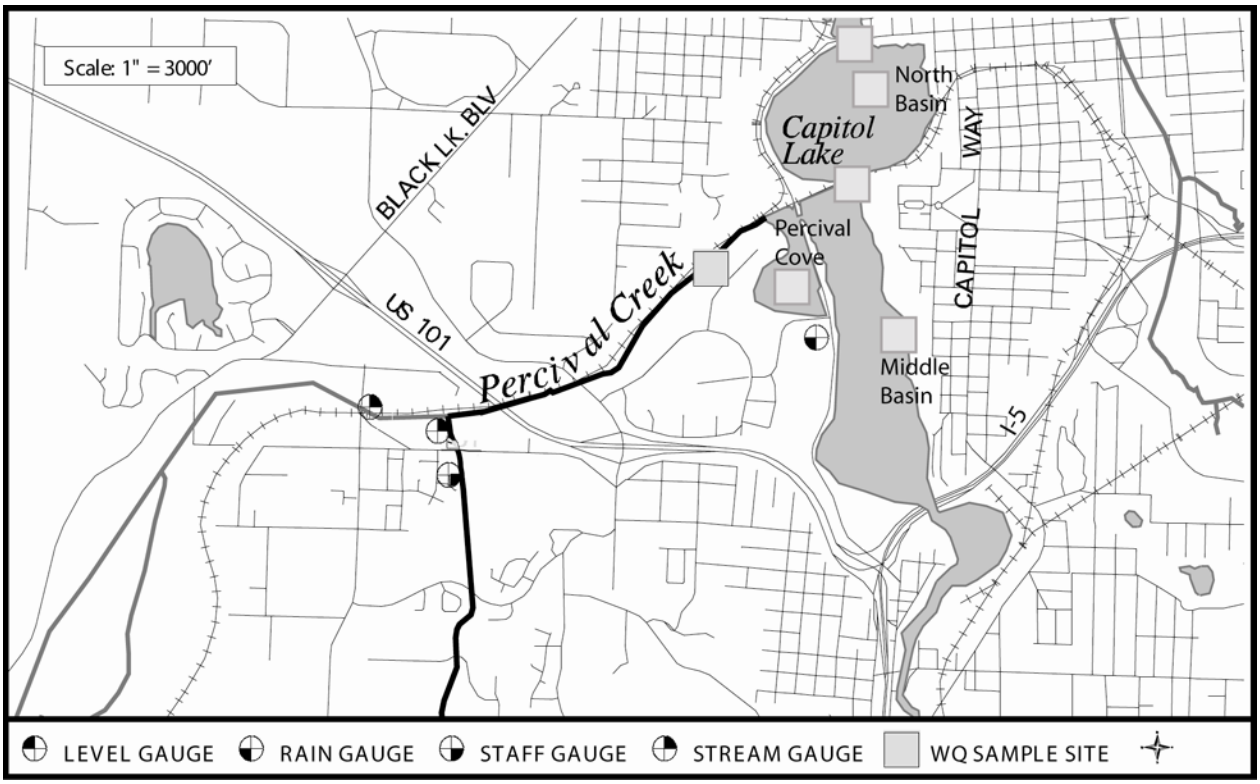
Capitol Lake 2012



PART OF Budd Inlet **WATERSHED**

LENGTH OF LAKE: 1.6 miles

SHORELINE LENGTH: 5.3 miles

LAKE SIZE: 270 acres

BASIN SIZE: 185 square miles

MEAN DEPTH: 9 feet

MAXIMUM DEPTH: 20 feet

VOLUME: 2400 acre-feet

PRIMARY LAND USES:

The Deschutes River/Capitol Lake basin includes commercial forestry in the upper basin and agriculture and rural residential in the middle of the watershed. Urban land uses in the lower watershed include portions of the Cities of Tumwater and Olympia and the state capitol campus.

PRIMARY LAKE USES:

Shoreline trails are used by walkers, joggers, and bird watchers. The lake is closed to boating and fishing to prevent the spread of an invasive species, the New Zealand Mudsnail.

PUBLIC ACCESS:

All of the northern basin and much of the western sides of the middle and southern basins are publicly owned. There are four parks along the lake, including Marathon Park, Tumwater Historical Park, Heritage Park, and the Capitol Lake Interpretive Center. There is a trail system along much of the western shoreline and around the north basin.

The public boat launch at Tumwater Historical Park on the south side of the Interstate 5 Bridge is currently closed to help prevent the spread of an invasive snail species, the New Zealand Mudsnail.

GENERAL TOPOGRAPHY:

The lake is essentially at sea level. Capitol Lake now covers much of the former saltwater estuary for the Deschutes River. In 1951 a tide gate was constructed at 5th Avenue, creating a freshwater lake and preventing saltwater from flowing into the lake under all but extreme high tide conditions. The lake is divided into three basins, constricted by fill at the Interstate 5 overpass and the railroad trestle near Marathon Park.

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

Poor: The lake is listed on the state's 303(d) list of water quality impaired water bodies for total phosphorus and fecal coliform. Sediment deposition from the Deschutes River, Percival Creek, shoreline erosion, and landslides has been progressively filling in the lake since it was created. Aquatic plant and algae growth is extensive in the summer. Control is on-going for invasive species, such as Eurasian water milfoil and purple loosestrife. In 2009 another invasive species, the New Zealand Mudsnail, was discovered in the lake. Efforts are underway to control its spread.

OTHER AVAILABLE DATA:

Thurston County Environmental Health Division, (360) 867-2626, (historical water quality data) or www.co.thurston.wa.us/health/ehswat/swater.htm

GENERAL DISCUSSION:

Background

The area of Capitol Lake was formerly an estuary of Budd Inlet. The lake was formed by the construction of a tide gate in 1951, which impounded the Deschutes River. The tide gate was constructed to create a reflection pond for the state capitol building. The resulting body of water looks like a lake; however the exchange of water into and out of the lake occurs fairly quickly compared to most lakes. During high winter flows in the Deschutes River, the water exchange in the lake can be as fast as a few hours. During the summer low-flow period, the exchange rate is much slower and it can take as long as 9 days for the river water to move through the lake.

Capitol Lake has several water quality problems. As an impoundment of the Deschutes River, Capitol Lake shares some of the river's characteristics, such as elevated nutrient levels and high turbidity during winter storms. The lake is gradually filling with sediments transported into it by the Deschutes River and Percival Creek, as well as other smaller sources. The wide shallow basins result in high surface water temperatures and allow light to reach the bottom of most of the lake. This provides excellent habitat for aquatic plants and algae, which impair recreational uses and further contribute to water quality problems. Until 1985, a swimming area was operated by the City of Olympia at the north end of the lake. However, poor water clarity and high fecal coliform bacteria levels forced closure of the swimming area. Water circulation into and out of the swim area was poor and likely contributed to its chronic water quality problems. There are numerous stormwater discharges into the lake along the shoreline in all three basins.

Likely sources of bacteria and nutrient pollution include: agricultural activities along the Deschutes River and its tributaries, septic systems, resident waterfowl, highway and urban stormwater runoff, accidental spills, illicit sewage discharges, and other nonpoint pollution sources.

To reduce water quality impacts on Percival Creek from stormwater discharges, City of Olympia constructed a regional stormwater detention/wetland system along Black Lake Ditch in the early 1990's. In 2003, City of Olympia initiated an illicit discharge detection and elimination program to identify and eliminate sewer connections to the city storm sewer systems. Since the program's inception several illicit connections have been found and eliminated.

City of Tumwater has plans to construct four major stormwater facilities in 2014 and 2015. One project is to install rain gardens and stormwater filters prior to discharge into Percival Creek. The other projects are to construct biofiltration swales and wetland treatment facilities on stormwater systems that discharge to the Deschutes River. Designs are being completed, permits are being obtained, and funding has been granted for these projects.

Management of Capitol Lake is the responsibility of Washington Department of Enterprise Services (formerly General Administration). Management of the lake has been guided by a 10-year Capitol Lake Adaptive Management Plan adopted in 2003. In September 2009, the Capitol Lake Steering Committee delivered a majority recommendation to the Director of Enterprise Services to remove the tidegate and restore the Deschutes River estuary in place of the existing lake. The community is divided regarding the estuary recommendation. Some residents support maintaining the lake. In 2010, the Capitol Lake adaptive management planning process was suspended.

2012 Ambient Monitoring Program

In 2012, the sampling locations for the ambient monitoring program included two mid-lake sites, one each in the north and middle basins. The sampling program included monthly sampling at those two locations, May through October. Sampling was done with the assistance of the Department of Enterprise Services staff, using a boat that is dedicated to Capitol Lake. During and after sampling, special procedures are used to prevent the spread of the New Zealand Mudsnail.

Sample parameters included temperature, pH, dissolved oxygen, specific conductivity, water clarity, total phosphorus, total nitrogen, nitrate, ammonia, chlorophyll *a*, fecal coliform bacteria, and algae identification. Nutrient, chlorophyll, and algae samples were collected at a depth of one-meter. Nitrate and ammonia are included in the nutrient analyses to examine how nutrients from the Deschutes River are utilized as water moves through the lake basins. The water quality data is located at the end of this chapter.

Field Parameters

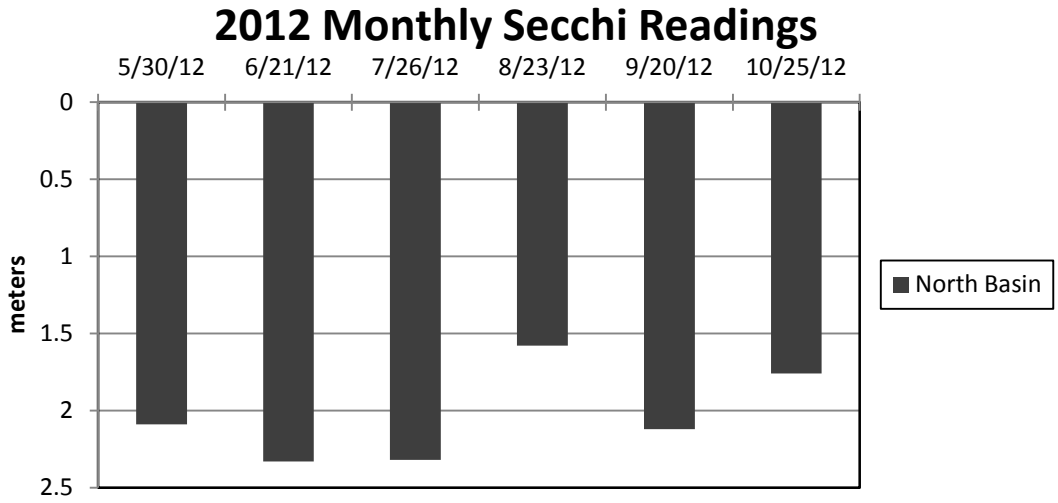
Unlike most Thurston County lakes, Capitol Lake does not thermally stratify due to its shallow depth and riverine influence. During 2012, temperature at the bottom in the north basin was less than 1^{o}C cooler than at the surface. In the middle basin, the temperature difference between the surface and bottom was less than 2.5^{o}C. High conductivity (saline water) was measured near the bottom in the both basins, which is the result of marine water from Budd Inlet flowing over the fish ladder into the lake during tides higher than 14 feet. Heavier saltwater settles in the deepest part of the lake.

Capitol Lake typically experiences large diurnal swings in dissolved oxygen levels during late summer, with high dissolved oxygen levels in the day time and low levels during the night and just before sunrise. These swings in dissolved oxygen are driven by algae and aquatic plants. Dissolved oxygen increases during daylight hours when photosynthesis is occurring and decreases at night when respiration continues, but photosynthesis does not. Diurnal variations are the greatest in late

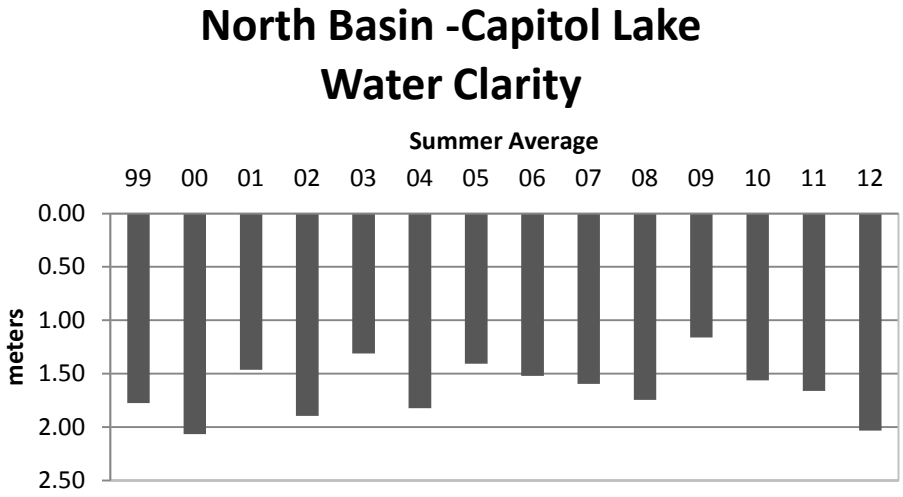
summer, when longer sunlight exposure and warmer temperatures increase photosynthetic and respiration rates. The highest dissolved oxygen level measured was in the north basin during September, with a surface concentration of 13.79 mg/L at 10:00 AM. On that day, chlorophyll *a* concentration was also relatively high, 14 µg/L, indicating that algae was likely influencing dissolved oxygen. Rooted aquatic plants were also likely contributing to the high dissolved oxygen levels. There was no 24-hour continuous monitoring conducted in 2012. Profile graphs of the field measurements are located on pages 13 and 14.

Water Clarity

The graph below shows 2012 monthly water clarity measurements in the north basin. The water clarity standard that is applied to bathing beaches is four (4) feet or greater. The north basin of Capitol Lake met this standard all season. The poorest water clarity was measured in August at 1.6 meters (5.3 feet). The highest water clarity was measured in June at 2.3 meters (7.5 feet).



The season average clarity in the north basin in 2012 was 2.0 meters (6.6 feet). The graph below shows average summer water clarity for the past fourteen years. Generally averages are calculated using four to six monthly measurements collected between May and October period. The exception is 1999, where only September and October data was collected. The graph shows that yearly water clarity averages vary by up to 0.9 meters, from 2.1 meters in 2000 to 1.2 meters in 2009.



Fecal Coliform Bacteria

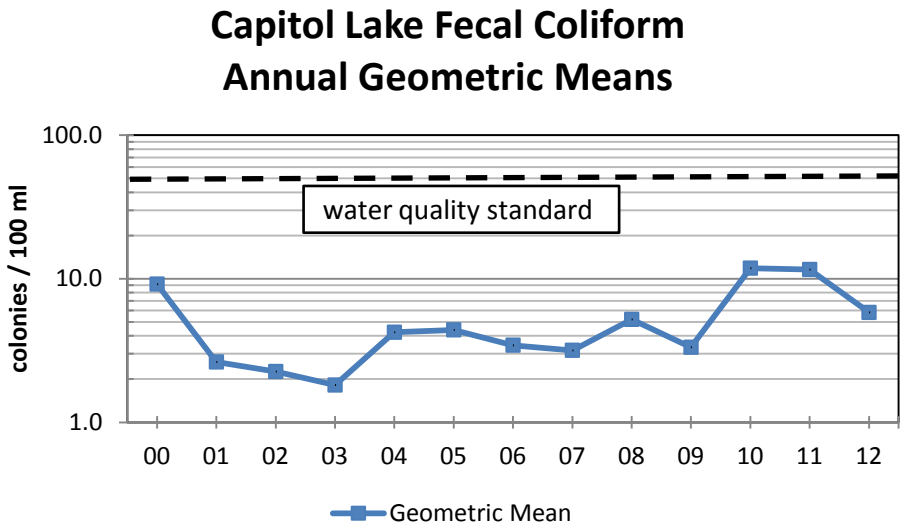
Fecal coliform bacteria samples are collected as part of the monitoring program because of historic use of the lake for water contact recreation. Additionally, the lake is listed on the Washington Department of Ecology 303(d) list of impaired water bodies for fecal coliform bacteria standard violations. Results from this year's bacteria sampling are shown in the table below.

Capitol Lake Fecal Coliform Bacteria Sampling Results

Date	North Basin	Middle Basin
5/30/12	5	5
6/21/12	15	<5
7/26/12	20	<5
8/23/12	10	30
9/20/12	<1	<1
10/25/12	40	10

The state water quality standard for primary contact recreation is a geometric mean of 50 fecal coliform colonies per 100 ml with not more than ten (10) percent of the samples exceeding 100. County policy regarding closure of a bathing beach sets the fecal coliform standard at a geometric mean of 200 colonies per 100 ml. All sample results in 2012 in both basins met both parts of the water quality standard and were also below the county beach closure threshold. Geometric means for 2012 in the north and middle basins were 8 and 3, respectively, and all samples results were below 100 colonies per 100 ml.

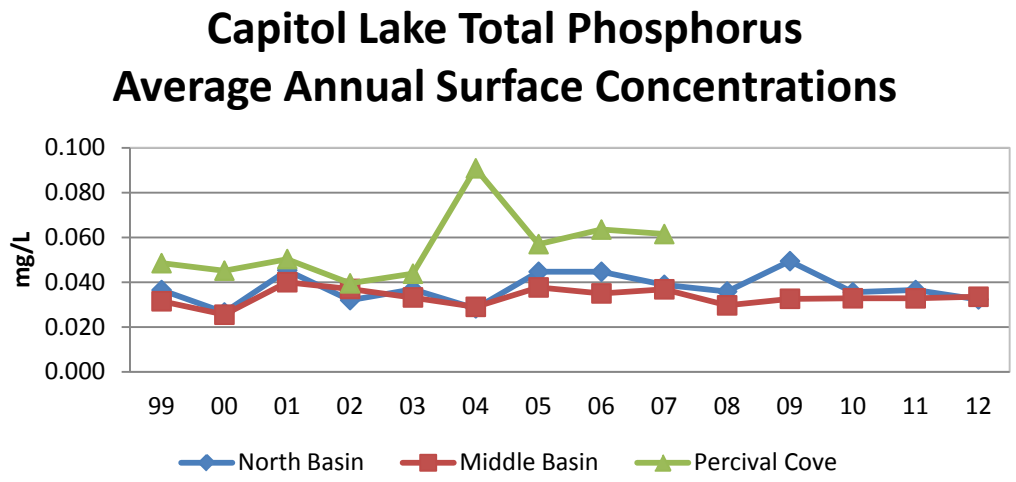
Individual sample results from the past twelve years are included in a table on pages 12 and 13. The graph below shows annual geometric means of all the fecal coliform results collected at both sites since 2000. The lake experienced higher than normal fecal coliform levels in 2010 and 2011. All years since 2000 have met the water quality standard of 50 colonies per 100 ml.



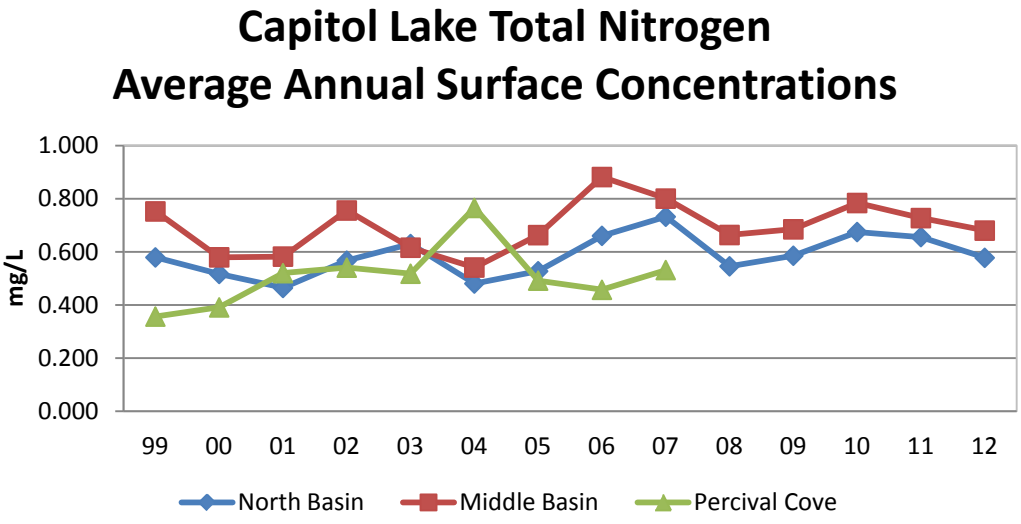
Nutrients

Generally, lakes in the Puget Sound region with summer average surface total phosphorus concentrations greater than 0.030 mg/l experience undesirable algae growth which interferes with recreational uses (USGS Water Supply Paper 2240). The action level established in WAC 173-201A, "Water Quality Standards for Surface Water of the State of Washington" is 0.020 mg/l.

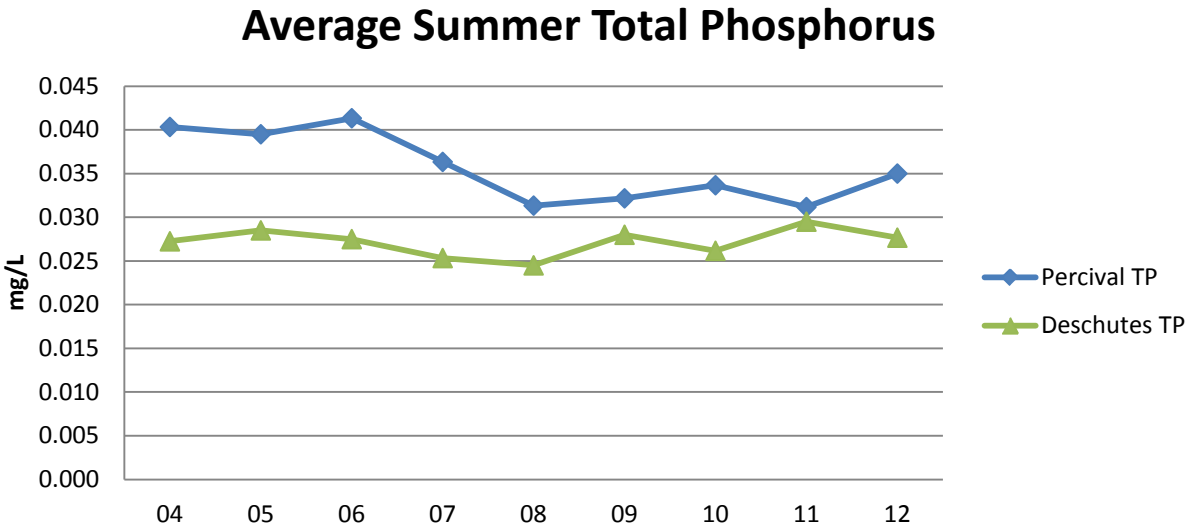
Average 2012 surface total phosphorus (TP) concentrations in the north and middle basins were 0.032 mg/l and 0.034 mg/l, respectively. All individual samples in both basins during 2012 had total phosphorus concentrations equal to or greater than the 0.020 mg/l state action level. Annual average total phosphorus concentrations since 1999 for north and middle basins and Percival Cove (up to year 2007) are graphed below. Generally, phosphorus concentrations in the north and middle basins were similar. Percival Cove had notably higher phosphorus than the main lake basins.



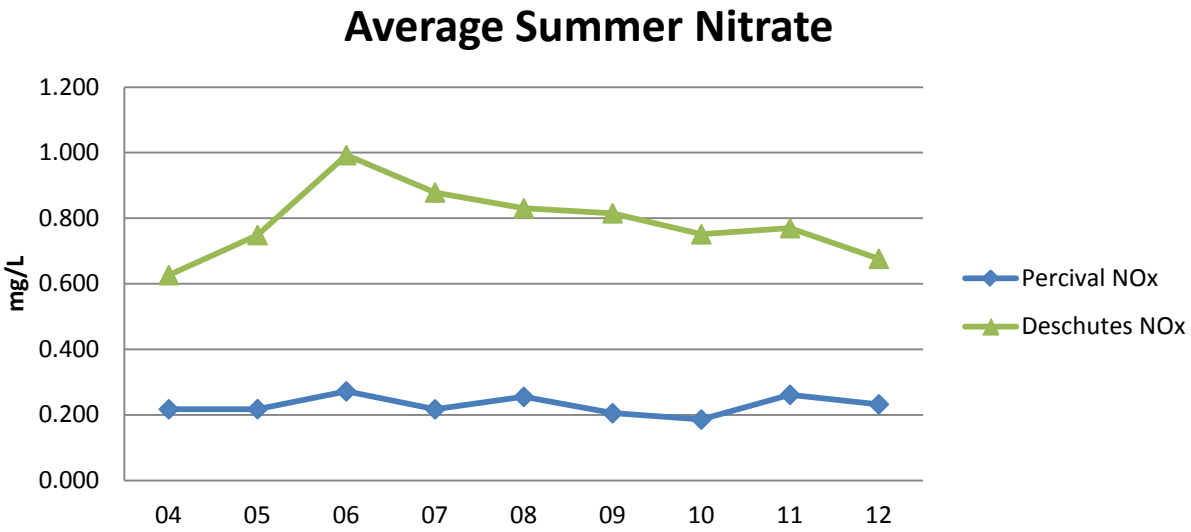
Annual average total nitrogen concentrations are graphed below. In 2012, average total nitrogen concentrations for north and middle basins respectively were 0.722 mg/l and 0.807 mg/l. The graph shows that the middle basin consistently has higher nitrogen concentrations than the north basin. Total nitrogen to phosphorus ratios in both basins indicate that aquatic plant growth in summer is limited by the amount of available phosphorus.



Deschutes River and Percival Creek are the two primary tributaries to the lake. Average summer total phosphorus and nitrate concentrations from 2004 to 2012 for the Deschutes River and Percival Creek are graphed below. Percival Creek has higher phosphorus concentrations than the river.



The river nitrate concentrations are more than double those in Percival Creek. The river average ranges from 0.63 mg/l in 2004 to 0.99 mg/l in 2006. The average **total** nitrogen concentrations in the middle basin of the lake follow a very similar pattern as nitrate in the river, although at slightly lower levels. The range of the average **total** nitrogen in the middle basin was from 0.54 mg/l in 2004 to 0.88 mg/l in 2006.

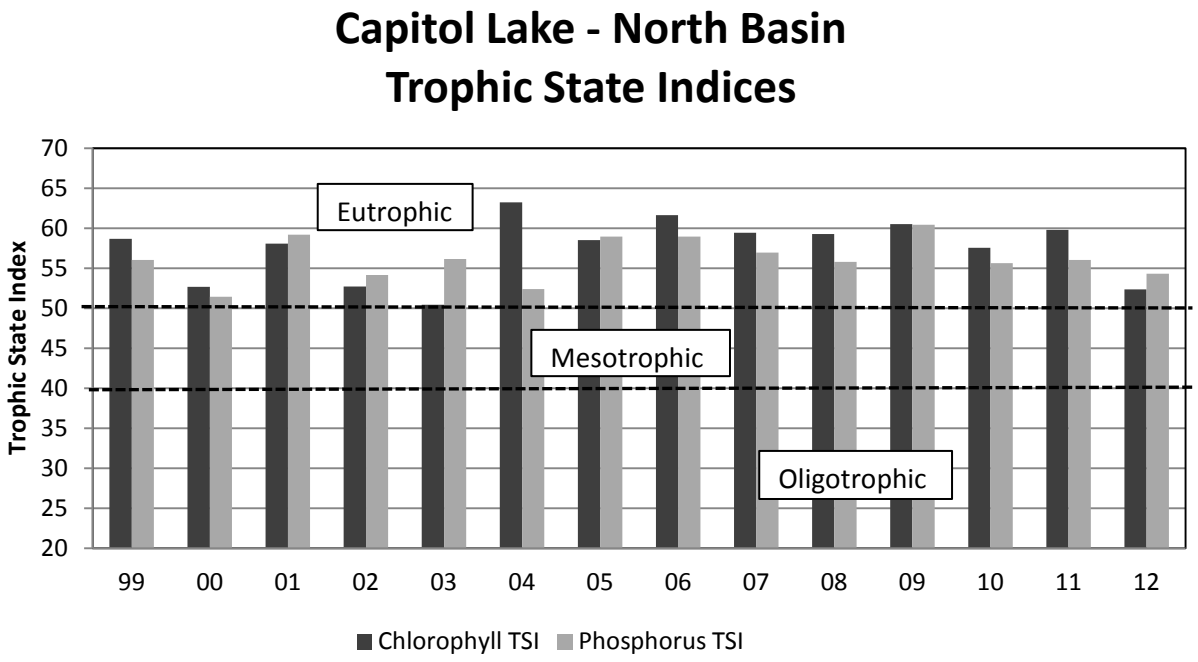


Trophic State Indices

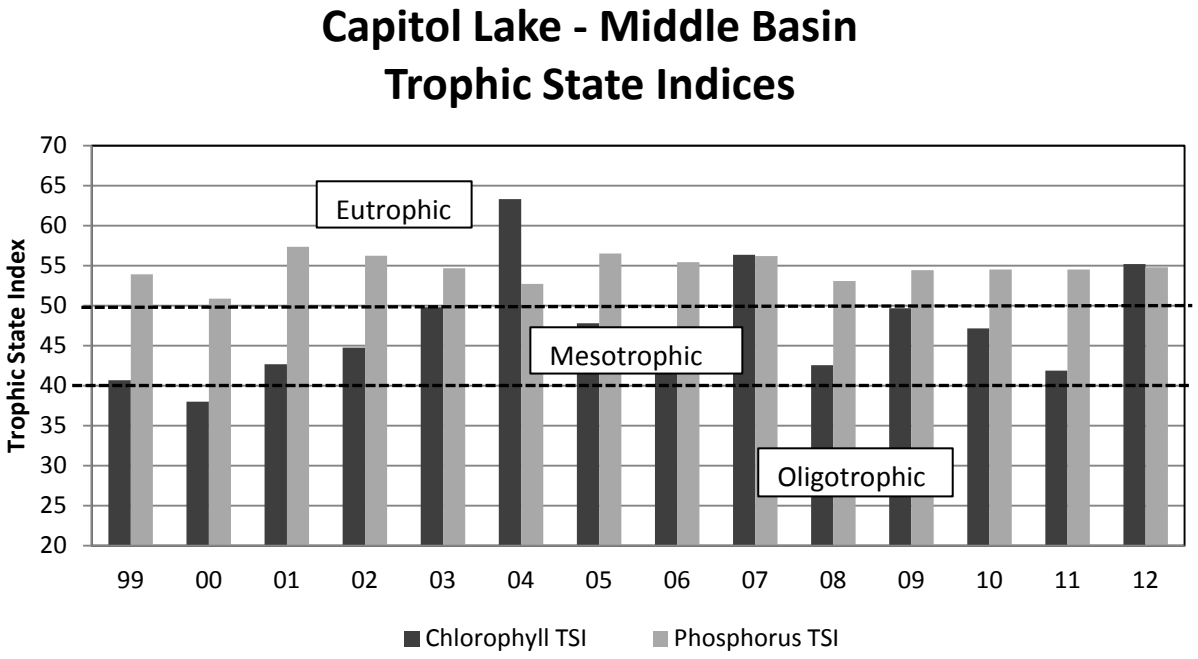
The Carlson trophic state indices (TSI) are used to express the degree of productivity of a lake. Average summer total phosphorus and chlorophyll *a* concentrations and secchi disk transparency are each used to calculate TSIs for a lake. TSIs of 0 to 40 indicate an oligotrophic, or low productivity, lake. TSIs of 41 to 50 indicate a mesotrophic, or moderately productive lake. TSIs greater than 50 indicate a eutrophic, or highly productive lake. Due to the shallow nature of Capitol Lake and the dense rooted aquatic plant growth that occurs, secchi disk visibility is often either to the bottom or is

obscured by plants, especially in the middle basin. Therefore, secchi TSIs are not a good indicator of trophic status in Capitol Lake and were not calculated for either basin.

The north basin's 2012 TSIs for chlorophyll *a* and total phosphorus were 52 and 54, respectively. The middle basin had TSI values of 55 for both chlorophyll *a* and total phosphorus. TSIs from 1999 to 2012 are shown on the graphs below.



Note: '99 indices calculated from Sept and Oct data only



Note: '99 indices calculated from Sept and Oct data only

The phosphorus TSIs show that both basins are nutrient-rich and fall in the eutrophic range. The chlorophyll TSI for the north basin is also consistently in the eutrophic range indicating a highly productive system. In 2012 the middle basin chlorophyll TSI also registered in the eutrophic range. Most years the chlorophyll TSI for the middle basin TSIs is much lower than the north basin and has typically been within the mesotrophic range, indicating less algae production. This condition is the result of the middle basin being closer to the in-coming river, where the algae community has not had as much time to develop as it has farther downstream in the north basin of the lake.

On note for 2004 is that the TSIs that year were artificially high as a result of the effects of an herbicide treatment in the lake for the control of the invasive aquatic plant, Eurasian water milfoil.

Algae

In most nutrient-rich Thurston County lakes, blue-green algae tend to be the dominant algae group and the ones associated with "algae blooms". The algae composition in Capitol Lake is different, in that it tends to have more diatom species present than most other eutrophic lakes in this county. This is likely due to the lake's location at the downstream end of the Deschutes River system. In G.W. Prescott's, "The Algae: A Review", it states that water current is a major factor in the algae composition of flowing water environments. The organisms must be able to physically survive the rigors of current, be able to assimilate nutrients readily from flowing water, and be able to reproduce under those conditions. The diatom group is a diverse group, and many of the diatom species have characteristics that allow them to inhabitat flowing water environments. The blue-green algae, typical of a eutrophic lake, appear more often in the north basin than the middle basin, and during late summer and early fall.

The 2012 algae data is included at the end of this report. It is a list of those genera present in the sample, in alphabetical order by category. The order listed does not reflect dominance.

Major Issues:

- A 10-year plan (for 2003 to 2013) for adaptively managing Capitol Lake was developed by the Washington Department of Enterprise Services and a multi-agency steering committee. The goal of the plan is to achieve measurable improvements in flood control, water quality, sediment management and infrastructure improvements. The plan identifies fourteen management objectives, which have been adopted by the State Capitol Committee and are being implemented by the Washington State Department of Enterprise Services and the other participating agencies.

- In 2009 the Capitol Lake steering committee made a recommendation to the Washington Department of Enterprise Services to return the lake to a naturally functioning estuary after reviewing the results of several scientific studies conducted to determine the feasibility of estuary restoration. However, in May 2010, Enterprise Services, at the directive of the Legislature, suspended the Capitol Lake adaptive management planning process, due to budget limitations.

- The Washington State Department of Ecology is conducting a total maximum daily load study in the Deschutes River/Budd Inlet system. This includes modeling the effects of the lake on Budd Inlet. Discharge limits for pollution sources will also be established. The final technical report was released in June 2012. A stakeholder committee was convened in 2009 and is developing a water quality cleanup plan. The plan is anticipated to be completed by December 2013.

- Some of the past and present Capitol Lake management issues include:
  Sediment deposition and dredging
  Poor water quality
  Controlling the population of resident Canada geese
  Accidental sewage and chemical spills
  Excessive aquatic plant and algae growth
  Invasive species such as purple loosestrife, Eurasian water milfoil**,** New Zealand mudsnail
  Flooding and lake shoreline erosion
  Chinook salmon hatching and rearing operation
  Stormwater discharges

- In 2001 Eurasian water milfoil, an invasive aquatic plant, was discovered in the lake. In summer 2004, the herbicide triclopyr was applied to the lake to control the milfoil infestation. In 2005, some surviving milfoil plants were discovered in the south basin and in the wetland near the Interpretive Center. Since then hand pulling and other alternative means of control are being used to help control the plant's spread.

- In 2009 the invasive species, New Zealand mudsnail was discovered in the lake. The Department of Enterprise Services has restricted lake access to prevent the spread of the snail to other water bodies. They are trying various control techniques including lake draw down during freezing weather conditions.

Funding Sources:

Funds for water quality monitoring in 2012 were provided by the State of Washington Department of Enterprise Services (formerly the Department of General Administration)

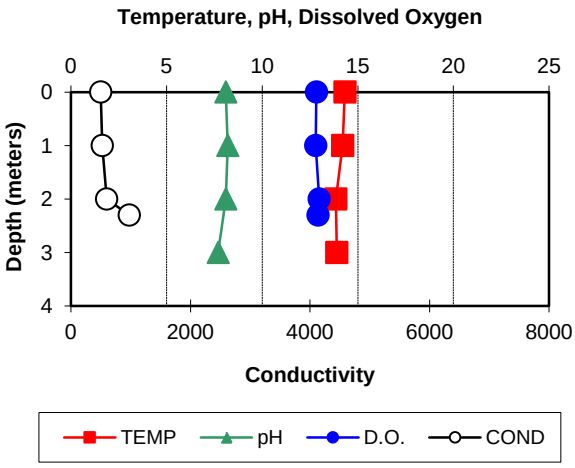
Capitol Lake Fecal Coliform Bacteria Sample Results

Date	North Basin	Middle Basin	Percival Cove
6/21/00	5	5	10
7/19/00	5	3	10
8/23/00	<5	5	<5
9/21/00	25	20	5
10/25/00	40	35	5
5/16/01	35	45	10
6/20/01	<5	<5	5
7/17/01	5	<5	<5
8/15/01	<5	<5	<5
9/20/01	10	<5	5
10/19/01	<5	<5	10
5/20/02	<5	5	<5
6/17/02	<5	13	5
8/28/02	<5	<5	–
9/26/02	<5	7	–
6/19/03	–	--	5
7/17/03	<5	<5	5
8/19/03	<5	5	<5
9/24/03	5	<5	5
5/25/04	8	<5	<5
6/14/04	6	11.5	5
7/13/04	2	3	5
8/18/04	1	1	<5
9/29/04	4.5	9	10
10/13/04	<5	15	5
5/18/05	50	45	60
6/22/05	5	38	<5
7/20/05	<5	<5	<5
8/17/05	<5	5	<5
9/14/05	<5	<5	<5
10/18/05	<5	15	<5
5/24-25/06	10	105	40
6/21-22/06	5	<5	<5
7/26/06	<5	<5	<5
8/16/06	<5	<5	5
9/20/06	5	10	10
10/11/06	<5	5	<5
5/23/07	<5	<5	15
6/18/07	<5	20	10
9/12/07	<5	<5	--
9/26/07	5	<5	--
10/17/07	15	50	--

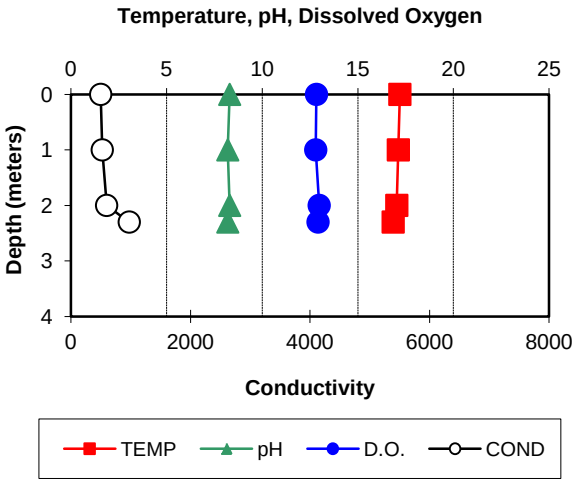
Date	North Basin	Middle Basin	Percival Cove
5/21/08	50	25	--
6/16/08	5	5	--
7/15/08	<5	5	--
8/12/08	20	<5	--
9/17/08	<5	<5	--
10/15/08	5	10	--
5/26/09	10	20	--
6/24/09	<5	<5	--
8/19/09	<5	5	--
9/14/09	<5	10	--
10/14/09	<5	10	--
5/27/10	45	60	--
6/23/10	45	10	--
7/22/10	10	45	--
8/25/10	<5	80	--
9/22/10	--	10	--
10/21/10	<5	<5	--
6/22/11	20	30	--
7/20/11	--	15	--
8/30/11	<5	5	--
9/21/11	<5	5	--
10/12/11	60	163	--
10/12/11	60	163	--
5/30/12	5	5	--
6/21/12	15	<5	--
7/26/12	20	<5	--
8/23/12	10	30	--
9/20/12	<1	<1	--
10/25/12	40	10	--
Mean (GMV)	3	4	4
# of records	68	70	37

CAPITOL LAKE - NORTH BASIN

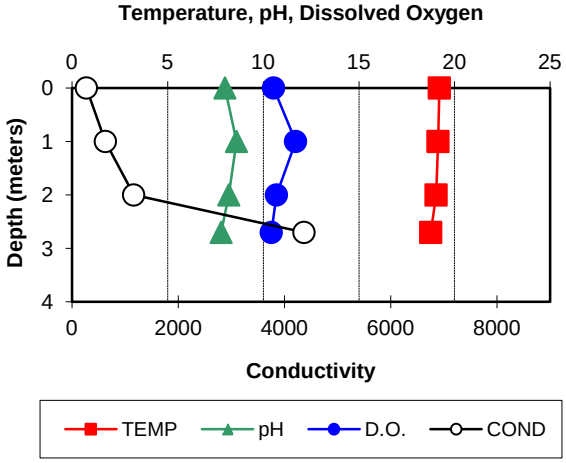
May 30, 2012



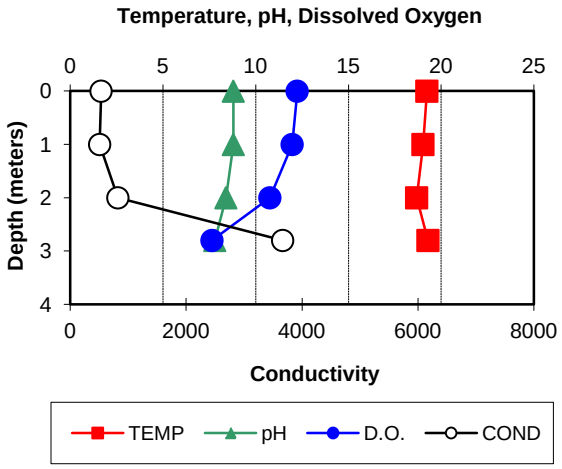
June 21, 2012



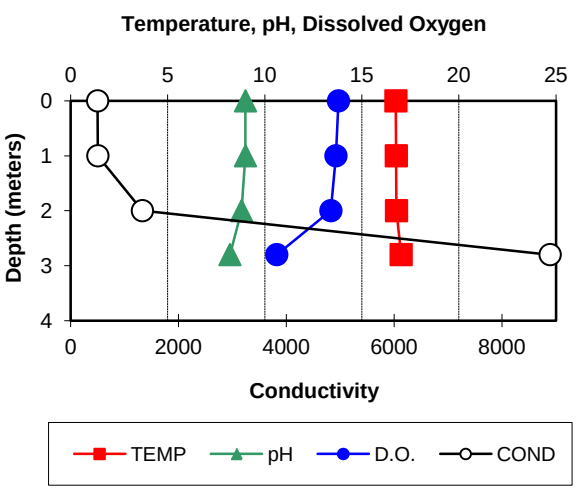
July 26, 2012



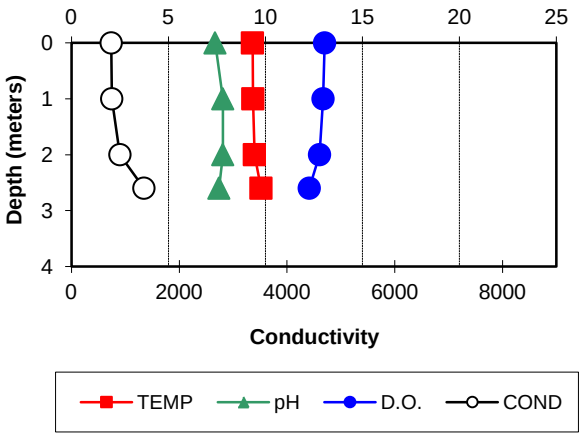
August 23, 2012



September 20, 2012

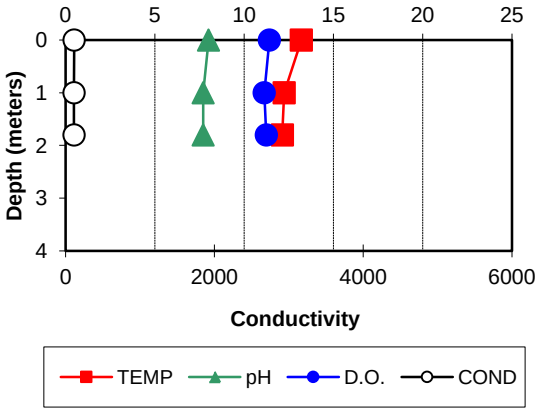


October 25, 2012



CAPITOL LAKE - MIDDLE BASIN

May 30, 2012



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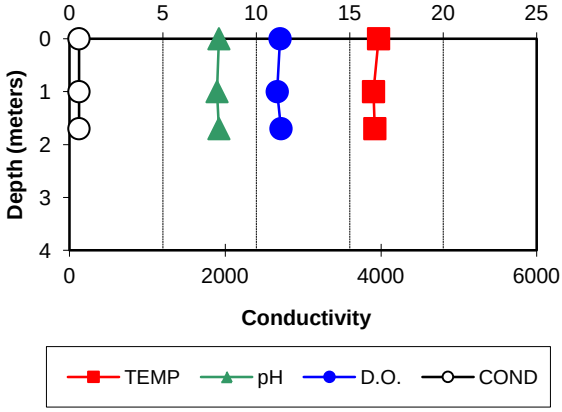
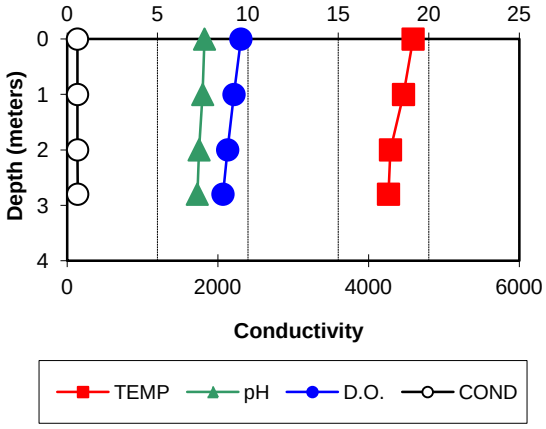


July 26, 2012



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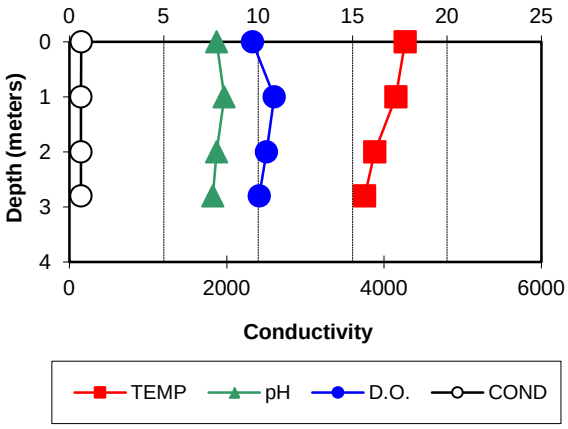

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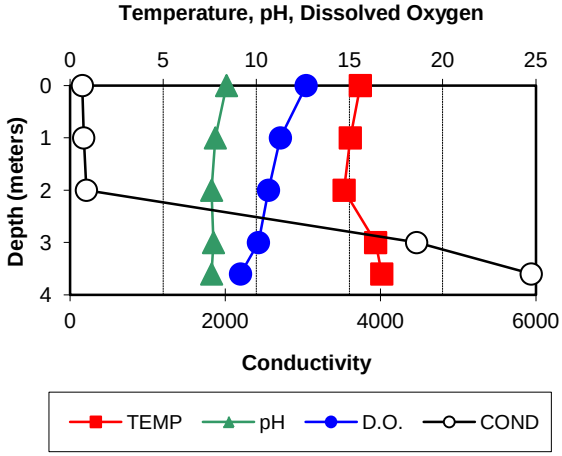
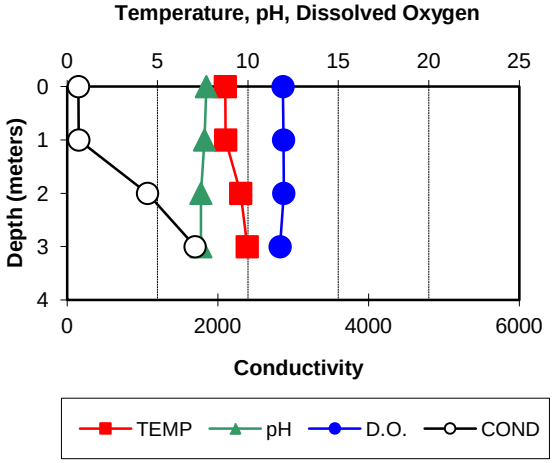


October 25, 2012



Capitol Lake @ Mid-North Basin

Site ID# *BUDCAL005*

Date	*Time*	*Bottom Depth m*	*Sur TP mg/L*	*Sur TN mg/L*	*NO3+NO2 mg/L*	*NH4 mg/L*	*Secchi m*	*Chl a ug/L*	*Phae a ug/L*	*Water Color*	*Lake Notes*
05/30/2012	9:45:00 AM	3	0.024	0.527	0.24	0.005	2.09	5.9	2	#6 yellow-green	Sample collected at 1M depth. Ammonia reported as <0.010.
06/21/2012	9:40:00 AM	2.5	0.022	0.412	0.299	0.024	2.33	3.7	1.9	#6 yellow-green	Sample collected at 1M depth.
07/26/2012	10:20:00 AM	2.7	0.032	0.640	0.409	0.021	2.32	8	2.1	#6	Sample collected at 1M depth. Very little algae scum on lake.
08/23/2012	9:45:00 AM	2.8	0.059	0.676	0.183	0.005	1.58	18	5.6	#6 yellow-green	Sample collected at 1M depth. Ammonia reported as <0.010.
09/20/2012	10:00:00 AM	2.8	0.029	0.491	0.227	0.005	2.12	2.7	1.8	#6 yellow-green	Sample collected at 1M depth. Ammonia reported as <0.010.
10/25/2012	10:00:00 AM	2.6	0.028	0.722	0.543	0.015	1.76	17	1.8	#6 yellow-green	Sample collected at 1M depth.

Summary for 'Site Description' = Capitol Lake @ Mid- North Basin (6 detail records)

Averages:	**Sur TP**	*0.032*
	Secchi	*2.03*
	Chl a	*9.2*

Capitol Lake @ Mid- Middle Basin

Site ID# *BUDCAL015*

Date	*Time*	*Bottom Depth m*	*Sur TP mg/L*	*Sur TN mg/L*	*NO3+NO2 mg/L*	*NH4 mg/L*	*Secchi m*	*Chl a ug/L*	*Phae a ug/L*	*Water Color*	*Lake Notes*	
05/30/2012	10:00:00 AM	1.8	0.021	0.548	0.32	0.013	2.07	2.7	2.2	#6 yellow-green	Sample collected at 1M depth.	
06/21/2012	9:20:00 AM	1.85	0.020	0.421	0.345	0.03	2.57	3.2	1.7	#6 yellow-green	Sample collected at 1M depth.	
07/26/2012	10:00:00 AM	2.8	0.034	0.711	0.419	0.073	2.57	4.8	4.5	#6	Sample collected at 1M depth.	
08/23/2012	9:30:00 AM	2.8	0.079	0.909	0.44	0.005	1.58	46	15	#6 yellow-green	Sample collected at 1M depth.	Ammonia reported as <0.010.
09/20/2012	9:45:00 AM	3.6	0.020	0.686	0.474	0.011	3.60	14	1.8	#6 yellow-green	Sample collected at 1M depth.	
10/25/2012	9:40:00 AM	3.2	0.027	0.807	0.693	0.024	2.80	3.2	2	#6 yellow-green	Sample collected at 1M depth.	

Summary for 'Site Description' = Capitol Lake @ Mid- Middle Basin (6 detail records)

Averages:

Sur TP	*0.034*
Secchi	*2.53*
Chl a	*12.3*

Algae data: Capitol Lake @ Mid- North Basin

	Type	*Description*	*Dominant in Sample*
05/30/2012			
	CP	Cryptomonads	☐
	DT	Asterionella species	☐
	DT	Diatoms species	☐
	DT	Meridion circulare	☐
	DT	Rhizosolenia eriensis	☐
	DT	Synedra species	☐
	GR	Eutetramorus globosus	☐
	GR	Scenedesmus species	☐
	YL	Dinobryon species	☐
06/21/2012			
	CP	Cryptomonads	☐
	DT	Cyclotella species	☐
	DT	Cymbella species	☐
	DT	Diatoms species	☐
	DT	Meridion circulare	☐
	GR	Pandorina species	☐
	GR	Scenedesmus species	☐
	YL	Dinobryon species	☐
07/26/2012			
	BG	Oscillatoria species	☐
	CP	Cryptomonads	☐
	DT	Aulacoseira species	☐
	DT	Cyclotella species	☐
	DT	Synedra species	☐
	GR	Actinastrum species	☐

Type	Description	Dominant in Sample
08/23/2012		
DT	Aulacoseira species	☐
DT	Cocconeis pediculus	☐
DT	Cyclotella species	☐
DT	Diatoms species	☐
DT	Synedra species	☐
GR	Golenkinia species	☐
GR	Pandorina species	☐
09/20/2012		
DT	Cyclotella species	☐
DT	Diatoms species	☐
DT	Fragilaria species	☐
GR	Golenkinia species	☐

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

Algae data: Capitol Lake @ Mid- Middle Basin

	Type	*Description*	*Dominant in Sample*
05/30/2012			
	DT	Cocconeis pediculus	☐
	DT	Cymbella species	☐
	DT	Diatoms species	☑
	DT	Fragilaria species	☐
	DT	Meridion circulare	☐
06/21/2012			
	BG	Oscillatoria species	☐
	CP	Cryptomonads	☐
	DT	Cocconeis pediculus	☐
	DT	Cyclotella species	☐
	DT	Cymbella species	☐
	DT	Diatoms species	☐
	DT	Fragilaria species	☐
	DT	Meridion circulare	☐
	DT	Synedra species	☐
	GR	Scenedesmus species	☐
07/26/2012			
	BG	Oscillatoria species	☐
	CP	Cryptomonads	☐
	DT	Cocconeis pediculus	☐
	DT	Meridion circulare	☐
	DT	Navicula species	☐
	DT	Synedra species	☐
	GR	Tetraedron species	☐
08/23/2012			
	DT	Cocconeis pediculus	☐
	DT	Diatoms species	☐
	GR	Ankistrodesmus species	☐
	GR	Unicellular four flagella	☑

Type	Description	Dominant in Sample
09/20/2012		
CP	Cryptomonads	☐
DT	Cocconeis pediculus	☐
DT	Diatoms species	☐
DT	Synedra species	☐

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