

Black Watershed

WRIA 23

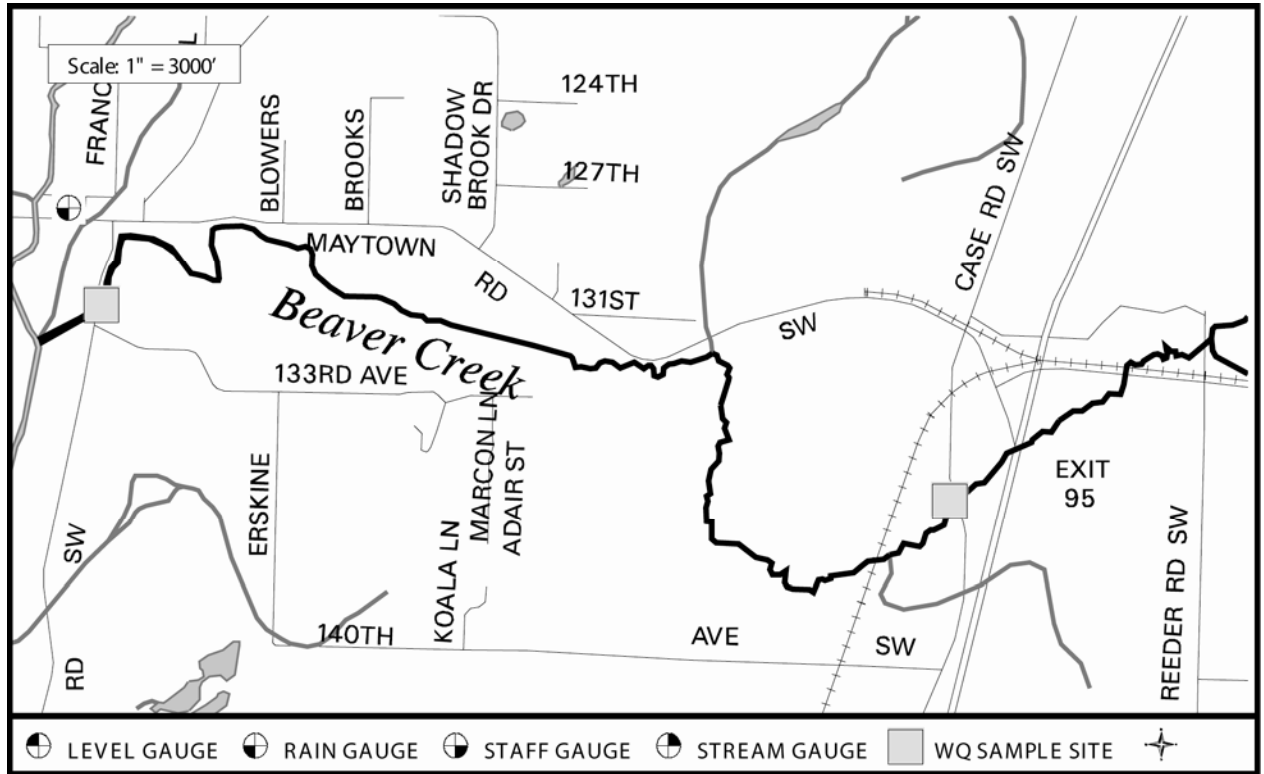
Chapter Includes:

Beaver Creek

Black River

Deep Lake

Salmon Creek



PART OF CHEHALIS RIVER WATERSHED

LENGTH OF RIVER: 11.4 miles

BASIN SIZE: 21 square miles

STREAM ORDER: 3

PRIMARY LAND USES:

Light industrial and commercial in the Maytown and Littlerock communities, and agriculture and rural residential

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

Coho

GENERAL TOPOGRAPHY:

Beaver Creek is a tributary to the Black River and drains the east side of the river basin,

including Scott and Deep Lakes. It has extensive wetlands associated with it.

GENERAL WATER QUALITY:

Good – Water quality has improved. Both parts of the fecal coliform standard were met at the Littlerock Rd. site for both water years 2005/06 and 2006-07.

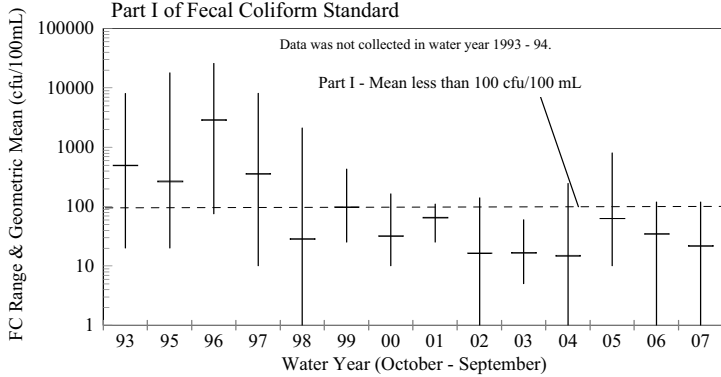
OTHER DATA:

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

Thurston County Environmental Health Division, (360) 754-4111 or www.co.thurston.wa.us/health/ehswat/swater.htm

Beaver Creek @ Littlerock Rd.

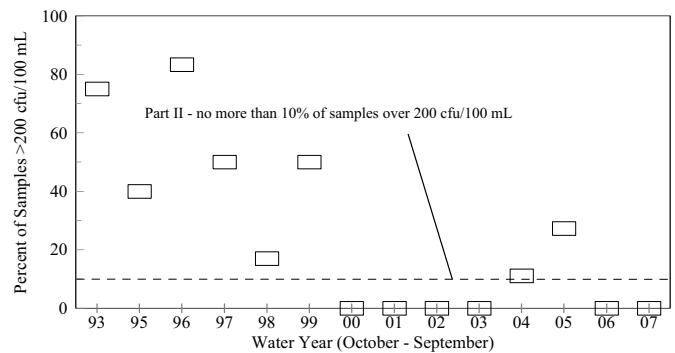
Part I of Fecal Coliform Standard



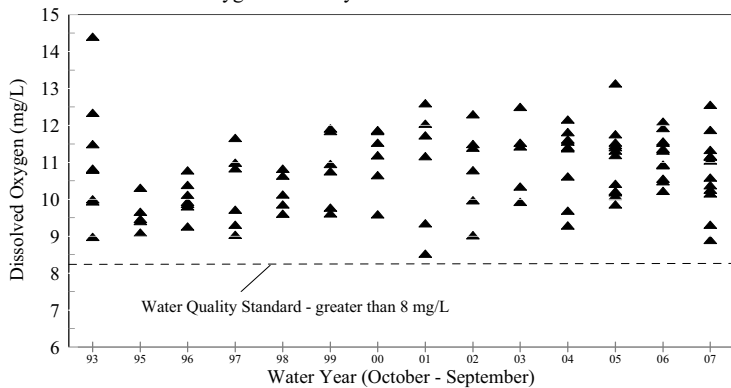
The water quality standard for fecal coliform bacteria has two parts: Part I - the geometric mean shall not exceed 100 colony forming units per 100 milliliters of sample *and*, Part II - no more than ten percent of the samples shall exceed 200 cfu/100 mL.

The creek has met Part I since 1997/98 at the Littlerock Road site. Part II of the standard has been met since 2005/06.

Part II of Fecal Coliform Standard



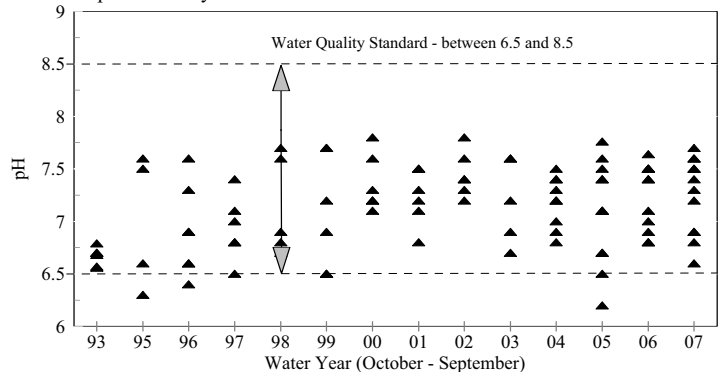
Dissolved Oxygen Levels by Year



The water quality standard for dissolved oxygen is a lowest one-day minimum of 8 mg/L. There have been no recorded violation of the dissolved oxygen standard at the Littlerock Road site, but low dissolved oxygen has been measured farther upstream at Case Road.

The standard for pH requires the pH to be within the range of 6.5 to 8.5. There have been three violations measured in the period of record since 1993.

pH Levels by Year



Water Quality Summary
 Conventional Parameters
Beaver Creek at Littlerock Road (formerly Hwy 121)

Parameter	Units	WQ Standard WAC 173-201A	Water Year Data: 2005/06 and 2006/07				Cumulative Data: 1992-2005	
			Water Year	Mean	Range	# samples violating standard	Mean	Range
Temperature	°C	Highest 7-DAD Max of 17.5°C	05/06		5.40 – 16.80			2.90 – 18.25
			06/07		5.09 – 17.39			
Dissolved Oxygen	mg/L	Lowest one-day minimum of 8.0	05/06		10.23 – 12.1	0 of 11		8.53 – 14.4
			06/07		8.9 – 12.6	0 of 12		
Conductivity	: mhos/cm		05/06	91	66 – 119		87	43 – 160
			06/07	88	54 – 114			
pH		6.5 – 8.5	05/06	7.4*	6.8 – 7.6	0 of 12		6.2 – 7.8
			06/07	7.4*	6.6 – 7.7	0 of 12		
Turbidity	NTU	not to exceed 5 NTU over background	05/06	2.02	1.1 – 3.3	0 of 12		0.7 – 10.0
			06/07	2.13	0.3 – 4.3	0 of 12	2.76	
Fecal Coliform	colonies/100 ml	GMV: ≤100 and ≤ 10% not to exceed 200	05/06	33**	0 - 120	% exceeding 200	83**	0 – 26000
			06/07	20**	0 - 110			
Total Phosphorus	mg/L		05/06	0.036	0.024 - 0.057		0.063	0.022 – 0.425
			06/07	0.042	0.022 – 0.061			
Nitrate + Nitrite-nitrogen	mg/L		05/06	0.821	0.571 – 1.11		0.903	0.327 – 2.61
			06/07	0.661	0.422 – 0.929			

* Median
 ** Geometric mean value (GMV)

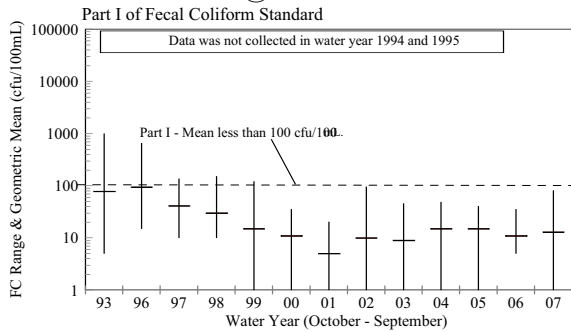
Thurston County Water Resources Monitoring Report 2005 - 2006 *Beaver Creek @ Littlerock Road*

<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>
10/11/2005	1:30:00 PM	11.51	7.5	11.32	119	65	1.1	7.1	0.033	1.050	Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.
11/8/2005	1:00:00 PM	7.35	6.8	10.94	81	70	3.0	69.8	0.057	0.828	
12/7/2005	12:30:00 PM	5.40	7.1	11.93	70	0	1.4	50.7	0.030	0.789	
1/4/2006	2:10:00 PM	6.24	6.8	11.53	66	25	2.5		0.042	0.812	Very high water, full width of stream bed, too high to do flow.
2/7/2006	1:00:00 PM	5.50	6.9	12.10	66	5	1.8		0.029	0.703	too high and fast to wade & measure flow
3/13/2006	12:00:00 PM	5.46	7.0	10.49	73	10	2.1	82.8	0.024	0.681	
4/26/2006	3:00:00 PM	12.56	7.5	11.57	97	50	2.2	27.3	0.034	0.884	
5/16/2006	1:30:00 PM	16.70	7.4	10.23	106	55	3.3	14.8	0.035	1.110	
6/14/2006	1:00:00 PM	15.77	7.4	10.56	103	90	2.3	15.5	0.029	0.833	
7/11/2006	9:15:00 AM	15.24	7.5		110	80	1.7	8.0	0.051	0.752	no DO measurement
8/9/2006	12:10:00 PM	16.80	7.6	10.92	110	120	1.4	2.8	0.038	0.571	Samples not stored at proper temperature for 3-5 days, NO2+NO3 may be high
9/11/2006	1:20:00 PM	12.73	7.5	11.37	90	70	1.4	2.9	0.036	0.834	

Thurston County Water Resources Monitoring Report 2006 - 2007 *Beaver Creek @ Littlerock Road*

<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>
10/9/2006	12:45:00 PM	11.86	7.4	10.59	111	15	0.6	3.2	0.031	0.594	
11/13/2006	3:15:00 PM	8.29	6.6	10.38	59	40	4.3		0.059	0.603	too fast/deep to wade
12/12/2006	2:15:00 PM	7.14	6.8	11.16	71	40	4.0		0.048	0.477	too fast too deep
1/22/2007	3:00:00 PM	5.09	6.9	11.05	75	0	1.1	102.0	0.022	0.702	F.C. result was <5.
2/21/2007	11:50:00 AM	6.28	6.9	9.31	54	65	3.8		0.051	0.422	too fast to wade
3/21/2007	12:50:00 PM	7.93	7.3	12.56	73	5	0.3		0.036	0.457	Too fast and deep to wade
4/24/2007	12:45:00 PM	11.93	7.2	11.34	85	35	2.2	49.1	0.035	0.586	
5/15/2007	2:45:00 PM	14.72	7.6	11.88	93	85	2.9	24.2	0.034	0.698	
6/11/2007	2:15:00 PM	14.32	7.6	10.26	102	15	1.6	12.0	0.040	0.772	
7/17/2007	10:45:00 AM	17.39	7.5	8.90	106	0	2.1	7.0	0.061	0.836	F.C. result was <5.
8/20/2007	2:45:00 PM	15.82	7.5	10.16	113	110	1.0	5.5	0.043	0.859	
9/18/2007	12:00:00 PM	12.84	7.7	11.17	114	70	1.7	3.7	0.038	0.929	

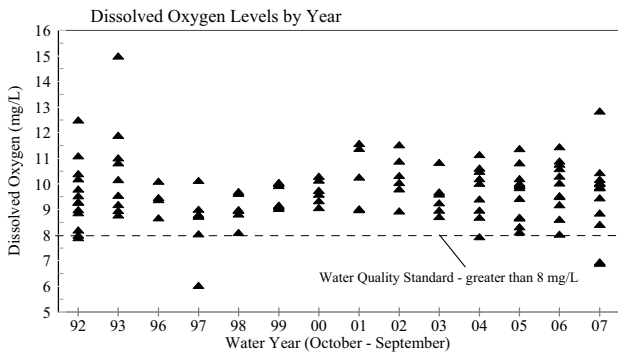
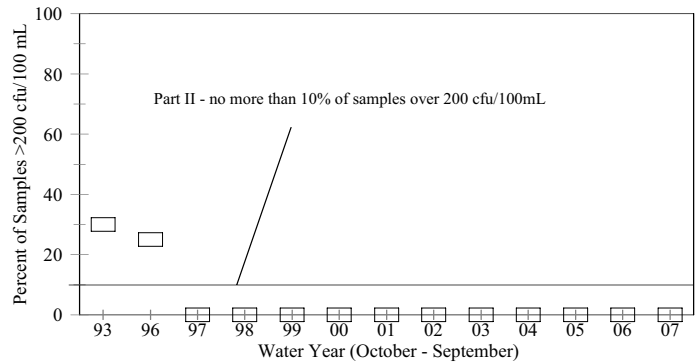
Black River @ Moon Rd



The water quality standard for fecal coliform bacteria has two parts: part I - the geometric mean shall not exceed 100 colony forming units per 100 milliliters of sample and, part II - no more than 10 percent of the samples shall exceed 200 cfu/100 mL.

There have been no recorded violations of part I or part II of the fecal coliform standard since 1997. Part II of the standard was violated in 1993 and 1996. No data was collected in 1994 and 1995.

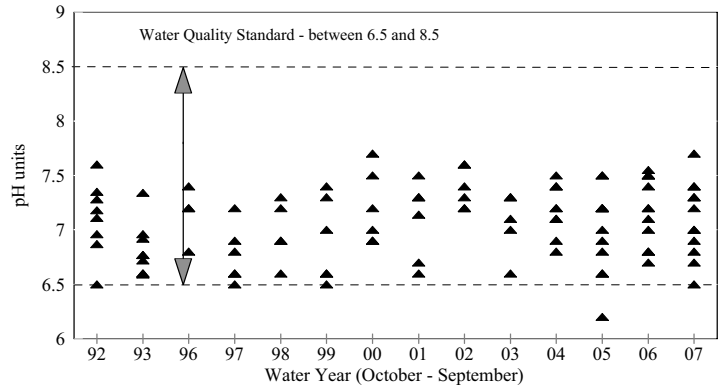
Part II of Fecal Coliform Standard



The water quality standard for dissolved oxygen is a lowest one-day minimum of 8 mg/L. Due in part to the physical characteristics of the river, there are occasions when the dissolved oxygen standard is violated. No violations occurred between 1999 and 2003, one measurement was slightly below the standard in 2004. Two violations occurred in 2006/07.

The standard requires the pH to be within the range of 6.5 and 8.5. There were no violations recorded between 1992 and 2003. However, there was one violation in water year 2004/05.

pH Levels by Year



The Black River is monitored at the Moon Road Bridge as part of the ambient monitoring program. There is data for the period from 1991 through 1993 at other upstream sites that can be made available upon request or by visiting www.geodata.org/swater.

Water quality monitoring will be continued next water year.

Major Issues:

- High temperatures and low dissolved oxygen levels during summer low flow conditions.
- Non-point pollution from rural land-uses.

Funding Sources:

- Thurston County

Water Quality Summary
Conventional Parameters
Black River at Moon Road

Parameter	Units	WQ Standard WAC 173-201A	Water Year Data: 2005/06 and 2006/07				Cumulative Data: 1992-2005	
			Water Year	Mean	Range	# samples violating standard	Mean	Range
Temperature	° C	Highest 7-DAD Max of 17.5 ° C	05/06		5.52 – 19.2			4.22 – 22.80
			06/07		5.02 – 18.91			
Dissolved Oxygen	mg/L	Lowest one-day minimum of 8.0	05/06		8.04 – 11.5	0 of 11		6.04 – 15.00
			06/07		6.91 – 12.9	2 of 12		
Conductivity	µmhos/cm		05/06	88	54- 117			41 – 136
			06/07	87	49 - 115		80	
pH		6.5 - 8.5	05/06	7.2*	6.7 – 7.6	0 of 12		6.2 - 7.7
			06/07	7.1*	6.5 – 7.7	0 of 12	7.1*	
Turbidity	NTU	not to exceed 5 NTU over background	05/06	1.62	0.6 – 3.8	0 of 12		0.07 – 14
			06/07	1.73	0 – 6.8	0 of 12	2.48	
Fecal Coliform	colonies/100 ml	GMV: ≤100 and ≤ 10% not to exceed 200	05/06	11**	5 - 35	% exceeding 200		0 – 1100
			06/07	12**	0 – 80			
Total Phosphorus	mg/L		05/06	0.03	0.024 - 0.049			0.014 - 0.071
			06/07	0.03	0.022 - 0.047		0.04	
Nitrate + Nitrite-nitrogen	mg/L		05/06	0.724	0.568- 0.836			0.303 - 1.51
			06/07	0.623	0.358 – 0.798		0.666	

* Median

** Geometric mean value (GMV)

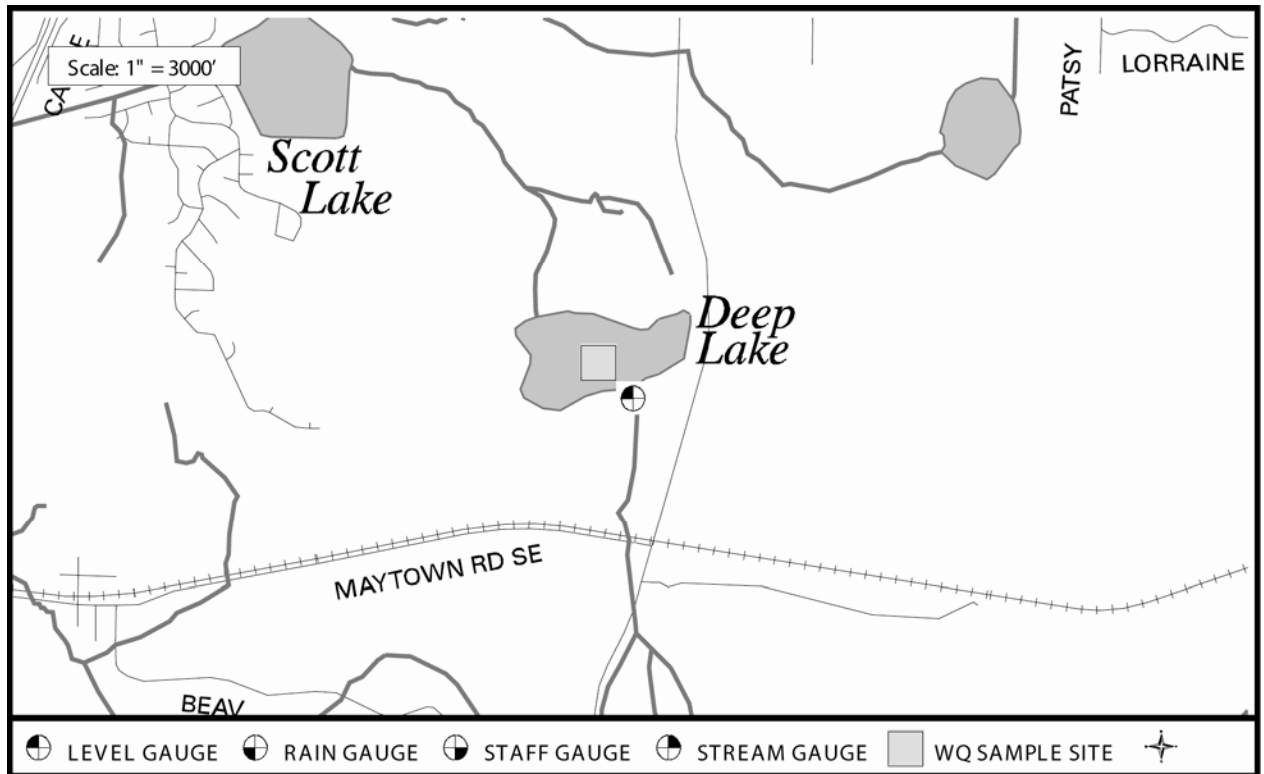
Thurston County Water Resources Monitoring Report 2005 - 2006 *Black River @ Moon Rd Br*

<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>	
10/11/2005	12:30:00 PM	12.26	7.2	9.19	113	20	0.6		0.033	0.836	Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.	
11/8/2005	12:30:00 PM	7.82	6.8	8.04	62	35	3.8		0.049	0.568		
12/7/2005	12:05:00 PM	5.52	7.1	10.78	76	5	1.3		0.032	0.729		
1/4/2006	12:45:00 PM	6.96	6.7	8.62	54	5	2.9		0.031	0.610		
2/7/2006	12:20:00 PM	6.62	6.8	10.04	57	15	2.0		0.027	0.653		
3/13/2006	12:30:00 PM	5.95	7.0	9.51	72	10	2.5		0.024	0.768		
4/26/2006	2:40:00 PM	12.96	7.5	10.90	89	5	1.6		0.028	0.773		
5/16/2006	2:15:00 PM	16.80	7.5	11.45	97	5	1.2		0.025	0.790		
6/14/2006	12:30:00 PM	15.45	7.2	9.54	100	5	1.3		0.039	0.789		
7/11/2006	9:45:00 AM	17.08	7.4		110	15	0.7		0.031	0.797		no DO measurement
8/9/2006	11:35:00 AM	19.20	7.6	10.60	111	25	0.8		0.024	0.613		Samples not stored at proper temperature for 3-5 days, NO2+NO3 may be high
9/11/2006	12:45:00 PM	17.60	7.5	10.31	117	10	0.7		0.029	0.764		

Thurston County Water Resources Monitoring Report 2006 - 2007 *Black River @ Moon Rd Br*

<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>
10/9/2006	12:20:00 PM	13.70	7.3	9.88	114	15	0.3		0.029	0.786	
11/13/2006	3:00:00 PM	8.59	6.5	6.91	53	80	5.8		0.047	0.358	
12/12/2006	1:45:00 PM	7.43	6.8	9.85	70	10	2.2		0.030	0.456	
1/22/2007	2:30:00 PM	5.02	6.7	9.46	74	10	1.1		0.022	0.738	
2/21/2007	12:10:00 PM	7.14	6.9	8.42	49	10	6.8		0.038	0.472	
3/21/2007	12:30:00 PM	8.96	7.0	10.01	71	10	0.0		0.034	0.455	
4/24/2007	12:20:00 PM	11.52	7.0	10.18	82	0	1.1		0.026	0.601	F.C. result was <5.
5/15/2007	2:15:00 PM	14.93	7.3	12.85	92	5	1.5		0.029	0.687	
6/11/2007	12:15:00 PM	14.56	7.4	10.05	100	10	0.6		0.028	0.754	
7/17/2007	10:00:00 AM	18.91	7.2	6.96	108	20	0.7		0.029	0.644	
8/20/2007	2:25:00 PM	17.12	7.4	8.86	110	25	0.2		0.023	0.723	
9/18/2007	11:40:00 AM	15.12	7.7	10.44	115	20	0.5		0.024	0.798	

Deep Lake



PART OF Black River WATERSHED

LENGTH OF LAKE: 0.4 miles

SHORELINE LENGTH: 1.4 miles

LAKE SIZE: 66 acres

BASIN SIZE: 1.2 square miles

MEAN DEPTH: 12 feet

MAXIMUM DEPTH: 17 feet

VOLUME: 770 acre-feet

PRIMARY LAND USES:

Most of the watershed is inside Millersylvania State Park. It is forested, but is a heavily used recreation area.

PRIMARY LAKE USES:

Swimming, boating, and fishing

PUBLIC ACCESS:

The state park has three swimming beaches that are used heavily in the summer. A private resort is located on the east side of the lake.

GENERAL TOPOGRAPHY:

The approximate altitude of the lake is 198 feet. The lake is situated between gentle hills (elevation 300 feet). There is a small unnamed inlet on the southeast side of the lake and an unnamed outlet on the northwest side of the lake. The outlet creek flows into Scott Lake.

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

Good - Visibility is usually good, and phosphorus levels are below the state water quality action level.

OTHER AVAILABLE DATA:

Water quality data - Thurston County Environmental Health Division, (360) 754-4111, www.co.thurston.wa.us/health/ehswat/swater.htm

GENERAL DISCUSSION:

Deep Lake was sampled monthly, May through October, since 1994. Profile graphs of temperature, pH, dissolved oxygen, and conductivity data for 2007 can be found at the end of this narrative. In 2007, Deep Lake was thermally stratified from May through September. This means that the lake developed a warm surface layer and a cooler bottom layer, as the solar radiation warmed the water. The lake's shallow depth (average depth of 12 feet or 3.7 meters) and good water clarity results in a dense population of rooted aquatic plants along the lake bottom, which usually keeps the lake well oxygenated at all depths. At a depth of about two to four meters the water was supersaturated with oxygen.

The 2007 average water clarity, as measured with a secchi disk, was 3.4 meters (11 feet). The range of measurements was from 2.6 meters (8.4 feet) in May to 3.7 meters (12.3 feet) in July. A graph of average summer secchi disk measurements from 1975 and 1994 through 2007 is included at the end of this narrative. A graph of water clarity trends is also shown at the end of this chapter comparing the annual average to the long-term average for the lake.

Total phosphorus concentrations at the surface averaged 0.009 milligrams per liter (mg/L) in 2007. This is well within the state water quality standard of 0.020 mg/L for Puget Sound lowland lakes. The chlorophyll *a* concentration averaged 8 µg/L. The highest concentration measured in 2007 was 17 µg/L in May, which corresponded with the lowest water clarity measurement.

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.

For 2007, the Deep Lake TSI's for chlorophyll *a*, total phosphorus, and secchi disk visibility are 51, 36, and 42, respectively. The trophic state indices for the years of record are graphed and included on the page following the monthly profile graphs. In 2007 the secchi disk and chlorophyll indices were within the mesotrophic range, indicating moderate productivity, and the total phosphorus index was within the oligotrophic range, indicating low productivity. In most years in the record, Deep Lake TSIs have been near the upper end of the oligotrophic range and low end of the mesotrophic range indicating low to moderate productivity with some annual variability probably resulting from weather influences.

Major Issues:

- Heavy recreational usage in the summer increases the risk of the spread of a communicable disease associated with poor personal hygiene and facility over-usage.
- Swimmer's itch is reported to be a regular summer problem in this lake, so preventative measures should be taken by bathers.

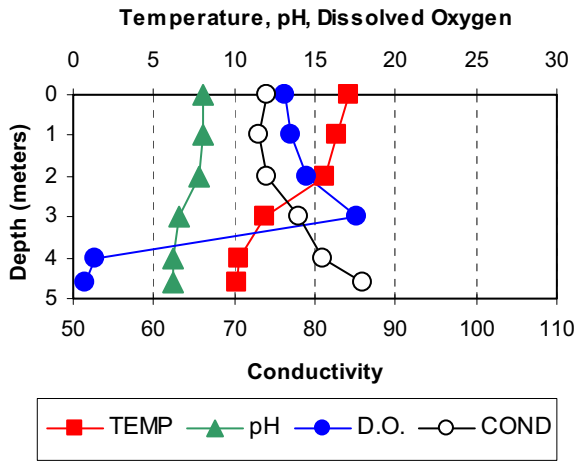
- An invasive, non-native aquatic plant, Eurasian water milfoil, was discovered in the lake in 2003. Washington State Parks and Recreation is taking steps to control its spread in the lake.

Funding Sources:

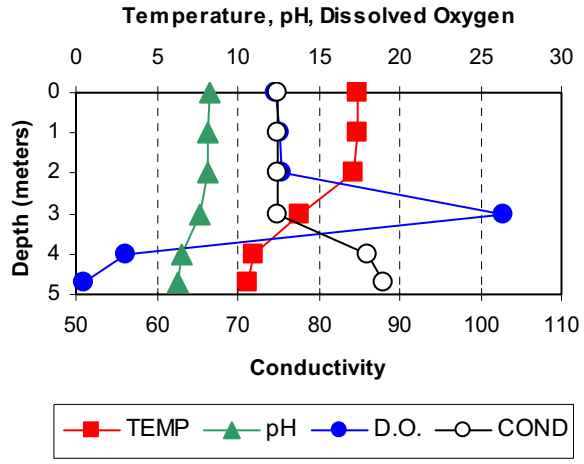
Thurston County funding will continue to support sampling in 2008.

DEEP LAKE

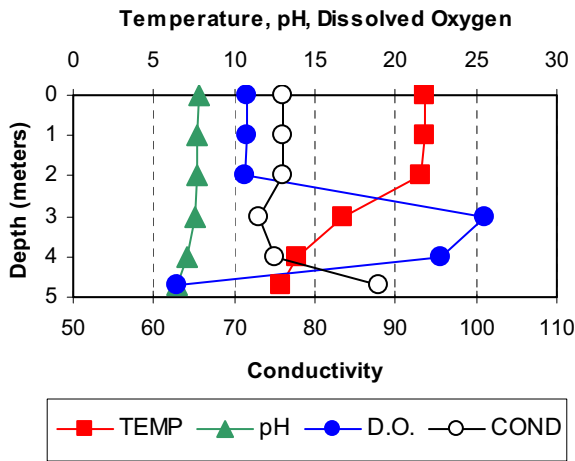
May 23, 2007



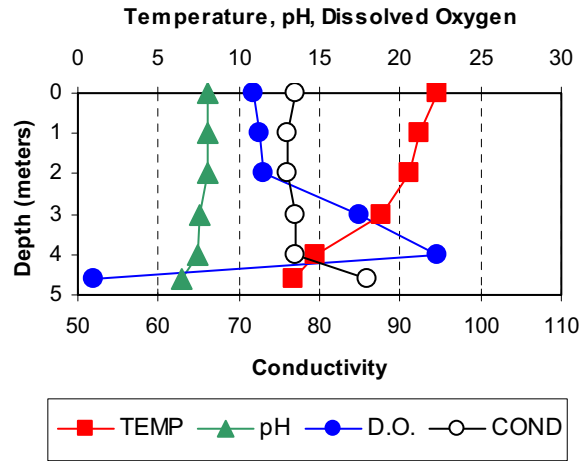
June 18, 2007



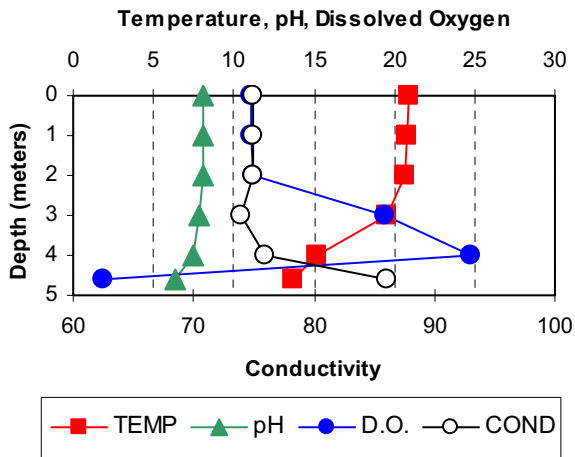
July 23, 2007



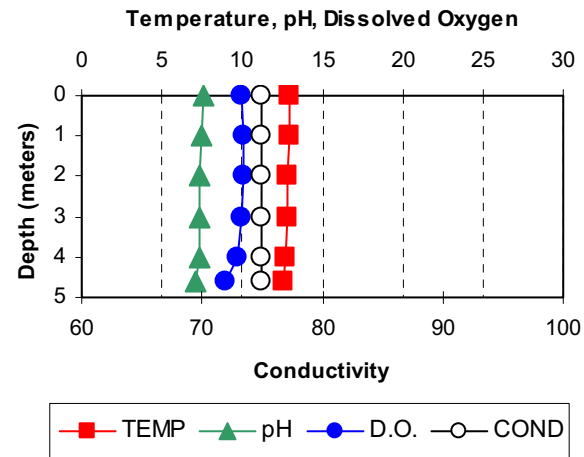
August 14, 2007



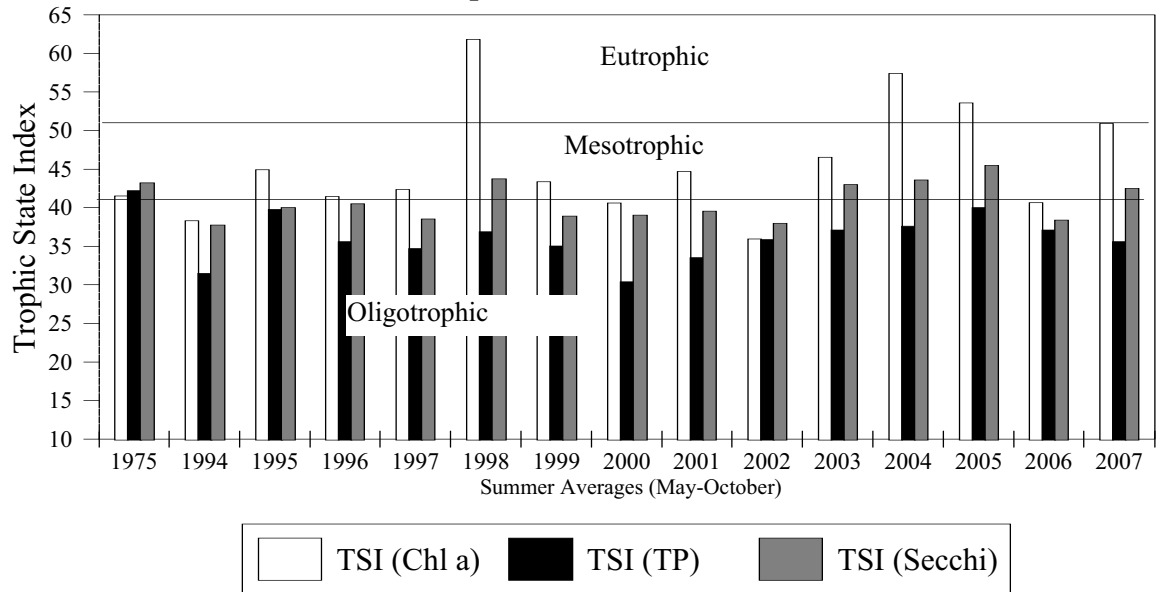
September 12, 2007



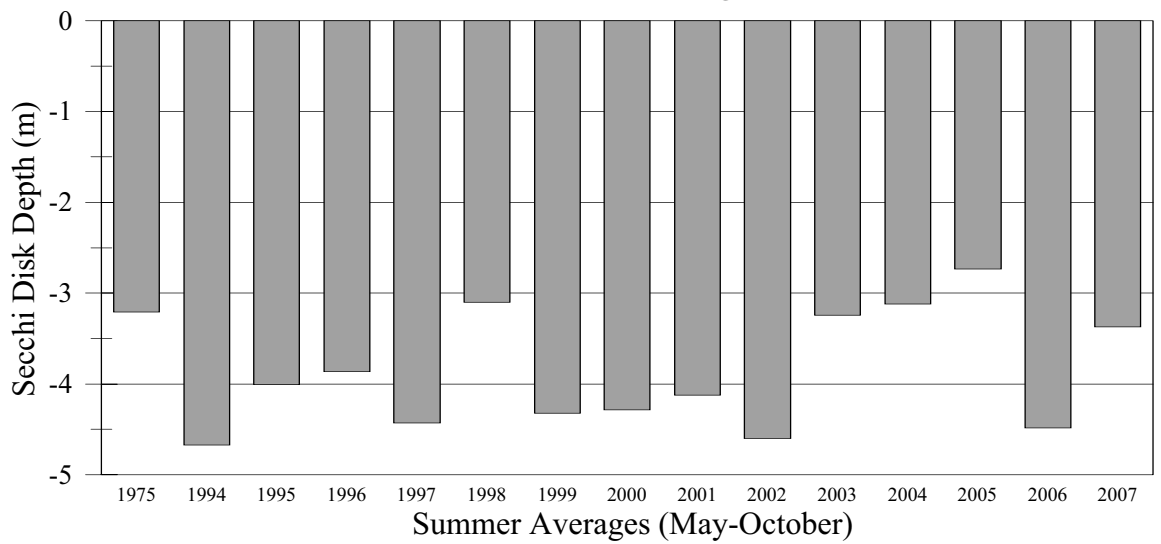
October 17, 2007



Deep Lake Trophic State Indices

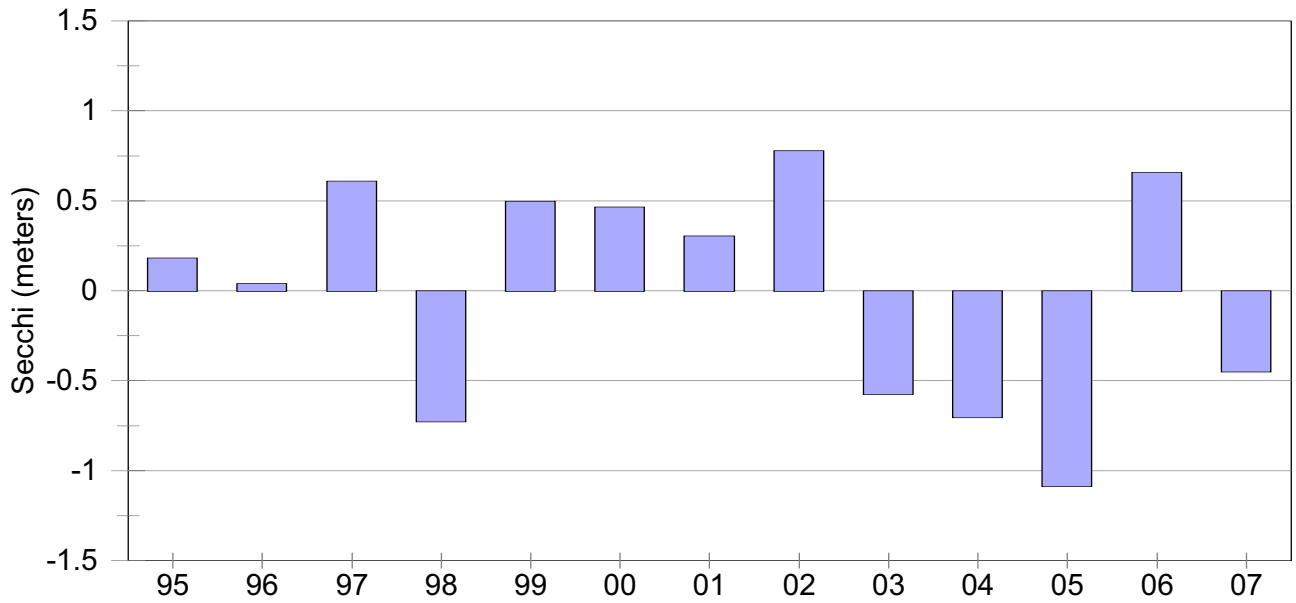


Secchi Disk Readings



Deep Lake Water Clarity Trend

Annual Mean minus Long-Term Mean



Thurston County Water Resources Annual Report - 2007

Deep Lake

Site ID# BLADEL000

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
05/23/2007	12:30:00 PM	4.6	4.0	0.010	0.033	0.377	0.955	2.57	17	3.1	#6 yellow-green	Chl a & algae composite @ 1, 2, & 3M.
06/18/2007	1:30:00 PM	4.7	4.0	0.007	0.050	0.333	0.985	3.06	10	1.8	#6 yellow-green	Chl a & algae composite @ 1, 2, & 3M.
07/23/2007	2:00:00 PM	4.7	4.0	0.007	0.200	0.324	6.640	3.74	5.3	1	#6 yellow-green	Chl a & algae composite @ 1, 2, & 3M.
08/14/2007	1:45:00 PM	4.6	4.0	0.008	0.028	0.262	0.612	3.55	4.8	0.4	#6 yellow-green	Chl a & algae composite @ 1, 2, & 3M.
09/12/2007	1:00:00 PM	4.6	4.0	0.007	0.015	0.270	0.371	3.58	4.8	3	#6 yellow-green	Chl a & algae composite @ 1, 2, & 3M.
10/17/2007	12:00:00 PM	4.6	4.0	0.014	0.012	0.354	0.347	3.69	5.9	6.8	#6 yellow-green	Chl a & algae composite @ 1, 2, & 3M.

Summary for 'Site Description' = Deep Lake (6 detail records)

Averages: Sur TP 0.009
 Secchi 3.37
 Chl a 8.0

Algae data: Deep Lake

	<i>Type</i>	<i>Description</i>	<i>Dominant in Sample</i>
<i>05/23/2007</i>			
	BG	Anabaena species	<input type="checkbox"/>
	DF	Ceratium species	<input type="checkbox"/>
	EU	Phacus species	<input type="checkbox"/>
	YL	Dinobryon species	<input checked="" type="checkbox"/>
<i>06/18/2007</i>			
	CP	Cryptomonas species	<input type="checkbox"/>
	DT	Cymbella species	<input type="checkbox"/>
	GR	Botryococcus braunii	<input type="checkbox"/>
	YL	Dinobryon species	<input checked="" type="checkbox"/>
<i>07/23/2007</i>			
	CP	Chroomonas species	<input type="checkbox"/>
	DT	Cocconeis pediculus	<input type="checkbox"/>
	DT	Tabellaria species	<input type="checkbox"/>
	GR	Elakatothrix species	<input type="checkbox"/>
	GR	Oocystis species	<input type="checkbox"/>
	YL	Dinobryon species	<input checked="" type="checkbox"/>
<i>08/14/2007</i>			
	BG	Anabaena species	<input type="checkbox"/>
	BG	Chroococcus species	<input type="checkbox"/>
	CP	Chroomonas species	<input type="checkbox"/>
	CP	Cryptomonas species	<input type="checkbox"/>
	DT	Asterionella species	<input type="checkbox"/>
	GR	Scenedesmus species	<input type="checkbox"/>
	YL	Dinobryon species	<input type="checkbox"/>
<i>09/12/2007</i>			
	BG	Anabaena species	<input type="checkbox"/>
	CP	Chroomonas species	<input type="checkbox"/>
	DF	Ceratium species	<input type="checkbox"/>
	DT	Gomphonema lanceolatum	<input type="checkbox"/>
	GR	Oocystis borgei	<input type="checkbox"/>
	GR	Sphaerocystis schroeteri	<input type="checkbox"/>
	YL	Dinobryon species	<input checked="" type="checkbox"/>

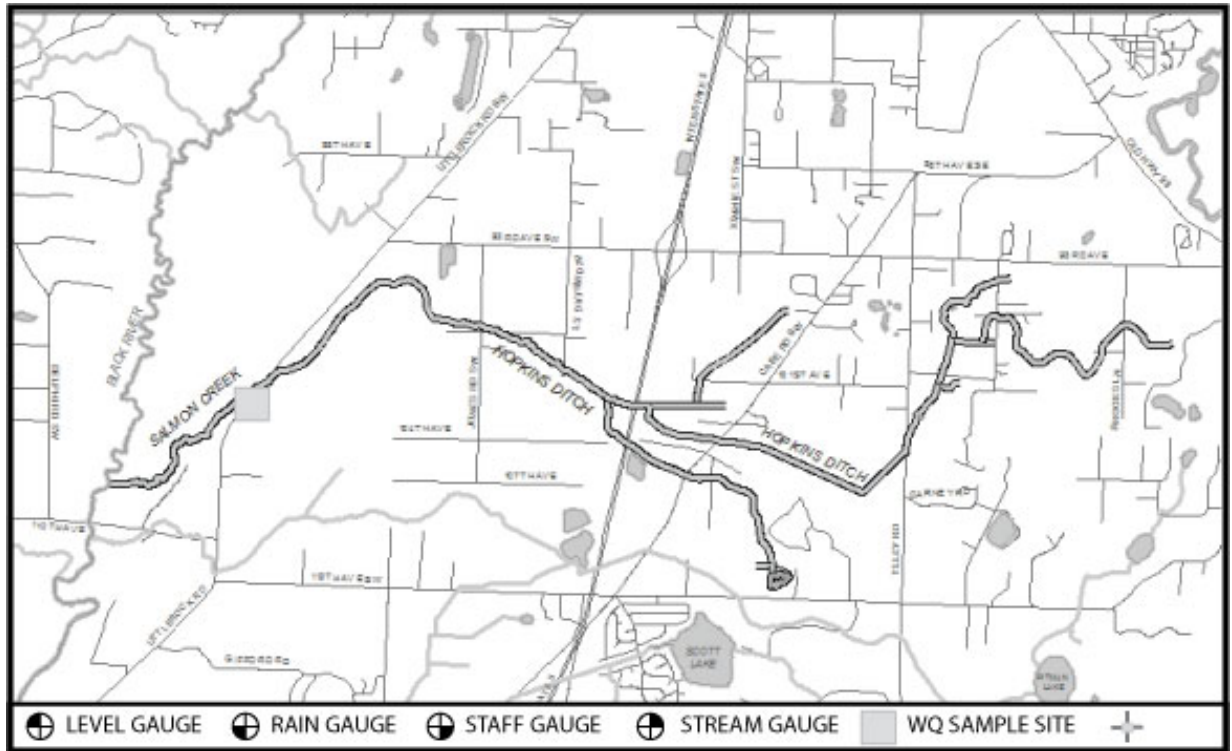
10/17/2007

<i>Type</i>	<i>Description</i>	<i>Dominant in Sample</i>
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CP	Cryptomonas species	<input type="checkbox"/>
DF	Ceratium species	<input type="checkbox"/>
DT	Melosira species	<input type="checkbox"/>
DT	Tabellaria species	<input type="checkbox"/>
GR	Elakatothrix species	<input type="checkbox"/>
GR	Scenedesmus species	<input type="checkbox"/>
YL	Dinobryon species	<input type="checkbox"/>

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

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PART OF BLACK RIVER WATERSHED

LENGTH OF RIVER: 7.4 miles

BASIN SIZE: 7500 acres

PRIMARY LAND USES:

Agriculture including a large government forestry nursery, rural residential and light industrial near highway interchange.

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

Coho

GENERAL TOPOGRAPHY:

Salmon Creek is a tributary to the Black River and drains the prairie on the east side of the river basin and includes Hopkins Ditch.

The basin is a flat glacial outwash plain with low-lying areas prone to groundwater flooding during periods of prolonged above average rainfall.

GENERAL WATER QUALITY:

Good. Met fecal coliform standard. Dissolved oxygen is low in dry months.

OTHER DATA:

Thurston County Environmental Health Division (360) 754-4111 (water quality data for 1991-1993). www.co.thurston.wa.us/health/ehswat/swater.htm

Thurston County Department of Water and Waste Management, Storm Water Utility (360) 357-2491 Salmon Creek and groundwater monitoring. Salmon Creek Drainage Basin Plan www.co.thurston.wa.us/monitoring

Salmon Creek drainage basin is naturally prone to groundwater flooding because of the geology and topography. The land is virtually flat and surface drainage is slow. Standing water can remain on the surface for months. Monthly water quality monitoring of Salmon Creek began in January 2005. The water quality standard for fecal coliform has two parts: part I - the geometric mean shall not exceed 100 colony forming units per 100 milliliters of sample *and*, part II - no more than 10 percent of the samples shall exceed 200 colonies/100 mL of sample. Both parts of the fecal coliform standard were met in 2005/06, with a geometric mean of 19 colonies per 100 ml, and no samples were greater than 200. In 2006/07 both parts were met; however, one sample was greater than 200 (8 percent). During 2005/06, the dissolved oxygen fell below the standard four times and during 2006/07 it fell below the standard six times. There were 2 violations of the turbidity standard during each water year.

Water quality monitoring will continue.

Major Issues:

- During the rainy seasons of 1996/97 and 1998/99, above average rainfall caused localized flooding, failed septic systems, contaminated drinking water and restricted access to property. Flooding is expected to occur again when there is above average rainfall.

Funding Sources:

- Thurston County

Water Quality Summary
 Conventional Parameters
 Salmon Creek

Parameter	Units	WQ Standard WAC 173-201A	Water Year Data: 2005/06 and 2006/07				2004-2005	
			Water Year	Mean	Range	# samples violating standard	Mean	Range
Temperature	°C	Highest 7-DAD Max of 17.5 °C	05-06		4.57 – 16.24			1.99 – 16.47
			06-07		5.13 – 17.12			
Dissolved Oxygen	mg/L	Lowest one-day minimum of 8.0	05-06		6.79 – 10.8	4 of 12		5.32 – 11.2
			06-07		5.53 – 10.3	6 of 12		
Conductivity	µmhos/m		05-06	97	67 – 130		98	78 - 136
			06-07	92	64 - 125			
pH		6.5 - 8.5	05-06	7.0*	6.5 – 7.2	0 of 12	6.8*	6.4 – 7.2
			06-07	6.9*	6.7 – 7.5	0 of 12		
Turbidity	NTU	not to exceed 5 NTU over background	05-06	4.24	0.6 – 18.2	2 of 12	2.57	0.7 – 6.1
			06-07	3.69	0 – 9.8	2 of 12		
Fecal Coliform	Colonies/100ml	GMV: ≤100 and ≤10% not to exceed 200	05-06	19**	0 – 200	% exceeding 200	18**	0 - 170
			06-07	17**	0 - 515	0% 8%		
Total Phosphorus	mg/L		05-06	0.043	0.018 – 0.083		0.045	0.015 – 0.073
			06-07	0.037	0.014 – 0.092			
Nitrate + Nitrite-nitrogen	mg/L		05-06	0.232	0.017 – 0.696		0.172	0.033 – 0.588
			06-07	0.207	0.035 – 0.714			

* Median
 ** Geometric mean value (GMV)

Salmon Creek @ Littlerock Rd.

Thurston County Water Resources Monitoring Report 2005- 2006

Date	Time	Temp C	pH	DO mg/L	Cond @25c umhos/cm	FC cfu/100mL	Turb NTU	Flow cfs	TP mg/L	NOx mg/L	COMMENTS
10/11/2005	2:15:00 PM	11.34	6.8	6.79	130	10	2.9	0.59	0.057	0.044	Turb standard recall of lot used to cal YSI on this date. Results could be up to 8% lower than the true turb value.
11/8/2005	1:40:00 PM	6.60	6.5	8.54	79	10	1.9	13.92	0.035	0.095	
12/7/2005	1:15:00 PM	4.85	6.7	9.55	83	0	0.6	10.80	0.019	0.255	F.C. result was <5.
1/4/2006	2:25:00 PM	6.04	6.6	9.80	67	10	1.7	42.60	0.023	0.667	
2/7/2006	1:15:00 PM	5.21	6.8	10.81	69	20	0.8		0.030	0.655	Too high to wade.
3/13/2006	11:30:00 AM	4.57	6.9	9.31	82	15	1.4	24.90	0.018	0.696	
4/24/2006	3:00:00 PM	11.97	7.2	9.39	94	0	1.4	10.10	0.028	0.050	F.C. result was <5.
5/16/2006	12:50:00 PM	14.67	7.1	7.68	101	75	1.7	4.87	0.028	0.017	
6/14/2006	2:15:00 PM	14.78	7.1	7.51	108	45	3.0	4.02	0.047	0.019	
7/11/2006	8:45:00 AM	14.26	7.1		121	200	7.5	0.81	0.077	0.029	no DO measurement
8/9/2006	12:45:00 PM	16.24	7.1	7.10	124	75	9.8	0.11	0.075	0.099	Samples not stored at proper temperature for 3-5 days, NO2+NO3 may be high
9/11/2006	2:00:00 PM	13.91	7.2	6.93	109	70	18.2	0.11	0.083	0.163	

Thurston County Water Resources Monitoring Report 2006- 2007 *Salmon Creek @ Littlerock Rd.*

<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>
10/9/2006	1:20:00 PM	12.21	7.2	7.42	116	515	4.6	0.32	0.043	0.045	
11/15/2006	12:15:00 PM	7.60	6.8	7.52	68	0	1.5	43.00	0.029	0.180	F.C. result was <5.
12/12/2006	2:30:00 PM	7.30	6.7	9.19	77	0	1.1	32.90	0.016	0.368	F.C. result was <5.
1/22/2007	3:30:00 PM	5.13	6.7	9.65	80	0	1.0	32.08	0.014	0.714	F.C. result was <5.
2/21/2007	3:00:00 PM	7.05	6.7	8.72	64	85	9.8	58.39	0.034	0.456	
3/21/2007	1:15:00 PM	7.66	6.8	10.27	79	10	0.0	36.70	0.027	0.376	
4/24/2007	1:30:00 PM	10.99	6.8	8.99	87	20	0.6	19.25	0.022	0.129	
5/15/2007	3:45:00 PM	13.17	7.0	9.97	92	15	2.1	9.27	0.025	0.035	
6/11/2007	2:45:00 PM	13.71	7.0	7.82	90	45	2.5	2.99	0.041	0.038	
7/17/2007	11:15:00 AM	17.12	7.0	5.53	125	25	8.2	1.87	0.092	0.038	
8/20/2007	3:15:00 PM	15.71	7.0	7.22	110	65	5.8	1.63	0.051	0.036	
9/18/2007	12:30:00 PM	12.86	7.2	6.51	120	40	7.1	0.74	0.052	0.066	