

Lake Beecher

Lake Beecher has low water clarity, high nutrient levels, and dense aquatic plants, which is likely the natural condition for such a shallow oxbow lake. However, the lake is at risk of future declines in water quality because of potential impacts from surface runoff and nutrients coming from the lake's large watershed.

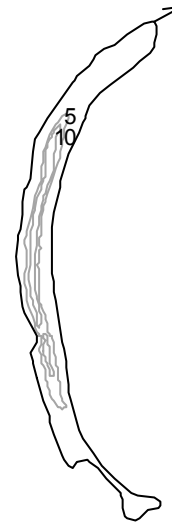


State of the Lakes Report
March 2003

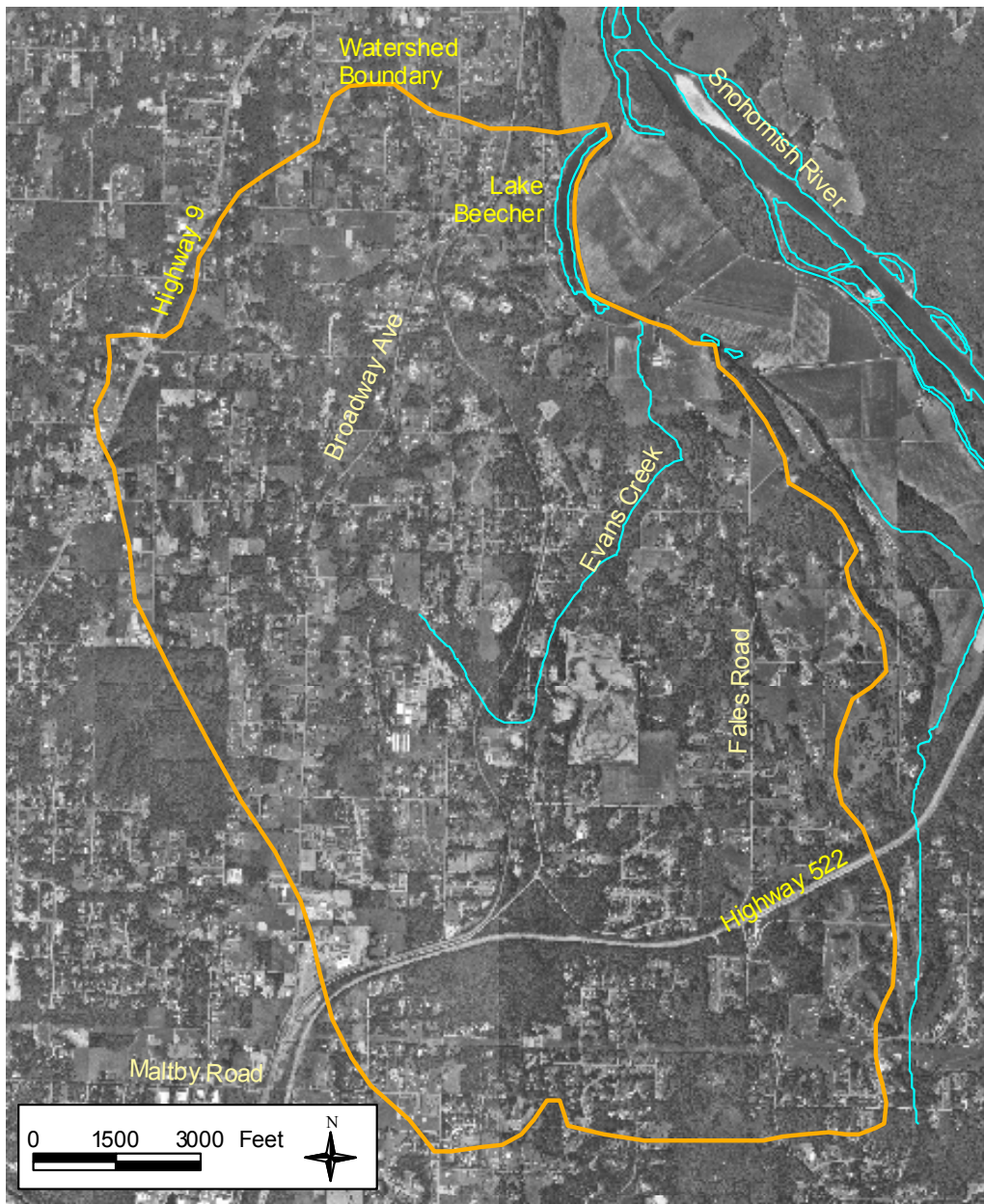
Snohomish County Public Works
Surface Water Management

LAKE AND WATERSHED DATA

Lake Area: 20 acres
 Watershed Area: 4318 acres
 Watershed to Lake Area Ratio: 215.9
 Maximum Depth: 10 feet (3.0 meters)
 Average Depth: 5 feet (1.5 meters)
 Lake Volume: 105 acre-feet
 Length of Shore: 1.6 miles



	<u>1981</u>	<u>Mid-90's</u>
# of nearshore homes	8	10
# of homes/1000' of shoreline	0.9	1.2
% of homes with bulkhead or fill		NA
% of homes with some native vegetation near shore		NA
% of watershed developed (residential or commercial)	8%	40% (est.)



LAKE ASSESSMENT

DESCRIPTION

■ **Location/Access** – Located just west of the Snohomish River and east of Cathcart, Lake Beecher is a good example of an oxbow lake. The lake occupies a former meander of the river that was cut off from the main channel when the river excavated a new channel. In addition to the water that enters the lake from the watershed, some water probably moves through the lake as ground water associated with underground flows through the river floodplain. The lake eventually drains back into the Snohomish River. There is no developed public access to Lake Beecher, although the County's Heirman Wildlife Preserve at Thomas' Eddy borders the lake to the north.

■ **Size/Shape** – Typical of an oxbow lake, Lake Beecher is long and narrow and very shallow. It has a maximum depth of 3 meters and an average depth of only 1.5 meters. The lake covers 20 surface acres and has a volume of 105 acre-feet.

■ **Watershed** – The Lake Beecher watershed is quite large, covering 4,318 acres. The watershed is 216 times the size of the lake, which is by far the largest watershed area to lake area ratio of the lakes in the county. With such a large watershed, there is a high potential for pollutants to enter the lake from the surrounding watershed. In 1973, only 8% of the watershed was developed, but by the mid-1990s approximately 40% of the watershed had been developed for either residential or commercial uses. The size of the watershed and the surge in development since 1973 have the potential to have a large impact on the water quality in the lake.

■ **Shoreline** – The shoreline of Lake Beecher is 1.6 miles in length. There were 8 nearshore homes in 1973, all on the west side. This increased to 10 shoreline homes by the mid-1990s, making this one of the least developed shorelines in the county. There has been no survey of shoreline disturbance, however much of the shoreline supports native vegetation. A zone of native vegetation next to the water helps to filter some of the pollutants carried by runoff from the watershed.



LAKE CONDITIONS

■ **Water Clarity** – Summer water clarity in Lake Beecher has consistently averaged around 1.1 meters since 1997, although the data are limited. One measurement in 1981 showed similar water clarity.

■ **Color** – Naturally occurring tannins from humic organic matter color the water, reducing the clarity somewhat. Descriptions of water color have ranged from light brown to dark or greenish brown.

■ **Nutrients** – Total phosphorus concentrations were measured on one occasion each in 1981 and 1997 and on four dates in the summer of 2002. Total phosphorus values ranged from 46 to 126 $\mu\text{g/l}$ in the epilimnion and from 58 to 127 $\mu\text{g/l}$ in the hypolimnion. These phosphorus levels are very high for lakes in Snohomish County, indicating that there are substantial nutrients available to feed algal growth. The similarity between epilimnion and hypolimnion concentrations also indicates that the water column in the lake is regularly mixed. One total nitrogen sample measured in 1981 showed a concentration of 1.2 mg/l , which suggests that nitrogen was also abundant at that time and not limiting algal growth.

■ **Oxygen/Temperature** – Because the lake is so shallow, it does not stratify strongly between warm, upper waters and cool, bottom waters. However, the lake sediments are organic, so there is high

oxygen demand from decaying organic matter that reduces dissolved oxygen throughout the lake. The lake is also sheltered from the wind, which limits the re-supply of oxygen from the atmosphere. One profile measured in July 1997 showed low oxygen near the surface and high oxygen levels at deeper depths. Runoff from a recent storm may have introduced cool, oxygenated water which sank to the bottom of the lake and was not fully mixed at the time of the monitoring.

- **Algae**– A single chlorophyll *a* sample taken in 1981 had a concentration of 9.5 µg/l. This reflects a high level of algae in the water. However, algal growth and chlorophyll *a* can be quite variable, so a single measurement gives a very limited picture of conditions in the lake. Observations by the citizen volunteer and SWM staff indicate that algae and surface algae scums are often present at moderate levels, but have not posed a severe problem in the lake.

- **Aquatic Plants**– There have been no surveys of aquatic plants in the lake. However, dense plants, including pondweeds and elodea, cover much of the lake bottom. The presence of these plants stabilizes the bottom sediments and may out-compete algae for available nutrients. Without dense aquatic plants, the lake might experience substantially more problems from excess algae.

- **Fish**– Because of its proximity to the Snohomish River, the lake is considered potential habitat for threatened fish species, including Chinook salmon and bull trout. This means that the water quality of the lake may affect the health of these species.

- **Water Levels**– The citizen volunteer reports that the water level in Lake Beecher sometimes rises quickly. Likely, such water level fluctuations occur in response to runoff from the large watershed and from the influence of high flows in the nearby Snohomish River. The water level changes do not appear to threaten homes and septic systems because most are located significantly above the level of the lake surface.

SUMMARY

- **Trophic State**– Based on limited water quality data indicating elevated total phosphorus concentrations, high algae levels, low water clarity, and dense aquatic plants, Lake Beecher may be classified as eutrophic.

- **Current Conditions/Trends**– The current condition of Lake Beecher is satisfactory, but the lake is at risk for declines in water quality because of potential impacts from its very large watershed. Fortunately, water clarity and total phosphorus measurements have shown little change from 1997 to 2002.

- **Future Concerns/Targets**– The main concern for Lake Beecher is possible impacts from widespread development in its large watershed. Incidents of rapid changes in water levels suggest that runoff is a significant source of water to the lake. Additional development in the watershed will likely increase the amount of surface water runoff and associated nutrients entering the lake. Improving water clarity and reducing phosphorus levels are targets for the lake.

- **Recommendations**– Additional monitoring is needed to better characterize lake conditions and identify future impacts. A new bathymetric map and an aquatic plant survey should be completed to establish baseline conditions. Maintaining the natural vegetation along the shoreline of the lake and along tributary streams will help to minimize the impacts of pollution from surface water runoff.

CITIZEN VOLUNTEERS

Thanks to Nan McGuire for volunteering her time to monitor Lake Beecher.

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	7/6/81	1.2	60	90	-	9.5
SWM Staff or Volunteer	Summer 1997	1.0 - 1.3 (1.1) <i>n = 10</i>	126	58	-	-
Volunteer	Summer 1998	1.0 - 1.4 (1.1) <i>n = 4</i>	-	-	-	-
Volunteer	Summer 1999	1.1	-	-	-	-
Volunteer	Summer 2000	0.8 - 1.3 (1.0) <i>n = 3</i>	-	-	-	-
SWM Staff or Volunteer	Summer 2002	0.8 - 1.3 (1.1) <i>n = 4</i>	46 - 71 (62) <i>n = 4</i>	67 - 127 (98) <i>n = 4</i>	-	-

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

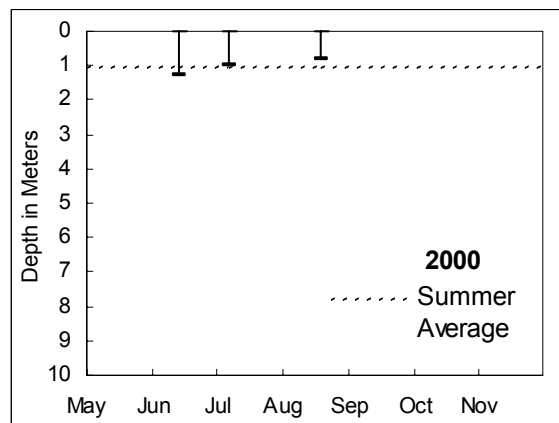
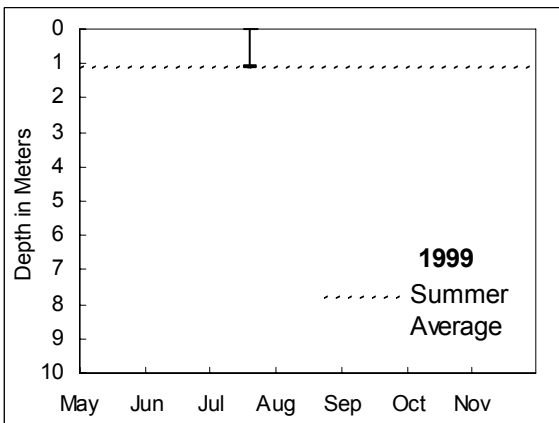
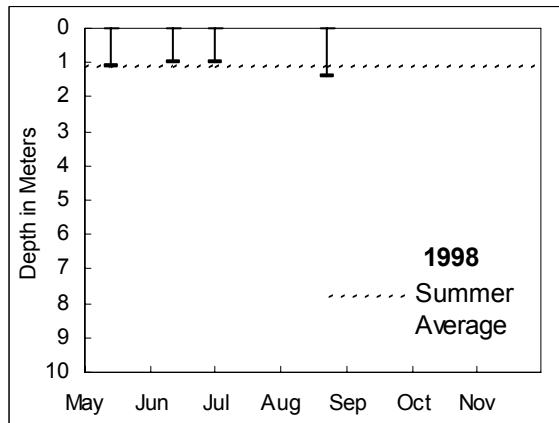
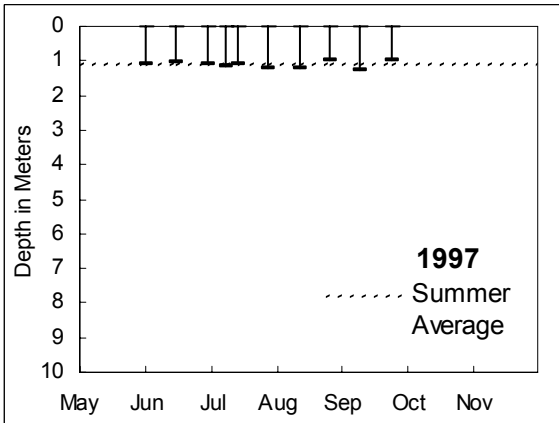
- ***Total Nitrogen*** – one sample in 1981 was 1.2 mg/l, which suggests that nitrogen was abundant and not limiting algal growth.
- ***pH*** – data from 1981 and 1997 were 6.6 to 6.7, which is near neutral. Data from 2002 were similar.
- ***Conductivity*** – data from July 1981 showed a value of 132 μ mhos, which suggests a high level of dissolved materials in the water.
- ***Fish*** – according to the Washington State Department of Fish and Wildlife (WDFW), fish

species found in Lake Beecher include largemouth bass, yellow perch, and pumpkinseed sunfish.

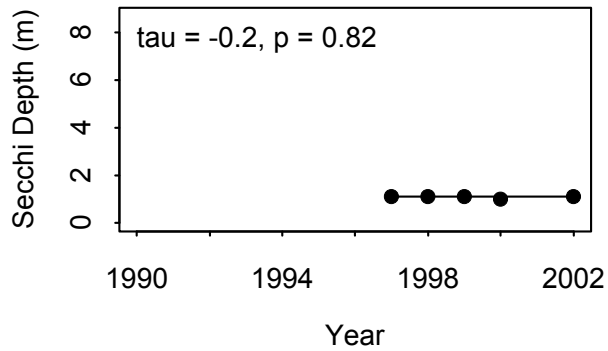
DATA SOURCES

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

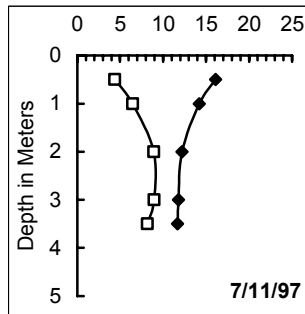
WATER CLARITY



TREND ANALYSIS



DISSOLVED OXYGEN AND TEMPERATURE PROFILES (SELECTED YEARS)



—□— DO (mg/l) —◆— Temp (°C)

BASIC MONITORING DATA

1997									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	C	C
6/4/97	1.1	17.5	16		90	moderate	light	lt brown	No algae, scum or odor, slight aquatic plants. 6-12 ducks/geese.
6/18/97	1.1	18.5	18		100	moderate	breezy	lt brown	Slight algae, moderate plants, no scum or odor. 6-10 ducks/geese.
7/2/97	1.1	18	17		0	trace	calm	lt brown	A few heron - no ducks/geese.
*07/11/97	1.2				90	moderate	calm	lt-mdbrn	Volunteer stated that lake had risen 1-2 feet rapidly in last couple of days.
7/16/97	1.1	26	19	2.8	10	none	light	medbrown	0 ducks/geese.
7/30/97	1.2	23	21	3.1	25	none	calm	medbrown	Slight algae, moderate plants. 0 ducks/geese.
8/13/97	1.2	31	24		10	none	light	medbrown	Slight algae, scum. Moderate plants.
8/27/97	1.0	21	19	3	90	heavy	breezy	medbrown	Moderate algae, plants. slight algal scum. 10-12 ducks/geese.
9/10/97	1.3	18	19	3.3	50	none	calm	medbrown	Slight algae, scum, moderate plants, no odor. 12-15 ducks/geese.
9/24/97	1.0	30	18	3	0	none	calm	medbrown	Slight algae, no scum, moderate plants, odor. 15-20 ducks/geese.

1998									
DATE	Depth (m s)	Air Temp	Water Temp	Lake L (in)	C (%)	Rain	Wind	Color	COMMENT
5/17/98	1.1	17	14	2.6	100	light	calm	dk brown	No scum, odor; slight algae, plants. 10-12 ducks/geese.
6/14/98	1.0	20	18		100	trace	strong	dk brown	No odor; slight algae and scum; moderate aquatic plants; 12 ducks/geese.
7/4/98	1.0	16	16		100	moderate	calm	dk brown	Mod. algae and plants; slight scum; no odor; 6-8 ducks/geese.
8/24/98	1.4	22	19		0	none	calm	dk brown	Slight algae, scum & plants; no odor; 12-15 ducks/geese.

1999									
DATE	Depth (m s)	Air Temp	Water Temp	Lake L (in)	C (%)	Rain	Wind	Color	COMMENT
7/22/99	1.1	22	20	2.7	75	none	light	lt brown	

*indicates data collected by Snohomish County staff.

2000

DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
6/16/00	1.3	29	19	2.9	0	light	light	gr-brown	15 ducks, slight algae, no algae scum, and moderate aquatic plants.
7/9/00	1.0	27	21		0	light	calm	gr-brown	15 ducks, moderate algae, algae scum, and aquatic plants.
8/20/00	0.8	21	17		90	heavy	calm	gr-brown	23 ducks, slight algae and algae scum, and moderate aquatic plants.

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

HOW YOU CAN HELP LAKE BEECHER

- 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 Lake Beecher.

(TTY users call 425-388-3700)