Ruggs Lake

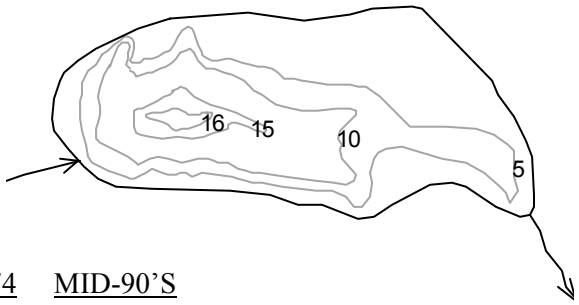
Ruggs Lake has low water clarity, moderate nutrients, and abundant algae and aquatic plants. The lake is also filling with sediment. The sedimentation and excess aquatic plants impair the use of the lake at times. However, water clarity is improving, and the lake provides valuable recreation and aesthetic enjoyment. Controlling the sediment and nutrient sources is key to restoring the lake.

State of the Lakes Report
March 2003

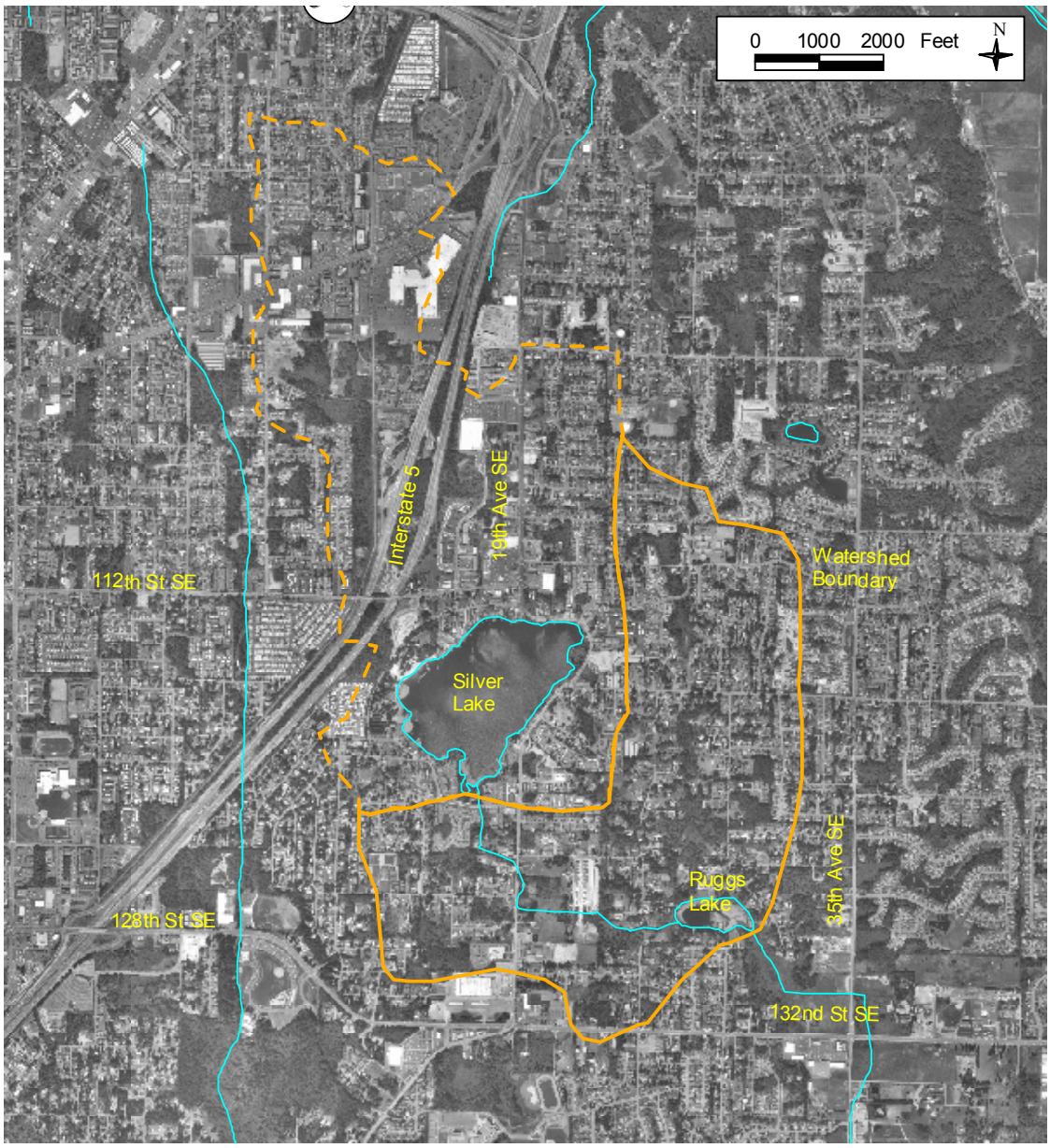
Snohomish County Public Works
Surface Water Management

LAKE AND WATERSHED DATA

Lake Area:	11 acres
Watershed Area:	717 (1665 total area) acres
Watershed to Lake Area Ratio:	65.2 (151.4 total area)
Maximum Depth:	16 feet (4.9 meters)
Average Depth:	7 feet (2.1 meters)
Lake Volume:	77 acre-feet
Length of Shore:	0.6 miles



	1974	MID-90'S
# of nearshore homes	12	27
# of homes/1000' of shoreline	3.8	8.5
% of homes with bulkhead or fill		11%
% of homes with some native vegetation near shore		81%
% of watershed developed (residential or commercial)	40%	80% (est.)



LAKE ASSESSMENT

DESCRIPTION

■ *Location/Access* – Ruggs Lake lies east of Interstate 5 just outside the Everett city limits and about one-half mile southeast of Silver Lake. The outlet stream from Silver Lake flows into Ruggs Lake, which in turn drains into Thomas Lake, Penny Creek, North Creek, and, ultimately, Lake Washington. Ruggs Lake has no public access, although there is a shared community access for nearby residences on the north side of the lake.

■ *Size/Shape* – The surface area of the lake covers 11 acres. The lake has a maximum depth of 4.9 meters and an average depth of 2.1 meters, making it one of the shallowest lakes in the county. The lake volume contains only about 77 acre-feet of water.

■ *Watershed* – In contrast to its small surface area, Ruggs Lake has a large watershed—the immediate watershed totals 717 acres, including the lake. Adding the watershed of Silver Lake, which drains into Ruggs Lake, brings the total watershed to 1665 acres. The ratio of the immediate watershed to lake area is 65.2, one of the largest in Snohomish County. Having a large watershed means that there is greater potential for receiving pollution and sediment from the surrounding lands than at a lake with a small watershed. In 1974, approximately 40% of the immediate watershed was developed with residential and commercial uses. By the mid-90s, development had expanded to about 80% of the watershed. The larger Silver Lake watershed is also heavily developed. This rapid growth may be having a negative impact on the lake.

■ *Shoreline* – The shoreline of Ruggs Lake is 0.6 miles long. Around the shore, there were only 12 homes in 1974. By the mid-90s, there were 27 homes on the lake. Only 11% of the nearshore homes have modified the shoreline with bulkheads or fill because of the very gradual slope of the lake shore. About 81% 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 Ruggs Lake is relatively low. Summer averages ranged from 1.8 to 2.6 meters from 1996 through 2002. Individual measurements have fluctuated from as high as 4.0 meters to as low as 1.0 meters, likely in response to periodic algal blooms. However, water clarity appears to be increasing slightly. Analysis shows that there has been a statistically significant improvement in water clarity from 1994 through 2002. Reasons for this apparent increase are unknown, but may be related to less color in the water in some years.

■ *Color* – There have been no measurements of color in the lake. However, volunteers have described the water color as green-brown to black, which suggests moderate to heavy coloring from algae and from dissolved organic (humic) materials from surrounding wetlands.

■ *Nutrients* – Total phosphorus measurements from single samples in 1981, 1999, and 2001 ranged from 10 to 19 µg/l in the epilimnion and 21 to 44 µg/l in the hypolimnion. Four samples in summer 2002 averaged 37 µg/l in the epilimnion and 33 µg/l in the hypolimnion. These values reflect moderate phosphorus levels with some release of phosphorus from bottom sediments during periods of oxygen depletion. Total nitrogen samples in 1981 were 1,100 µg/l in the upper waters and 1,500 µg/l in the bottom waters. These

data suggest that nitrogen is abundant and that phosphorus is the nutrient that limits algal growth.

■ *Oxygen/Temperature* – Vertical profiles of dissolved oxygen and temperature taken on limited dates in 1981, 1999, and 2002 show that Ruggs Lake was weakly stratified between warm, oxygenated upper waters and somewhat cooler, oxygen-poor bottom waters. The volume of the hypolimnion is small, so winds may be able to mix the lake even during warm periods of the year. When the lake is stratified, dissolved oxygen is usually depleted below 1 or 2 meters depth. In late summer 2002, oxygen levels were low even at the lake surface. These data indicate the presence of substantial amounts of decaying organic matter in the lake bottom.

■ *Algae* – The only chlorophyll *a* measurement available for Ruggs Lake was 2.5 µg/l in 1981. Observations by volunteers have noted regular moderate to heavy algal blooms during the summer months. There are often algal scums on the lake surface, probably from blooms of nuisance blue-green algae.

■ *Aquatic Plants* – Ruggs Lake supports dense growths of aquatic plants throughout almost the entire lake because of the large areas of shallow water. Although there has been no formal survey, the common aquatic plants are yellow water-lily, fragrant water-lily (a non-native), coontail, elodea, bladderwort, large-leaf pondweed, and naiad. The plants are thick enough to cause nuisance problems and interfere with uses of the lake.

■ *Sedimentation* – Ruggs Lake is filling with sediment and with organic matter from dead plants and algae. In recent years, residents have observed that the lake is becoming more and more shallow. Some portions of the lake now have exposed mud flats during summer low water. The 1994 North Creek Watershed Management Plan identified runoff from roads north and southeast of the lake, as well as inadequate ditch maintenance, as some of the causes of lake sedimentation. It is also likely that land development, clearing, and grading upstream toward Silver Lake contribute to the sedimentation of the lake. The large watershed of the lake also provides proportionately more sources of sediment than for many other lakes.

SUMMARY

■ *Trophic State* – Based on low water clarity, moderate phosphorus concentrations, severe oxygen depletion, regular algal blooms, and high aquatic plant productivity, Ruggs Lake may be classified as eutrophic.

■ *Current Conditions/Trends* – Ruggs Lake shows signs of accelerated eutrophication, such as increasing sedimentation and excess aquatic plant growth. The dense aquatic plants and shallow water caused by sedimentation impair the use of the lake at times. However, water clarity appears to be improving, and the lake still provides valuable fishing, boating, and aesthetic enjoyment for lake users.

■ *Future Concerns/Targets* – The primary concerns for Ruggs Lake are impacts from the large surrounding watershed which contribute to increased sedimentation and excess aquatic plants and algae. Unless sedimentation is greatly reduced and algae and plant growth controlled, use of the lake may become more difficult in the future. Maintaining higher water clarity, reducing phosphorus levels, and reducing sediment inflow are targets for the lake.

■ *Recommendations* – The lake should be monitored to better identify the sources of sediment and track the levels of nutrients, algae, and aquatic plants. An updated bathymetric map and an aquatic plant survey should be completed to establish baseline conditions. The road and ditch maintenance and sediment reduction and removal recommendations in the North Creek Watershed Management Plan should also be implemented.

CITIZEN VOLUNTEERS

Thanks to Fred and Alita Jones for volunteer monitoring of Ruggs 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
Sumioka and Dion, 1985	**7/1/81**	2.4	10	30	-	2.5
Volunteer	Summer **1996**	1.4 - 2.3 (1.8) *n = 9*	-	-	-	-
Volunteer	Summer **1997**	1.0 - 3.0 (1.9) *n = 10*	-	-	-	-
Volunteer	Summer **1998**	1.2 - 3.3 (2.1) *n = 8*	-	-	-	-
SWM Staff or Volunteer	Summer **1999**	1.1 - 4.0 (2.4) *n = 9*	19	44	-	-
Volunteer	Summer **2000**	1.4 - 3.5 (2.1) *n = 8*	-	-	-	-
SWM Staff or Volunteer	Summer **2001**	1.3 - 4.1 (2.4) *n = 7*	19	21	-	-
SWM Staff or Volunteer	Summer **2002**	1.7 - 4.1 (2.6) *n = 7*	14 - 58 (37) *n = 4*	20 - 63 (33) *n = 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

■ *Total Nitrogen* – single samples in 1981 showed 1.1 mg/l in the epilimnion and 1.5 mg/l in the hypolimnion; which suggests that nitrogen levels were high and not limiting algal growth.

■ *pH* – from single observations in 1999, pH was 6.8 near the surface and 6.2 near the bottom, which is within the normal range for Snohomish County lakes. Readings from 2002 were similar.

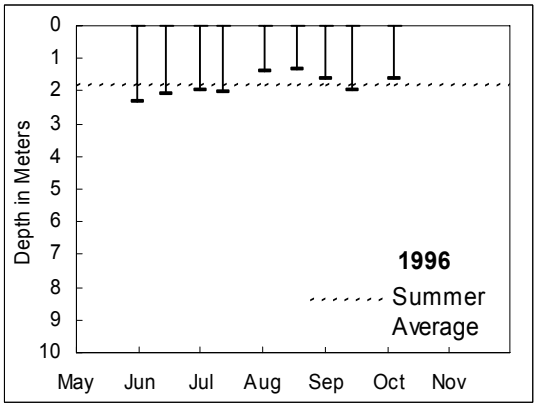
■ *Conductivity* – single 1999 measurements were 68 µmhos in the epilimnion and 152 µmhos near the lake bottom, indicating relatively high levels of dissolved materials in the water compared to other Snohomish County lakes. Readings from 2002 were similar.

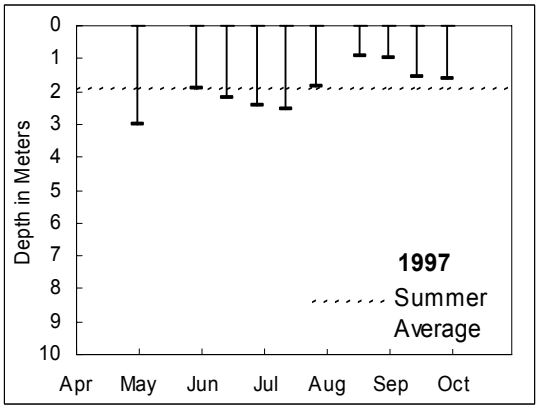
■ *Fish* – according to the Washington State Department of Fish and Wildlife (WDFW), the main fish found in Ruggs Lake are brown bullhead catfish. Residents also report that rainbow and cutthroat trout and largemouth bass are found in the lake, and that the lake provides good fishing.

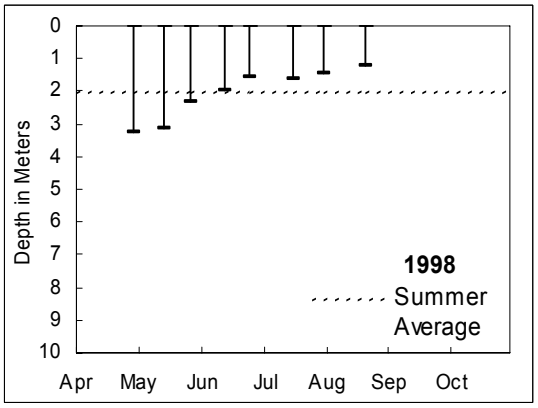
DATA SOURCES

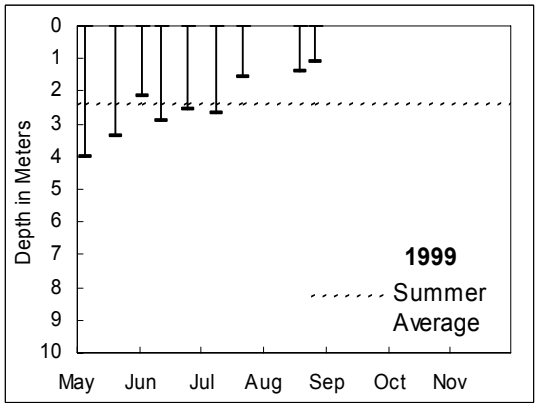
In addition to data from Snohomish County SWM staff and citizen volunteers, data for Ruggs Lake are also available from: Sumioka and Dion, 1985. Please refer to the full list of references in the County-Wide Summary.

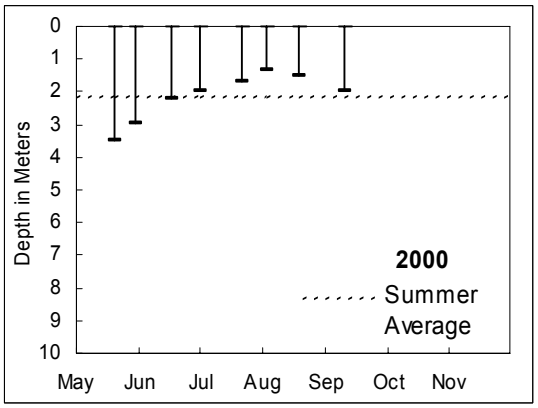
WATER CLARITY



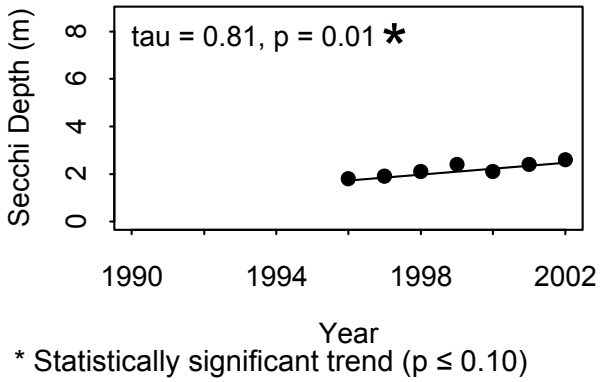






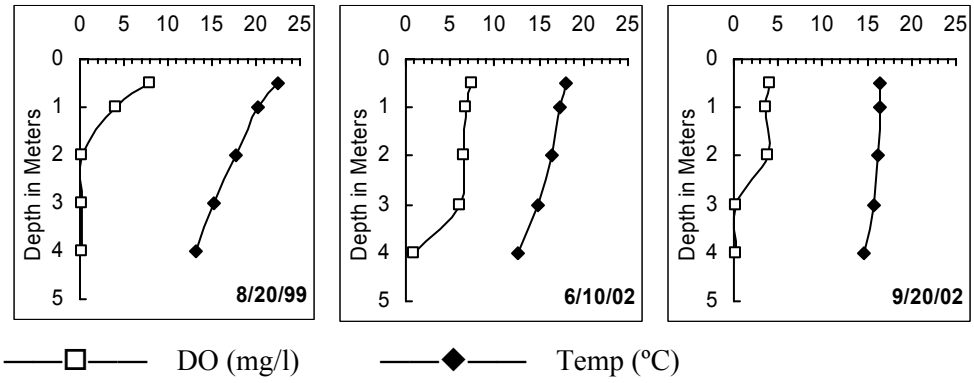


TREND ANALYSIS



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

DISSOLVED OXYGEN AND TEMPERATURE PROFILES (SELECTED YEARS)



BASIC MONITORING DATA

1996									
DATE	**Secchi Depth (meters)**	**Air Temp (C)**	**Water Temp (C)**	**Lake Level (in)**	**Clouds (%)**	**Rain**	**Wind**	**Color**	**COMMENT**
6/3/1996	2.3	23	20	3.5	50	none	calm	grn brown	White fluffy things floating on water, looks like from trees or plants. Moderate algae, plants, slight scum, no odor. 13 ducks, 9 are new babies.
6/17/1996	2.1	15	20	6	75	heavy	calm	grn brown	Heavy rain 1 hour prior to sample; not raining during sampling. No odor, slight scum, moderate algae, plants. 4 ducks, 10 geese.
7/4/1996	2.0	19	20	8.75	90	moderate	calm	grn brown	Typical particles between surface & secchi disk. No odor, slight scum, moderate algae, heavy plants. 12 geese, 1 duck.
7/15/1996	2.1	29	27	10.3	0	none	calm	black	No odor, slight algae, scum, heavy plants. 10 geese, 3 ducks.
8/4/1996	1.4	18	20	12	100	moderate	calm	black	Lots of mushy green particles, about the average size of a pea, floating on the water. Heavy algae, plants, moderate scum.
8/19/1996	1.4	22	18	13.5	75	none	calm	black	Scum moderate to heavy.
9/2/1996	1.7	18	20	15	90	moderate	calm	black	Lily pads heavy along edges.
9/15/1996	2.0	17	18	12	90	moderate	calm	black	
10/5/1996	1.7	15	15	7.5	100	heavy	light	black	Aquatic plants showing first sign of decline.

1997									
DATE	**Secchi Depth (meters)**	**Air Temp (C)**	**Water Temp (C)**	**Lake Level (in)**	**Clouds (%)**	**Rain**	**Wind**	**Color**	**COMMENT**
5/4/1997	3.1	18	15	-0.25	50	moderate	breezy	grn brown	Slight algae, plants. 12 ducks/geese.
6/1/1997	1.9	19	19	0.75	100	trace	breezy	grn brown	No algae, scum, odor, moderate plants. 4 ducks, 0 geese.
6/16/1997	2.2	19	20	5.75	100	light	light	grn brown	Slight algae, scum, no odor, moderate plants. 2 ducks. Fewer ducks/geese than last year.
6/30/1997	2.4	20	17	0	75	moderate	calm	grn brown	Heavy plants. 30 ducks, 0 geese.
7/14/1997	2.7	31	22	-2.5	10	none	calm	grn brown	Slight algae, scum; heavy plants, moderate odor. Algae along edge, scum also, with odor, when pulling lily pads around dock earlier in the day.
7/28/1997	1.9	25	23	-6.5	0	none	calm	grn brown	Slight algae, heavy plants. 5 ducks. Heavy scum along edge, light towards the middle. Increase in milfoil along edges, worse than previous years.
8/18/1997	1.0	24	24	-7.75	75	none	calm	grn brown	Moderate algae, scum (algae/scum in the middle, but heaviest along shore). Heavy plants. 6 ducks
9/1/1997	1.0	21	21	6.5	50	moderate	breezy	black	Moderate algae, slight scum, heavy plants. Along shore, lots of underwater weed - maybe milfoil?
9/15/1997	1.6	17	18	8.5	100	moderate	breezy	black	Moderate algae, scum, heavy plants, no odor. 10 ducks, 6 geese.
9/29/1997	1.6	18	16	6.5	50	light	calm	grnbrown	Slight algae, no scum, odor, heavy plants. 2 ducks, 2 geese, more ducks and geese at dusk.

*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**
5/2/1998	3.3	19	20	10.5	100	trace	calm	lt green	No odor, slight algae, plants and scum. 10 geese, 8 ducks, 10 juveniles. Water level seems lower than usual.
5/17/1998	3.2	10	15	9.5	100	light	calm	grnbrown	No algae, scum, odor, moderate plants. No ducks. Water level is low compared to last 2 years--Silver Lake seems higher than normal.
5/30/1998	2.3	17	16	10.5	90	none	calm	grnbrown	No algae, scum, odor, heavy plants. Water level high at Silver Lake and low at Ruggs.
6/15/1998	2.0	13	19	10	100	light	calm	grnbrown	No algae, scum or odor; heavy aquatic plants; no ducks/geese; some ducks and geese on shore; light rain during test.
6/27/1998	1.6	20	18	9.5	25	light	light	grnbrown	No scum or odor; slight algae; heavy aquatic plants; 12 ducks on shore; 0 geese; duck and geese numbers increase at dusk.
7/18/1998	1.6	23	23	14.3	75	none	calm	grnbrown	No algae, scum or odor; heavy plants; 15 ducks; 10 geese; film and small particles on top of lake.
8/2/1998	1.5	30	22	16	10	none	calm	grnbrown	Slight algae; moderate scum; heavy plants; no odor; 10 ducks; 10 geese; many more on land. On 8/4/96 water level was 12"; on 7/28/97, level was 6.5"; on 8/2/98 level was 16"--lowest level in 3 years. Silver Lake appears high.
8/22/1998	1.2	24	21	18.8	50	none	calm	lt brown	Slight algae & scum; heavy plants; no odor; 2 ducks; light film along lily pad edge at E/S end; water level very low, e.g., on 8/18/97, 7.75" under water, but on 8/22/98, 18.75" above water.
9/13/1998									Water level too low; inaccessible at point of use.

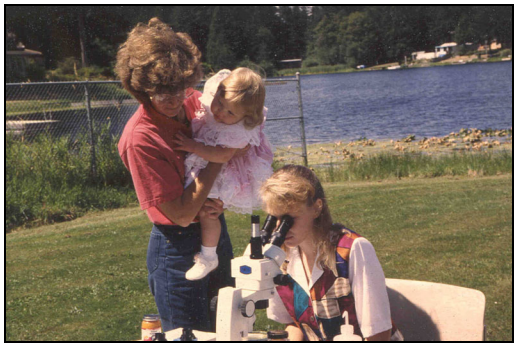
1999									
DATE	**Secchi Depth (meters)**	**Air Temp (C)**	**Water Temp (C)**	**Lake Level (in)**	**Clouds (%)**	**Rain**	**Wind**	**Color**	**COMMENT**
5/9/1999	4	8	13	6	90	light	calm	lt green	
5/23/1999	3.4	21	19	9.5	0		breezy	grnbrown	Lily pads are coming up.
6/5/1999	2.2	13	16	8.75	100	moderate	calm	grnbrown	
6/14/1999	2.9	24	22	2.5	10	none	calm	medgreen	
6/27/1999	2.6	15	16	-2.5	100	moderate	calm	grnbrown	Lake level marker is under water.
7/11/1999	2.7	22	21	-2.75	0	none	calm	grnbrown	
7/24/1999	1.6	15	19	7.25	90	moderate	calm	grnbrown	
*8/20/99	1.4	20	22.5		25	none	light	dk brown	Lots of zooplankton, and large clumps of algae. Plants in the lake include Nuphar, Nymphaea, Coontail, Elodea, Bladderwort, Naiad, and Large-leaf pondweed.
8/28/1999	1.1	23	21	9.75	50	none	calm	lt brown	

2000									
DATE	**Secchi Depth (meters)**	**Air Temp (C)**	**Water Temp (C)**	**Lake Level (in)**	**Clouds (%)**	**Rain**	**Wind**	**Color**	**COMMENT**
5/23/2000	3.6	14.5	15	5.5	50	light	calm	gr-brown	4 ducks, no algae or algae scum, and moderate aquatic plants.
6/2/2000	3	17	18.5	4.5	50	none	calm	gr-brown	Lily pads at E shoreline. 23 ducks, no algae or algae scum, and heavy aquatic plants.
6/20/2000	2.2	21.5	22	6.5	50	none	calm	gr-brown	29 ducks, no algae or algae scum, and heavy aquatic plants.
7/4/2000	2	17	19.5	7.1	75	light	calm	lt brown	5 ducks, no algae or algae scum, and heavy aquatic plants.
7/24/2000	1.8	19.5	22	8	10	moderate	calm	lt brown	Milfoil at edge of lily pads. 45 ducks, slight algae and algae scum, and heavy aquatic plants.
8/5/2000	1.4	24	24	9.5	0	none	calm	gr-brown	Algae scum in the middle and edge. Increase in milfoil. No ducks, moderate algae and algae scum, and heavy aquatic plants.
8/20/2000	1.5	20	20	10.8	90	heavy	calm	dark brown	Milfoil, 32 ducks, heavy algae and aquatic plants, and moderate algae scum.
9/11/2000	2	18	18	13	0	moderate	calm	gr-brown	40 ducks, slight algae, no algae scum, and heavy aquatic plants.

Click here to view more recent data.

HOW YOU CAN HELP RUGGS 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 Ruggs Lake.

(TTY users call 425-388-3700)

Snohomish County
Public Works
Surface Water Management

Working together for people, streams & fish.