

## Lake Samish -- Whatcom County

Lake Samish is located 6.5 miles southeast of Bellingham. It is comprised of two basins which are connected by a narrow strait. The west arm is a small deep bay and the east arm is a larger shallow bay. There are several small inlets that flow into the lake, including Lake Creek and Barnes Creek. Lake Samish drains via Friday Creek to the Samish River.

Size (acres)	814
Maximum Depth (feet)	140
Mean Depth (feet)	71
Lake Volume (acre-feet)	33,100
Drainage Area (miles <sup>2</sup> )	3.7
Altitude (feet)	273
Shoreline Length (miles)	1.8

Estimated Trophic State:	Oligo-mesotrophic
Mean Trophic State Index* (Secchi) East Arm:	39
Mean Trophic State Index* (Total Phosphorus) East Arm:	39

\* From Carlson (1977)

### Summary of Questionnaire Results and Information From the Volunteers

The following are from the volunteers' remarks and questionnaire responses. Lake Samish is used for fishing, boating, water skiing, swimming, rowing, and jet skiing. There is a park, a picnic area, a beach and one public boat ramp on the lakeshore for public recreation. Lake water is withdrawn for drinking and other domestic uses. Currently the watershed is used for logging and lakeshore development. In the past, the watershed was used for logging and animal grazing, and the lake was dredged. There are 505 houses within the Lake Samish basin; of these, 288 are on the lakeshore. All houses are occupied year-round, and the lakeshore is fully sewerred. There are about 60 storm drains and culverts that empty into the lake. Presently there is a water district (#12) for sewage collection for the lake. The worst problems in the lake, in the opinion of the volunteers, are 1) aquatic plants, and 2) water level. The water level problems have involved Ecology and have affected some lake residents. The beaver dam at the outlet, which affects the lake level, was torn down three times during 1990. Overall, the volunteers find that Lake Samish has excellent recreational water quality, but they are concerned about aquatic weeds and stormwater runoff from I-5, as well as the limited water resource allocations at the lake. The volunteers also noted that the cove at the mouth of Lake Creek is almost totally filled up, despite dredging after the construction of I-5.

The volunteers noted four predominant aquatic plants growing in the lake. Three of the plants, wild celery (*Vallisneria americana*, also known as tapegrass), a water lily (*Nymphaea*

## Lake Samish -- Whatcom County

spp.) and northern watermilfoil (*Myriophyllum exalbescens*) were identified by the Whatcom County Cooperative Extension Office. Wild celery grows along the shoreline of the east basin, with the exception of two areas that have a steep shoreline. Wild celery grows along about 60% of the shore of the west basin. Lilies and northern watermilfoil grow predominantly in an area about 1500 feet east of the bridge on the south shore of the east basin. Cattails and "grass" grow along an area just east of the Lake Creek inlet. There is a wetland at the south end of the east basin, at the lake's outlet. Please see the Comments section regarding identification of aquatic plant species in Lake Samish.

In the 1989 questionnaire, the volunteers noted that cattails (*Typha* spp.), small oval-pad lilies (possibly *Brasenia schreberi*) and large round pad lilies (possibly *Nymphaea odorata*) were mapped in shallower areas near Lake Creek, Wefer Creek, and Friday Creek. The volunteers reported that growth of a variety of weeds was rapidly spreading along the shoreline in water up to ten feet deep.

The volunteers were interviewed for an article printed in the Bellingham Herald on July 12, 1989. The article reported that the Lake Samish shoreline was sewered in 1976-77, and the volunteers commented that the lake water was clearer after the sewers were installed. Local residents are concerned about how water quality may be affected by roadside spraying, potential spills along Interstate 5, and motor oil from boats.

### Monitoring Results/Summary of Other Available Information

Secchi data collected during 1990 show that the lowest water clarity occurred from August through September, in both basins of the lake. Lower water clarity during September was particularly evident in the West Arm of the lake. Compared with data collected during 1989, there were more distinct variations in water clarity during 1990, and mean summer water clarity was slightly better in 1990 than in 1989.

Profile data were collected from the East Arm during June and August 1990. The profile data show that on both sampling dates, the lake was thermally stratified and concentrations of dissolved oxygen decreased with depth below the thermocline. The decrease in dissolved oxygen concentrations probably resulted from bacteria consuming oxygen while decomposing organic material (such as algae, aquatic plants and woody debris) in the water and sediments. The decrease in pH with depth is most likely related to increased decomposition near the lake bottom. The profile data were very similar to profile data collected by Ecology in 1989 (Brower and Kendra, 1990). Data from October 1968 showed that concentrations of dissolved oxygen decreased to 1.5 mg/L near the bottom of the lake (Lee, 1969). A phenomenon known as metalimnetic maxima (higher concentrations in the metalimnion of the lake, caused by either lower temperatures or by algae which grow faster than they sink) was apparent in dissolved oxygen profiles in this study as well as during June 1989 (Brower and Kendra, 1990) and October 1968 (Lee, 1969). The lake was described

## Lake Samish -- Whatcom County

as oligotrophic in 1969 (Lee, 1969). Dissolved oxygen concentrations were also found to be depleted near the bottom of the lake in 1971 (Bortleson *et al.*, 1974).

In 1990, the concentrations of total phosphorus and total nitrogen were low to moderate compared to other lakes monitored for the program. Concentrations of these nutrients were similar to concentrations in 1989 (Brower and Kendra, 1990) and in 1971 (Bortleson *et al.* 1976).

In 1971, 26-50% of the shoreline was covered by submerged plants, including *Vallisneria* (Bortleson *et al.*, 1974). In 1989, *Vallisneria americana* was growing along approximately 90% of the shoreline of the east basin (Brower and Kendra, 1990).

In 1989, Ecology staff collected sediment and largemouth bass samples from both basins, and analyzed the samples for selected heavy metals and organic pollutants. No unusual concentrations of metals and no organochlorine pesticides or PCBs were detected in the fish samples (Johnson and Norton, 1990). Sediments contained arsenic (21.0  $\mu\text{g}/\text{Kg}$ ), 4-methylphenol (1500  $\mu\text{g}/\text{kg}$ ), and polyaromatic hydrocarbons (PAH; 81-110  $\mu\text{g}/\text{Kg}$ ). The concentrations found were not high enough to warrant further study. Possible sources of the 4-methylphenol are natural degradation of biological material, auto exhaust, asphalt, and domestic sewage. The most likely sources of PAH are urban runoff and combustion of fossil fuels (Johnson and Norton, 1990).

The Water Resources Program of Ecology has been monitoring the lake stage because of an ongoing controversy over water withdrawal permits.

Residential development of the lakeshore has increased since 1954. The volunteer reported there were 288 nearshore homes in 1990; in 1954 there were 142 nearshore homes (Bortleson *et al.*, 1974).

During the August 1990 visit with the volunteers, both tapegrass (*Vallisneria americana*) and waterweed (*Elodea* spp.) were observed near the public boat launch.

### Comments

Although each basin of the lake varies considerably with respect to size and depth, both basins had the same mean summer trophic state index (Secchi) value.

Identification of the water lilies may need to be verified, because there are some discrepancies in the identifications of the small-leaved versus the large-leaved varieties. Both *Nymphaea odorata* (a white-flowering water lily with large, round leaves) and *Brasenia schreberi* (a small, round-leaved "lily pad" that has small, inconspicuous flowers; also known as water shield) were found in Lake Samish in 1989 (Brower and Kendra, 1990).

**Lake Samish -- Whatcom County**

**Identification of the small-leaved lily was not consistent with the identification conducted at the County Extension Office.**

**Acknowledgement**

**I thank A. B. Davis and J. David Jenkins for volunteering their time to monitor the east and west arms of Lake Samish, respectively, during 1989 - 1990.**

## Lake Samish -- Whatcom County

### Volunteer-Collected Data -- East Arm

Date 1990	Temperature (°C) (°F)		pH	Water Color	%Cloud Cover	Recent Rain	Wind	Secchi (ft) *	Lake Ht	Abbreviated Comments
04-Jun	15.0	59.0	7.2	Lt-Green	50	Heavy	Gusty	13.7**		
22-Jun	20.0	68.0		Lt-Green	100	None	Gusty	15.6		
07-Jul	20.0	68.0	6.3	Lt-Green	100	Light	Light	17.9		
21-Jul	24.5	76.1	6.0	Lt-Green	0	None	Calm	22.0	267.4	
04-Aug	24.0	75.2	6.0	Lt-Green	0	None	Light	19.3	267.3	
15-Aug	24.0	75.2	6.0	Lt-Green	90	None	Strong	9.6	265.8	
30-Aug	21.0	69.8	7.3	Green	100	Moderate	Light	8.7		
13-Sep	20.0	68.0		Green	0	None	Calm	10.1	267.2	
26-Sep	19.5	67.1	6.5	Lt-Green	100	None	Calm	10.1	267.2	
09-Oct	16.0	60.8	6.5	Lt-Green	100	None	Calm	9.2**	267.5	

\* Secchi data corrected for rope shrinkage

\*\* There was high variability between the first and second Secchi depths collected; these two data points may not be included in data comparisons

### Volunteer-Collected Data -- West Arm

Date 1990	Temperature (°C) (°F)		pH	Water Color	%Cloud Cover	Recent Rain	Wind	Secchi (ft) *	Lake Ht	Abbreviated Comments
22-Jun	20.0	68.0	6.0	Lt-Green	100	None	Gusty	16.4		
07-Jul	20.0	68.0	6.0	Lt-Green	0	Trace	Light	19.3	268.0	
22-Jul	24.0	75.2	6.3	Lt-Green	0	None	Light	22.2	267.5	
04-Aug	22.0	71.6	6.0	Lt-Green	0	None	Calm	18.3	267.3	
15-Aug	24.0	75.2	6.0	Lt-Green	0	None	Light	11.0	267.2	Sea level elevation is a DOE lake gage compared to a gage set by water district engineers.
30-Aug	20.5	68.9	7.3	Lt-Green	100	Moderate	Light	10.1	267.20	
13-Sep	20.0	68.0		Lt-Green	0	None	Breezy	6.0	267.18	
26-Sep	18.0	64.4	6.5	Lt-Green	100	None	Calm	10.1	267.2	Height above sea level is calculated by adding 266.63 to DOE gage reading. Differential calculated from sea level gage established by engineers.
09-Oct	15.5	59.9	6.5	Lt-Green	100	None	Calm	11.0	267.5	

\* Secchi data corrected for rope shrinkage

## Lake Samish -- Whatcom County

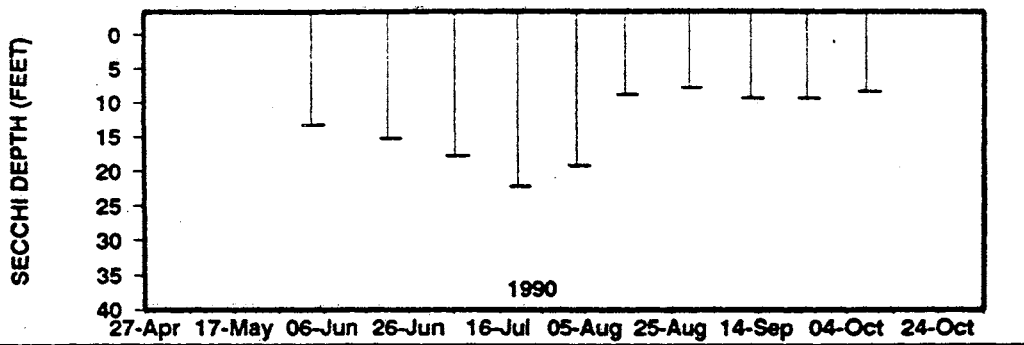
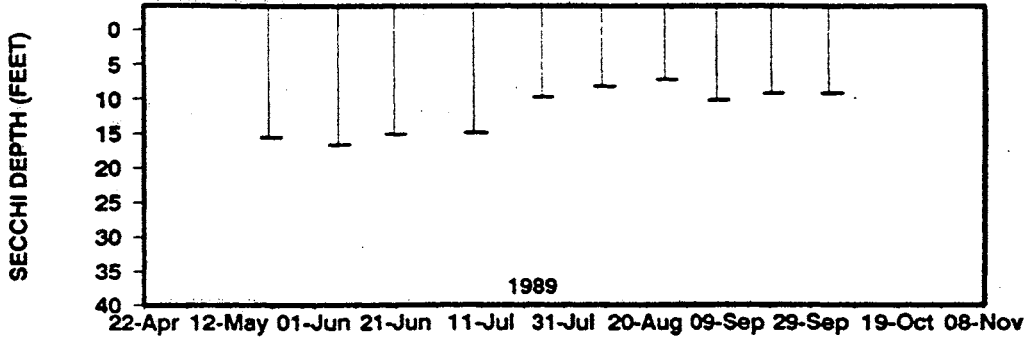
### Onsite Visit Data

Date 1990	Depth (meters)	Temp (°C)	pH	Dissolved oxygen (mg/L)	Conductivity (µmhos/cm)	Composite sample depths (m)	Total phosphorus (mg/L)	Total nitrogen (mg/L)
06/04	0.0	15.6	7.2	10.6	62	1, 4, 7	0.013	NA
	0.5	15.6	7.3	10.6	62			
	1.0	15.6	7.3	10.6	62			
	2.0	15.6	7.3	10.6	62			
	3.0	15.6	7.3	10.6	63			
	4.0	15.6	7.3	10.6	63			
	5.0	15.5	7.3	10.6	63			
	6.0	15.5	7.3	10.6	65			
	7.0	13.5	7.3	10.6	65			
	8.0	13.7	7.1	10.8	67			
	9.0	11.8	7.0	11.1	68			
	10.0	10.1	6.9	11.4	89			
	11.0	9.1	6.8	10.8	70			
	13.0	8.1	6.7	8.9	71			
	15.0	7.5	6.4	8.0	71			
	17.0	6.9	6.7	8.1	70			
	20.0	6.6	6.3	4.7	72			
08/15	0.0	23.4	8.5	9.8	71	1, 3, 6	0.010	0.362
	1.0	23.5	8.6	9.8	71			
	2.0	23.5	8.6	9.8	71			
	4.0	23.4	8.7	9.8	70			
	6.0	22.6	8.6	9.8	69			
	8.0	4.3	7.7	10.8	68			
	10.0	12.6	7.0	8.5	68			
	12.0	8.9	6.7	3.2	70			
	14.0	8.1	6.5	2.1	70			
	16.0	7.6	6.4	1.7	68			
	18.0	7.3	6.3	0.5	69			
19.0	7.2	6.1	0.2	73				

NA data not available -- sample not analyzed by laboratory

# LAKE SAMISH (WHATCOM COUNTY)

East Arm



# LAKE SAMISH (WHATCOM COUNTY)

West Arm

