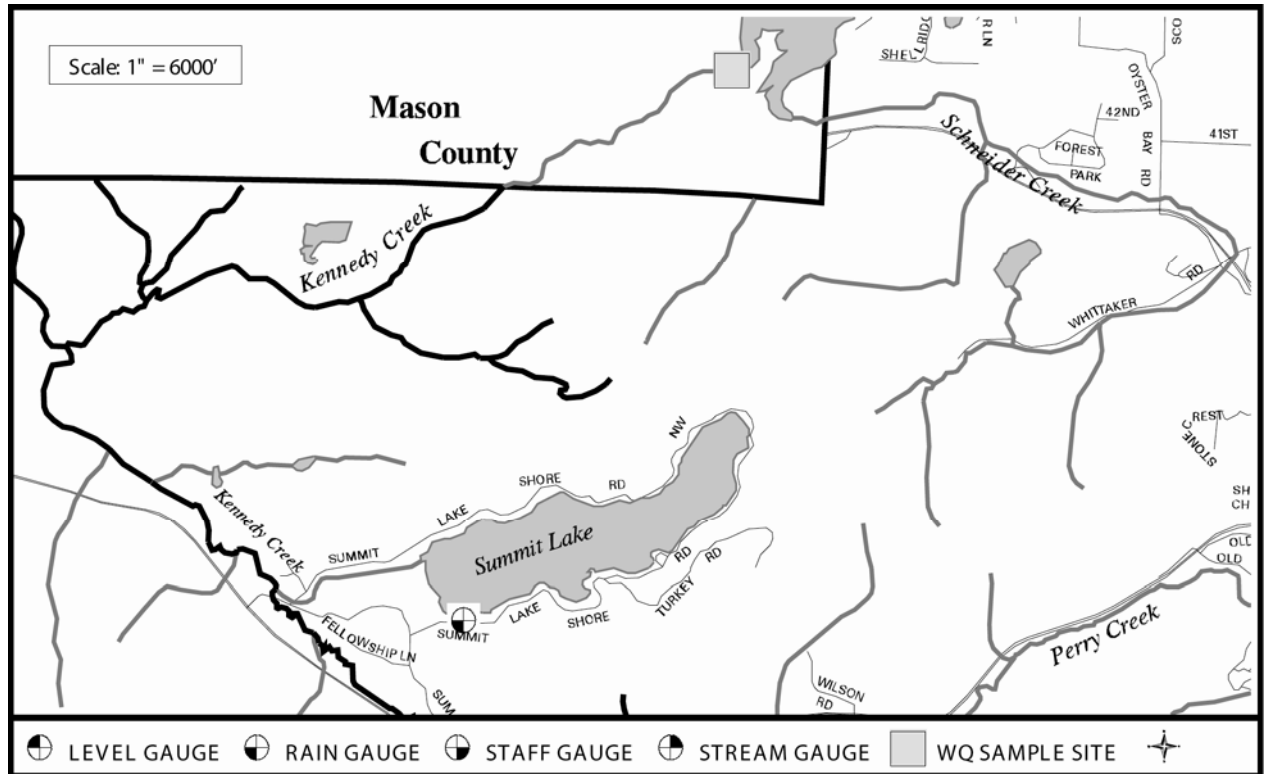


Totten / Little Skookum Inlet Watershed

WRIA 13

Chapter Includes:

**Kennedy Creek
Schneider Creek (Totten)
Summit Lake**



PART OF TOTTEN/LITTLE SKOOKUM WATERSHED

LENGTH OF CREEK: 10 miles

BASIN SIZE: 19 square miles

STREAM ORDER: 3

PRIMARY LAND USES:

Rural residential
Forestry and some farming

FISHERIES RESOURCES: (From A Catalog of Washington Streams and Salmon Utilization, WDOF)

Chinook (probable not proven)
Coho, Chum salmon

GENERAL TOPOGRAPHY:

The creek originates in Black Hills; falls gradually to lowlands except for a series of falls, cascades, and log jams 2.5 miles from the mouth. It discharges into the head of Totten Inlet.

GENERAL WATER QUALITY: (Excellent, Good, Fair, Poor)

Good – Failed Part II of the bacteria standard, and has dissolved oxygen violations during summer low flow periods.

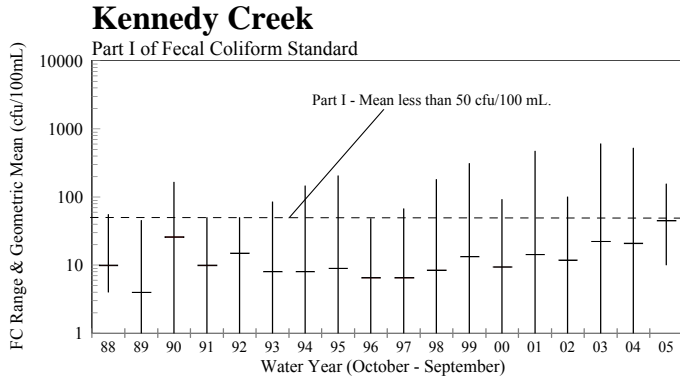
OTHER DATA:

Thurston County Environmental Health Division, (360) 754-4111 or www.geodata.org/swater

Thurston County Department of Water and Waste Management, Storm Water Utility, Stream flow (360) 357-2491 or www.co.thurston.wa.us/monitoring

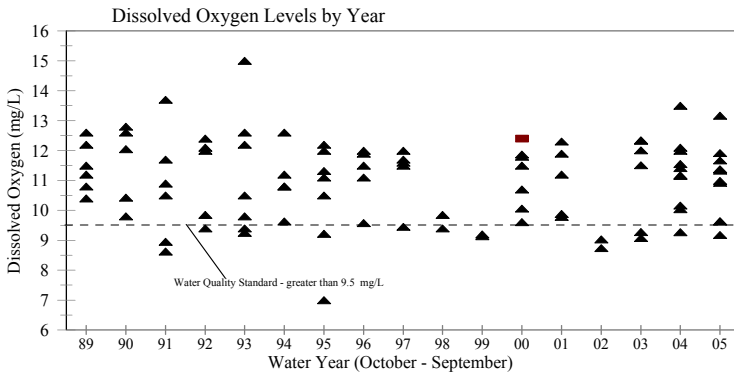
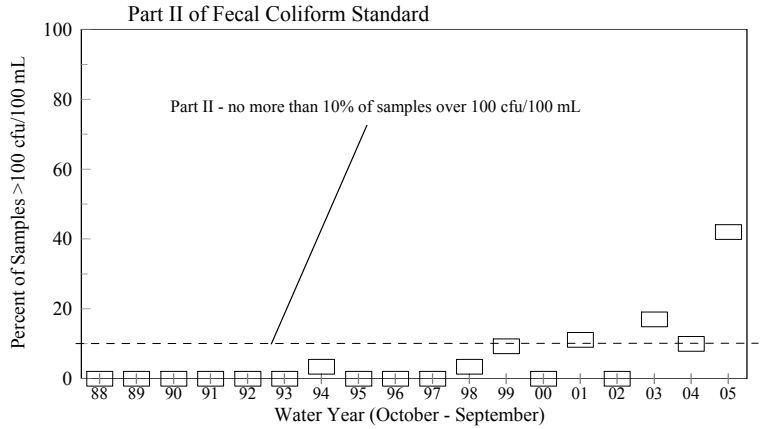
Washington Department of Ecology, Environmental Assessment Program, National Monitoring Program Project, Intensive wet season data between 1992 and 2002, (360) 407-6000.

Kennedy Creek #0012



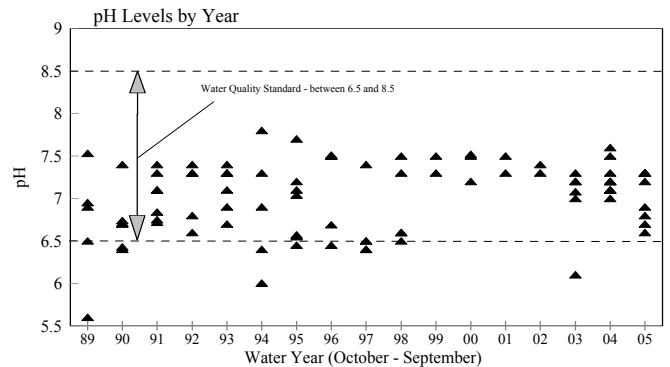
The water quality standard for fecal coliform has two parts: the geometric mean shall not exceed 50 mg/100mL *and* no more than 10% of the samples shall exceed 100 org/100 mL.

In the past, the water quality of this stream has been excellent. However in 2004/2005, the mean was the highest on record at 45 f.c./100mL, and Part II of the standard was violated at 42% of the samples greater than 100.



The water quality standard for dissolved oxygen is a lowest one-day minimum of 9.5 mg/L. The DO frequently falls below the standard during the summer low-flow period. In both the 03/04 and 04/05 water years there was a violation.

The water quality standard for pH requires the pH to be within the range of 6.5 to 8.5. Throughout the period of record there are occasional measurements below the standard. There were no violations in 03/04 or 04/05.



Major Issues:

- Fecal coliform bacteria levels during dry season appear to be increasing. Investigation for potential sources will be conducted in 2006 and 2007.
- Kennedy Creek was part of a Washington Department of Ecology Total Maximum Daily Load Study that will require development of a water quality clean-up plan in the next few years.
- The chum salmon run in Kennedy Creek continues to be a valued local resource. Various private and public entities worked together to build salmon spawning viewing areas for the public along a lower portion of the creek.

Funding Sources:

- Local stormwater utility rate

Water Quality Summary
Conventional Parameters
Kennedy Creek

Parameter	Units	WQ Standard WAC 173-201A	Water Year Data: 2003/2004 & 2004/2005				Cumulative Data: 1988-2003	
			Water Year	Mean	Range	# samples violating standard	Mean	Range
Temperature	EC	Highest 7-DAD Max of 16EC	03/04 04/05		6.1 – 15.91 4.43 - 14.95	0 of 10 0 of 12		1.09 - 17.53
Dissolved Oxygen	mg/L	Lowest one-day minimum of 9.5	03/04 04/05		9.27 – 13.5 9.18 - 13.2	1 of 10 1 of 10		7 – 13.7
Conductivity	F mhos/cm		03/04 04/05	74 75	55 – 95 57 – 99		68	37 – 202
pH		6.5 - 8.5	03/04 04/05	7.2* 7.3*	7.0 - 7.6 6.6 - 7.3	0 of 10 0 of 12		5.6 - 7.8
Turbidity	NTU	not to exceed 5 NTU over background	03/04 04/05	0.79 3.0	0 – 2.6 0.5 – 7.6	0 of 10 0 of 12	4.6	0.35 – 120
Fecal Coliform	colonies / 100 ml	GMV: ≤ 50 and $\leq 10\%$ not to exceed 100	03/04 04/05	18** 46**	0 – 520 10 – 155	% exceeding 100 10% 42%	10**	0 – 605
Total Phosphorus	mg/L		03/04 04/05	0.019 0.04	0.014 - 0.023 0.022 - 0.144		0.026	0.006 - 0.23
Nitrate+Nitrite-nitrogen	mg/L		03/04 04/05	0.423 0.593	0.192 - 0.578 0.384 - 0.894		0.623	0.185 - 1.52
Ammonia	mg/L						0.039	<0.010 - 0.402

* Median

** Geometric mean value (GMV)

Thurston County Water Resources Monitoring Report 2003 - 2004

Kennedy Creek @ Mouth

<i>Date</i>	<i>Time</i>	<i>Temp C</i>	<i>pH</i>	<i>DO mg/L</i>	<i>Cond @25c umhos/cm</i>	<i>FC cfu/100mL</i>	<i>Turb NTU</i>	<i>Flow cfs</i>	<i>TP mg/L</i>	<i>NOx mg/L</i>	<i>COMMENTS</i>
12/16/2003	1:40:00 PM	7.52	7.5	11.55	57	15	0.9	155.5	0.022	0.539	
1/21/2004	2:30:00 PM	7.30	7.2	13.50	59	520	1.2	93.1	0.016	0.578	
2/17/2004	10:15:00 AM	6.10	7.1	12.00	55	0	2.6	136.9	0.016	0.561	FC <5
3/15/2004	12:00:00 PM	8.47	7.6	12.10	65	15	0.8	46.1	0.016	0.459	Saw horse tracks along the trail today. Ducks in creek upstream. Garbage, etc. was a little cleaner than previous.
4/19/2004	1:50:00 PM	10.06	7.2	11.42	71	0	0.6	26.5	0.016	0.390	FC <5 Human waste pile along the trail w/ tp!
5/17/2004	11:45:00 AM	11.79	7.2	11.15	82	30	0.4	12.5	0.020	0.371	
6/22/2004	9:25:00 AM	14.33	7.1	10.16	88	40	0.2	10.1	0.023	0.343	
7/15/2004	2:00:00 PM	15.91	7.3	10.04	85	65	0.0	9.7	0.021	0.192	Cloudy ~75 degrees.
8/24/2004	2:15:00 PM	15.89	7.1	9.27	95	25	0.3	6.6	0.023	0.269	
9/22/2004	10:30:00 AM	11.64	7.0	11.17	85	15	0.9	13.9	0.014	0.531	Raining.

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Thurston County Water Resources Monitoring Report 2004 - 2005

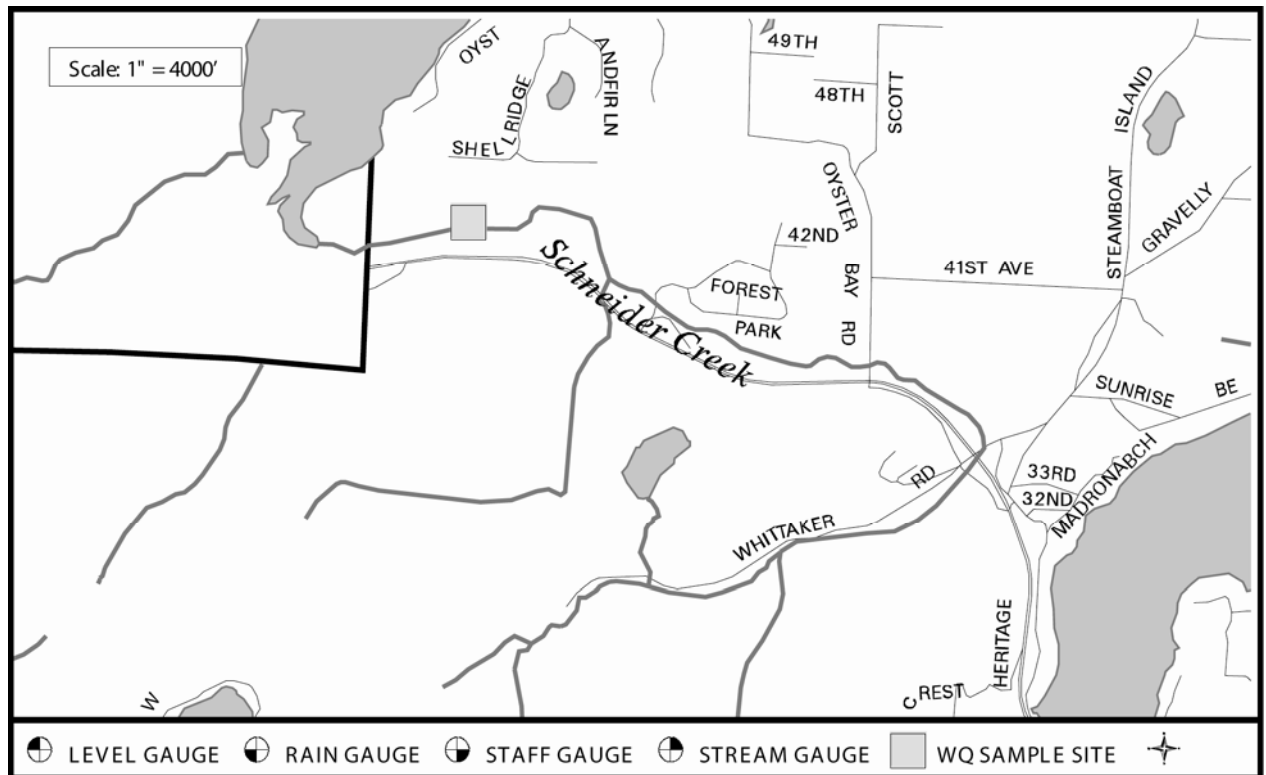
Kennedy Creek @ Mouth

<i>Date</i>	<i>Time</i>	<i>Temp C</i>	<i>pH</i>	<i>DO mg/L</i>	<i>Cond @25c umhos/cm</i>	<i>FC cfu/100mL</i>	<i>Turb NTU</i>	<i>Flow cfs</i>	<i>TP mg/L</i>	<i>NOx mg/L</i>	<i>COMMENTS</i>
10/19/2004	11:40:00 AM	11.09	6.9		73	105	5.4	50.1	0.035	0.776	D.O. did not post calibrate.
11/9/2004	10:30:00 AM	10.10	6.6		83	60	7.6		0.144	0.810	Fish spawning may account for higher turb. Did not take flow due to fish present. DO recording error.
12/13/2004	10:00:00 AM	7.79	6.8	11.67	61	10	7.0		0.035	0.894	Too high to measure flow.
1/10/2005	11:00:00 AM	5.02	6.7	11.33	66	20	3.2	71.0	0.038	0.701	Pt. cloudy, high 30's.
2/15/2005	12:15:00 PM	4.43	7.3	13.17	68	18	1.2	38.5	0.022	0.593	Swoffer #2 now calibrating to 185 instead of 186.
3/14/2005	9:20:00 AM	6.76	7.3	11.38	70	10	0.9	16.3	0.037	0.573	
4/12/2005	9:45:00 AM	7.14	7.3	11.92	57	10	3.0	122.8	0.023	0.585	Rain, 40 degrees.
5/10/2005	10:15:00 AM	11.16	7.3	10.99	69	110	3.7	58.3	0.039	0.496	Overcast -55 degrees.
6/7/2005	11:45:00 AM	11.49	7.3	10.93	76	130	0.5	21.3	0.023	0.436	
7/11/2005	10:00:00 AM	13.66	7.3	9.63	86	155	0.8	11.1	0.028	0.441	
8/9/2005	9:15:00 AM	14.95	7.3	9.18	94	90	0.6	5.9	0.033	0.421	Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.
9/27/2005	10:00:00 AM	11.47	7.2	9.64	99	115	1.9	4.2	0.028	0.384	Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.

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Kennedy Creek #0012

Schneider Creek #0009 (In Totten/Little Skookum Inlet Watershed)



PART OF TOTTEN/LITTLE SKOOKUM WATERSHED

LENGTH OF CREEK: 5.3 miles

BASIN SIZE: 4,738 Acres

STREAM ORDER: 3

PRIMARY LAND USES:

- Rural residential
- Agriculture
- Forestry

FISHERIES RESOURCES: (From [A Catalog of Washington Streams and Salmon Utilization](#), WDOF)

Coho, Chum salmon

GENERAL TOPOGRAPHY:

Stream originates on Schneider Prairie and flows through generally flat and level pastures

and forest land. The stream gradient is gentle throughout its length.

WASHINGTON D.O.E. WATER QUALITY CLASSIFICATION: Class AA

GENERAL WATER QUALITY: (Excellent, Good, Fair, Poor)

Fair - Failed Part II of the fecal coliform standard. Dissolved oxygen, and occasional temperature violations in summer months.

OTHER DATA:

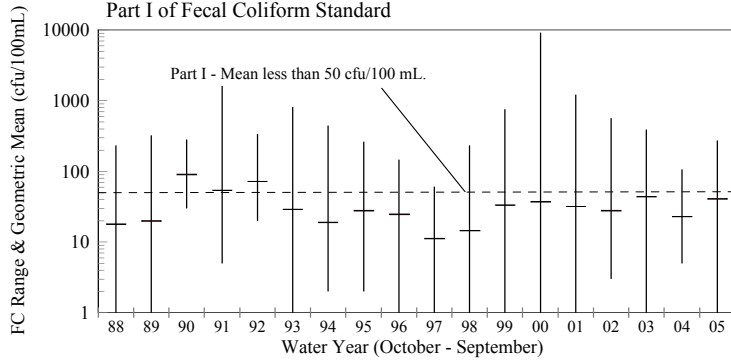
Thurston County Environmental Health Division, (360)754-4111 or www.geodata.org/swater

Washington Department of Ecology, Environmental Assessment Program, National Monitoring Program Project, Intensive wet season data between 1992 and 2002, (360) 407-6000.

Schneider Creek #0009
(In Totten/Little Skookum Inlet Watershed)

Schneider Creek

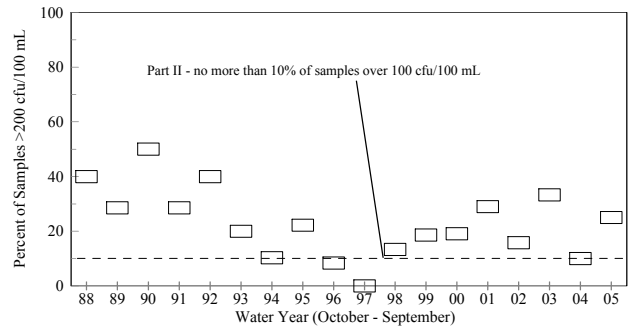
Part I of Fecal Coliform Standard



The water quality standard for fecal coliform has two parts: the geometric mean shall not exceed 50 mg/100mL *and* no more than 10% of the samples shall exceed 100 org/100 mL.

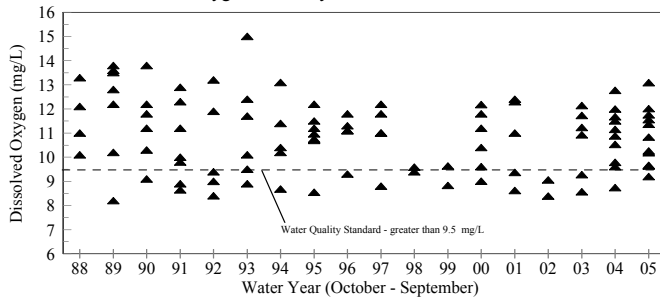
Part I of the standard has been met since 1993 but Part II of the standard is violated in most years on record.

Part II of Fecal Coliform Standard



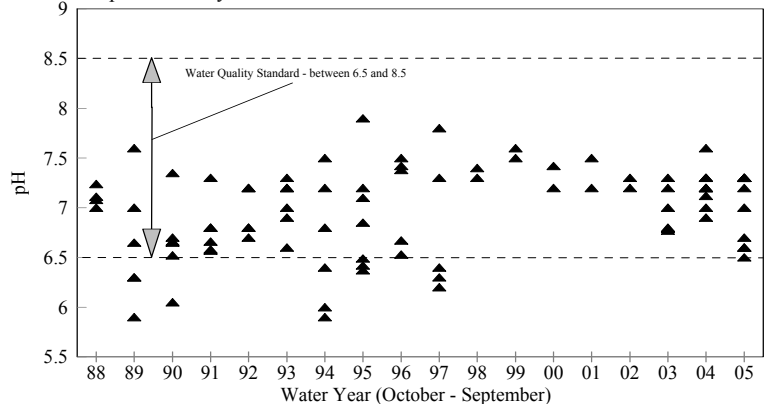
The water quality standard for dissolved oxygen is a lowest one-day minimum of 9.5 mg/L. Over the period of record, the dissolved oxygen standard is often below the water quality standard during the summer low flow period.

Dissolved Oxygen Levels by Year



The standard for pH requires the pH to be within the range of 6.5 to 8.5. There have been no violations since 1997.

pH Levels by Year



Schneider Creek has been monitored by the County since 1985 when the first water quality study was conducted in the watershed. A ten-year national monitoring project designed to document water quality change as a result of implementing best management practices was completed by the Washington Department of Ecology in 2002. There is currently a total maximum daily load study which recommends actions to improve water quality. Thurston County intends to continue long-term ambient monitoring of this creek.

Major Issues:

- The creek has the potential to be impacted by animal keeping practices.
- Logging practices and stream-side development also have the potential to affect water quality.

Funding Sources:

- Local Storm and Surface Water Utility

Water Quality Summary
Conventional Parameters
Schneider Creek (in Totten/Little Skookum Inlet Watershed)

Parameter	Units	WQ Standard WAC 173-201A	Water Year Data: 2003/2004 & 2004/2005				Cumulative Data: 1987-2003	
			Water Year	Mean	Range	# samples violating standard	Mean	Range
Temperature	EC	Highest 7-DAD Max of 16EC	03/04 04/05		6 – 16.22 3.63 – 14.73	1 of 10 0 of 12		1.5 – 18.15
Dissolved Oxygen	mg/L	Lowest one-day minimum of 9.5	03/04 04/05		8.74 – 12.77 9.2 – 13.1	1 of 10 1 of 12		8.2 – 15
Conductivity	F mhos/cm		03/04 04/05	87 89	59 – 115 63 – 109		75	37 – 169
pH		6.5 - 8.5	03/04 04/05	7.2* 7.2*	6.9 – 7.6 6.5 - 7.3	0 of 10 0 of 12		5.9 – 7.9
Turbidity	NTU	not to exceed 5 NTU over background	03/04 04/05	2.68 2.8	0.4 – 13 0.9 – 7.7	1 of 10 0 of 12	6.4	0.8 – 100
Fecal Coliform	colonies / 100 ml	GMV: ≤50 and ≤ 10% not to exceed 100	03/04	23**	5 – 105	% exceeding 100 10% 25%	27**	0 – 9100
			04/05	40**	0 – 270			
Total Phosphorus	mg/L		03/04 04/05	0.031 0.035	0.019 – 0.041 0.02 - 0.06		0.03	<0.005 - 0.134
Nitrate+Nitrite-nitrogen	mg/L		03/04 04/05	0.140 0.173	0.073 – 0.232 0.075 – 0.381		0.231	0.015 - 0.67
Ammonia	mg/L						0.017	<0.005 - 0.044

* Median

** Geometric mean value (GMV)

Thurston County Water Resources Monitoring Report 2003 - 2004

Schneider Creek off Hwy 101

<i>Date</i>	<i>Time</i>	<i>Temp C</i>	<i>pH</i>	<i>DO mg/L</i>	<i>Cond @25c umhos/cm</i>	<i>FC cfu/100mL</i>	<i>Turb NTU</i>	<i>Flow cfs</i>	<i>TP mg/L</i>	<i>NOx mg/L</i>	<i>COMMENTS</i>
12/16/2003	1:00:00 PM	6.71	7.3	11.50	59	20	13.0	41.7	0.041	0.203	Very Turbid!
1/21/2004	2:00:00 PM	7.29	7.2	12.77	64	10	2.5	21.2	0.019	0.232	Many horses at Outback Stables. Mattresses and stuff piled in yard - burn pile? Still strong odor of dead fish
2/17/2004	9:45:00 AM	6.00	7.0	11.68	60	5	3.5	37.5	0.023	0.153	
3/15/2004	11:15:00 AM	8.61	7.6	12.00	74	10	1.8	10.3	0.021	0.136	Horses at the Outback Stable seem to be gone. None in any of the paddocks or fields.
4/19/2004	1:30:00 PM	10.51	7.3	11.15	84	5	2.1	7.1	0.026	0.115	
5/17/2004	11:15:00 AM	11.59	7.2	10.88	96	20	1.0	2.4	0.028	0.154	
6/22/2004	10:00:00 AM	14.63	7.1	9.79	107	105	0.8	1.2	0.036	0.144	
7/15/2004	2:30:00 PM	15.80	7.3	9.61	107	30	0.4	1.5	0.038	0.111	Staff gage is at the edge of the bank.
8/24/2004	1:45:00 PM	16.22	7.2	8.74	107	90	0.8	1.0	0.041	0.076	
9/22/2004	9:45:00 AM	11.70	6.9	10.53	115	85	0.9	1.2	0.038	0.073	

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Schneider Creek #0009
(In Totten/Little Skookum Inlet Watershed)

Thurston County Water Resources Monitoring Report 2004 - 2005

Schneider Creek @ West Bay Dr

<i>Date</i>	<i>Time</i>	<i>Temp C</i>	<i>pH</i>	<i>DO mg/L</i>	<i>Cond @25c umhos/cm</i>	<i>FC cfu/100mL</i>	<i>Turb NTU</i>	<i>Flow cfs</i>	<i>TP mg/L</i>	<i>NOx mg/L</i>	<i>COMMENTS</i>
1/12/2005	10:45:00 AM	7.68	7.1	11.73	140	45	0.9	2.1	0.024	1.190	
2/14/2005	12:15:00 PM	7.63	7.1	10.64	144	15	0.4	1.1	0.019	1.360	sunny, 40 degrees
3/15/2005	10:10:00 AM	9.38	7.7	11.32	150	0	0.5	1.2	0.025	1.320	F.C. result is <5. Cloudy, 50 degrees.
4/11/2005	3:00:00 PM	10.18	7.5	11.23	81	1500	2.4	4.3	0.026	0.901	
5/9/2005	9:45:00 AM	10.34	7.6	11.20	151	10	0.6	1.7	0.024	1.500	
6/6/2005	3:00:00 PM	10.83	7.6	11.40	146	40	0.0	1.9	0.025	1.390	
7/11/2005	1:00:00 PM	13.57	7.5	10.20	96	2200	7.2	2.8	0.060	0.999	75 degrees, cloudy, humid.
8/10/2005	9:30:00 AM	11.21	7.6	11.05	160	5	0.4	1.6	0.027	1.490	Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.
9/26/2005	12:40:00 PM	10.86	7.7	11.10	161	55	0.3	1.4	0.026	1.440	Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.

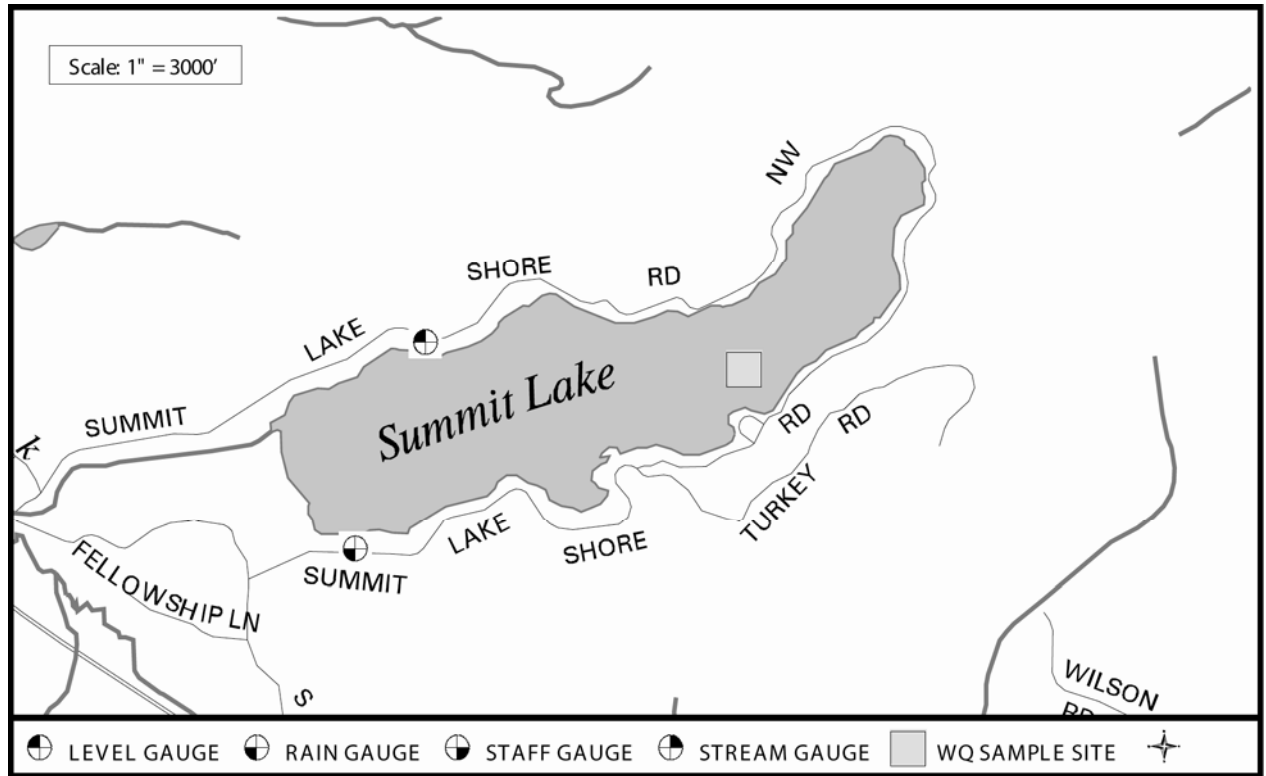
Thurston County Water Resources Monitoring Report 2004 - 2005

Schneider Creek off Hwy 101

<i>Date</i>	<i>Time</i>	<i>Temp C</i>	<i>pH</i>	<i>DO mg/L</i>	<i>Cond @25c umhos/cm</i>	<i>FC cfu/100mL</i>	<i>Turb NTU</i>	<i>Flow cfs</i>	<i>TP mg/L</i>	<i>NOx mg/L</i>	<i>COMMENTS</i>
10/19/2004	11:15:00 AM	10.94	6.7		104	90	3.3	5.0	0.060	0.097	D.O. did not post calibrate.
11/9/2004	10:00:00 AM	9.03	6.6	10.26	96	10			0.042	0.113	Did not measure flow because chum are spawning. No turb reading taken.
12/13/2004	9:15:00 AM	6.73	6.6	12.01	63	20	6.5	34.3	0.028	0.381	gage 2.12
1/10/2005	10:30:00 AM	3.63	6.5	11.76	74	0	2.7	15.4	0.027	0.250	F.C. result is <5. gage 1.8
2/15/2005	12:00:00 PM	3.77	7.3	13.09	81	15	1.5	7.4	0.020	0.231	Did not read staff gage; 2 logs up against staff gage.
3/14/2005	9:00:00 AM	6.32	7.3	11.56	95	25	1.7	3.4	0.025	0.159	gage 1.62
4/12/2005	9:20:00 AM	7.63	7.2	11.37	65	75	3.5	25.5	0.022	0.108	Rain, 40 degrees
5/10/2005	9:45:00 AM	12.17	7.0	10.19	81	100	7.7	23.9	0.058	0.147	Overcast -50 degrees.
6/7/2005	11:15:00 AM	11.33	7.3	10.83	91	25	0.9	4.6	0.031	0.162	
7/11/2005	9:30:00 AM	13.53	7.3	9.66	103	270	1.1	1.9	0.040	0.178	65 degrees, cloudy, sprinkling.
8/9/2005	9:50:00 AM	14.73	7.3	9.20	106	225	0.9	0.8	0.035	0.172	staff 1.40. Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.
9/27/2005	9:30:00 AM	11.44	7.3	9.64	109	135	1.0	0.4	0.031	0.075	Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.

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Schneider Creek #0009
(In Totten/Little Skookum Inlet Watershed)



PART OF TOTTEN INLET WATERSHED

LENGTH OF LAKE: 2.2 miles

SHORELINE LENGTH: 5.6 miles

LAKE SIZE: 530 acres

BASIN SIZE: 2.8 square miles

MEAN DEPTH: 53 feet

MAXIMUM DEPTH: 100 feet

VOLUME: 28,000 acre-feet

PRIMARY LAND USES:

The majority of the basin is commercial forest with dense development concentrated along the shoreline. There are approximately 400 homes along the shoreline.

PRIMARY LAKE USE:

Domestic water supply, fishing, boating, swimming, and other water sports.

PUBLIC ACCESS:

Washington Department of Fish and Wildlife public boat launch; three small private community accesses; 126-acre boy scout camp at the west end of the lake.

GENERAL TOPOGRAPHY:

The approximate altitude of the lake is 500 feet. The drainage is steep and rugged with slopes up to 80 percent. There are numerous springs and intermittent streams that flow into the lake. The outlet, at the west end of the lake, is controlled by flash boards and flows into Kennedy Creek.

GENERAL WATER QUALITY: (Excellent, Good, Fair, Poor)

Excellent - The lake has low nutrient and chlorophyll *a* levels and high visibility. The high water quality is important because the lake is the drinking water source for most of the lake residents. Uses are not impeded by aquatic weeds or algal growth.

Summit Lake

OTHER DATA:

Thurston County Dept. of Water and Waste Management, Storm and Surface Water Utility, (360) 357-2491, (Precipitation, lake level, and stream flow data).

Washington Department of Ecology, Environmental Assessment Program, (360) 407-6700 (water quality data).

Thurston County Environmental Health Division, Surface Water Section, (360) 754-4111 (water quality data since 1990).

GENERAL DISCUSSION:

Summit Lake is one of the deepest lakes in Thurston County, with a maximum depth of 30 meters (100 feet). The lake clearly stratifies into two distinct layers of water in the summer, as can be seen in the profile graphs which follow. In 2005 the lake was already stratified in May and remained so through October. The warm upper layer extends from the surface to between 6 and 14 meters deep. The colder bottom water had developed anoxic conditions (lack of dissolved oxygen in the water) by August. When the lake is thermally stratified and there is no replenishment of the dissolved oxygen from the atmosphere to the bottom waters, bacterial decomposition of material such as aquatic plants, algae, and other organic matter depletes the available oxygen at the bottom. During the anoxic period, phosphorus is released from the sediments into the water near the bottom. This increase in bottom phosphorus concentrations can be seen in the data report at the end of this narrative.

The water clarity in 2005 averaged 6.3 meters (20.7 feet) and ranged from 4.8 meters (15.6 feet) in May to 8.6 meters (28.1 feet) in July. As can be seen from the secchi disk readings graph at the end of this narrative, Summit Lake consistently has average secchi disk readings between 5.75 and 8 meters. The graph entitled 'Summit Lake Water Clarity Trend' charts the difference between each year's average secchi reading and the overall average Summit Lake secchi reading from the period of record. Graphing the secchi disk visibility in this way helps to visually see true trends in water quality versus normal annual fluctuations. For Summit Lake, it appears there is no upward or downward trend in water clarity over the past 15 years of record, just plus or minus one meter variation around the mean.

The Carlson trophic state indices (TSI), are used to express the degree of productivity of a lake. Average summer total phosphorus concentrations, chlorophyll *a* concentrations, and secchi disk transparency are each used to calculate a TSI for the lake. A TSI of 0 to 40 indicates an oligotrophic, or low productivity, lake. A TSI of 41 to 50 indicates a mesotrophic, or moderately productive lake. A TSI of greater than 50 indicates a eutrophic, or highly productive lake.

Summit Lake is an oligotrophic, or low productivity, lake. The Summit Lake TSI's for total phosphorus, chlorophyll *a*, and secchi disk for 2005 are 29, 36, and 33, respectively. The trophic state indices graph which follows this narrative, shows that all three parameters, total phosphorus, chlorophyll *a* concentrations, and water clarity, indicate a lake low in nutrients and algae growth with high water clarity.

Because this lake is clear and low in algae and aquatic plant growth, it is popular with recreational users. It is also used as a domestic water source for the majority of residences around the lakeshore due to the absence of an adequate ground water supply. Blue-green algae species, which are common in more nutrient rich environments, are often present in this lake but are rarely dominant. To date, only relatively minor and localized blue-green algae blooms occur. Algae species present

in the lake are included in a table at the end of this chapter. Rooted aquatic plants in this lake are minimal and do not interfere with recreational uses.

Major Issues:

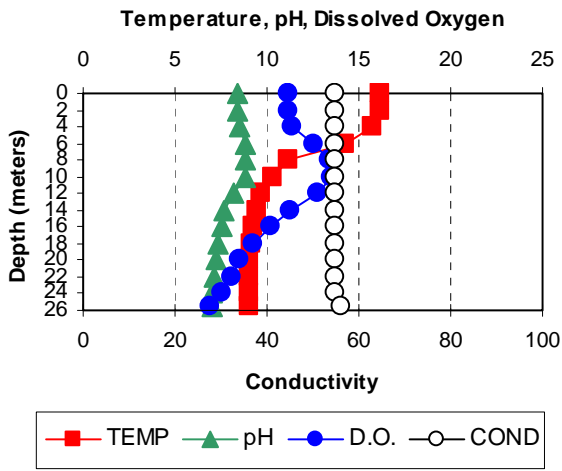
- Steep slopes, shallow soils, and generally small lots sizes make siting and functioning of on-site sewage systems around the lake difficult. A 1992-1997 sanitary survey of 330 on-site sewage systems around the lake perimeter found 58 systems were failing (18%). Nearly all of the 58 failing systems were repaired.
- The majority of lakeshore residents use lake water as their domestic water supply, and many do not disinfect it prior to use. Surface waters cannot be adequately protected from contamination to be safely used as a domestic water supply without treatment. A public health advisory issued in 1987 advises against consumption of untreated lake water at Summit Lake.
- The high density residential activities along the shoreline and forestry activities in the upper watershed are a concern for water quality.

Funding Sources:

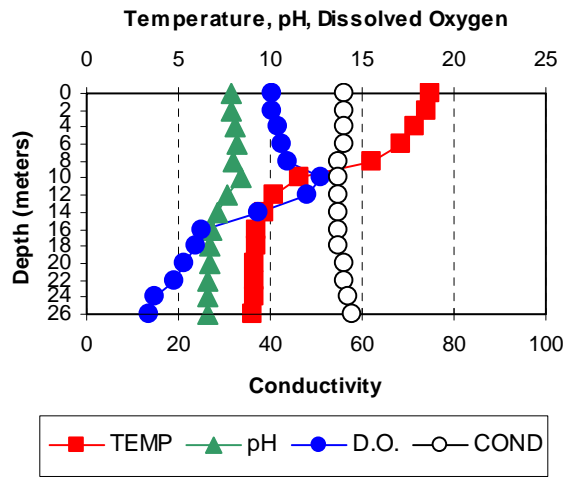
Thurston County funds will continue to support monitoring in 2006.

SUMMIT LAKE

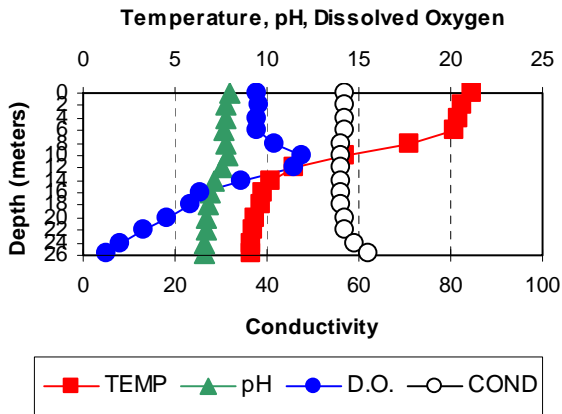
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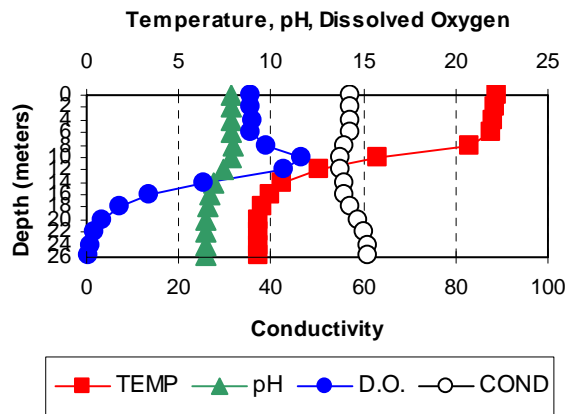
June 20, 2005



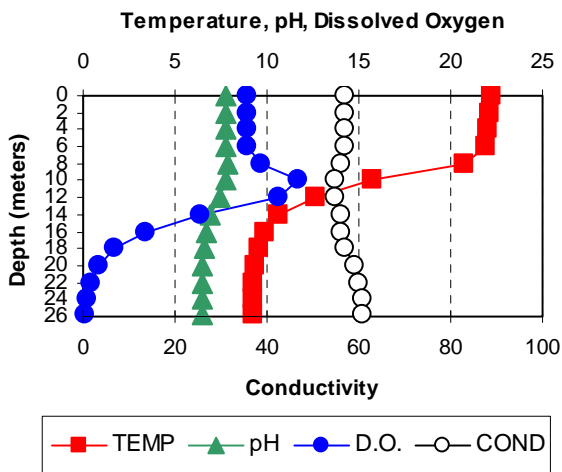
July 18, 2005



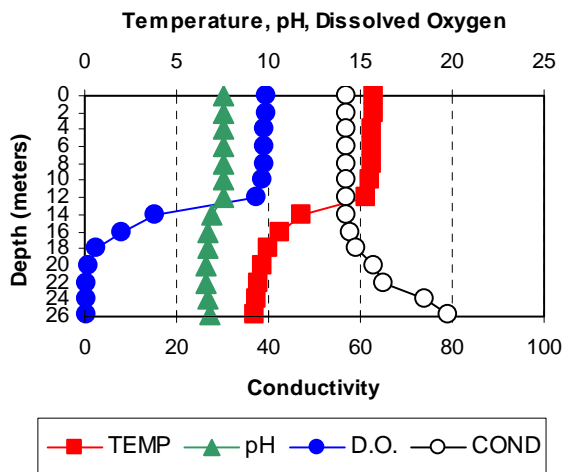
August 17, 2005



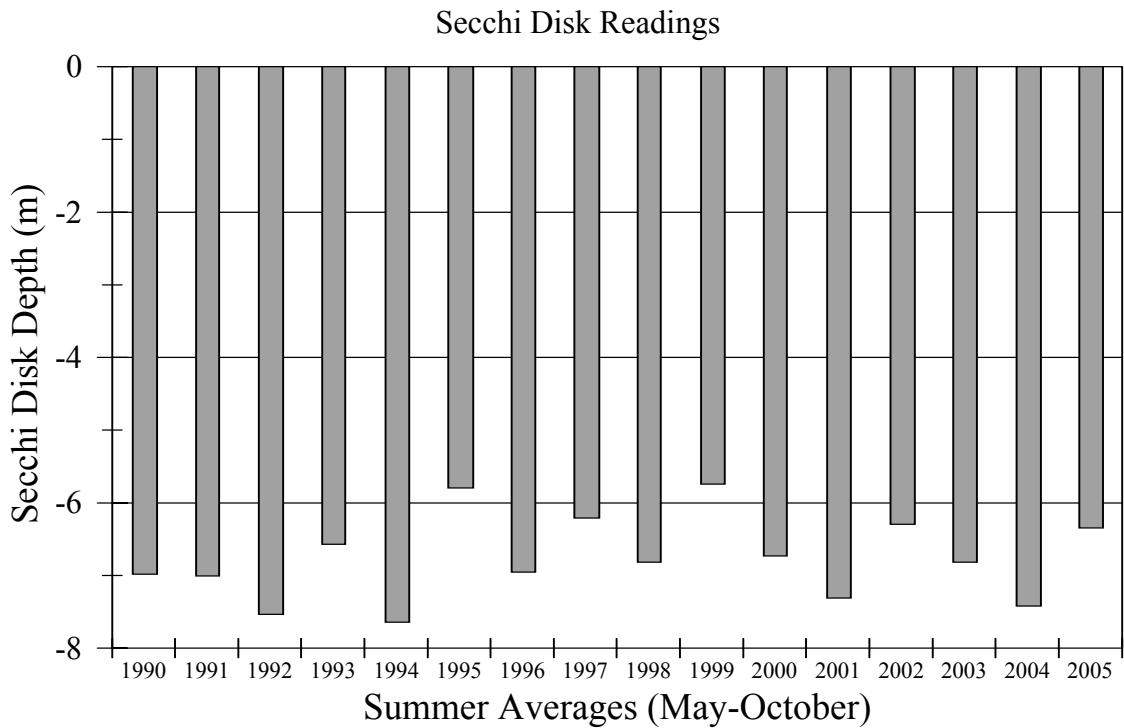
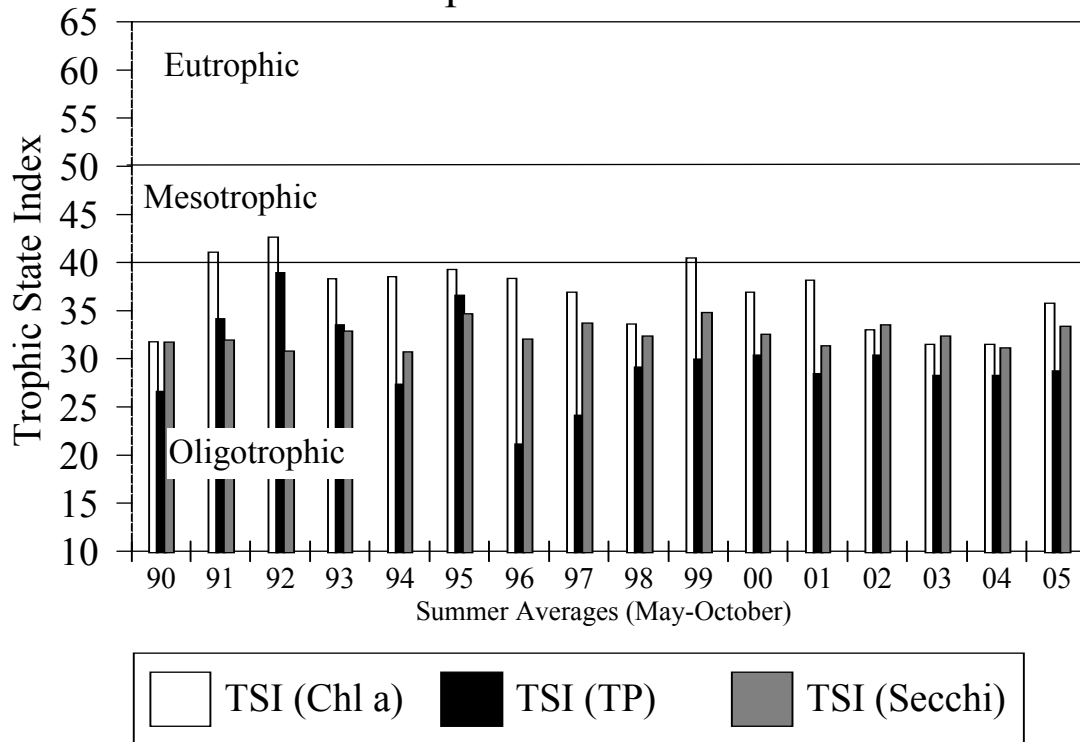
September 12, 2005



October 19, 2005

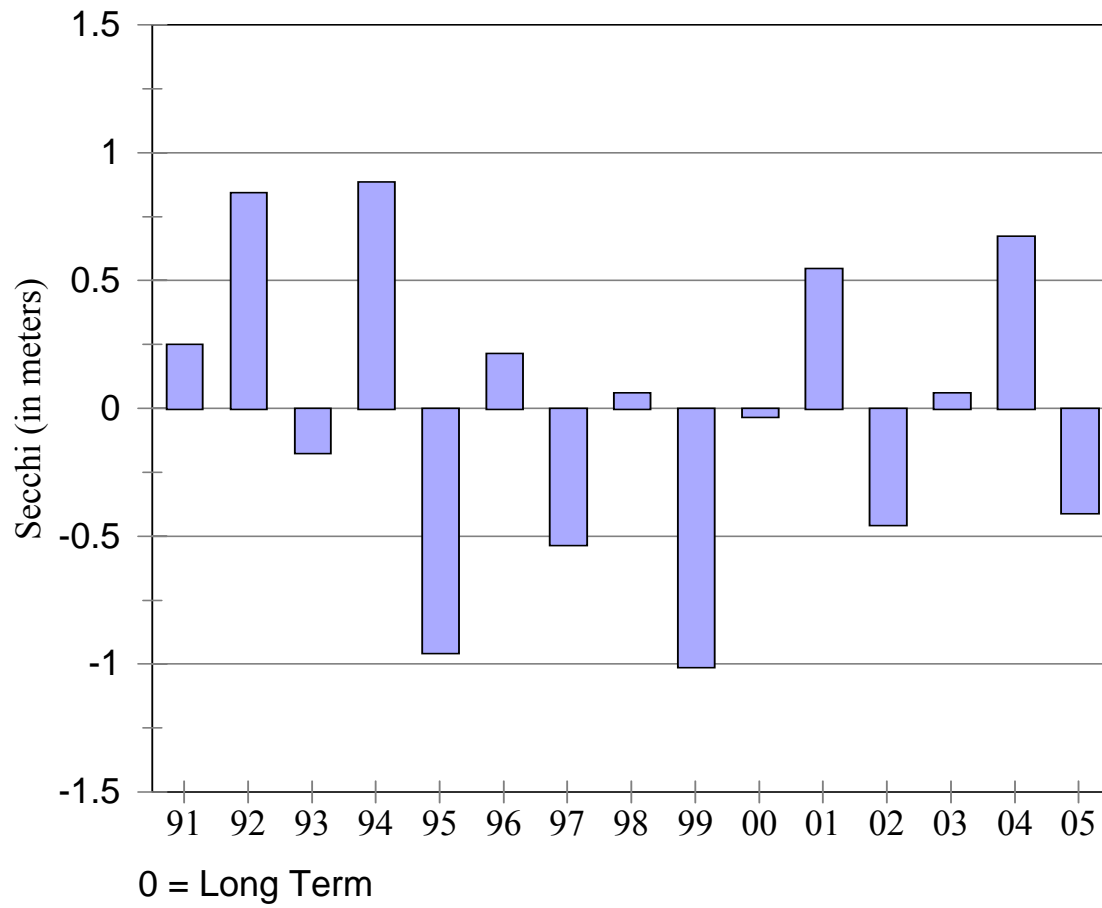


Summit Lake Trophic State Indices



Summit Lake Water Clarity Trend

Annual Mean Secchi - Long-Term Mean



Thurston County Water Resources Annual Report - 2004

Summit Lake, Main (North) Basin

Site ID# TOTSUL010

Date	Time	Bottom Depth m	Bottom Sample Depth m	Sur TP mg/L	Bott TP mg/L	Sur TN mg/L	Bott TN mg/L	Secchi m	Chl a ug/L	Phae a ug/L	Water Color	Lake Notes
5/27/2004	11:45:00 AM	25.2	24.0	0.007	0.012	0.117	0.159	7.22	1.3	0.5	#2 light green	Chlorophyll & algae composite @ 2,4,6M Raining, Calm, 60's
6/28/2004	11:00:00 AM	25.7	24.0	0.006	0.017	0.108	0.153	7.77	1.1	0.2	#2 light green	70's sunny, moderate breeze. Chlorophyll & algae composite @ 2,4,&6M
7/19/2004	12:15:00 PM	26	25.0	0.005	0.017	0.074	0.086	6.73	0.9	0.2	#2 lt green	Mod breeze, cloudy, 70's. Chlorophyll & Algae composite @ 2,5&8M
8/18/2004	2:30:00 PM	25.7	25.0	0.004	0.033	0.147	0.181	8.28	0.8	0.1	#2 lt green	Sunny, 70's, calm. Chlorophyll & algae composite @ 2,5 & 8M
9/17/2004	12:30:00 PM	25.3	24.0	0.005	0.028	0.183	0.202	6.80	1.4	0.8	#2 lt green	Cloudy, 60's, lt breeze. Chlorophyll & algae composite @ 2,6,& 10M
10/12/2004	11:50:00 AM	25.6	25.0	0.005	0.027	0.154	0.280	7.59	1.1	1.4	#2 lt green	Sunny, 60's, lt breeze. Chlorophyll & algae composite @ 2.6.&10M

Summary for 'Site Description' = Summit Lake, Main (North) Basin (6 detail records)

Averages
Sur TP 0.005
Secchi 7.40
Chl a 1.1

Thurston County Water Resources Annual Report - 2005

Summit Lake, Main (North) Basin

Site ID# TOTSUL010

Date	Time	Bottom Depth m	Bottom Sample Depth m	Sur TP mg/L	Bott TP mg/L	Sur TN mg/L	Bott TN mg/L	Secchi m	Chl a ug/L	Phae a ug/L	Water Color	Lake Notes
5/17/2005	1:15:00 PM	25.6	24.0	0.007	0.010	0.133	0.129	4.75	2.7	0.05	#2 Lt. Green	Chl a & algae composite @ 2, 4, 6M. Phae a below detection limit @ <0.1.
6/20/2005	11:40:00 AM	26	24.5	0.005	0.015	0.135	0.161	5.84	1.9	0.2	#2 Lt. Green	Chl a & algae composite @ 2, 4, 6M.
7/18/2005	2:45:00 PM	25.8	25.0	0.005	0.021	0.125	0.127	8.56	1.1	0.1	#2 Lt. Green	Chl a & algae composite @ 2, 4, 6M.
8/17/2005	1:00:00 PM	25.7	24.0	0.005	0.041	0.212	0.199	5.65	1.3	0.2	#2 Lt. Green	Chl a & algae composite @ 2, 4, 6M.
9/12/2005	11:30:00 AM	25.7	24.0	0.005	0.510	0.194	0.185	6.90	1.3	0.3	#2 Lt. Green	Chl a & algae composite @ 1, 5, 10M.
10/19/2005		25.7	24.0	0.006	0.103	0.181	0.358	6.23	1.9	0.7	#2 Lt. Green	Chl a & algae composite @ 1, 5, 12M.

Summary for 'Site Description' = Summit Lake, Main (North) Basin (6 detail records)

Averages	Sur TP	0.006
	Secchi	6.32
	Chl a	1.7

Algae data: Summit Lake, Main (North) Basin

	<i>Type</i>	<i>Description</i>	<i>Dominant in Sample</i>
<i>5/27/2004</i>			
	CP	Cryptomonas species	<input type="checkbox"/>
	DT	Cyclotella species	<input checked="" type="checkbox"/>
	DT	Fragilaria species	<input type="checkbox"/>
	DT	Melosira species	<input type="checkbox"/>
	DT	Synedra species	<input type="checkbox"/>
	GR	Spondylosium species	<input type="checkbox"/>
<i>6/28/2004</i>			
	DT	Cyclotella species	<input type="checkbox"/>
	DT	Cymbella species	<input type="checkbox"/>
	DT	Fragilaria species	<input type="checkbox"/>
	DT	Melosira species	<input type="checkbox"/>
	GR	Spondylosium species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
<i>7/19/2004</i>			
	BG	Aphanocapsa species	<input type="checkbox"/>
	BG	Chroococcus species	<input type="checkbox"/>
	DT	Cyclotella species	<input type="checkbox"/>
	GR	Spondylosium species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
<i>8/18/2004</i>			
	BG	Aphanocapsa species	<input type="checkbox"/>
	BG	Chroococcus species	<input type="checkbox"/>
	DF	Peridinium wisconsinense	<input type="checkbox"/>
	DT	Synedra species	<input type="checkbox"/>
	EU	Trachelomonas species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
<i>9/17/2004</i>			
	BG	Aphanocapsa species	<input type="checkbox"/>
	CP	Cryptomonas species	<input type="checkbox"/>
	DT	Asterionella species	<input type="checkbox"/>
	DT	Cyclotella species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>

10/12/2004

<i>Type</i>	<i>Description</i>	<i>Dominant in Sample</i>
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BG	Anabaena species	<input type="checkbox"/>
BG	Aphanocapsa species	<input type="checkbox"/>
BG	Chroococcus species	<input type="checkbox"/>
CP	Chilomonas species	<input type="checkbox"/>
DT	Asterionella species	<input type="checkbox"/>
DT	Fragilaria species	<input type="checkbox"/>
DT	Melosira species	<input type="checkbox"/>
EU	Trachelomonas species	<input type="checkbox"/>
YL	Dinobryon species	<input type="checkbox"/>
YL	Mallomonas species	<input type="checkbox"/>

Key: BG = Blue green EU = Euglenophyte
 CP = Cryptophyte GR = Green
 DF = Dinoflagellate YL = Yellow
 DT = Diatom

Algae data: Summit Lake, Main (North) Basin

	<i>Type</i>	<i>Description</i>	<i>Dominant in Sample</i>
<i>5/17/2005</i>			
	BG	Anabaena species	<input type="checkbox"/>
	BG	Chroococcus species	<input type="checkbox"/>
	DT	Cyclotella species	<input type="checkbox"/>
<i>6/20/2005</i>			
	CP	Chroomonas species	<input type="checkbox"/>
	DT	Asterionella species	<input type="checkbox"/>
	DT	Cyclotella species	<input type="checkbox"/>
	DT	Fragilaria species	<input type="checkbox"/>
	GR	Botryococcus species	<input type="checkbox"/>
	GR	Spondylosium species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
<i>7/18/2005</i>			
	BG	Chroococcus species	<input type="checkbox"/>
	DT	Asterionella species	<input type="checkbox"/>
	DT	Cymbella species	<input type="checkbox"/>
	DT	Fragilaria species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
<i>8/17/2005</i>			
	BG	Chroococcus species	<input type="checkbox"/>
	CP	Chilomonas species	<input type="checkbox"/>
	CP	Chroomonas species	<input type="checkbox"/>
	DT	Melosira species	<input type="checkbox"/>
	GR	Elakatothrix species	<input type="checkbox"/>
	GR	Quadrigula species	<input type="checkbox"/>
	GR	Tetraedron species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
	YL	Synura species	<input type="checkbox"/>

	<i>Type</i>	<i>Description</i>	<i>Dominant in Sample</i>
<i>9/12/2005</i>			
	BG	Anabaena species	<input type="checkbox"/>
	BG	Gomphosphaeria species	<input type="checkbox"/>
	DT	Asterionella species	<input type="checkbox"/>
	GR	Oocystis species	<input type="checkbox"/>
	GR	Quadrigula species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
	YL	Synura species	<input type="checkbox"/>
<i>10/19/2005</i>			
	BG	Chroococcus species	<input type="checkbox"/>
	BG	Microcystis species	<input type="checkbox"/>
	CP	Chilomonas species	<input type="checkbox"/>
	CP	Chroomonas species	<input type="checkbox"/>
	DT	Asterionella species	<input type="checkbox"/>
	GR	Cosmarium species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
Key:	<i>BG = Blue green</i>	<i>EU = Euglenophyte</i>	
	<i>CP = Cryptophyte</i>	<i>GR = Green</i>	
	<i>DF = Dinoflagellate</i>	<i>YL = Yellow</i>	
	<i>DT = Diatom</i>		