

# LAKE BOSWORTH

## REPORT DESCRIPTION

This report is an annual update to the 2003 State of the Lakes Report and includes water quality data collected from 2003 through 2010. For additional background on the information provided here or to find out more about Lake Bosworth visit [www.lakes.surfacewater.info](http://www.lakes.surfacewater.info) or call Snohomish County Surface Water Management (SWM) at 425-388-3464.

## LAKE DESCRIPTION

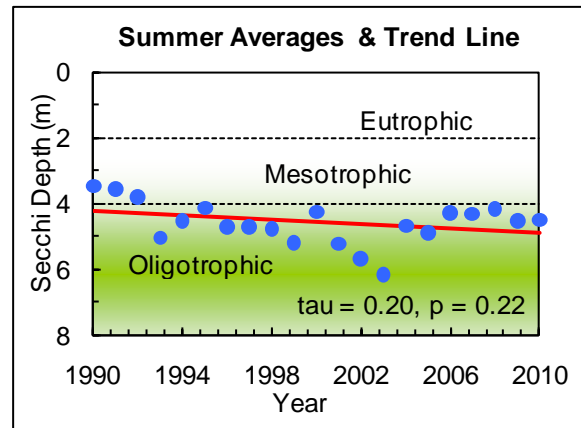
Lake Bosworth is a 103-acre lake located three miles south of Granite Falls. It is a deep lake, with a maximum depth of 24 meters and a mean depth of 10.7 meters. The watershed is mostly undeveloped, except for dense homes located around the lake shore.

## LAKE CONDITIONS

The following graphs illustrate the summer averages and trend lines (in red) for water clarity, total phosphorus, and chlorophyll *a* for Lake Bosworth. Please refer to the table at the end of the report for long-term averages and for averages and ranges for individual years.

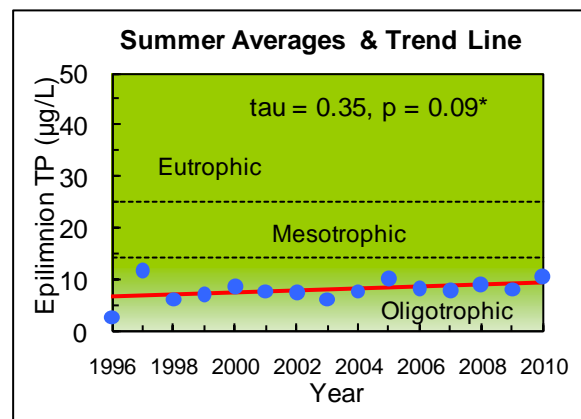
### Water Clarity

The water clarity in Lake Bosworth is high, with a long-term summer average of 4.6 meters. From 2001 through 2003, water clarity was much better than the long-term average, peaking in 2003 when the clarity averaged 6.2 meters. However, that improvement was short-lived, as water clarity from 2004 through 2010 has been near the long-term average. There has been no overall trend towards improving water clarity in Lake Bosworth between 1990 and 2010, but in general water clarity is better than in the mid-1990s.



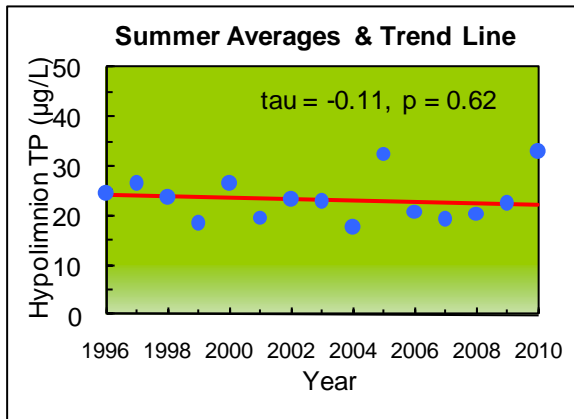
### Total Phosphorus (key nutrient for algae)

Total phosphorus concentrations in Lake Bosworth are low, with a long-term summer average of 8 µg/l in the epilimnion (upper waters). There has been very little variation year-to-year in phosphorus concentrations. However, between 1996 and 2010, there has been a small but statistically significant trend toward increasing phosphorus levels in the epilimnion. If this trend continues, it may lead to greater production of algae and reduced water clarity in the lake.



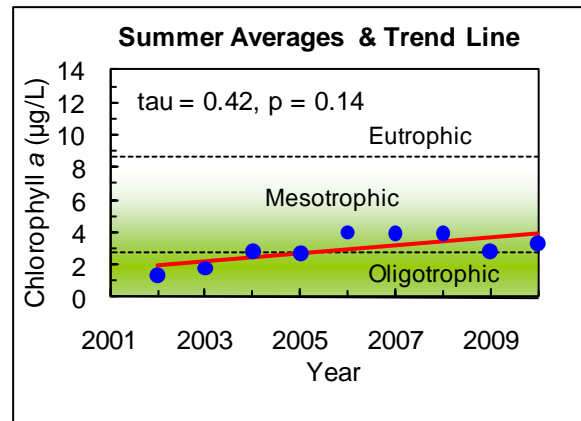
# LAKE BOSWORTH

Phosphorus values in the hypolimnion (bottom waters) are also low and relatively stable, with a long-term summer average of 24 µg/l. However, in 2005 the average rose to 33 µg/l, the highest value on record. The same high average of 33 µg/l occurred in 2010. These higher phosphorus levels could indicate a build-up of nutrients in the bottom waters that may contribute to more algal growth over time. In spite of the higher averages in these two years, there is no statistical evidence of long-term changes in phosphorus levels in the bottom waters of Lake Bosworth.



### Chlorophyll a (Algae)

Chlorophyll a samples showed low to moderate algae levels in the summers of 2002 to 2010. The long-term summer average is 3.0 µg/l. Although there appears to be a slight increase in chlorophyll a over time, it is not a statistically significant trend because chlorophyll a levels were lower in 2009 and 2010 than in the previous three years. There also have been occasional observations of dense algae in Lake Bosworth, but algal blooms are not yet a persistent problem in the lake. The main concern is that any increase in phosphorus concentrations can lead to more algal growth. More years of data are needed to better assess any chlorophyll a trends in Lake Bosworth.



### SHORELINE CONDITION

The Lake Bosworth shoreline was surveyed in 2008 (see map on page 4). The lake shoreline condition is important in understanding the overall lake health. Frequently, lake shorelines are modified through removal of natural vegetation, the installation of bulkheads or other hardening structures, and/or removal of partially submerged logs and branches. These types of alterations can be harmful to the lake ecosystem because natural shorelines protect the lake from harmful pollution, prevent bank erosion, and provide important habitat for fish and wildlife.

The lake has one of the most densely developed shorelines in the County. Surveys conducted in the mid-90s indicated 116 homes border the lake. Although homes were not counted in 2008, 116 docks are present on the lake, covering 1.1 acres of the lake. For the high level of the development, the shoreline still has relatively moderate shoreline armoring at 26%. Bulkheads comprised the majority of the modification (74%), with some rock revetments (23%). The vegetation immediately adjacent to the shoreline, however, has been greatly altered, with only 15% being classified as intact native vegetation. In many cases, the native vegetation has been replaced by lawns down to the water. Lawns can be a source of nutrients

## LAKE BOSWORTH

and do not protect the lake as well as a buffer of native vegetation. There is a moderate amount (about 118 pieces) of large wood still remaining in the lake. These old logs and branches are valuable for fish and wildlife habitat.

### **SUMMARY**

#### *Trophic State*

Lake Bosworth may be classified as oligo-mesotrophic, with high water clarity, low phosphorus levels, and low productivity of plants and algae.

#### *Condition and Trends*

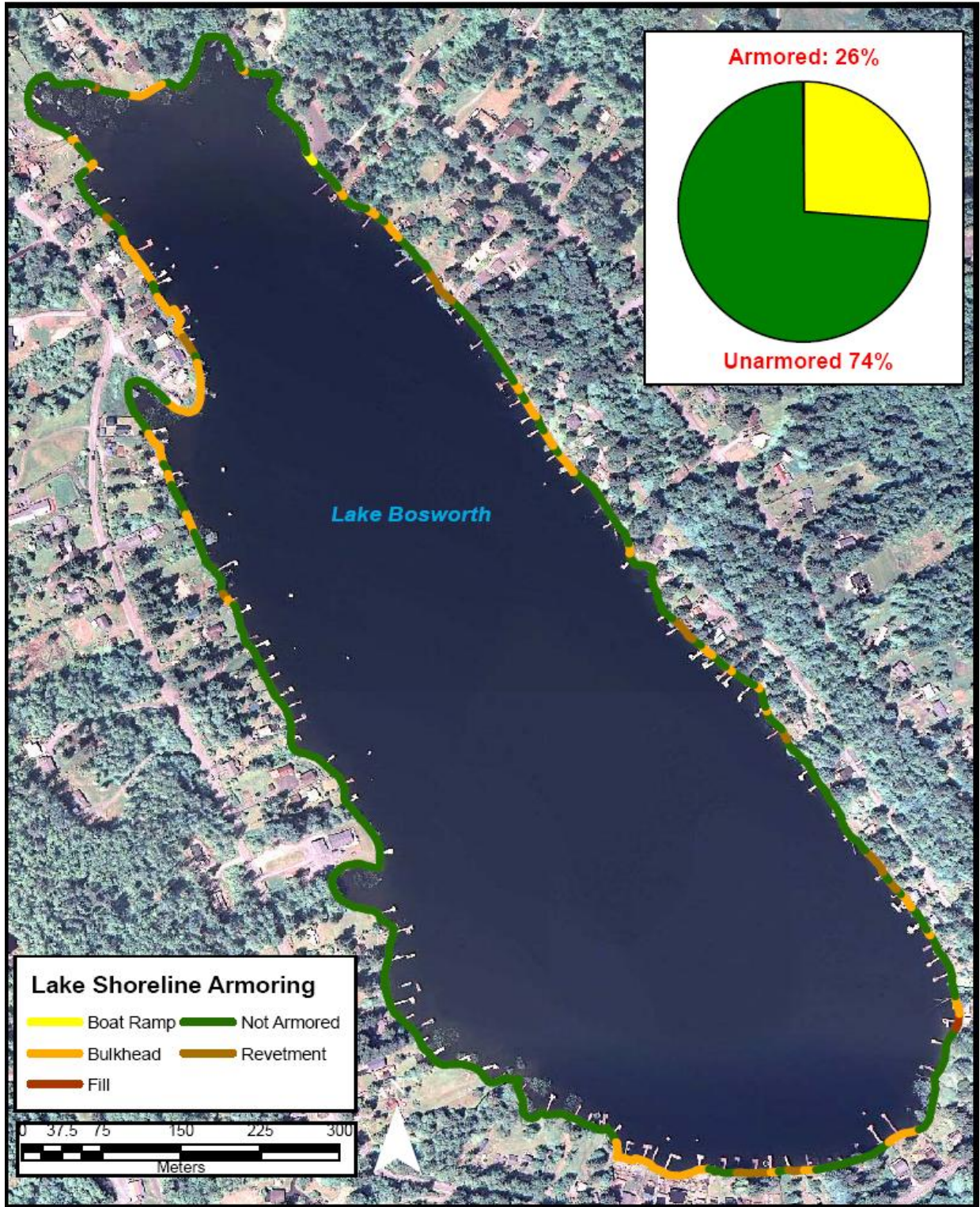
Overall, Lake Bosworth is in healthy condition. In the 2003 State of the Lakes Report, the target of maintaining high water quality was identified. Since that time there have been no large changes in water quality. However, there has been a very small, statistically significant, increase in phosphorus concentrations in the upper waters. And, in some recent years, phosphorus levels have also been higher in the bottom waters. Overall, water quality is still high; but these changes raise concerns about future water quality.

The other potential problem in the lake's water quality condition is an apparent increase in chlorophyll *a* concentrations. However, this trend is not significant, and the levels are similar to measurements taken in the early 1990s. If phosphorus and algae levels do continue to increase, this may be a sign of accelerated eutrophication that will eventually affect lake users' perceptions of the lake.

The primary threat to Lake Bosworth's water quality is the possibility of an increase in nutrients which come from new development or other human activities in the watershed. Lake Bosworth may be particularly susceptible to changes in the watershed since the shoreline

vegetation has been significantly altered. In order to protect the healthy condition of the lake, measures should be taken to control nutrients in the watershed. Nutrients enter the lake through stormwater runoff or streams flowing into the lake. Sources of nutrients include fertilizers, pet wastes, and erosion from land clearing and construction. Nutrients may also directly enter the lake through poorly maintained septic systems. To find out more about the causes and problems of elevated lake nutrient levels and to obtain tips to improve lake water quality visit [www.lakes.surfacewater.info](http://www.lakes.surfacewater.info).

# LAKE BOSWORTH



## LAKE BOSWORTH

DATA SUMMARY FOR LAKE BOSWORTH					
Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)		Chlorophyll a (ug/l)
			Surface	Bottom	Epilimnion
Bortleson, et al, 1976	8/2/73	4.0	4	11	-
DOE	1990	3.0 - 4.0 (3.5) n = 10	-	-	-
DOE	1991	2.8 - 5.1 (3.5) n = 10	-	-	-
DOE	1992	3.0 - 5.2 (3.8) n = 12	-	-	1.5 - 2.2 (1.9) n = 2
DOE	1993	3.4 - 6.7 (5.0) n = 10	-	-	2.4 - 5.7 (4.1) n = 2
SWM Staff or DOE	1994	3.4 - 6.0 (4.5) n = 15	-	-	1.5 - 3.5 (2.8) n = 4
SWM Staff or DOE	1995	2.4 - 5.8 (4.1) n = 13	-	-	2.0 - 2.7 (2.4) n = 2
SWM Staff or DOE	1996	3.7 - 5.8 (4.7) n = 14	2 - 3 (3) n = 2	23 - 26 (25) n = 2	2.7 - 5.3 (4.0) n = 2
SWM Staff or DOE	1997	3.4 - 6.1 (4.7) n = 12	10 - 13 (12) n = 2	25 - 28 (27) n = 2	4.8
SWM Staff or DOE	1998	3.7 - 6.0 (4.8) n = 14	5 - 7 (6) n = 4	18 - 31 (24) n = 4	-
SWM Staff or DOE	1999	4.0 - 6.2 (5.2) n = 13	6 - 8 (7) n = 4	11 - 22 (19) n = 4	-
SWM Staff or DOE	2000	1.7 - 5.8 (4.3) n = 11	7 - 10 (9) n = 4	22 - 31 (27) n = 4	-
SWM Staff	2001	3.7 - 6.3 (5.2) n = 4	5 - 9 (8) n = 4	13 - 23 (20) n = 4	
SWM Staff	2002	5.0 - 6.5 (5.7) n = 4	5 - 9 (7) n = 4	19 - 28 (24) n = 4	0.5 - 2.1 (1.3) n = 4
SWM Staff	2003	5.7 - 7.4 (6.2) n = 4	5 - 7 (6) n = 4	20 - 29 (23) n = 4	1.0 - 2.1 (1.8) n = 4
SWM Staff or Volunteer	2004	3.3 - 6.0 (4.7) n = 10	6 - 10 (8) n = 4	11 - 23 (18) n = 4	0.5 - 6.4 (2.9) n = 4

## LAKE BOSWORTH

DATA SUMMARY FOR LAKE BOSWORTH					
Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus ( $\mu\text{g/l}$ )		Chlorophyll <i>a</i> ( $\mu\text{g/l}$ )
			Surface	Bottom	Epilimnion
SWM Staff or Volunteer	<b>2005</b>	4.3 - 5.8 (4.9) <i>n</i> = 12	7 - 13 (10) <i>n</i> = 4	24 - 40 (33) <i>n</i> = 4	1.9 - 4.0 (2.7) <i>n</i> = 4
SWM Staff or Volunteer	<b>2006</b>	3.4 - 5.7 (4.3) <i>n</i> = 13	6 - 10 (8) <i>n</i> = 4	12 - 28 (21) <i>n</i> = 4	2.1 - 7.5 (4.0) <i>n</i> = 4
SWM Staff or Volunteer	<b>2007</b>	3.4 - 5.5 (4.3) <i>n</i> = 14	7 - 9 (8) <i>n</i> = 4	8 - 29 (19) <i>n</i> = 4	3.5 - 4.3 (4.0) <i>n</i> = 4
SWM Staff or Volunteer	<b>2008</b>	2.9 - 6.1 (4.2) <i>n</i> = 10	6 - 12 (9) <i>n</i> = 4	14 - 28 (20) <i>n</i> = 4	2.4 - 5.9 (3.9) <i>n</i> = 4
SWM Staff or Volunteer	<b>2009</b>	3.6 - 6.0 (4.5) <i>n</i> = 11	6 - 10 (8) <i>n</i> = 4	18 - 27 (23) <i>n</i> = 4	1.3 - 4.8 (2.8) <i>n</i> = 4
Volunteer	<b>2010</b>	3.1 - 5.5 (4.5) <i>n</i> = 10	7 - 16 (11) <i>n</i> = 4	15 - 65 (33) <i>n</i> = 4	1.1 - 4.8 (3.4) <i>n</i> = 4
<b>Long Term Avg</b>		<b>4.6</b> <b>(1990-2010)</b>	<b>8</b> <b>(1996-2010)</b>	<b>24</b> <b>(1996-2010)</b>	<b>3.0</b> <b>(2002-2010)</b>
<b>TRENDS</b>		<b>None</b>	<b>Increasing</b>	<b>None</b>	<b>None</b>

## NOTES

- Table includes summer (May-Oct) data only.
- Each box shows the range on top, followed by summer average in ( ) and number of samples (*n*).
- Total phosphorus data are from samples taken at discrete depths only.
- DOE = Washington Department of Ecology
- "Surface" samples are from 1 meter depth and "bottom" samples are from 1-2 meters above the bottom.