

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

LAKE DESCRIPTION

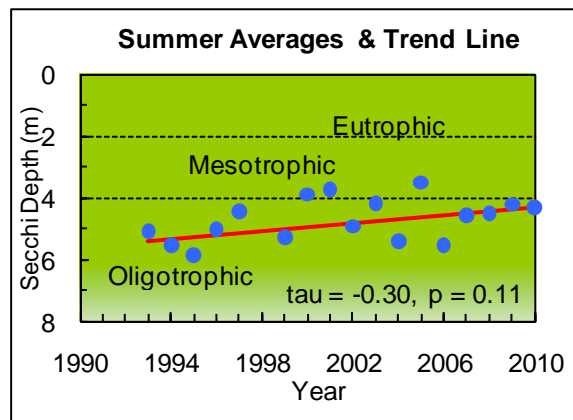
Nina Lake is a 14-acre, man-made lake located just west of I-5 and north of the Tulalip Reservation. The lake is fed primarily by groundwater and drains into the west fork of Quilceda Creek. The Nina Lake watershed is very small; it consists of only the homes and streets that immediately encircle the lake. The 2003 bathymetric map shows that the lake has a maximum depth of 12.5 meters (41 feet) in the west basin, and only 5.2 meters (17 feet) in the east basin. The two basins are distinctive, with few aquatic plants in the west basin and dense aquatic plants and more algae in the east basin.

LAKE CONDITIONS

The following graphs illustrate the summer averages and trend lines (in red) for water clarity and total phosphorus for Nina Lake. Please refer to the table on the third page for long-term averages and for averages and ranges for individual years.

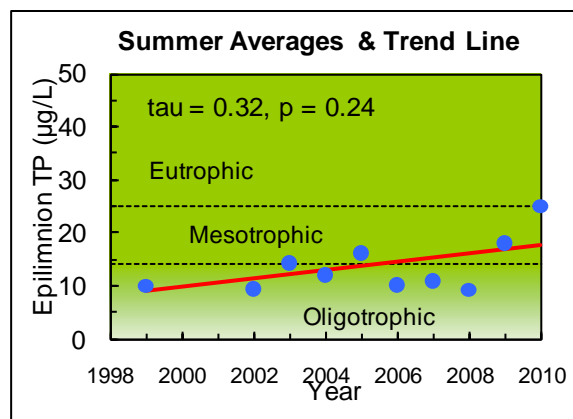
Water Clarity

Water clarity in Nina Lake (measured in the west basin) is moderate to high. The 1993 – 2010 long-term summer average is 4.7 meters. Although there is not yet a statistically significant trend, it appears that water clarity may be gradually getting poorer. The water clarity is also quite variable from year to year, and there is a wide range of water clarity readings within a single summer. For example, water clarity measurements ranged from 1.4 meters to 5.8 meters in 2009 and from 3.2 to 5.3 meters in 2010. This variability is likely in response to the amount of algae in the lake. Also, it is possible that algae growing in the shallow east basin sometimes drifts into the west basin and affects the water clarity readings. Unfortunately, there are no chlorophyll *a* measurements to document the amount of algal growth.



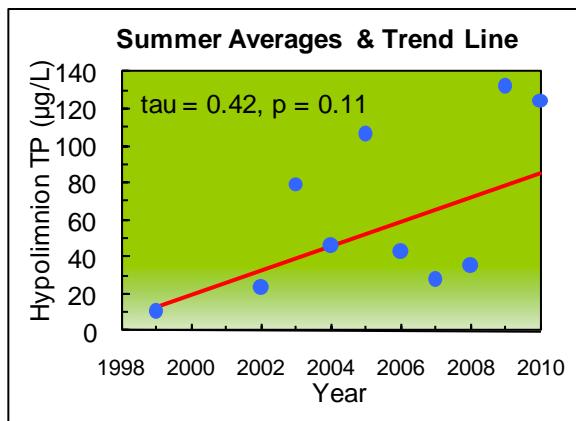
Total Phosphorus (key nutrient for algae)

Total phosphorus concentrations in the epilimnion (upper waters) of the west basin are low to moderate, with no discernible trends. However, the summer average in 2010 was 25 µg/l, the highest on record. The 1999 to 2010 long-term summer average is 14 µg/l. There is also a wide variability in phosphorus measurements through the summer, ranging from 12 to 30 µg/l in 2009 and 12 to 42 µg/l in 2010. If more phosphorus is available, more algal growth will occur, leading to reduced water clarity in the lake.



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Summertime phosphorus levels in the hypolimnion (bottom waters) are higher than in the upper waters, with a long-term summer average of 63 µg/l. The phosphorus levels are also much more variable than in the upper waters, ranging from a low of 13 µg/l in 1999 to a high of 133 µg/l in 2009. The highest phosphorus averages on record occurred in 2009 and 2010. Overall, phosphorus levels in the bottom waters appear to be increasing over time, although this trend is not yet statistically significant. The fluctuations in recent years mirror the changes in total phosphorus in the upper waters and, to a lesser degree, the changes in water clarity.



Chlorophyll a (Algae)

No chlorophyll *a* data are available for Nina Lake, so the levels of algae are unknown. However, periodic algal blooms have been observed in the lake. As mentioned above, the wide variations in water clarity from month to month are probably a result of fluctuating algal levels in the water. It is apparent that there are enough nutrients in the lake water to support nuisance algal growth in Nina Lake.

Aquatic Plants

The east basin of Nina Lake supports dense growth of rooted aquatic plants because of the shallow water. There is a narrow band of aquatic plants around the west basin. Most of the plants are native, primarily elodea and thin-leaf pondweeds. However, since the late 1990s, citizens have been trying to eliminate small

patches of a non-native, invasive plant, parrotfeather milfoil (*Myriophyllum aquaticum*) in the east basin.

In 2010, a new infestation of Eurasian watermilfoil (*Myriophyllum spicatum*) was identified in numerous locations around Nina Lake. This invasive plant spreads by small fragments and is transported from lake to lake by boats and fishing gear. Citizens at Nina Lake are now working with aquatic plant specialists to control the milfoil in the lake. Unless it is controlled, Eurasian watermilfoil has the potential to take over the entire shallow water portions of the lake and severely impact swimming, boating, and fishing.

SHORELINE CONDITION

The shoreline condition of a lake is important in overall lake health. At many lakes, bulkheads or other hardening structures are installed along the shoreline, and the zones of native vegetation by the water are removed. This type of developed shoreline does not protect a lake as well as more natural shorelines.

When Nina Lake was created, it had no natural shorelines around the lake. Fortunately, many land owners have allowed buffers of native vegetation to grow up along the shoreline. However, others cultivate lawns down to the water's edge. Efforts to create and maintain more natural shorelines with native vegetation can reduce the sources of nutrients (such as fertilizers), can help filter out pollution before it reaches the lake, and can provide valuable habitat for fish and wildlife.

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SUMMARY

Trophic State

Based on moderate to high water clarity and low to moderate phosphorus concentrations, the west basin of Nina Lake may be classified as oligo-mesotrophic. In contrast, the eastern basin of the lake supports dense aquatic plants and filamentous algae that create problems for lake users; so this portion of the lake may be classified as meso-eutrophic.

Condition and Trends

One water quality target for Nina Lake set forth in the 2003 State of the Lakes Report was to improve water clarity. Through 2010, water clarity has not improved; in fact, the long-term average is slightly worse (4.7 meters compared to 4.9 meters through 2002), and summer averages may be declining. However, this change is not yet considered a statistically significant trend toward declining water clarity.

Another target for the lake was to maintain stable phosphorus levels. There is no trend in long-term averages in the epilimnion, but the highest averages on record occurred in 2009 and 2010. In addition, phosphorus levels in the hypolimnion have been very high in some years, and the highest averages on record also occurred in 2009 and 2010. There is not yet a statistically significant trend toward increasing phosphorus in the hypolimnion, but it appears that phosphorus levels may be increasing. More phosphorus can lead to more algae in the lake and poorer water conditions.

Overall, Nina Lake appears to be at risk of future water quality declines if decreases in water clarity and increases in phosphorus levels become trends. These changes may be signs of accelerating eutrophication. This is not unexpected in a man-made lake where nutrient levels and plant and algal growth can steadily increase.

In order to protect the condition of the lake, measures to control nutrients around the shoreline should be taken. Nutrients enter the lake through stormwater runoff and can increase in response to new development and human activity. Sources of nutrients include fertilizers, pet wastes, runoff from roofs and paved areas, and erosion from construction and land

clearing. 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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DATA SUMMARY FOR NINA LAKE				
Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus ($\mu\text{g/l}$)	
			Surface	Bottom
Volunteer	1993	4.0 - 6.0 (5.1) $n = 7$	-	-
Volunteer	1994	4.0 - 7.5 (5.5) $n = 9$	-	-
Volunteer	1995	4.1 - 7.7 (5.9) $n = 5$	15	33
Volunteer	1996	4.1 - 5.8 (5.0) $n = 5$	9	20
Volunteer	1997	2.3 - 5.6 (4.5) $n = 3$	-	-
SWM Staff or Volunteer	1999	5.3 (5.3) $n = 2$	8 - 12 (10) $n = 2$	11 - 14 (13) $n = 2$
Volunteer	2000	3.2 - 4.6 (3.9) $n = 2$	-	-
Volunteer	2001	3.5 - 4.0 (3.8) $n = 2$	-	-
Volunteer	2002	2.5 - 5.7 (4.9) $n = 8$	8 - 13 (10) $n = 4$	16 - 37 (24) $n = 4$
Volunteer	2003	2.5 - 6.0 (4.2) $n = 12$	9 - 18 (14) $n = 4$	38 - 152 (79) $n = 4$
Volunteer	2004	5.0 - 6.5 (5.4) $n = 8$	10 - 14 (12) $n = 4$	31 - 67 (47) $n = 4$
Volunteer	2005	2.0 - 4.8 (3.5) $n = 7$	12 - 19 (16) $n = 4$	49 - 159 (107) $n = 4$
SWM Staff or Volunteer	2006	3.9 - 6.5 (5.6) $n = 8$	6 - 19 (10) $n = 4$	39 - 50 (43) $n = 4$
SWM Staff or Volunteer	2007	3.9 - 5.1 (4.6) $n = 6$	9 - 15 (11) $n = 4$	20 - 34 (28) $n = 4$
SWM Staff or Volunteer	2008	4.1 - 4.9 (4.5) $n = 6$	8 - 11 (9) $n = 4$	21 - 61 (36) $n = 4$
SWM Staff or Volunteer	2009	1.4 - 5.8 (4.2) $n = 9$	12 - 30 (18) $n = 3$	66 - 179 (133) $n = 3$

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Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)	
			Surface	Bottom
SWM Staff or Volunteer	2010	3.2 - 5.3 (4.3) <i>n</i> = 6	12 - 42 (25) <i>n</i> = 4	75 - 176 (125) <i>n</i> = 4
Long Term Avg		4.7 (1993-2010)	14 (1999-2010)	63 (1999-2010)
TRENDS		None	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 from 1995-1996 are from **composite samples** taken at varied depths.
- Total phosphorus data from 1999 and later 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.