LAKE WAGNER

REPORT DESCRIPTION

This report is an annual update to the 2003 State of the Lakes Report that includes water quality data collected from 2003 through 2009. For additional background on the information provided here or to find out more about Lake Wagner visit www.lakes.surfacewater.info or call Snohomish County Surface Water Management (SWM) at 425-388-3464.

LAKE DESCRIPTION

Lake Wagner is a 21-acre lake located three miles northeast of Monroe. The lake outlet flows south to Woods Creek and the Skykomish River. The lake is relatively shallow, with a maximum depth of 6.7 meters (22 feet) and an average depth of 4.0 meters (13 feet).

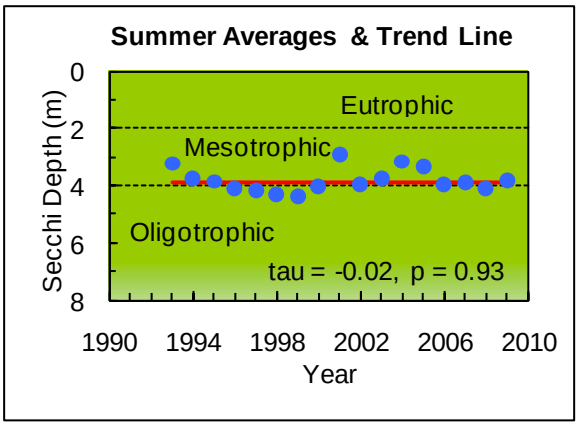
Much of the shoreline of Lake Wagner is still covered with native vegetation. About a dozen homes on large lots surround the lake. The watershed of the lake is relatively large—almost 18 times the size of the lake—which means there is more potential for pollution to affect lake water quality than at lakes with small watersheds.

LAKE CONDITIONS

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

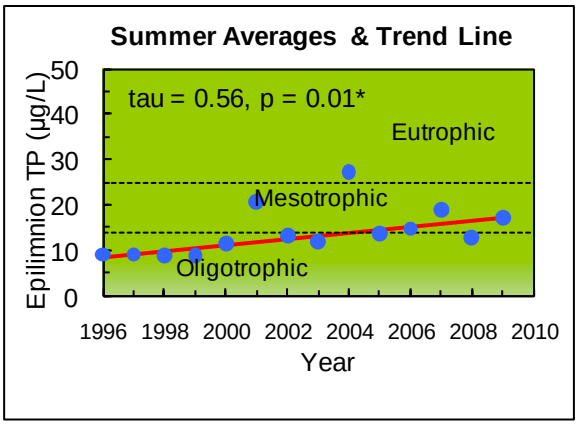
Water Clarity

Water clarity in Lake Wagner is moderate, with a long-term 1993 - 2009 summer average of 3.8 meters. There is no evidence of any trend in water clarity, but the summer averages have varied considerably from year to year. The highest average on record was 4.4 meters in 1999; the lowest was 2.9 meters in 2001.



Total Phosphorus (key nutrient for algae)

Total phosphorus concentrations in the epilimnion (upper waters) are low to moderate, with a long-term summer average of 14 µg/l. Between 1996 and 2009 there has been a steady, and statistically significant, increase in phosphorus levels in the epilimnion. In 2004, the summer average was nearly twice the long-term average. More phosphorus can result in increasing algal growth and may be a sign of accelerated eutrophication.



Summertime phosphorus levels in the hypolimnion (bottom waters) are higher. The long-term summer average is 52 µg/l. Values in recent years have been much higher than the 10 µg/l average recorded in 1996. Although the concentrations are highly variable from year to year, phosphorus appears to be increasing over

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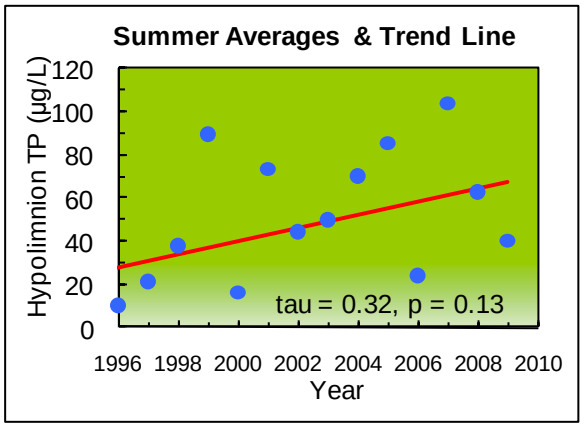
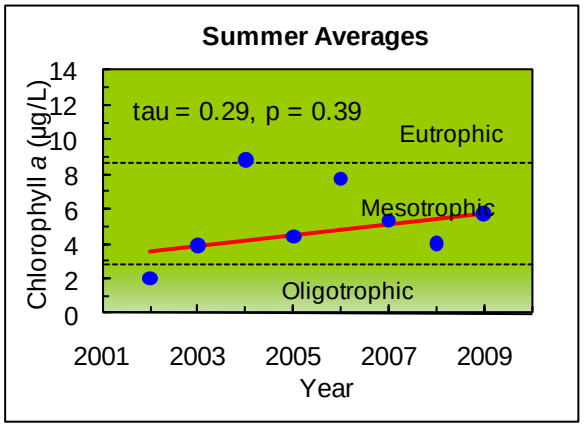
time. However, this trend is not yet statistically significant. Higher phosphorus in the hypolimnion comes, in part, from releases of phosphorus built up in the bottom sediments. This phosphorus can lead to more algal growth in the lake and is a sign of increasing eutrophication.



Chlorophyll a (Algae)

Chlorophyll *a* values showed moderate algal growth in the summers of 2002 through 2009, with a long-term summer average of 5.2 µg/l. Although the period of record is too short to determine any real trends, it appears that algal growth may be increasing. The averages in 2004 and 2006 were substantially higher than other years, primarily because of dense algal blooms occurring each summer.



SHORELINE CONDITION

The Lake Wagner shoreline was surveyed in 2008 (see map on page 4). The condition of the lake shoreline is important to understanding overall lake health. As development on a lake increases, lake shorelines typically are modified either 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 because natural shorelines protect the lake from harmful pollution, prevent bank erosion, and provide important habitat for fish and wildlife.

Lake Wagner still has a relatively undeveloped shoreline. Surveys conducted in the mid-90s identified 11 homes bordering the lake. Although homes were not surveyed in 2008, there have not been any significant changes. There were 6 docks counted around the lake shore. Approximately 17% of the shoreline has been armored with revetments or fill, which is lower than at many other lakes in the County. The majority (66%) of the shoreline was also bordered by intact vegetation in 2008. Intact vegetation means there is a significant amount of native grasses, shrubs, or trees bordering the lake. There is also a relatively high amount of large wood still remaining in the lake (about 79 pieces). These old logs and branches are valuable for fish and wildlife habitat.

Maintaining and improving the state of the shoreline is important to protecting the water quality of Lake Wagner. The buffer of shoreline vegetation, in particular, reduces pollution sources, filters out pollution before it reaches the lake, protects the shoreline from erosion, and provides valuable aquatic habitat for fish and wildlife.

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SUMMARY

Trophic State

Based on moderate water clarity and moderate phosphorus and chlorophyll *a* concentrations, Lake Wagner may be classified as mesotrophic. The lake is moderately productive of plants and algae.

Condition and Trends

The water quality targets for Lake Wagner set forth in the 2003 State of the Lakes Report were to maintain stable water clarity and total phosphorus levels. The lake is not quite meeting the water clarity target because the long-term average has declined from 3.9 meters to 3.8 meters.

Similarly, the lake is not meeting the phosphorus targets in the upper or lower waters. The long-term phosphorus concentrations have increased from 12 to 14 µg/l in the upper waters and from 50 to 52 µg/L in the lower waters. There is also a statistically significant increasing trend in summer average phosphorus concentrations in the upper waters. These increases suggest that more nutrients may be entering the lake from the watershed and are warning signs of future problems.

Overall, Lake Wagner appears to be at risk of future water quality declines. Human activities in the watershed are likely the primary sources of elevated phosphorus levels in the lake. Phosphorus enters the lake through stormwater runoff. Sources of phosphorus include fertilizers, pet wastes, runoff from roofs and driveways, and soil erosion from land clearing and construction. Phosphorus 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 the causes and problems of increased phosphorus levels and for tips to improve lake water quality please visit www.lakes.surfacewater.info.

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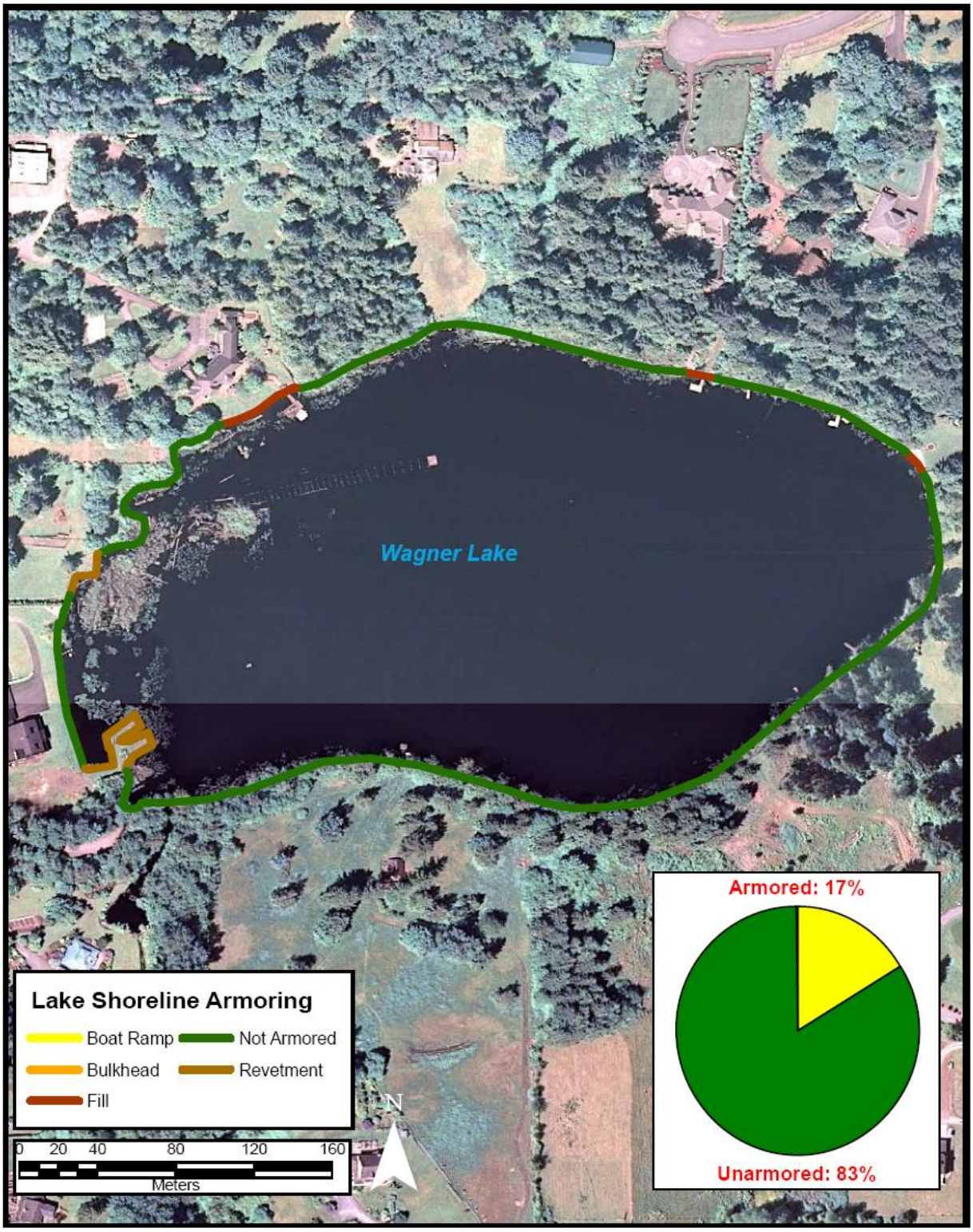
Wagner Lake
Lake Shoreline Armoring
Boat Ramp
Not Armored
Bulkhead
Revetment
Fill
0 20 40 80 120 160
Meters
N
Armored: 17%
Unarmored: 83%

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DATA SUMMARY FOR LAKE WAGNER					
		Water Clarity (Secchi depth	Total Phosphorus (*ug*/l)		Chlorophyll *a* (*ug*/l)
Source	**Date**	**in meters)**	**Surface**	**Bottom**	**Epilimnion**
Sumioka and Dion, 1985	**7/7/81**	3.0	10	<10	6.6
Volunteer	**1993**	2.7 - 3.9 (3.2) *n = 8*	-	-	-
SWM Staff or Volunteer	**1994**	2.9 - 4.9 (3.8) *n = 7*	-	-	2.6 - 2.9 (2.8) *n = 2*
SWM Staff or Volunteer	**1995**	3.3 - 4.7 (3.9) *n = 4*	-	-	3.2
SWM Staff	**1996**	3.2 - 5.0 (4.1) *n = 2*	3 - 15 (9) *n = 2*	8 - 12 (10) *n = 2*	-
SWM Staff	**1997**	3.7 - 4.7 (4.2) *n = 2*	7 - 11 (9) *n = 2*	20 - 22 (21) *n = 2*	-
SWM Staff or Volunteer	**1998**	4.0 - 5.0 (4.3) *n = 9*	6 - 13 (9) *n = 4*	14 - 65 (38) *n = 4*	-
SWM Staff or Volunteer	**1999**	4.0 - 4.9 (4.4) *n = 9*	8 - 10 (9) *n = 4*	63 - 145 (90) *n = 4*	-
SWM Staff	**2000**	3.9 - 4.2 (4.1) *n = 4*	5 - 16 (12) *n = 4*	6 - 22 (16) *n = 4*	-
SWM Staff	**2001**	1.8 - 3.4 (2.9) *n = 4*	11 - 42 (21) *n = 4*	51 - 127 (74) *n = 4*	-
SWM Staff	**2002**	3.4 - 4.6 (4.0) *n = 4*	7 - 18 (13) *n = 4*	35 - 62 (45) *n = 4*	1.6 - 2.7 (2.0) *n = 4*
SWM Staff	**2003**	3.1 - 4.1 (3.8) *n = 4*	7 - 17 (12) *n = 4*	17 - 68 (50) *n = 4*	1.9 - 8.5 (3.9) *n = 4*
SWM Staff or Volunteer	**2004**	2.2 - 4.1 (3.2) *n = 4*	13 - 47 (27) *n = 4*	36 - 108 (70) *n = 4*	2.1 - 27 (8.8) *n = 4*
SWM Staff or Volunteer	**2005**	2.6 - 4.0 (3.3) *n = 4*	9 - 18 (14) *n = 4*	27 - 173 (85) *n = 4*	2.7 - 6.7 (4.4) *n = 4*
SWM Staff	**2006**	3.7 - 4.3 (4.0) *n = 4*	10 - 23 (15) *n = 4*	16 - 43 (24) *n = 4*	3.2 - 19 (7.8) *n = 4*
SWM Staff	**2007**	3.3 - 4.7 (3.9) *n = 4*	14 - 28 (19) *n = 4*	45 - 181 (104) *n = 4*	3.7 - 6.4 (5.3) *n = 4*
SWM Staff or Volunteer	**2008**	3.7 - 4.5 (4.1) *n = 8*	8 - 16 (13) *n = 3*	29 - 116 (63) *n = 3*	1.6 - 8.0 (4.0) *n = 3*

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DATA SUMMARY FOR LAKE WAGNER					
		Water Clarity (Secchi depth	Total Phosphorus (*ug*/l)		Chlorophyll *a* (*ug*/l)
Source	**Date**	**in meters)**	**Surface**	**Bottom**	**Epilimnion**
SWM Staff or Volunteer	**2009**	3.3 - 4.3 (3.8) n = 5	13 - 26 (17) n = 4	33 - 50 (40) *n = 4*	4.0 - 9.3 (5.7) *n = 4*
Long Term Avg		**3.8** **(1993-2009)**	**14** **(1996-2009)**	**52** **(1996-2009)**	**5.2** **(2002-2009)**
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.
- "Surface" samples are from 1 meter depth and "bottom" samples are from 1-2 meters above the bottom.