

Lake Cassidy

Lake Cassidy has high nutrient levels, abundant algae, low water clarity, and dense aquatic plants. Although the lake provides valuable recreation and aesthetic enjoyment, these conditions impair the use of the lake at times. Preservation of nearby wetlands and careful development in the watershed are important for protecting the health of the lake.

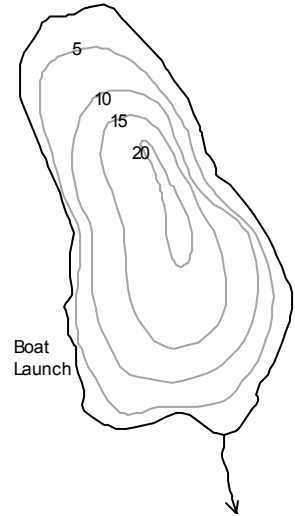


***State of the Lakes Report
March 2003***

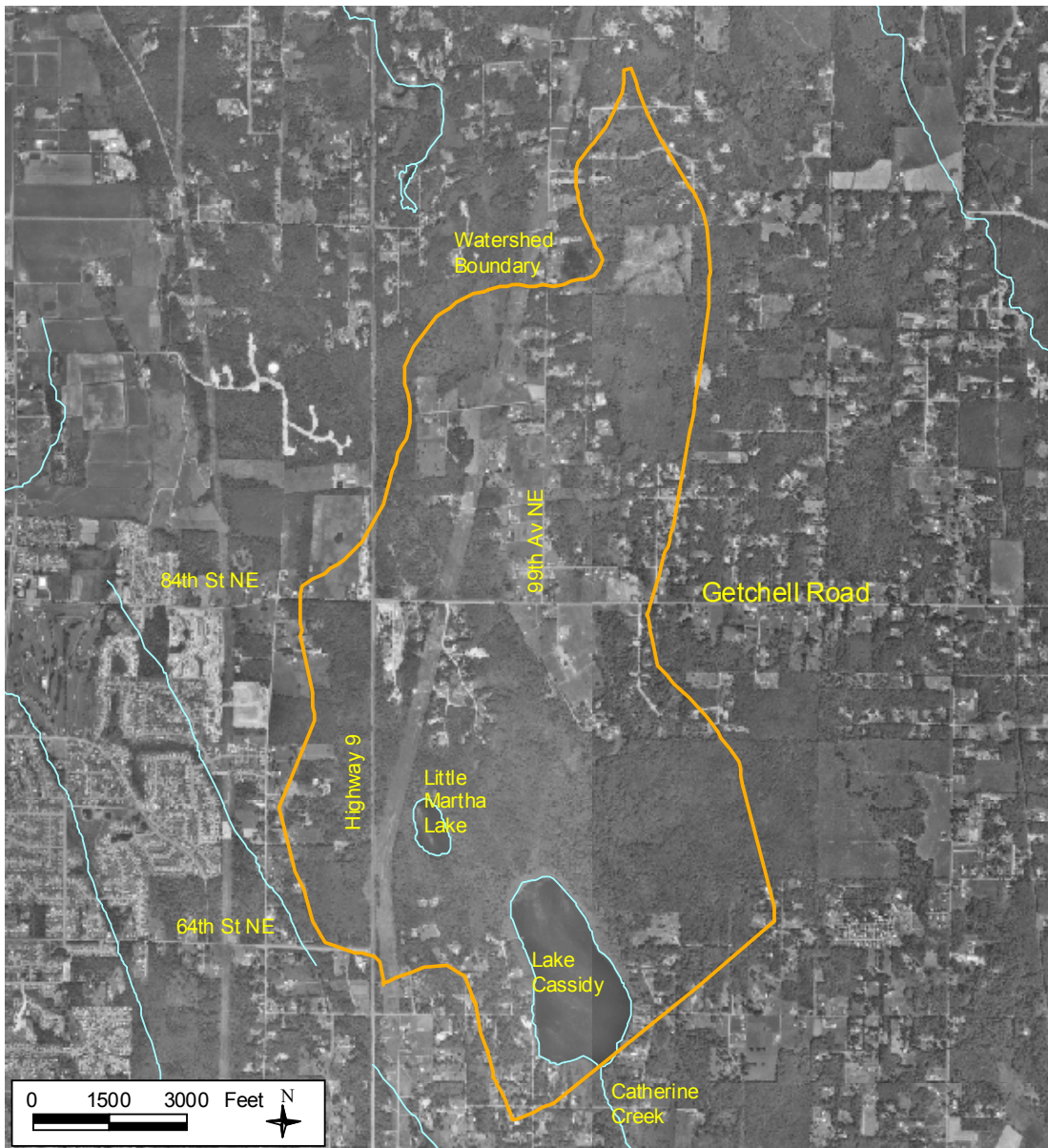
**Snohomish County Public Works
Surface Water Management**

LAKE AND WATERSHED DATA

Lake Area: 123 acres
 Watershed Area: 2477 acres
 Watershed to Lake Area Ratio: 20.1
 Maximum Depth: 20 feet (6.1 meters)
 Average Depth: 11 feet (3.4 meters)
 Lake Volume: 1300 acre-feet
 Length of Shore: 1.8 miles



	<u>1974</u>	<u>MID-90'S</u>
# of nearshore homes	22	18
# of homes/1000' of shoreline	2.3	1.9
% of homes with bulkhead or fill		6
% of homes with some native vegetation near shore		78
% of watershed developed (residential or commercial)	1%	18% (est.)



LAKE ASSESSMENT

DESCRIPTION

■ **Location/Access**– Lake Cassidy is located north of Lake Stevens and three miles east of Marysville. Fed by Little Martha Lake, Lake Cassidy drains southward to the Pilchuck River via Catherine Creek. A public boat launch is located on the southwest shore. Power boats are permitted, but restricted to 10 hp and a maximum speed of 8 mph. The lake is popular for fishing, especially for warm water fish. As part of the Centennial Trail project, Snohomish County Parks purchased a large property of wetlands and old growth trees on the north side of the lake.

■ **Size/Shape**– The lake covers 125 surface acres, but is relatively shallow, with a maximum depth of 6.1 meters and an average depth of 3.4 meters. The lake volume contains 1,300 acre-feet of water.

■ **Watershed**– The Lake Cassidy watershed, including the lake, covers 2,477 acres. This makes the watershed over 20 times the size of the lake. Such a large watershed has a high potential for introducing pollution to the lake. In 1974, approximately 14% of the watershed was in agricultural use and only 1% was dedicated to residential uses. The remainder of the watershed was undeveloped. By the mid-90s, residential development in the northern portion of the watershed had increased substantially, bringing development to about 18% of the total watershed. However, more than 50% of the watershed remains wooded or undeveloped today. A small commercial node has been developed at the intersection of N.E. 84th Street (Getchell Road) and Highway 9.

■ **Shoreline**– The shoreline of Lake Cassidy is 1.8 miles long. In 1974, there were 22 homes—mostly small cabins—along the shoreline. This number dropped to 18 year-round homes by the mid-90s. Of the few homes on the lake, only 6% have modified the shoreline with bulkheads or fill, while 78% have retained some native vegetation along the shore. A zone of vegetation is important for filtering pollution.



LAKE CONDITIONS

■ **Water Clarity**– Summer water clarity in Lake Cassidy averaged 1.0 meters from 1992 through 2002. The clarity has been fairly consistent from year to year, although there were only a few measurements in some years, and none in 1998 and 1999.

■ **Color**– Dissolved organic (humic) material in the lake sediments and from surrounding wetlands colors the water medium to dark brown. Limited measurements show that Lake Cassidy has the darkest colored water of any monitored lake in the county. Heavy algal blooms also affect the appearance of the water's color, sometimes giving it a greenish hue. The orange color noted in May of 1995 may also be the result of an algal bloom.

■ **Nutrients**– Summer average total phosphorus concentrations in the epilimnion ranged from 25 to 41 $\mu\text{g/l}$ between 1996 and 2002, which is relatively high for Snohomish County lakes. Average total phosphorus concentrations in the hypolimnion were also high, ranging from 44 to 73 $\mu\text{g/l}$. The elevated phosphorus concentrations in the hypolimnion point to a substantial release of phosphorus from the bottom sediments during times of oxygen depletion. Being a shallow lake, Cassidy probably also experiences phosphorus releases from shallow sediments when dissolved oxygen levels drop overnight during the summer. Total nitrogen levels were measured in single samples from 1974 and 1981. Concentrations were fairly high, ranging from 920 to 1,500 $\mu\text{g/l}$, which suggests that

nitrogen was abundant and phosphorus was probably limiting algal growth.

- **Alkalinity**– Limited data from 1994 and 1995 indicate that Lake Cassidy has a low buffering capacity and is sensitive to nutrient pollution.
- **Oxygen/Temperature**– Vertical profiles of dissolved oxygen and temperature from the summers of 1993-2002 show mild temperature stratification between the warm upper waters and cool bottom waters. The large size of the lake and shallow depth allow the wind and waves to easily mix the water to 4 or 5 meters deep, leaving only a small zone of cool bottom water. However, because of the large amount of decaying organic matter in the lake, dissolved oxygen is usually depleted below 3 or 4 meters depth in the summer.
- **Algae**– Limited summer chlorophyll *a* data are available for 1981 and for most years between 1994 and 2002. Individual values covered a wide range—from 0.6 µg/l to 90 µg/l. Summer averages for 1997 and 2002 (the years with the most data) were 15 µg/l and 50 µg/l. These values indicate high levels of algae production, significantly above the general threshold of 8.7 µg/l that suggests eutrophic conditions. Analysis of three algae samples collected in 1994 and 1995 revealed high biovolumes, with blue-green algae dominant at times. Lake monitors have noted that algal blooms and surface scum are frequently present.
- **Aquatic Plants**– Although the dark color of the water reduces the available habitat for aquatic plants to a shallow zone around the lake shore, Lake Cassidy supports moderate to dense growths of aquatic plants. These plants provide habitat for fish and other aquatic life. Yellow water-lily and coontail, both natives, are the dominant plants in the lake. Coontail takes nutrients directly out of the water column, competing with algae for the available nutrients. Bulrushes are also prevalent along portions of the shoreline. Most of the lake shore is bordered by dense wetlands, which are also valuable for fish and wildlife habitat. However, purple loosestrife—a non-native invasive wetland plant—has invaded these wetlands and is currently the dominant vegetation along the southeast shore.
- **Water Levels**– Lake Cassidy experiences high water levels during wet winters. The flooding damages homes and septic systems, especially on

the south and east shores. Beaver activity along the outlet channel and the flatness of the shoreline areas are the main causes of the flooding.

SUMMARY

- **Trophic State**– Based on low water clarity, high phosphorus concentrations, the presence of blue-green algal blooms, oxygen depletion, and dense aquatic plant growth, Lake Cassidy may be classified as eutrophic.
- **Current Conditions/Trends**– Lake Cassidy suffers from excess algae and high nutrient levels. These conditions impair the use of the lake at times. However, the lake still provides valuable recreation, and there is no evidence that lake conditions have degraded in recent years.
- **Future Concerns/Targets**– The main concern for Lake Cassidy is the potential for further declines in water quality. Purple loosestrife is also a threat to the wetlands around the lake. Improving water clarity and reducing phosphorus levels are targets for the lake.
- **Recommendations**– The lake should be monitored carefully to determine if nutrient levels rise or if blue-green algal blooms become more severe. Development in the upper watershed should take steps to control runoff and nutrients. The wetlands and native vegetation surrounding Lake Cassidy should be preserved. The purple loosestrife should be controlled to protect the habitat values of the natural wetlands.

VOLUNTEERS/OTHER AGENCIES

Thanks to Glenn Phipps and John Naples for past volunteer monitoring of Lake Cassidy. Thanks also to Drainage Improvement District #8 which has conducted lake monitoring since 1997.

DATA SUMMARY TABLE

Source	Date	Secchi Depth (meters)	Total Phosphorus (ug/l)		Color (Pt-Co scale)	Chlorophyll a (ug/l)
			Surface	Bottom	Epilimnion	Epilimnion
Bortleson, et al, 1976	6/21/74	1.5	70	36	150	-
Sumioka and Dion, 1985	7/7/81	0.6	20	60	-	21.1
Volunteer	Summer 1992	0.6 - 1.6 (1.3) n = 7	-	-	-	-
Volunteer	Summer 1993	1.0	-	-	-	-
SWM Staff or Volunteer	Summer 1994	1.0 - 1.2 (1.1) n = 5	-	-	120 - 140 (130) n = 2	10 - 43 (27) n = 2
SWM Staff or Volunteer	Summer 1995	0.8 - 1.3 (1.0) n = 7	-	-	140	21
SWM Staff	Summer 1996	0.8 - 1.0 (0.9) n = 2	32 - 43 (38) n = 2	37 - 108 (73) n = 2	-	-
DD#8	Summer 1997	0.5 - 1.2 (0.9) n = 5	18 - 36 (25) n = 7	23 - 106 (44) n = 6	-	3.1 - 31 (15) n = 8
DD#8	Summer 1998	-	-	51	-	13.3
DD#8	Summer 1999	-	24 - 45 (35) n = 2	-	-	1.9 - 5.9 (3.9) n = 2
DD#8	Summer 2000	0.8 - 1.0 (0.9) n = 2	26 - 52 (39) n = 2	-	-	0.6
SWM Staff or DD#8	Summer 2001	0.8 - 1.3 (1.1) n = 5	33 - 47 (41) n = 6	34 - 58 (47) n = 4	-	
SWM Staff or DD#8	Summer 2002	0.9 - 1.3 (1.1) n = 5	30 - 46 (37) n = 4	32 - 107 (53) n = 4	-	25 - 90 (50) 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.
- DD#8 = Lake Stevens Drainage Improvement District #8

SUMMARY OF OTHER DATA

■ **Total Nitrogen** – single samples in 1974 and 1981 averaged 1.21 mg/l in the epilimnion and 1.14 mg/l in the hypolimnion; which suggests that nitrogen levels were high and were probably not limiting algal growth.

■ **Alkalinity** – limited data from 1994 and 1995 ranged from 10 -- 21 mg/l CaCO₃, which suggests that Cassidy has a low buffering capacity and is sensitive to nutrient pollution.

■ **pH** – readings from 1994 through 1997 averaged 6.9 near the surface and 6.0 near the bottom, which is within the normal range for Snohomish County lakes. Readings from 2001-2002 were similar.

■ **Conductivity** – 1994-1997 data averaged 46 µmhos in the epilimnion and 56 µmhos near the lake bottom, indicating relatively low levels of dissolved materials in the water compared to other Snohomish County lakes. 2001-2002 data were similar.

■ **Iron** – limited 1994-95 data showed high levels in the epilimnion (avg. 227 µg/l) and higher levels in the hypolimnion (avg. 547 µg/l, high of 1100 µg/l), which indicates release of iron and phosphorus from the bottom sediments under low oxygen conditions.

■ **Algae** – the following table shows the total biovolume and percent biovolume of the main types of algae from three samples collected in 1994-95. The data show that the total algal volumes were high and that blue-greens, gold-browns/diatoms, and dinoflagellates were each most prevalent at times. Cell counts of the same samples revealed that blue-green algae were most

abundant in two samples (97%) and gold-browns in one sample (82%).

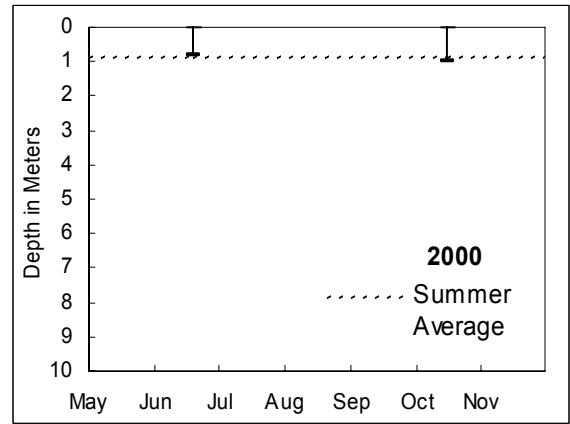
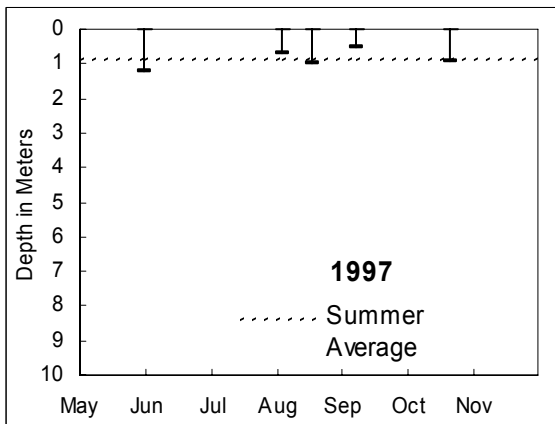
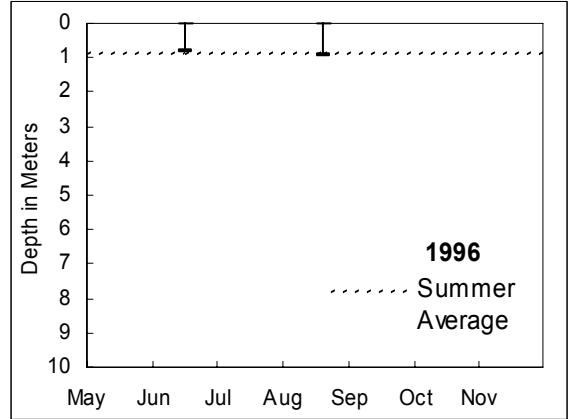
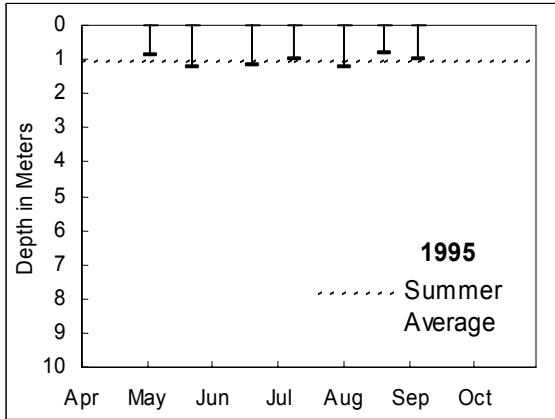
ALGAE TYPES	7/25/94	9/14/94	8/21/95
Cyanophyta (Blue-greens)	33%	2%	89%
Chlorophyta (Greens)	2%	2%	0%
Chrysophyta (Golden/diatoms)	1%	87%	3%
Cryptophyta (Cryptomonads)	16%	2%	3%
Euglenophyta (Euglenoids)	0%	4%	0%
Pyrrhophyta (Dinoflagellates)	48%	3%	5%
TOTAL BIOVOLUME (mm³/l)	1.741	5.837	4.602

■ **Fish** – according to the Washington State Department of Fish and Wildlife (WDFW), fish species found in Lake Cassidy include rainbow trout, largemouth bass, black crappie, yellow perch, pumpkinseed sunfish, and brown bullhead catfish. WDFW usually stocks the lake each year with rainbow trout.

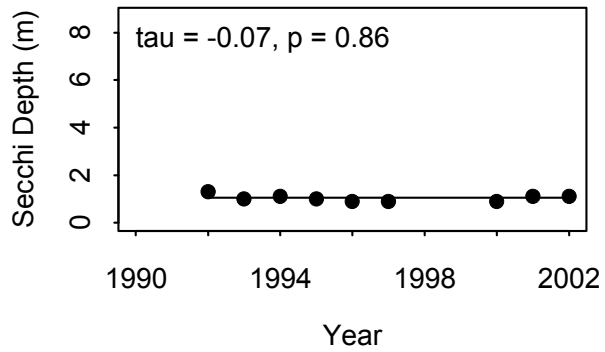
DATA SOURCES

In addition to data from Snohomish County SWM staff and citizen volunteers, data for Lake Cassidy are also available from: Bortleson, et. al., 1976; Gray & Osborne, 1998; Gray & Osborne, 1999; Gray & Osborne, 2000; Gray & Osborne, 2001; and Sumioka and Dion, 1985. Please refer to the full list of references in the County-Wide Summary.

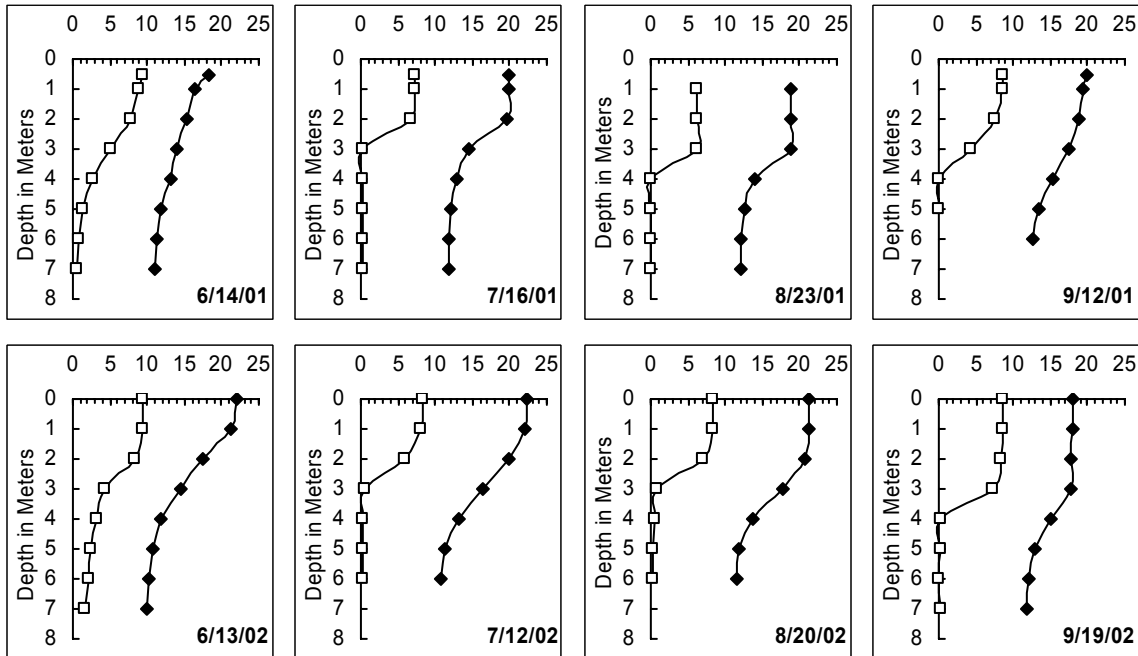
WATER CLARITY



TREND ANALYSIS

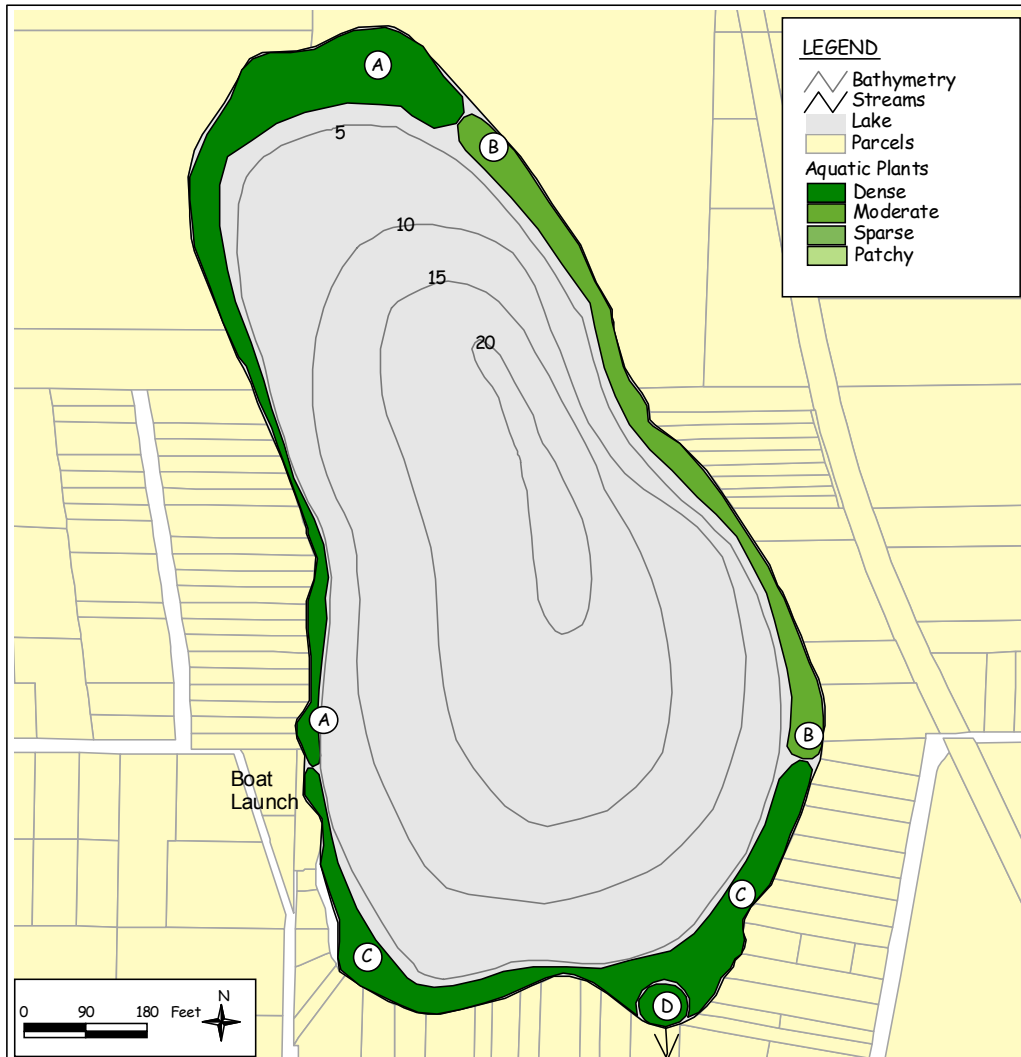


DISSOLVED OXYGEN AND TEMPERATURE PROFILES (SELECTED YEARS)



—□— DO (mg/l) —◆— Temp (°C)

AQUATIC PLANTS



Area	Density	Dominant Plants	Other Plants
A	Dense	<i>Nuphar polysepalum</i> (Yellow water-lily)	<i>Elodea canadensis</i> (Common elodea) <i>Utricularia vulgaris</i> (Common bladderwort) <i>Potamogeton sp.</i> (Thin-leaf pondweed) <i>Nitella sp.</i> (Brittlewort)
B	Moderate	<i>Nuphar polysepalum</i> (Yellow water-lily) <i>Scirpus sp.</i> (Bulrush) [emergent in shallow water]	<i>Elodea canadensis</i> (Common elodea) <i>Utricularia vulgaris</i> (Common bladderwort) <i>Potamogeton sp.</i> (Thin-leaf pondweed) <i>Ceratophyllum demersum</i> (Coontail)
C	Dense	<i>Nuphar polysepalum</i> (Yellow water-lily)	
D	Dense	<i>Ceratophyllum demersum</i> (Coontail)	<i>Nuphar polysepalum</i> (Yellow water-lily) <i>Utricularia vulgaris</i> (Common bladderwort) <i>Nitella sp.</i> (Brittlewort)

Note: Wetlands surround the north end of the lake and part of the south shore. *Lythrum salicaria* (Purple loosestrife), a noxious, invasive wetland plant, is scattered along the shore adjacent to zones A & B and is dense adjacent to zone C. *Dulichium arundinaceum* (Three-way sedge) and *Carex* spp. (Sedges) are scattered around the shoreline.

BASIC MONITORING DATA

1995									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
5/6/95	0.9	30	16		10	light	light	orange	Slight aquatic plants. Slight musty odor.
5/25/95	1.3	32	20	0	0	none	calm	medgreen	Slight algae & scum. Moderate aquatic plants. Milfoil floating in the water. Approx 15 ducks/geese & 20 -25 ducklings.
6/22/95	1.2	30	17		0	none	light	medgreen	Slight algae scum. Moderate aquatic plants. Slight septic like odor. Approx 30 ducks/geese. Some new sort of grass growth.
7/11/95	1.0	32	20		10	none	light	grn brown	Slight algae scum. Moderate aquatic plants. Slight musty odor. Approx 30 -35 ducks/geese. Less lily pad growth than normal.
8/3/95	1.2	30	18		50	light	breezy	grn brown	Slight algae scum. Moderate aquatic plants. Slight musty odor. Approx 15 ducks/geese.
*08/21/95	0.85				10	none	breezy	dk brown	Algae mostly Aphanizomenon, few Gleotrichia. Slight-mod rotten egg smell at 5m. Lots of zooplankton in epilimnion. Purple Loosestrife dominates at SE shore; scattered plants observed throughout rest of shore.
9/6/95	1.0	28	18		75	moderate	calm	lt brown	Moderate algae and algae scum. Slight aquatic plants. Algae bloom along entire shoreline. Milfoil type grass spotted.

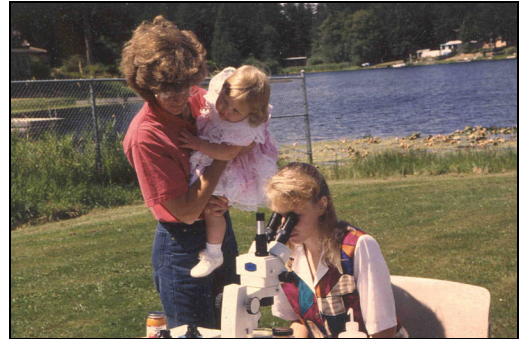
1996									
DATE	Secchi Depth (meters)	Air Temp (C)	Water Temp (C)	Lake Level (in)	Clouds (%)	Rain	Wind	Color	COMMENT
*06/19/96	0.8				0	trace	strong	dk brown	algae - skinny, stick shape, no H2S smell
*08/21/96	1					trace	breezy	dk brown	

*Indicates data collected by Snohomish County staff.

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

HOW YOU CAN HELP LAKE CASSIDY

- 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 Cassidy.

(TTY users call 425-388-3700)