LOST LAKE

REPORT DESCRIPTION

This report is an annual update to the 2003 State of the Lakes Report and includes water quality data collected from 2003 through 2010. For additional background on the information provided here or to find out more about Lost Lake visit www.lakes.surfacewater.info or call Snohomish County Surface Water Management (SWM) at 425-388-3464.

LAKE DESCRIPTION

Lost Lake is a small, 13-acre lake located southeast of Maltby. The lake is fed mainly by groundwater and drains south to Ricci Creek and then east to the Snoqualmie River.

Lost Lake is relatively deep for its size, with a maximum depth of 13.7 meters (45 feet) and a mean depth of 7.0 meters (23 feet). The watershed is slowly shifting from rural to suburban residential densities.

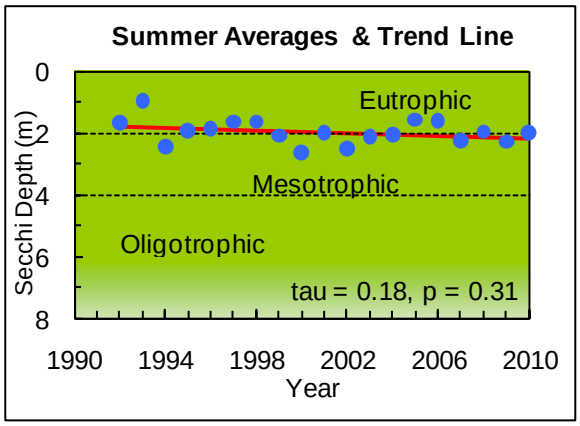
There is a large wetland downstream of the lake. In recent years, beaver activity in the wetland has dammed the outflow and raised the level of the lake. With Snohomish County SWM assistance, residents have worked to limit the effects of the beaver dams.

LAKE CONDITIONS

The following graphs illustrate the summer averages and trend lines (in red) for water clarity, total phosphorus, and chlorophyll *a* for Lost Lake. Please refer to the table at the end of the report for long-term averages and for averages and ranges for individual years.

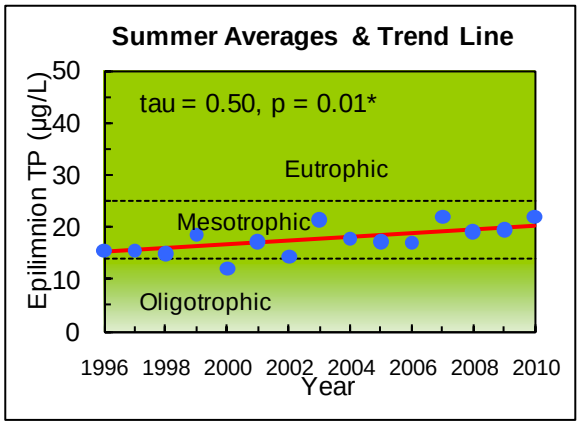
Water Clarity

Water clarity in Lost Lake is low to moderate, partly because of the dark water color. (The dark color comes from humic compounds from surrounding wetlands, but does not affect water quality.) The long-term 1992 – 2010 summer average water clarity is 2.0 meters. Over time, there has been some variability in the water clarity. The water clarity averages increased to 2.7 meters and 2.5 meters in 2000 and 2002, respectively. Then, in 2005 and 2006, the clarity dropped to the lowest levels since 1997—only 1.6 meters. Water clarity readings returned to 2.0 meters or greater in 2007 – 2010. Between 1992 and 2010, there have been no significant long-term trends in water clarity.



Total Phosphorus (key nutrient for algae)

Total phosphorus concentrations in the epilimnion (upper waters) of Lost Lake are moderate. The long-term 1996 - 2010 summer average is 18 µg/l. However, the summer averages have been slowly increasing. In fact, there has been a statistically significant increase in phosphorus averages between 1996 and 2010. This may be an indication that the lake is receiving more nutrient pollution from the surrounding watershed as development increases. This also may explain the higher chlorophyll *a* (algae) values in some years.



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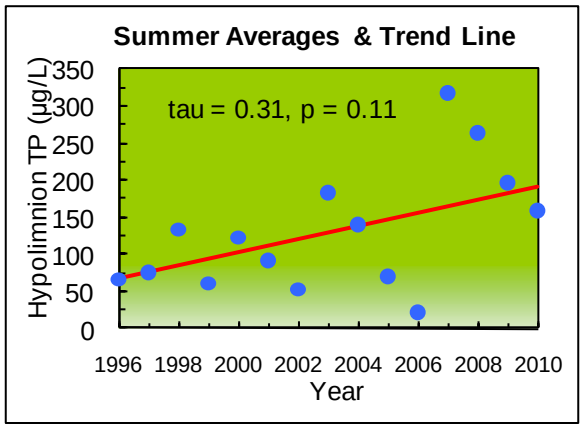
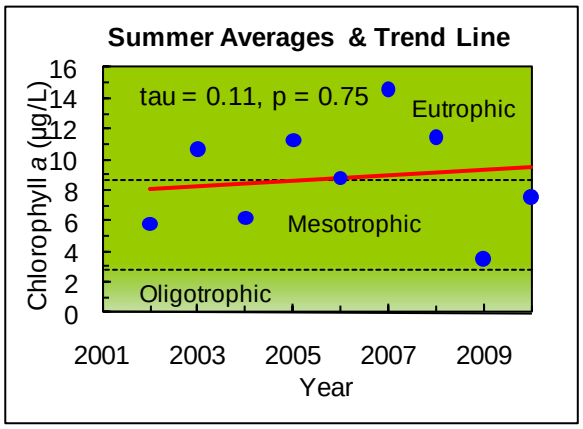
Phosphorus concentrations in the hypolimnion (bottom waters) are much higher. The long-term 1996 - 2010 summer phosphorus average is 131 µg/l. The phosphorus levels in the hypolimnion are also extremely variable. The averages for 2007 through 2009 were much higher than all previous years (between 197 and 318 µg/l). This is in stark contrast to the record low of 21 µg/l in 2006. Because of this wide variability, the apparent trend toward increasing phosphorus in the bottom waters is not yet statistically significant. However, the high averages in recent years are a warning sign of accelerating eutrophication. Higher phosphorus levels are the result of more nutrients washing into the lake, as well as phosphorus being released from the bottom sediments during periods of low dissolved oxygen.



Chlorophyll a (Algae)

Chlorophyll *a* values showed moderate to high levels of algae in the summers of 2002 – 2010, with a long-term average of 8.9 µg/l. Chlorophyll *a* was also highly variable, ranging from 3.5 ug/l (2009) to 15 ug/l (2007). Prior to the addition of the low 2009 average and the moderate 2010 average, there had been a statistically significant trend toward increasing chlorophyll *a*. However, this trend is no longer apparent. In some years, 2007 for example, it appears that greater algal growth is associated with higher phosphorus levels in the upper and lower waters. It is possible that more frequent nuisance algal growth will become a problem if nutrient levels continue to rise.



Toxic Blue-Green Algae (Cyanobacteria)

Blue-green algae, also called cyanobacteria, are a group of algae capable of producing toxins during periods of high growth, known as blooms. Toxic algae can cause serious illness in people and pets that come into contact with affected water. Algal blooms often look like blue or green paint floating on the water surface. Lake users should avoid contact with the water and keep pets away from the lake when it is experiencing a blue-green algal bloom. If a bloom has been identified, the lake will have notices posted at the public access site.

Since 2005, volunteers and SWM staff have screened algae at Lost Lake for potentially toxic blooms. Beginning in 2009, bi-weekly toxin testing also began as part of a larger project coordinated by the Washington State Department of Health. The project is funded by a grant from the U.S. Centers for Disease Control (CDC) and includes monitoring of thirty lakes in Snohomish, King, and Pierce Counties. The CDC project is being conducted to identify algal blooms that could pose a potential health threat and to alert the public about toxic algae. Water samples are tested for two types of toxins: microcystin (a liver toxin) and anatoxin-a (a neurotoxin).

In 2009 and 2010, Lost Lake did not have noticeable surface accumulations or scums of blue-green algae. However, one water sample taken in October 2009 did test positive for microcystin. The concentration

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was very low (0.052 ug/l), which is far below the Washington State Department of Health recreational standard of 6 ug/l. Anatoxin-a was not detected in any of the samples collected in either year. This project will continue in 2011 to help determine if toxic algae is a potential problem in Lost Lake.

SHORELINE CONDITION

The condition of the Lost Lake's shoreline was surveyed in 2008 (see map on page 4). The lake shoreline condition is important in understanding overall lake health. Frequently, lake shorelines are modified through removal of natural vegetation, the installation of bulkheads or other hardening structures, and/or removal of partially submerged logs and branches. This type of alteration can be harmful to the lake ecosystem as natural shorelines protect the lake from harmful pollution, prevent bank erosion, and provide important habitat for fish and wildlife.

The shoreline of Lost Lake is 3/4 of a mile long and mostly developed with residential uses. There were 19 homes or cabins around the shore in 1973, and by the mid-90s, there were 42. Although the number of homes was not surveyed in 2008, 43 docks were counted on the lake. The shoreline is not highly armored—10% has bulkheads, rock revetments, or fill. However, 33% of the shoreline no longer has a buffer of native vegetation immediately adjacent to the lake shore. Also, the amount of large wood remaining in the lake is relatively low (about 22 pieces). These old logs and branches are valuable for fish and wildlife habitat. Shoreline changes, such as armoring and loss of vegetation, leave the lake susceptible to pollution from the watershed, eliminate the buffer of native vegetation that can filter out pollution, and limit the amount of habitat available for fish and wildlife.

SUMMARY

Trophic State

Based on low to moderate water clarity and moderately high phosphorus and chlorophyll *a* concentrations, Lost Lake may be classified as meso-eutrophic. The lake is moderately productive of aquatic plants and algae.

Condition and Trends

The water quality targets for Lost Lake set forth in the 2003 State of the Lakes Report were to maintain stable long-term water clarity and to reduce phosphorus levels. The lake is meeting the target of maintaining stable water clarity. The long-term average water clarity has changed very little in recent years.

However, there have been no reductions in phosphorus concentrations. In fact, there has been a statistically significant increase in summer averages for phosphorus in the upper waters, with the long-term average increasing from 13 to 18 µg/l since 2003. Although there has been no significant trend in summer averages in the bottom waters, the long-term average in the hypolimnion has increased from 86 to 131 µg/l since 2003. Increased phosphorus in the hypolimnion indicates a release of nutrients from bottom sediments during times of low dissolved oxygen. Excess nutrients in the upper and lower waters are likely signs of accelerated eutrophication that may begin showing up in nuisance algal growth and reduced water clarity.

Overall, Lost Lake is still in satisfactory condition. However, the lake is at risk of future water quality declines if phosphorus levels continue to rise. The primary threat to lake water quality is an increase of nutrients entering the lake through new development and human activities in the watershed. Nutrients enter the lake through stormwater runoff from the watershed. Sources of nutrients include fertilizers, pet wastes, and erosion from construction and land clearing. Nutrients may also directly enter the lake through poorly maintained septic systems. Measures to control nutrients in the watershed should be taken now to prevent any future negative impacts to the lake. To find out more about ways to protect lake water quality and information on the causes and problems of elevated lake nutrient levels visit www.lakes.surfacewater.info.

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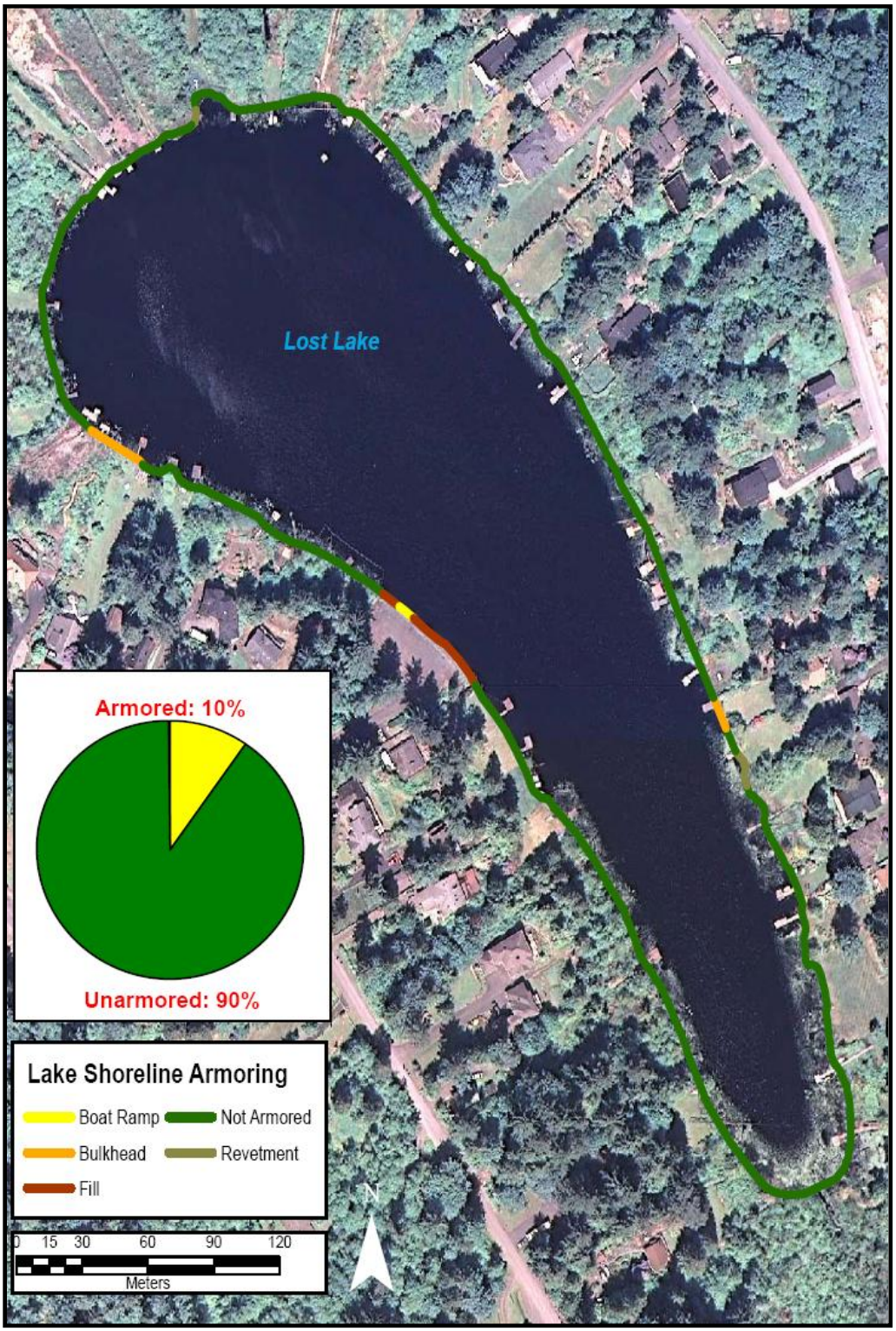
Lost Lake
Armored: 10%
Unarmored: 90%
Lake Shoreline Armoring
Boat Ramp
Not Armored
Bulkhead
Revetment
Fill
0 15 30 60 90 120
Meters
N

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DATA SUMMARY FOR LOST LAKE					
		Water Clarity (Secchi depth	**Total Phosphorus (*ug*/l)**		**Chlorophyll *a* (*ug*/l)**
Source	**Date**	**in meters)**	**Surface**	**Bottom**	**Epilimnion**
Bortleson, et al, 1976	**8/3/73**	2.1	11	49	-
Volunteer	**1992**	1.2 - 2.7 (1.7) *n = 8*	-	-	-
Volunteer	**1993**	0.4 - 1.4 (0.9) *n = 14*	-	-	-
SWM Staff or Volunteer	**1994**	1.8 - 3.2 (2.5) *n = 10*	-	-	4.3 - 8.8 (6.6) *n = 2*
SWM Staff or Volunteer	**1995**	1.6 - 2.3 (1.9) *n = 6*	-	-	10
SWM Staff, Volunteer or DOE	**1996**	1.5 - 2.2 (1.9) *n = 12*	10 - 21 (16) *n = 2*	43 - 89 (66) *n = 2*	5.4 - 8.3 (6.9) *n = 2*
SWM Staff or Volunteer	**1997**	1.1 - 2.3 (1.6) *n = 9*	11 - 20 (16) *n = 2*	38 - 112 (75) *n = 2*	-
SWM Staff or Volunteer	**1998**	1.2 - 2.2 (1.7) *n = 11*	10 - 20 (15) *n = 4*	105 - 159 (134) *n = 4*	-
SWM Staff or Volunteer	**1999**	1.7 - 2.5 (2.1) *n = 11*	10 - 26 (19) *n = 4*	31- 107 (61) *n = 4*	-
SWM Staff or Volunteer	**2000**	2.1 - 3.8 (2.7) *n = 8*	6 - 17 (12) *n = 4*	58 -200 (123) *n = 4*	-
SWM Staff or Volunteer	**2001**	1.7 - 2.4 (2.0) *n = 6*	12 - 23 (17) *n = 4*	44 - 133 (92) *n = 4*	
SWM Staff	**2002**	2.2 - 2.9 (2.5) *n = 4*	10 - 16 (14) *n = 4*	11 - 99 (53) *n = 4*	3.2 - 8.5 (5.8) *n = 4*
SWM Staff	**2003**	1.4 - 2.7 (2.2) *n = 4*	10 - 42 (21) *n = 4*	110 - 243 (183) *n = 4*	3.5 - 30 (11) *n = 4*
SWM Staff or Volunteer	**2004**	1.8 - 2.4 (2.1) *n = 5*	13 - 23 (18) *n = 4*	16 - 282 (141) *n = 4*	3.7 - 7.7 (6.2) *n = 4*
SWM Staff or Volunteer	**2005**	1.3 - 2.2 (1.6) *n = 4*	11 - 23 (17) *n = 4*	31 - 140 (70) *n = 4*	3.5 - 18 (11) *n = 4*

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DATA SUMMARY FOR LOST LAKE					
		Water Clarity (Secchi depth	**Total Phosphorus (*ug*/l)**		**Chlorophyll *a* (*ug*/l)**
Source	**Date**	**in meters)**	**Surface**	**Bottom**	**Epilimnion**
Volunteer	**2006**	1.6 - 1.8 (1.6) *n = 4*	15 - 19 (17) *n = 4*	16 - 27 (21) *n = 4*	5.9 - 13 (8.8) *n = 4*
SWM Staff	**2007**	1.9 - 2.8 (2.3) *n = 4*	13 - 29 (22) *n = 4*	138 - 455 (318) *n = 4*	6.9 - 28 (15) *n = 4*
SWM Staff	**2008**	1.7 - 2.3 (2.0) *n = 3*	16 - 23 (19) *n = 3*	85 - 474 (265) *n = 3*	7.4 - 17 (11) *n = 3*
SWM Staff or Volunteer	**2009**	1.5 - 3.2 (2.3) *n = 9*	16 - 22 (20) *n = 4*	49 - 420 (197) *n = 4*	2.1 - 4.8 (3.5) *n = 4*
SWM Staff or Volunteer	**2010**	1.4 - 2.5 (2.0) *n = 9*	16 - 31 (22) *n = 4*	72 - 235 (160) *n = 4*	4.8 - 12 (7.6) *n = 4*
Long Term Avg		**2.0** **(1992-2010)**	**18** **(1996-2010)**	**131** **(1996-2010)**	**8.9** **(2002-2010)**
TRENDS		**None**	**Increasing**	**None**	**None**

NOTES

- Table includes summer (May-Oct) data only.
- Each box shows the range on top, followed by summer average in ( ) and number of samples (*n*).
- Total phosphorus data are from samples taken at discrete depths only.
- DOE = Washington Department of Ecology
- "Surface" samples are from 1 meter depth and "bottom" samples are from 1-2 meters above the bottom.