

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 2010. 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).

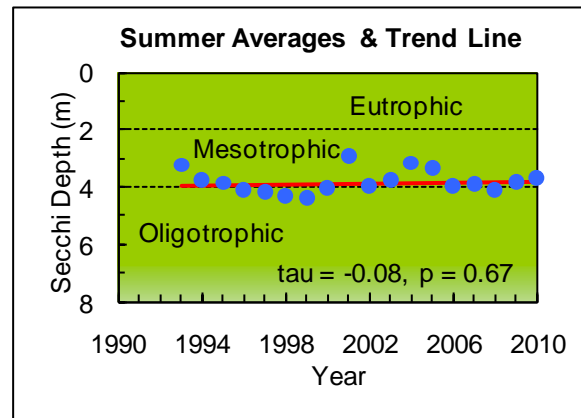
Much of the shoreline of Lake Wagner is still covered with native vegetation. About a dozen homes on large lots surround the lake. The watershed of the lake is relatively large—almost 18 times the size of the lake—which means there is more potential for pollution to affect lake water quality than at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

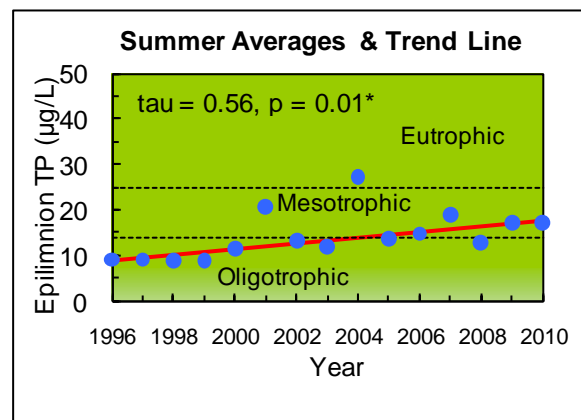
Water Clarity

Water clarity in Lake Wagner is moderate, with a long-term 1993 - 2010 summer average of 3.8 meters. Except for a few years, the summer averages have been fairly consistent 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)

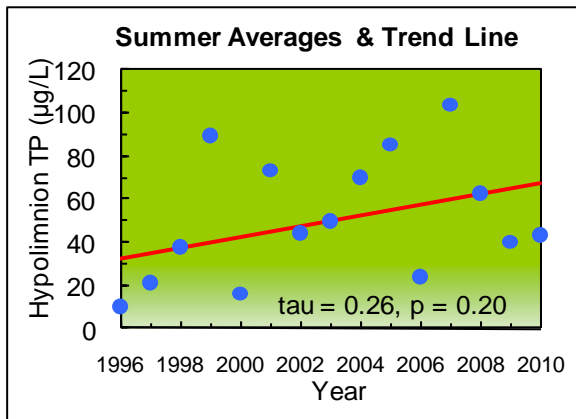
Total phosphorus concentrations in the epilimnion (upper waters) are low to moderate, with a long-term summer average of 14 µg/l. Between 1996 and 2010 there has been a steady, and statistically significant, increase in phosphorus levels in the epilimnion. In 2004, the summer average was nearly twice the long-term average. More phosphorus can result in increasing algal growth and may be a sign of accelerating eutrophication.



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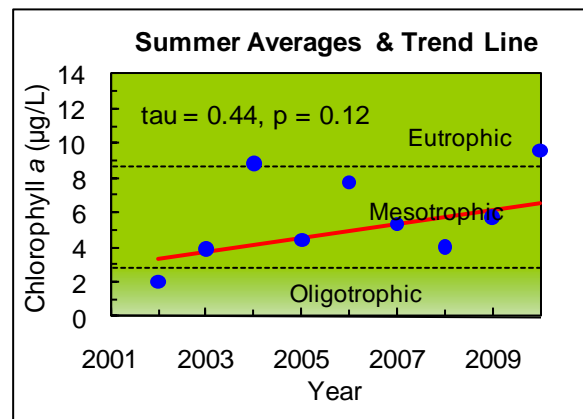
Summertime phosphorus levels in the hypolimnion (bottom waters) are higher and much more variable. The long-term 1996 – 2010 summer average is 52 µg/l. In spite of the variations from year to year, phosphorus concentrations in the bottom waters appear to be increasing over time. The long-term average has increased from the 42 µg/l that was reported in the 2003 [State of the Lakes Report](#) to 52 µg/l currently. However, because of the yearly variability, this trend is not yet considered statistically significant.

Higher phosphorus in the hypolimnion comes, in part, from releases of phosphorus built up in the bottom sediments. This phosphorus can eventually 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 2010, with a long-term summer average of 5.7 µg/l. It appears that chlorophyll a levels may be increasing over time. The 2010 summer average of 9.6 µg/l was the highest on record and is in the eutrophic range, meaning it is similar to algae levels in nutrient-enriched lakes. However, overall between 2002 and 2010, there is not yet a statistically significant trend toward increasing algae. Lake Wagner does experience dense blooms of blue-green algae many summers.



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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.

SUMMARY

Trophic State

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

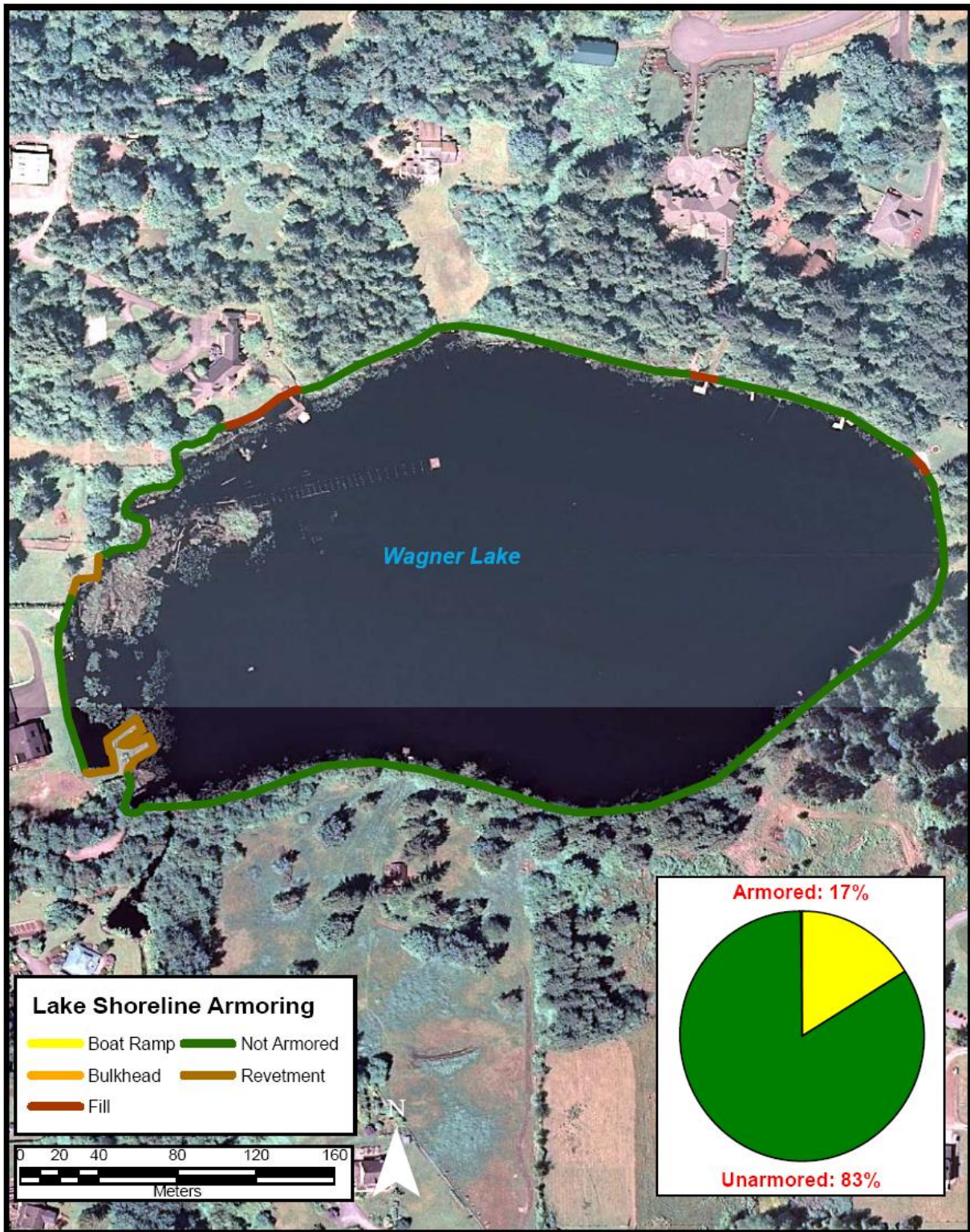
Condition and Trends

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 42 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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DATA SUMMARY FOR LAKE WAGNER					
Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)		Chlorophyll a (ug/l)
			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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Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)		Chlorophyll a (ug/l)
			Surface	Bottom	Epilimnion
SWM Staff or Volunteer	2009	2.9 - 4.3 (3.7) n = 6	13 - 26 (17) n = 4	33 - 50 (40) n = 4	4.0 - 9.3 (5.7) n = 4
SWM Staff or Volunteer	2010	3.1 - 4.6 (3.9) n = 5	8 - 28 (17) n = 4	26 - 79 (44) n = 4	2.7 - 26 (9.6) n = 4
Long Term Avg		3.8 (1993-2010)	14 (1996-2010)	52 (1996-2010)	5.7 (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.
- "Surface" samples are from 1 meter depth and "bottom" samples are from 1-2 meters above the bottom.