County Ordinance 2005-038*
- *City of Bellingham Ordinance 2005-06-044*

No person shall apply any commercial fertilizer to residential lawns or public properties within the Lake Whatcom Watershed, either liquid or granular, that is labeled as containing more than 0% phosphorus or other compounds containing phosphorus, such as phosphate, except when applied to newly established turf or lawn areas in the first growing season.

No commercial fertilizer of any type shall be applied when the ground is frozen.

No person shall apply, spill or otherwise deposit commercial fertilizer on impervious surfaces. Any fertilizer applied, spilled or deposited, either intentionally or accidentally, on impervious surfaces shall be immediately and completely removed.





CITY STORMWATER TREATMENT

- Stormwater facilities
- Treatment areas completed 1992-2006
- Treatment areas planned by City 2007-2008
- Areas where stormwater is not treated by City
- Untreated area drains to Whatcom Creek
(therefore lower priority for stormwater treatment)

By the end of 2008, the City of Bellingham will be treating stormwater collected from *321 acres* in the Lake Whatcom Watershed. This includes *56 percent* of the City's portion of watershed land draining toward Lake Whatcom. *(The 321 acres include 56 acres outside City Limits that are in Bellingham treatment areas. These 56 acres are not included in the percent calculation.)*

Why is the City of Bellingham treating stormwater?

We depend on stormwater drainage systems. This network of ditches, pipes, culverts and creeks keeps water from flooding our roads, yards and the buildings where we live, work, go to school or relax.

We need this stormwater system because we have added impervious surfaces to the earth — that is, surfaces that don't let water seep through. In the natural environment, rainwater is captured by soil and plants and slowly released into creeks, lakes and bays, or into the atmosphere. The more we replace nature's stormwater system with buildings and paved surfaces, the more runoff is channeled into the stormwater drainage system.

Stormwater runoff has two unintended consequences:

- It carries pollutants, including phosphorus, from lawns, exposed soil, roads, parking lots, and other developed land into our creeks, lakes and bays.
- During the wet season, the volume, peak flow and duration of the runoff increase dramatically. The high volumes undercut and erode stream banks, widen stream channels, deposit excessive sediment and

alter natural stream and wetland processes. This changes or damages fish and wildlife habitat, and overloads bodies of water like Lake Whatcom with nutrients, including phosphorus.

The City of Bellingham completed construction of its first stormwater treatment system in 1992. Since then, the City has spent about \$1.4 million building stormwater treatment systems in its highest-priority area: the Lake Whatcom Watershed. Spending will reach about \$2 million when watershed projects planned for 2007 and 2008 are completed.

Bellingham's first stormwater treatment systems were designed to capture bacteria and solids (including mercury and other metals), to prevent them from flowing into Lake Whatcom. They are effective at capturing bacteria and solids — important goals for the quality of our drinking water, the health of fish and the overall cleanliness of Lake Whatcom.

But the threat to Lake Whatcom from phosphorus would not be understood for several years. And the technology to remove phosphorus from stormwater is still in its infancy. Bellingham is one of many communities searching for effective methods to remove phosphorus from stormwater.

Since 2001, Bellingham has been refitting stormwater systems and building new ones in order to attempt to remove phosphorus. So far, despite the use of state-of-the-art technology, results have been disappointing. Measurements have not shown City stormwater systems to be effective at lowering the concentration of phosphorus downstream of filtration.

However, recent retrofits have shown promising early results. In addition, bioswales and other treatment methods that infiltrate part of the stormwater into the ground are presumably taking advantage of the soil's natural ability to absorb phosphorus.

Nevertheless, the City continues seeking stormwater treatment systems that can be proven to remove phosphorus. One forward-looking method the City uses is to install cartridges containing filtering materials. Like water filters in your home, these filters are replaced at set time intervals. The filtering materials used in these systems are currently being improved by manufacturers to better target phosphorus removal. Scientists working for the City are also experimenting with phosphorus-absorbing materials for use in other stormwater treatment systems.



The City follows “best management practices” required by the Washington State Department of Ecology, which are updated whenever better stormwater treatment methods are developed. Bellingham is ahead of most communities of our size in the state, having adopted the Ecology stormwater manual and substantially meeting all recommendations of the Puget Sound Action Team’s management plan.

Meanwhile, federal and state regulations leave us no choice: We must limit the amount of phosphorus reaching Lake Whatcom. But since we cannot depend on current methods of removing phosphorus, we must focus on preventing phosphorus from reaching the stormwater ditches and creeks that flow into Lake Whatcom.

This means the bulk of the responsibility for phosphorus reduction must fall on residents of the watershed and people who work in or visit the watershed. Government and environmental organizations can provide education and support, but individual actions will determine how much phosphorus continues to flow into Lake Whatcom.

HOW CAN I HELP?

- Have your car washed commercially, where sudsy water is not released untreated.
- If you must wash your own car at home, wash it on a porous surface like a lawn.
- Scoop the poop! Don’t leave pet waste to decompose.
- In your yard, allow as much water as possible to soak into the ground instead of running off in polluted torrents.
- Channel rainwater into a rain garden, where it can soak into the ground.
- Collect rainwater in rain barrels and use it for outdoor watering activities.
- Use porous cement or pavers, which let water soak through and into the ground.
- Rake leaves and needles off sidewalks and driveways, to keep them out of the stormwater system.

CAN STORMWATER BE TREATED AT HOME?

Yes. We can direct stormwater into our yards, to harness the soil’s natural ability to absorb phosphorus and other pollutants.

The best way to reduce the amount of phosphorus reaching Lake Whatcom is to reduce the volume of stormwater runoff, and every little bit counts.

In 2007, the City of Bellingham plans to build at least five residential stormwater retrofit projects, for homeowner volunteers in the Lake Whatcom watershed. These will be demonstration projects to illustrate small-scale stormwater treatment methods that may include:

- Constructing porous walkways and driveways that reduce runoff by allowing water to seep to the ground underneath.
- Installing rain gardens that filter pollutants.
- Increasing other vegetated landscape features.
- Amending soils to increase phosphorus absorption and retention.
- Collecting water from gutters to use on lawns or gardens.



DAVID SCHERRER

A Washington Conservation Corps crew weeds and removes litter from the rain garden near the Bloedel Donovan Park boat launch, in March 2007. The curb cut allows stormwater runoff from the parking lot to enter the rain garden, where plants and soil capture pollutants.

An award-winning project

The Bloedel Donovan stormwater project won the American Public Works Association's Charles Walter Nichols Award for Environmental Excellence in 2005. The project cost about \$123,000. It was funded by the City of Bellingham Storm and Surface Water Utility, with a small grant from Puget Sound Action Team, which is responsible for implementing Washington State's environmental agenda for Puget Sound. The engineering staff of Public Works designed the water quality system. Several city departments and Washington Conservation Corps assisted with construction.

How is stormwater being treated at Bloedel Donovan Park?

Again and again and again. Redundancy was the key word guiding the City's Public Works Department in designing a stormwater project for Bloedel Donovan Park. Since no single stormwater treatment method has been shown to be effective at removing phosphorus, water flowing off the Bloedel Donovan parking lot is guided through a series of systems, so the cumulative treatment prevents as much phosphorus and other contaminants as possible from reaching Lake Whatcom.

This project, constructed in 2003, won the American Public Works Association's Charles Walter Nichols Award for Environmental Excellence in 2005. The award application was aptly titled, "Getting Less from a Lot."

Before the project was built, stormwater running off the parking lot at Bloedel Donovan Park flowed directly into Lake Whatcom, carrying with it automotive fluids, animal waste and contaminated water from boats. This three-acre parking lot is the largest in the Lake Whatcom Watershed. It serves hundreds of vehicles a day, including many that haul trailers

to the lake's most accessible boat launch. Unfortunately, some boaters deposit motor fluids and other contaminants in the parking lot when they ignore the prohibition on dumping bilge water.

Now, 99 percent of water running off the parking-lot asphalt is treated to remove contaminants before they reach Lake Whatcom.

Four types of systems were built:

Rain Gardens:

Two clusters of bushes and groundcover are doing double duty — adding beauty to the park and harnessing the natural processes of plants and soil to capture pollutants. Two rain gardens were installed, one near the park's Electric Avenue entrance and the other near the boat launch. Much of the stormwater runoff from the parking lot flows downhill into one or the other rain garden. As water seeps slowly through specially constructed mulch, soil and gravel layers, pollutants are filtered out.

Plants in the rain gardens include yellow monkeyflower, black twinberry, Nootka rose, kinnikinnick, evergreen huckleberry and common

snowberry. These Pacific Northwest native plants were selected because they can thrive in very wet soil and very dry soil. They are adapted to our weather and resistant to local pests, minimizing the need for fertilizers or pesticides. These plants get some of their nourishment by absorbing nutrients carried by stormwater runoff.

The rain garden near the boat launch catches parking lot runoff that can't be guided toward any other treatment system.

Filter Cartridges

Two underground vaults filled with 18-inch-diameter filter cartridges were also installed in the park. Any stormwater that exceeds the upper rain garden's capacity overflows into the filter cartridge system. In the lower parking lot, a berm was built to divert stormwater away from the lake and into the cartridge vault.

The cartridges are packed with material designed to absorb contaminants. Like filters in your car, these cartridges are replaced at regular intervals. That lets the City try new materials, as the science of stormwater treatment advances. The original perlite cartridges have been replaced with a mixture of perlite, zeolite and granulated carbon.

So far, measurements indicate the cartridges are not effective at removing phosphorus, despite manufacturer claims they would be. The City will continue to install the best filtering materials as they become available.

Sand Filter

A sand-filter structure was designed to capture stormwater runoff from Electric Avenue, the arterial street bordering the park. Pipes transport stormwater runoff from the roadway toward the filter, where sand particles trap some pollutants.

Infiltration Galleries

Two infiltration galleries take water cleaned by the other three systems and direct it into the ground. Infiltration galleries are rows of buried pipes with holes that release water into the soil, where phosphorus can nourish plants. One gallery was installed near the playground and swimming area, the other near the boat launch and picnic area. After construction, topsoil was replaced and replanted as lawn, so the infiltration galleries operate without disrupting the functionality and beauty of the park.

HOW CAN I HELP?

- Walk or ride your bike to Bloedel Donovan Park.
- Or catch a WTA bus. Bloedel Donovan is only a 15-minute ride from Bellingham's downtown station, with buses leaving 25 minutes after the hour. For details, call 676-RIDE(7433).
- Boaters are prohibited from dumping bilge water at Bloedel Donovan Park.
- Bring your dog to the park to help chase away geese. The park is an off-leash area daylight hours from Oct. 1 to April 30, and from dawn to 10 a.m. from May 1 through Sept. 30.
- Always pick up after your dog.



FILTER CARTRIDGE CUTAWAY



CONTECH STORMWATER SOLUTIONS INC.

Stormwater enters an underground vault, where it flows through cartridges that are packed with filtering material designed to remove pollutants. Cartridge replacement occurs approximately annually, or when the material becomes plugged. Replacement may easily include new and improved filtering materials for better removal of pollutants, such as phosphorus, as such materials become available.

Can I eat the fish from Lake Whatcom?

Yes or no, depending on the type of fish, your age and whether you are a man or a woman.

Mercury has been found in Lake Whatcom smallmouth bass and yellow perch, and in largemouth bass in other Whatcom County lakes. Mercury can affect the development of the nervous system, which can result in learning disabilities in children. In adults, mercury can also affect the heart and the immune and reproductive systems.

Children are most at risk for the effects of mercury. Pregnant women, those who are breastfeeding or who are planning a future pregnancy may pass mercury contamination on to their children.



Lake Whatcom Fish Advisories

From Whatcom County Health Department and Washington State Department of Health

	Smallmouth Bass	Largemouth Bass	Yellow Perch
Women of childbearing age	Do not eat.	Don't eat more than two meals* per month.	Don't eat more than one meal* per week.
Children younger than age 6	Do not eat.	Don't eat more than two meals* per month.	Don't eat more than one meal* per week.
Other people	No restriction.	No restriction.	No restriction.

* Meal size ranges: One ounce for a 25-pound child, three ounces for a 70-pound child, six ounces for women weighing less than 135 pounds, eight ounces for larger adults.

There is no detectable concentration of mercury in Bellingham's drinking water, or in Lake Whatcom.

Mercury is found in the tissue of large fish because mercury concentrations increase at every step up the food chain. Mercury present in a lake or creek is taken up by bacteria, which are eaten by their predators, which

are eaten by their predators, all the way up the food chain to large fish. Concentrations of mercury in large, older fish can be many times concentrations found in insects near the bottom of the food chain.

Is swimming in Lake Whatcom safe?

Yes. It is safe to swim in Lake Whatcom.

Blue-green algae: Local health officials have not seen enough of the toxin-producing type of algae in Lake Whatcom to harm swimmers or pets. Although some of the algae growing in Lake Whatcom can produce toxins, concentrations have been too low to be of any concern. If blue-green algae are present in a high enough concentration to create a problem, there is typically the tell-tale appearance of a bluish or greenish paint-like material on a lake's surface. If this is ever observed, give the City's laboratory a call, at 676-7689, so scientists can determine if there's a danger to swimmers or pets.

Bacteria: The City of Bellingham monitors the water at Bloedel Donovan Park weekly in warm weather. High concentrations of bacteria have not been found since 2003, when beach closures were necessary. In 2002 and 2003, the City closed the Bloedel beach several times because of high concentrations of E. coli bacteria, but not the dangerous type of E. coli that is often associated with undercooked meat. DNA testing implicated Canada geese as a significant contributor to the fecal pollution at the swim area. If any beach must be closed for health reasons, signs are posted and announcements are made online and in local media.

Swimmer's itch: Lake Whatcom typically does not have a problem with swimmer's itch, the common name for a rash caused by a parasite that thrives in shallower lakes.

Protozoa: The Bellingham drinking water lab monitors the intake for giardia and cryptosporidium. These parasites enter lakes and rivers through sewage and animal waste, and cause gastrointestinal illness. Although levels in 2006 were not detectable, and the risk of exposure is considered to be very low in Lake Whatcom, exposure is still possible by drinking untreated lake water.



RESOURCES

The City of Bellingham is online at www.cob.org. The Public Works Department, which can be reached at 676-6850, is in charge of the City's drinking water, sewer and stormwater systems, and coordinates environmental programs. The Lake Whatcom Watershed Advisory Board, a citizens group appointed by the mayor that advises the City regarding the watershed land acquisition program, meets 7 p.m. the third Thursday of every month, in City Hall. Find out more online or at 676-6961.

The Lake Whatcom Management Program is the joint effort of the City of Bellingham, Whatcom County, and Lake Whatcom Water and Sewer District (formerly Water District 10) to protect Lake Whatcom as the source of drinking water for about half the residents of Whatcom County. Its web site www.lakewhatcom.wsu.edu is the most complete source for local **stewardship solutions**. Find tips about septic systems, lake-friendly gardening, cars, boating, Canada geese, construction, hobby farms and pet waste. The program's pamphlet "**Boatnotes: A handbook for boaters on Lake Whatcom**" summarizes environmental regulations for boaters and suggests dozens of lake-friendly practices. For a copy, call Bellingham's Environmental Resources office, 676-6961.

Whatcom County is online at www.co.whatcom.wa.us. The Public Works Stormwater Division coordinates tasks identified through the Lake Whatcom Management Program, and can be reached at 715-7450. Environmental health issues are handled by the Health Department, which can be reached at 676-6724.

Lake Whatcom Water and Sewer District (formerly Water District 10) is online at www.lwwsd.org, or call 734-9224.

Institute for Watershed Studies at Western Washington University monitors Lake Whatcom under a contract with the City of Bellingham. Reports are online at www.ac.wvu.edu/~iws.

Washington State Department of Ecology is online at www.ecy.wa.gov. For background information on water quality improvement plans and specific information about Lake Whatcom, search "TMDL." The Ecology web site will announce opportunities for public comment on the draft plan for Lake Whatcom, or call Ecology's Bellingham field office, 738-6250.

Washington State Department of Natural Resources implements the Lake Whatcom Landscape Management Pilot Project on about 15,000 acres of state forest trust land in the Lake Whatcom Watershed. Read about the program on the DNR web site www.dnr.wa.gov (search "Lake Whatcom.")

Washington State Department of Health Office of Drinking Water is online at www.doh.wa.gov/ehp/dw, or call (800) 521-0323.

Washington State Department of Fish and Wildlife is online at www.wdfw.wa.gov, or call the Bellingham office for freshwater resources, 676-2146.

Many local non-profit organizations contribute to the health of Lake Whatcom, including:

- **Whatcom Land Trust**, which protects land from development, and is online at whatcomlandtrust.org, or call 650-9470.
- **RE Sources**, which helps residents actively safeguard our environment, and is online at www.re-sources.org, or call 733-8307.
- **Sustainable Connections**, which promotes the Whatcom Watershed Business Pledge, and is online at www.sconnect.org, or call 647-7093.
- **Nooksack Salmon Enhancement Association (NSEA)**, which is working with the Dept. of Fish and Wildlife and Whatcom County to develop a Lake Whatcom Native Kokanee and Cutthroat Trout Conservation and Recovery Plan, and is online at www.n-sea.org, or call 715-0283.

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Calculations based on research by Environmental Defense and other members of the Paper Task Force. © New Leaf Paper

What's in a name?

Establishing the name "Lake Whatcom Reservoir" was a top goal when Bellingham, Whatcom County and the Lake Whatcom Water and Sewer District adopted the first cooperation agreement on lake issues in 1992. That agreement said establishing the name "Lake Whatcom Reservoir" was an affirmation of the goal of developing management principles for the lake and watershed consistent with a drinking water reservoir environment.

Bellingham City Council's official goals for 2007 include, "Protect and improve the quality of drinking water in the Lake Whatcom Reservoir."

Lake Whatcom Reservoir. Does it sound too goofy to say? Does it sound too much like a political agenda?

We've been calling it "Lake Whatcom" or "The Lake" for so long. "The Lake" sounds like a place for swimming, fishing, boating and relaxing.

When we say "The Reservoir," what do we think of doing? When we hear "The Reservoir," is it an unpleasant reminder of something we'd rather not think about?

Perhaps, just sometimes, we can start to use the word "Reservoir." Perhaps we can say to our children, "This glass of water comes from the Lake Whatcom Reservoir." Or perhaps we can say to each other, "Let's not wash our car in a place where the sudsy wastewater will flow into the Lake Whatcom Reservoir."

Perhaps calling it "The Reservoir," just sometimes, will help us protect the drinking water source for 95,000 people.

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