LAKE STICKNEY

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 Lake Stickney visit www.lakes.surfacewater.info or call Snohomish County Surface Water Management (SWM) at 425-388-3464.

LAKE DESCRIPTION

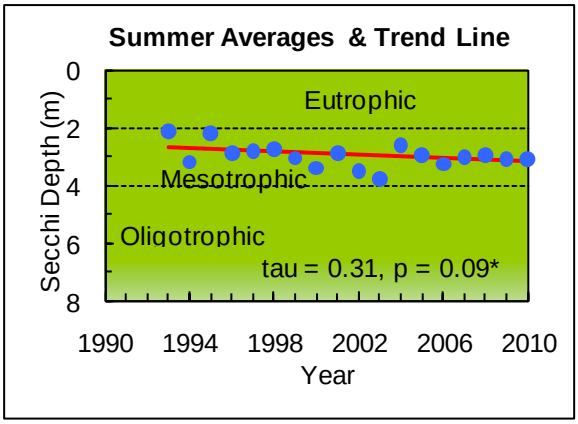
Lake Stickney is a 25-acre lake located between Interstate 5 and Highway 99 south of Everett. The lake has a maximum depth of 10.4 meters (34 feet) and an average depth of 4.6 meters (15 feet). The lake lies in the headwaters of Swamp Creek, which flows through the lake from the north to the west and eventually empties into the Sammamish River and Lake Washington. The watershed feeding the lake is very large—over 100 times the size of the lake—which means there is a high potential for pollution impacts from the watershed. About 2/3 of the lake shoreline is developed with single family homes, while the west and northwest shores are bordered by large wetlands. Recent proposed developments near the lake may impact water quality unless measures are taken to control nutrients.

LAKE CONDITIONS

The following graphs illustrate the summer averages and trend lines (in red) for water clarity, total phosphorus, and chlorophyll *a* for Lake Stickney. 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 Stickney is moderate, with a long-term summer average of 3.0 meters. From 1993 through 2010, there has been a small trend towards improving water clarity. With the addition of the 2009 and 2010 data, this trend is statistically significant. Potential explanations of the improving clarity include less sediment and algae in the lake (although the chlorophyll *a* data do not indicate lower algae levels), changes in the natural color of the water, or changes in monitoring procedures. The water clarity is affected by the naturally dark color of the water. The color comes from humic substances in the surrounding wetlands and does not affect water quality.



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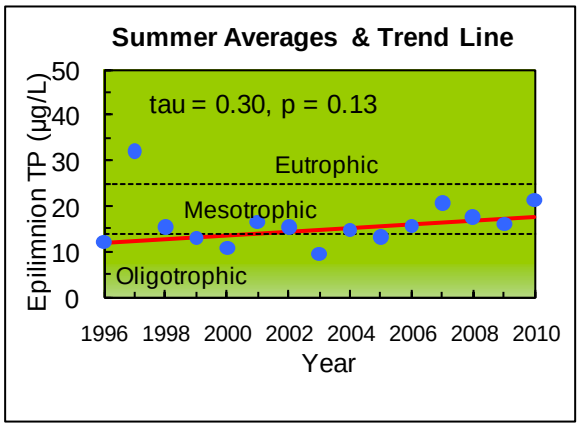
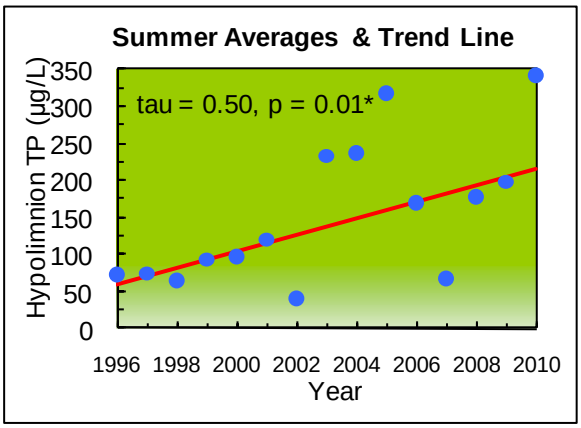
Total Phosphorus (key nutrient for algae)

Total phosphorus concentrations in the epilimnion (upper waters) of Lake Stickney are moderate. The 1996 – 2010 long-term summer average for the epilimnion is 16 µg/l. Excluding the high concentrations in 1997, the graph suggests that summer phosphorus averages are slowly but steadily increasing. However, there is not yet a statistically significant trend toward increasing phosphorus. If more phosphorus is washing into the lake, this can lead to increased algae and can be a sign of accelerating eutrophication.



In contrast, the summertime phosphorus averages in the hypolimnion (bottom waters) are high and clearly increasing. The long-term 1996 to 2010 summer average is 154 µg/l. Averages from 2003 through 2005 were elevated, and the 2010 average of 342 µg/l is the highest on record. Overall, there is a statistically significant trend toward increasing phosphorus in the hypolimnion of Lake Stickney. The increase in phosphorus in the bottom waters is likely a sign of on-going nutrient pollution from the large watershed. The nutrients build up in bottom sediments and are released during the summer period of low dissolved oxygen. Increased nutrient levels may lead to increased algal growth and are another sign of accelerating lake eutrophication.



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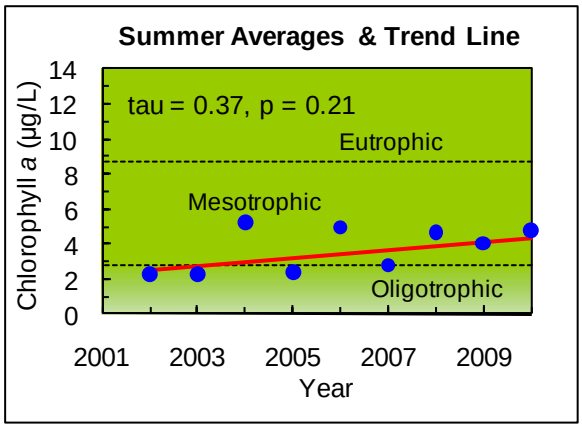
Chlorophyll a (Algae)

Chlorophyll *a* values in Lake Stickney from 2002 to 2010 are low to moderate, with a long term summer average of 3.7 µg/l. The averages are variable from year to year, likely in response to more substantial algal blooms in some years. There is no statistically significant trend in chlorophyll *a* levels, but recent years have been generally higher. The dark color of the water does reduce the availability of light for algal growth and limits the amount of algae found in Lake Stickney. If phosphorus levels in the bottom waters and in the upper waters continue to increase, more algal growth can be expected in future years.



SHORELINE CONDITION

The Lake Stickney shoreline was surveyed in 2008 (see map on page 4). The condition of the lake shoreline is important to understanding overall lake health. Frequently, lake shorelines are modified through removal of natural vegetation and the installation of bulkheads or other hardening structures. These types of alterations 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.

The Lake Stickney shoreline is moderately developed, with more development proposed. There were 33 homes or cabins around the lake shore in 1973. By the mid-90s, there were 45 homes bordering the lake. Homes were not counted in 2008. The survey did identify 33 docks around the lake.

Compared to many other suburban lakes, the shoreline of Lake Stickney has limited structural modifications. Only 4% of the shoreline has been altered with bulkheads and earthen fill. In addition, the zone of native vegetation immediately adjacent to the shoreline is still mostly intact, with 78% supporting native grasses, shrubs, and trees. Limiting shoreline modifications is important for the health of the lake. Shoreline changes 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. The loss of native vegetation along the shoreline can also lead to shoreline erosion.

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SUMMARY

Trophic State

Lake Stickney may be classified as meso-eutrophic, with moderate water clarity, moderate to high phosphorus, and low to moderate productivity of plants and algae. This is likely the natural state for this relatively shallow lake, and it is important to prevent any further enrichment.

Condition and Trends

The water quality targets for Lake Stickney set forth in the 2003 State of the Lakes Report were to maintain stable water clarity and reduce phosphorus levels. The lake is currently meeting the target for water clarity. There has been a small, but statistically significant, improvement in water clarity since 1993.

In contrast, phosphorus levels appear to be increasing. In the epilimnion, there is no statistical trend, but the values are higher in recent years than in the past. In the hypolimnion, there is a statistically significant and strong trend toward higher phosphorus concentrations. These changes are likely signs of increasing eutrophication that may lead to impaired water quality in the future.

Overall, Lake Stickney is in satisfactory condition. However, the lake is at risk of future water quality declines as indicated by the increasing phosphorus levels. The primary threat to lake water quality is an increase of nutrients entering the lake through new development and from human activities in the watershed. Nutrients enter the lake mainly through stormwater runoff. Sources of nutrients include fertilizers, pet wastes, runoff from roofs and driveways, and sediment from land clearing and construction. 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 the causes and problems of elevated lake nutrient levels and tips to protect lake water quality please visit www.lakes.surfacewater.info.

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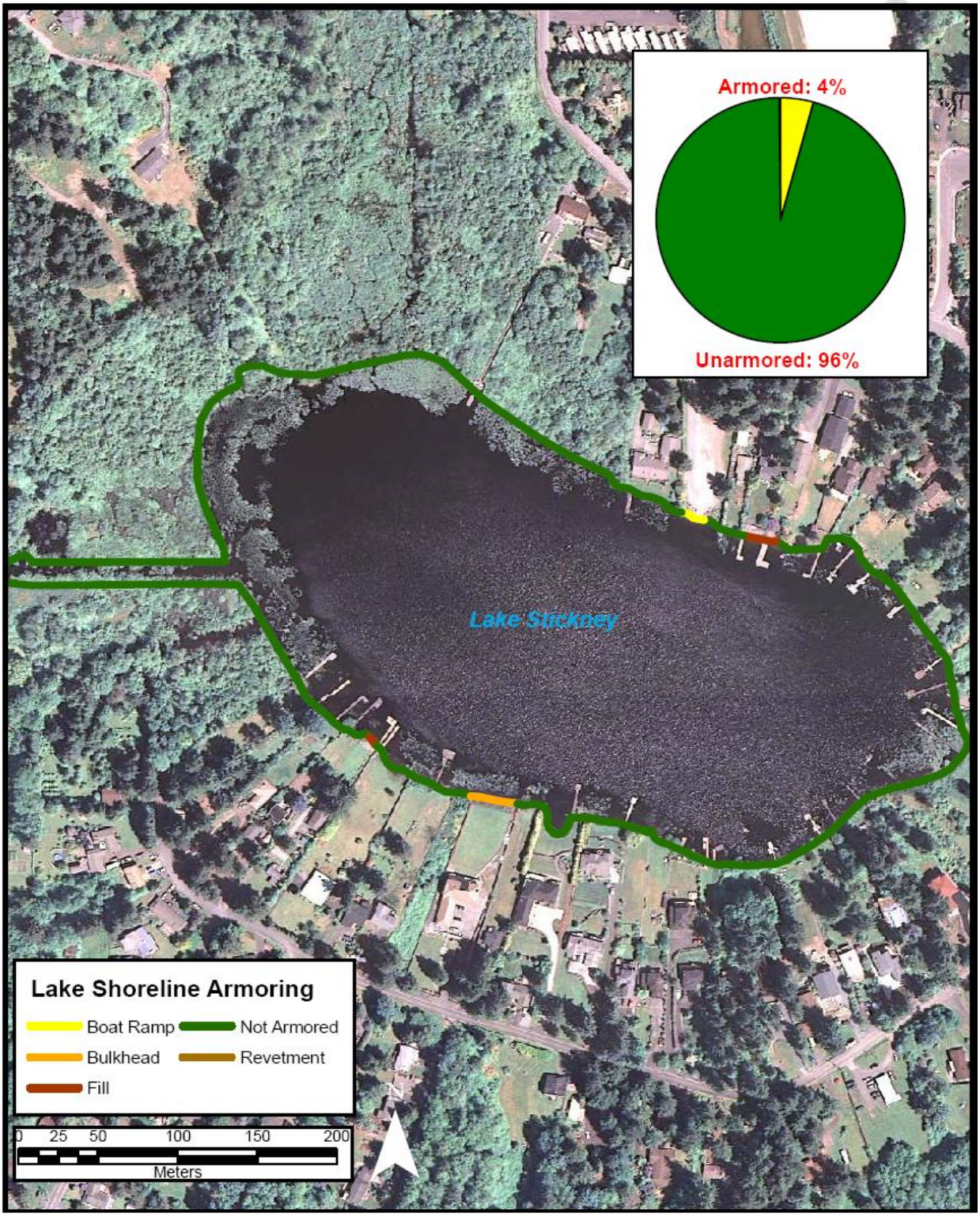

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DATA SUMMARY FOR LAKE STICKNEY					
		Water Clarity (Secchi depth	**Total Phosphorus (*u*g/l)**		**Chlorophyll *a* (*u*g/l)**
Source	**Date**	**in meters)**	**Surface**	**Bottom**	**Epilimnion**
Bortleson, et al, 1976	**7/25/73**	2.1	16	22	-
Sumioka and Dion, 1985	**7/1/81**	2.1	20	40	2.1
Volunteer	**1993**	1.9 - 2.6 (2.1) *n = 3*	-	-	-
SWM Staff	**1994**	2.4 - 4.1 (3.2) *n = 2*	-	-	3.7 - 5.3 (4.5) *n = 2*
SWM Staff or Volunteer	**1995**	1.7 - 2.8 (2.2) *n = 11*	-	-	12
SWM Staff or Volunteer	**1996**	2.6 - 3.2 (2.9) *n = 8*	7 - 17 (12) *n = 2*	58 - 86 (72) *n = 2*	-
SWM Staff or Volunteer	**1997**	2.3 - 3.4 (2.8) *n = 8*	31 - 33 (32) *n = 2*	43 - 105 (74) *n = 2*	-
Volunteer	**1998**	2.3 - 3.4 (2.7) *n = 7*	12 - 19 (15) *n = 4*	34 - 121 (65) *n = 4*	-
Volunteer	**1999**	2.6 - 3.4 (3.1) *n = 7*	11 - 16 (13) *n = 4*	29 - 136 (93) *n = 4*	-
Volunteer	**2000**	2.9 - 4.0 (3.4) *n = 7*	6 - 15 (11) *n = 4*	17 - 146 (97) *n = 4*	-
Volunteer	**2001**	2.2 - 3.5 (2.9) *n = 7*	13 - 19 (17) *n = 4*	79 - 235 (120) *n = 4*	-
Volunteer	**2002**	2.5 - 3.9 (3.5) *n = 5*	12 - 19 (15) *n = 4*	23 - 60 (41) *n = 4*	0.1 - 4.8 (2.3) *n = 4*
SWM Staff or Volunteer	**2003**	3.0 - 4.4 (3.8) *n = 10*	8 - 11 (10) *n = 4*	85 - 344 (233) *n = 4*	0.8 - 3.3 (2.3) *n = 4*
SWM Staff or Volunteer	**2004**	1.6 - 4.0 (2.6) *n = 12*	13 - 16 (15) *n = 4*	170 - 269 (236) *n = 4*	1.6 - 14 (5.2) *n = 4*
SWM Staff or Volunteer	**2005**	2.5 - 3.5 (3.0) *n = 7*	11 - 16 (13) *n = 4*	132 - 556 (317) *n = 4*	1.6 - 3.2 (2.4) *n = 4*
SWM Staff or Volunteer	**2006**	2.6 - 4.1 (3.3) *n = 9*	12 - 22 (16) *n = 4*	95 - 285 (170) *n = 4*	1.6 - 8.0 (5.0) *n = 4*

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DATA SUMMARY FOR LAKE STICKNEY					
		Water Clarity (Secchi depth	**Total Phosphorus (*ug*/l)**		**Chlorophyll *a* (*ug*/l)**
Source	**Date**	**in meters)**	**Surface**	**Bottom**	**Epilimnion**
SWM Staff or Volunteer	**2007**	2.7 - 3.7 (3.0) *n = 11*	9 - 43 (21) *n = 4*	21 - 116 (67) *n = 4*	2.1 - 4.3 (2.8) *n = 4*
SWM Staff or Volunteer	**2008**	2.4 - 3.9 (3.0) *n = 12*	11 - 27 (18) *n = 3*	59 - 338 (178) *n = 3*	3.7 - 6.4 (4.7) *n = 4*
SWM Staff or Volunteer	**2009**	2.4 - 4.1 (3.1) *n = 9*	8 - 22 (16) *n = 4*	107 - 354 (198) *n = 4*	2.4 - 5.3 (4.1) *n = 4*
SWM Staff or Volunteer	**2010**	2.4 - 4.2 (3.1) *n = 11*	15 - 35 (21) *n = 4*	233 - 445 (342) *n = 4*	3.2 - 6.4 (4.8) *n = 4*
Long Term Avg		**3.0** **(1993-2010)**	**16** **(1996-2010)**	**154** **(1996-2010)**	**3.7** **(2002-2010)**
TRENDS		**Increasing**	**None**	**Increasing**	**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.