

Nina Lake

Nina Lake has moderate to high water clarity, low to moderate phosphorus levels, and high plant productivity in shallow areas. Water clarity has declined in recent years, which is a sign of increasing eutrophication. The lake may be at risk of future declines in water quality unless nutrient runoff from the surrounding homes is controlled.

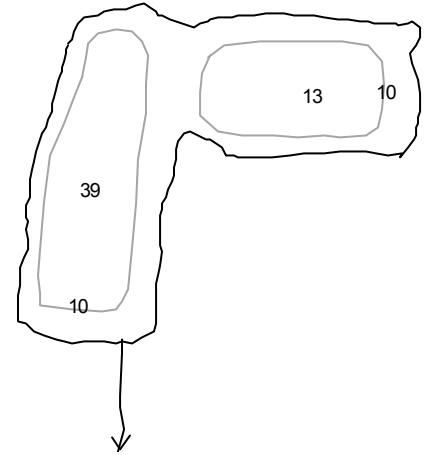


State of the Lakes Report
March 2003

Snohomish County Public Works
Surface Water Management

LAKE AND WATERSHED DATA

Lake Area: 14 acres
 Watershed Area: 36 acres
 Watershed to Lake Area Ratio: 2.3
 Maximum Depth: 39 feet (12.0 meters)
 Average Depth: 24 feet (7.4 meters)
 Lake Volume: 343 acre-feet
 Length of Shore: 0.8 miles



	<u>1974</u>	<u>Mid-90's</u>
# of nearshore homes	1	34
# of homes/1000' of shoreline	0.2	8.4
% of homes with bulkhead or fill		38
% of homes with some native vegetation near shore		56
% of watershed developed (residential or commercial)	5%	60% (est.)



LAKE ASSESSMENT

DESCRIPTION

■ ***Location/Access***— Nina Lake lies west of Interstate 5 just north of the Tulalip Reservation. The lake is man-made—it was excavated in the 1970s for fill material during construction of the freeway. The lake is fed almost exclusively by ground water. An outlet stream flows into the west fork of Quilceda Creek. Nina Lake has no public access.

■ ***Size/Shape***— The surface area of the lake covers 14 acres. The lake is divided into two distinct basins separated by a shallow sill. The east basin is shallow—about 4.0 meters deep—while the larger west basin is relatively deep at 12.0 meters. The overall average depth is about 7.4 meters. The lake volume contains approximately 340 acre-feet of water.

■ ***Watershed***— The watershed of Nina Lake totals just 36 acres and consists of only the homes and streets that immediately encircle the lake. Stream and ditch runoff from outside this area is diverted around the lake. However, ground water from a much larger area may have an influence on the lake. The immediate watershed is only 2.3 times the size of the lake. Such a small watershed means that there should be less potential for surface runoff to bring nutrients and sediment into the lake than at a lake with a large watershed. In 1973, soon after construction of the lake, the immediate watershed was mostly undeveloped, and agricultural activities occupied all the larger surrounding areas. By the mid-90s, the watershed had been subdivided and homes constructed on almost every lot around the lake. This dramatic change has the potential to impact the lake. There are still an abundance of agricultural uses in the area north of the lake watershed.

■ ***Shoreline***— The shoreline of Nina Lake is 0.8 miles long. Around the shore, there was only one home in 1974. In contrast, there were 34 homes by the mid-90s. Approximately 38% of the nearshore homes have modified the shoreline with bulkheads or fill, but 56% of the homes have retained some



native vegetation along the shore. A zone of vegetation is important for filtering pollution.

LAKE CONDITIONS

■ ***Water Clarity***— Water clarity in Nina Lake is moderate to high. Summer averages were generally greater than 5.0 meters from 1993 through 1999, with individual measurements as high as 7.7 meters and as low as 2.3 meters. However, water clarity has been lower during 2000 through 2002. Analysis shows that overall there has been a statistically significant decline in water clarity between 1993 and 2002. This trend should be interpreted with caution, however, because there were fewer measurements in recent years. It is possible that the changes in water clarity are within the range of natural variability for the lake. (Water clarity and other measurements are conducted in the deep west basin because the east basin is shallow, and the Secchi disk usually hits bottom or enters the weeds there.)

■ ***Color***— There have been no measurements of color in the lake. However, there are few natural sources of color, such as wetlands, within the watershed. Volunteers usually describe the water color as light green.

■ ***Nutrients***— Only limited total phosphorus measurements are available for Nina Lake. The data between 1995 and 1999 ranged from 8 to 15 $\mu\text{g/l}$ in the epilimnion and 11 to 33 $\mu\text{g/l}$ in the hypolimnion. Four samples in summer 2002 averaged 10 $\mu\text{g/l}$ in the epilimnion and 24 $\mu\text{g/l}$ in the hypolimnion. Although nitrogen data are not

available, it is likely that phosphorus is the nutrient that limits algal growth because of the low to moderate phosphorus levels.

- **Alkalinity/Conductivity**– Limited samples from 1995 and 1996 suggest that Nina Lake has relatively high alkalinity and a high buffering capacity compared to other Snohomish County lakes. Data from the same years also showed conductivity values indicating high levels of dissolved materials in the water. Both the alkalinity and conductivity levels may be the result of the relatively recent excavation of the lake out of native sand and gravels.

- **Oxygen/Temperature**– Vertical profiles of dissolved oxygen and temperature for the summers of 1995, 1996, and 2002 show that the west basin of Nina Lake stratified between warm upper waters and cool bottom waters. The shallower east basin did not stratify. These limited data also show that dissolved oxygen was depleted below about 6 or 7 meters depth. This indicates the presence of decaying organic matter in the lake bottom.

- **Algae**– The only chlorophyll *a* measurement available for Nina Lake is a value of 1.7 µg/l sampled in 1995. This corresponds to a low level of algae. However, observations by volunteers through the years have noted occasional algal blooms during the summer months.

- **Aquatic Plants**– The east basin of Nina Lake supports dense growths of aquatic plants because of the large area of shallow water. Plants also occupy a narrow band around the west basin. The dominant aquatic plants are elodea and thin-leaf pondweed. Two small patches of parrotfeather (*Myriophyllum aquaticum*) were found and removed from the lake during the late 1990s. This is an aggressive, non-native, invasive plant that can cause severe problems in lakes. To control the dense native plants, mostly in the east basin, the property owners received a permit and stocked the lake with sterile grass carp in the 1990s. These fish eat aquatic plants and can eventually eliminate all plants from a lake. However, little impact to the plants has been observed by the residents to date.

- **Waterfowl**– Nina Lake has a problem with excess waterfowl, primarily Canada geese.

Waterfowl droppings are unpleasant and pollute the water with nutrients and bacteria.

SUMMARY

- **Trophic State**– Based on moderate to high water clarity, low to moderate phosphorus concentrations, hypolimnetic oxygen depletion, and high aquatic plant productivity in shallow areas, Nina Lake as a whole may be classified as oligo-mesotrophic. However, the east basin is more eutrophic.

- **Current Conditions/Trends**– Nina Lake is in satisfactory condition. However, analysis reveals that water clarity may be declining. In addition, there is the potential for excess nutrients from the large number of homes around the shoreline to lead to more frequent algal blooms. For these reasons, Nina Lake may be at risk for future declines in water quality.

- **Future Concerns/Targets**– The primary concern for Nina Lake is nutrient pollution coming from the homes and yards surrounding the lake. Because there is no channelized inflow to the lake, direct runoff from the surrounding homes—which may bring nutrients from fertilizers and other pollutants—could have a significant impact on the water quality. Improving current water clarity and maintaining phosphorus levels are the targets for the lake.

- **Recommendations**– Additional monitoring of nutrients and algae should be done to develop a better understanding of the dynamics of Nina Lake. A bathymetric map and aquatic plant survey should be completed to characterize baseline conditions. Residents around the lake should take extra precautions to control potential sources of nutrient pollution. Property owners on the lake shore should also be encouraged to create or improve buffers of native vegetation to filter out pollution before it reaches the lake. Nuisance waterfowl numbers should be reduced.

CITIZEN VOLUNTEERS

Thanks to Kerry Mauer, Joan and Paul Perry, Fred Carpenter, and Terry Larsen for volunteer monitoring of Nina Lake.

DATA SUMMARY TABLE

Source	Date	Secchi Depth (meters)	Total Phosphorus (ug/l)		Color (Pt-Co scale)	Chlorophyll a (ug/l)
			Surface	Bottom	Epilimnion	Epilimnion
Volunteer	Summer 1993	4.0 - 6.0 (5.1) <i>n</i> = 7	-	-	-	-
Volunteer	Summer 1994	4.0 - 7.5 (5.5) <i>n</i> = 9	-	-	-	-
Volunteer	Summer 1995	4.1 - 7.7 (5.9) <i>n</i> = 5	15	33	-	1.7
Volunteer	Summer 1996	4.1 - 5.8 (5.0) <i>n</i> = 5	9	20	-	-
Volunteer	Summer 1997	2.3 - 5.6 (4.5) <i>n</i> = 3	-	-	-	-
SWM Staff or Volunteer	Summer 1999	5.3 (5.3) <i>n</i> = 2	8 - 12 (10) <i>n</i> = 2	11 - 14 (13) <i>n</i> = 2	-	-
Volunteer	Summer 2000	3.2 - 4.6 (3.9) <i>n</i> = 2	-	-	-	-
Volunteer	Summer 2001	3.5 - 4.0 (3.8) <i>n</i> = 2	-	-	-	-
Volunteer	Summer 2002	2.5 - 5.7 (4.9) <i>n</i> = 8	8 - 13 (10) <i>n</i> = 4	16 - 37 (24) <i>n</i> = 4	-	-

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.

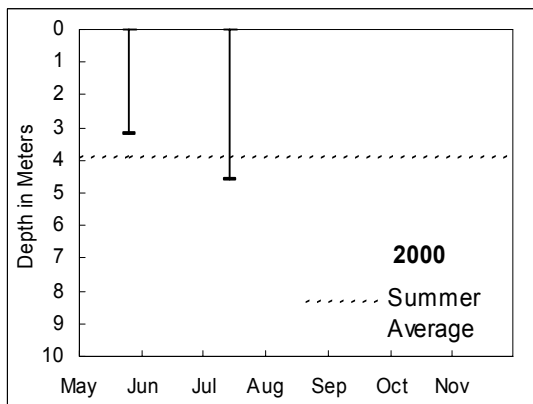
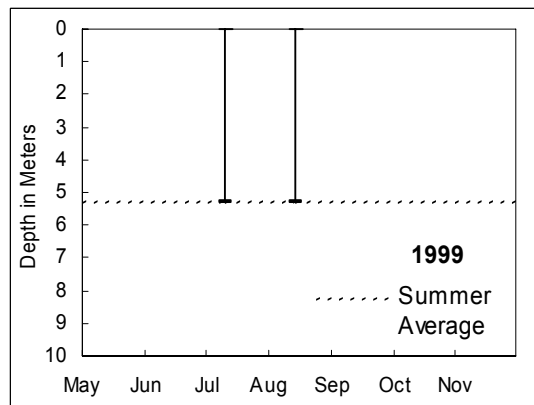
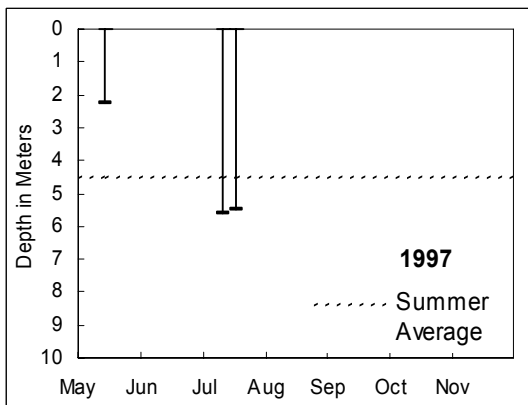
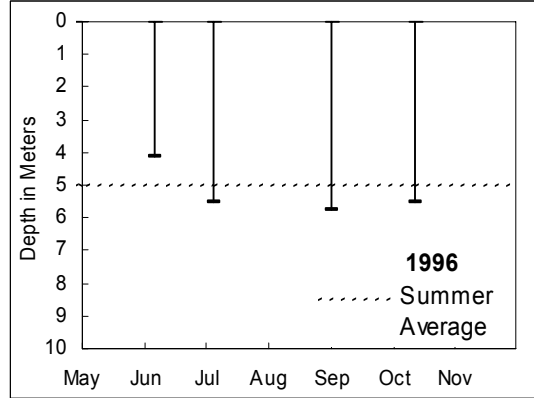
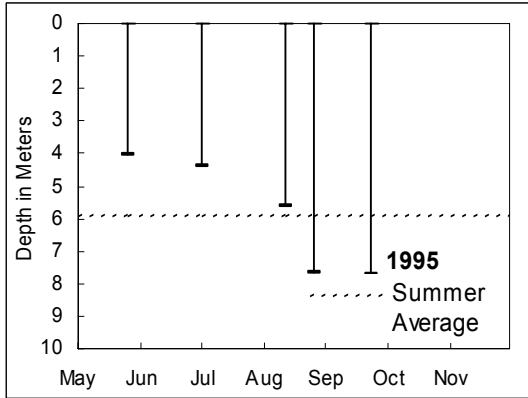
SUMMARY OF OTHER DATA

■ ***Alkalinity*** – limited samples in 1995 and 1996 ranged from 68 – 97 mg/l CaCO₃, which suggests that Nina has a high buffering capacity.

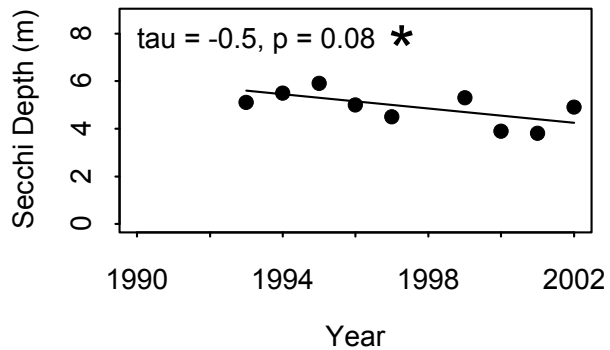
■ ***Conductivity*** – 1995 and 1996 samples ranged from 230 -- 286 µmhos, which indicates high levels of dissolved materials in the water.

■ ***Iron*** – data from one date each in 1995 and 1996 showed high levels in the epilimnion (avg. 336 µg/l) and moderate levels in the hypolimnion (avg. 508 µg/l), which indicates only minor release of iron and phosphorus from the bottom sediments under low oxygen conditions.

WATER CLARITY

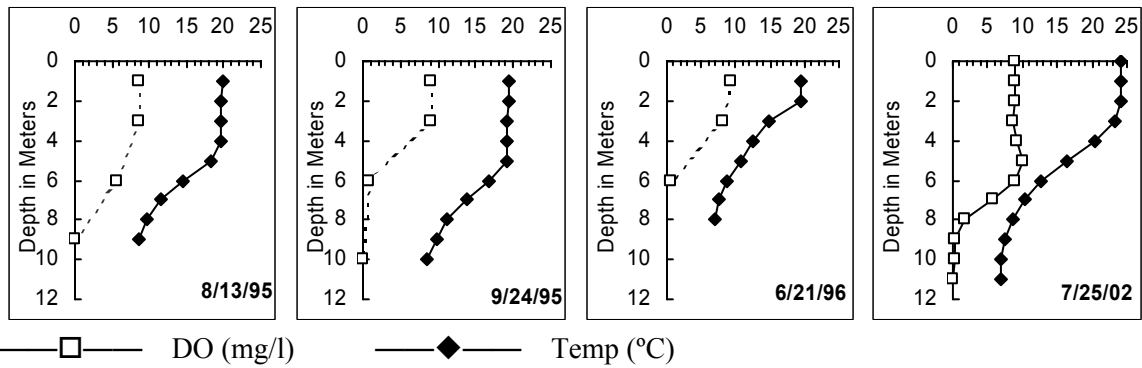


TREND ANALYSIS



* Statistically significant trend ($p \leq 0.10$)

DISSOLVED OXYGEN AND TEMPERATURE PROFILES (SELECTED YEARS)



BASIC MONITORING DATA

1995									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
2/5/1995	2.5	11	8	-6	50	trace	calm	lt green	At highest point this winter lake level rose to 6" above marker. After lake froze, coontail sank to bottom. Slight aquatic plants. 20 ducks/geese.
4/23/1995	3.6	14	14	-7	100	none	light	lt green	Slight algae.
5/29/1995	4.1	23.5	21.5	8	0	none	light	lt green	Slight algae, scum. 5 ducks/geese.
7/4/1995	4.4	21	21.5	10	75	trace	breezy	lt green	Slight algae, scum, plants. 15 ducks/geese.
8/13/1995	5.8	19	19.5	9	50	light	light	lt green	Slight aquatic plants. 3 ducks/geese daytime, 70-90 night.
8/27/1995	7.8	20.5	20	9	10	none	calm	lt green	Slight algae, plants. 5 ducks, geese have been gone a few days.
8/29/1995	4.1	23.5	21.5	8	0	none	light	lt green	Algae & algae scum slight.
9/24/1995	7.8	21	19.5	9	0	none	calm	lt green	Slight algae, scum, plants. 4 ducks/geese.

1996									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
2/25/1996	2.0	6	6.5	0	10		calm	ltbrown	Slight plants. Muddy because of wind.
5/1/1996	4.3	12	12	1	100	light	light	grn brown	Water coming into lake last 3 days. 10 ducks, 20 geese. Slight algae, scum (at south end), plants, no odor.
6/9/1996	4.1	18	19	-6	90	none	breezy	lt green	Slight algae, scum plants.
7/7/1996	5.6	19.5	21	8	0	none	light	lt green	
9/2/1996	5.8	21	22	6	10	trace	light	lt green	5 ducks/geese.
10/12/1996	5.6	16	15	6	50	moderate	light	lt green	Slight plants. Some coontail has risen to the surface.
11/9/1996	4.8	13	10.5	1	50	light	calm	lt green	20-30 ducks.

1997									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
4/5/1997	1.3	15	10		0	none	calm	grn brown	25 ducks
5/18/1997	2.3	21	20	2	0	none	breezy	grn brown	slight algae and plants, no odor. 10-12 ducks/geese with 5 family of ducks 2-12.
7/13/1997	5.6	21	21.5	1	90	none	light	lt green	100 ducks. some new plants - not sure what type. sent in dipin info.
7/20/1997	5.5	25	22	1	0	none	light	lt green	slight algae, scum, plants.

Non-summer data indicated by shading.

*Indicates data collected by Snohomish County staff.

1998									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
3/29/1998	2.0	9	10		10	trace	breezy	lt green	No algae, aquatic plants, odor, slight scum. 50 ducks/geese. Fish starting to stir.
4/26/1998	2.3	15	16		10	none	calm	lt green	No algae, plants, odor, slight scum. 10 juvenile Mallard Ducks.

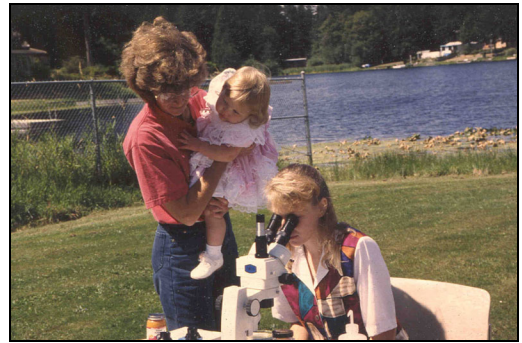
1999									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
*7/13/99	5.4	24	22		0	none	breezy	medgreen	
8/16/1999	5.4	19	21		50	heavy	light	medgreen	

2000									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
5/29/2000	3.4	18	13		25	moderate	light	lt green	7 ducks, moderate algae, no algae scum, and slight aquatic plants.
7/16/2000	4.6	20	16		0	none	calm	lt green	No ducks, algae, or algae scum, and moderate aquatic plants.

[Click here to view more recent data.](#)

HOW YOU CAN HELP NINA LAKE

- Educate yourself about lake ecology and the lake's health.
- Use lawn and garden fertilizers sparingly; test your soil first; choose low or no phosphorus fertilizers.
- Retain or plant native vegetation adjacent to the water to protect the shoreline and filter pollution.
- Infiltrate or filter the runoff from rooftops, patios, and driveways rather than piping it to the lake.



- Cover or mulch bare soil areas.
- Use pesticides, herbicides, and household chemicals sparingly and never near the water.
- Maintain your septic system—have it inspected every two years and pumped when needed.
- Conserve water both inside and outside.
- Clean up pet wastes and keep livestock away from the lake shore.

- Learn to identify non-native invasive aquatic plants and animals; check your boat and trailer for invaders; never empty an aquarium into the lake.
- Do not feed geese or ducks.
- Join with neighbors or the local property owners' association to work together to protect the lake.



Contact Snohomish County Surface Water Management at 425-388-3464 for information about these topics or if you have questions about Nina Lake.

(TTY users call 425-388-3700)

