

# HILTON LAKES WATER QUALITY ASSESSMENT

## LAKE DESCRIPTION

Hilton Lake is a private lake located in a residential area just southeast of the City of Everett. The lake is divided into distinct north and south basins separated by 104th Place S.E. The combined lakes cover 6.8 acres. Both lakes are relatively shallow—the north basin is only 2.5 meters deep and the south basin is 3.5 meters deep. The watershed of Hilton Lake is developed with suburban density residential uses.

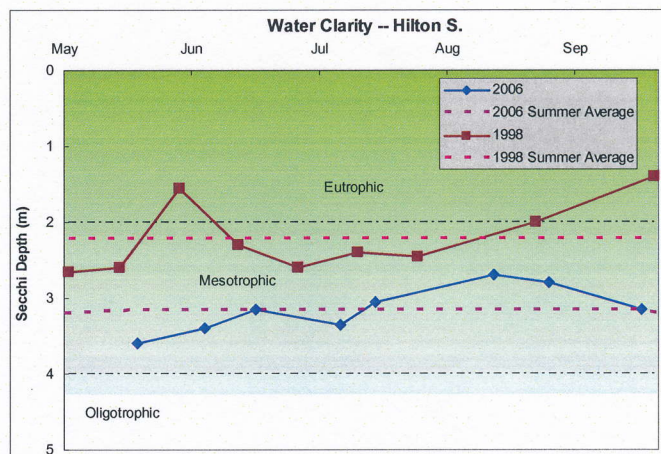
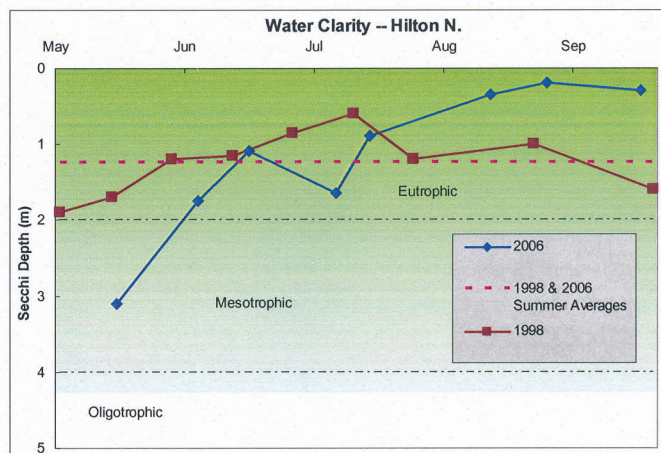
## LAKE CONDITIONS

### Water Clarity

There are limited water clarity data for Hilton Lakes. In 1998, water clarity averaged 1.2 meters in the north lake and 2.2 meters in the south lake. During 2006, the water clarity again averaged 1.2 meters in the north basin, but 3.2 meters in the south basin.

The most striking monitoring result is that the water clarity in the north lake steadily declined throughout the summer of 2008. This is likely because the algae community switched to blue-green algae as the summer progressed, causing turbid conditions and reducing water clarity. This may also be due to the short-term effects of the chemical treatment implemented by the citizens in late spring to improve water quality. By mid-summer, any effects of this treatment were gone.

Another interesting result is that the south lake seems to be in better condition than it was in 1998.



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### Total Phosphorus (key nutrient for algae)

Total phosphorus concentrations in the north basin of Hilton Lake were very high—much higher than in the south basin. The 2006 summer average was over 200 µg/l in both the epilimnion (upper waters) and in the hypolimnion (bottom waters). As the summer progressed, the phosphorus levels increased in the upper waters. This is likely the result of release of phosphorus from the bottom sediments and mixing upward to spread the nutrients throughout the lake.

Total phosphorus levels in the south basin were lower, generally in the mesotrophic range. The 2006 summer average for the epilimnion was 22 µg/l. The concentrations in the hypolimnion were slightly higher, with an average of 28 µg/l. The south lake is not nearly as enriched as the north basin, partly because it is deeper and mixes less frequently.

### Temperature and Dissolved Oxygen

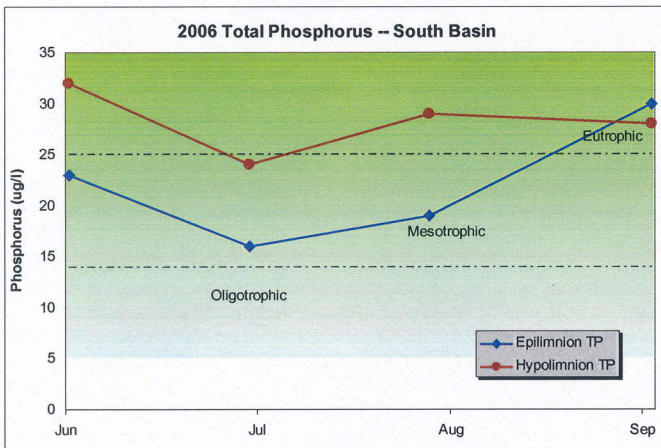
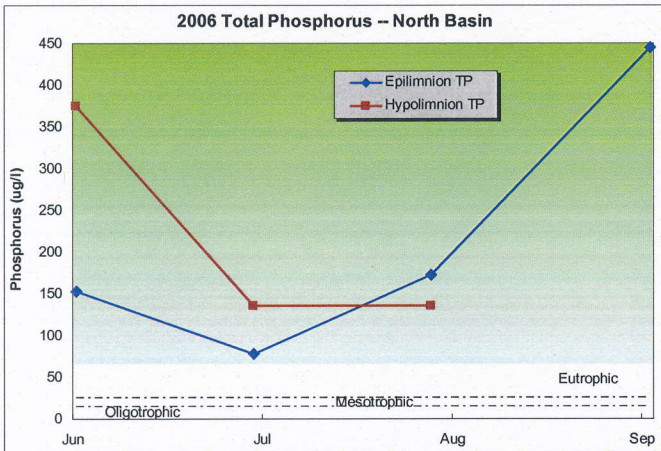
Temperature data indicate that the upper waters of both lakes become very warm during the summer. The temperatures near the lake bottoms are slightly lower, but the differences are so small that the lakes are only weakly stratified. This means that there is limited resistance to mixing and that nutrients in the bottom waters can easily spread to the upper waters.

Dissolved oxygen levels in the north lake were quite high near the surface (reflecting rapid algae growth) and very low near the bottom. Low dissolved oxygen is the result of organic decomposition of dead plants and algae which leads to the release of phosphorus from the bottom sediments. By late summer, the decomposition was so active that there was low oxygen even near the surface of the north lake.

In the south lake, dissolved oxygen levels were not so elevated near the surface and not so low near the bottom. This indicates less organic decomposition and less release of nutrients from the bottom sediments.

### Algae

There are no chlorophyll a data to measure the concentrations of algae in the Hilton lakes. However, observations by volunteers and SWM staff indicate that algal blooms—both floating algae and filamentous algae attached to the lake bottom—are regular summer occurrences, especially in the north lake.



## **HILTON LAKES WATER QUALITY ASSESSMENT**

### **SUMMARY**

#### Trophic State

Hilton Lake North may be classified as eutrophic based on low water clarity, high phosphorus concentrations, and severe oxygen depletion. This lake basin is highly productive of plants and algae.

Hilton Lake South may be classified as mesotrophic based on moderate water clarity, moderate phosphorus concentrations, and mild oxygen depletion. This lake basin is moderately productive of plants and algae.

#### Condition and Trends

Hilton Lake North is clearly more eutrophic and suffers from more water quality problems than Hilton Lake South. In effect, the north basin serves to trap many of the pollutants and nutrients and keeps them from reaching the south basin. The north basin is also more shallow (which may be the result of trapping sediment as well). Shallow lakes have more problems than deeper lakes. Hilton Lake North needs restoration, possibly dredging and/or an alum treatment, to improve water quality.

Overall, thanks to being protected by the north basin, Hilton Lake South is in satisfactory condition for a small urban lake.

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DATA SUMMARY FOR HILTON LAKE NORTH				
Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)	
			Surface	Bottom
SWM Staff or Volunteer	1998	0.6 - 1.9 (1.2) <i>n</i> = 9	-	-
SWM Staff or Volunteer	2006	0.2 - 3.1 (1.2) <i>n</i> = 8	77 - 445 (212) <i>n</i> = 4	135 - 375 (215) <i>n</i> = 3
<b>Multi-Year Avg</b>	<b>1998 &amp; 2006</b>	<b>1.2</b>		

DATA SUMMARY FOR HILTON LAKE SOUTH				
Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)	
			Surface	Bottom
SWM Staff or Volunteer	1998	1.4 - 2.7 (2.2) <i>n</i> = 9	-	-
SWM Staff or Volunteer	2006	2.7 - 3.6 (3.2) <i>n</i> = 8	16 - 30 (22) <i>n</i> = 4	24 - 32 (28) <i>n</i> = 4
<b>Multi-Year Avg</b>	<b>1998 &amp; 2006</b>	<b>2.7</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.
- "Surface" samples are from 1 meter depth and "bottom" samples are from 2-3 meters deep.