

PANTHER LAKE

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 2009. For additional background on the information provided here or to find out more about Panther Lake visit www.lakes.surfacewater.info or call Snohomish County Surface Water Management (SWM) at 425-388-3464.

LAKE DESCRIPTION

Panther Lake is a 49-acre lake located four miles northeast of Snohomish. It is the third lake in a three-lake chain. Storm Lake flows into Flowing Lake, which drains through a small stream into Panther Lake. The lake outlet becomes Panther Creek, which flows into the Pilchuck River.

Panther Lake has a maximum depth of 11 meters (36 feet) and an average depth of 7.0 meters (23 feet). The Panther Lake watershed, including the drainage from Flowing Lake and Storm Lake, is large—nearly 30 times the size of the lake. This means that there is more potential for the lake to receive pollution from its watershed. Housing density around the lake shore is moderate. The overall watershed is mainly rural, but residential development is slowly increasing.

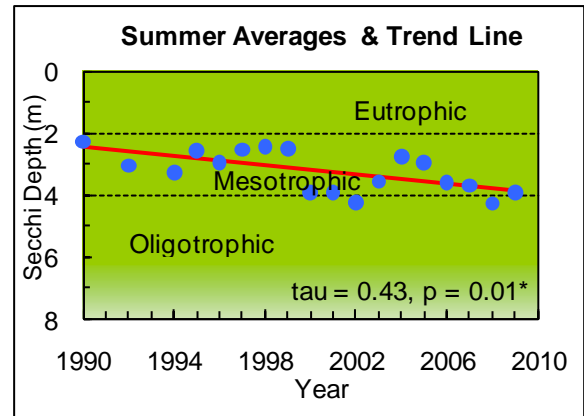
LAKE CONDITIONS

The following graphs illustrate the summer averages and trend lines (in red) for water clarity, total phosphorus, and chlorophyll for Panther Lake. 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

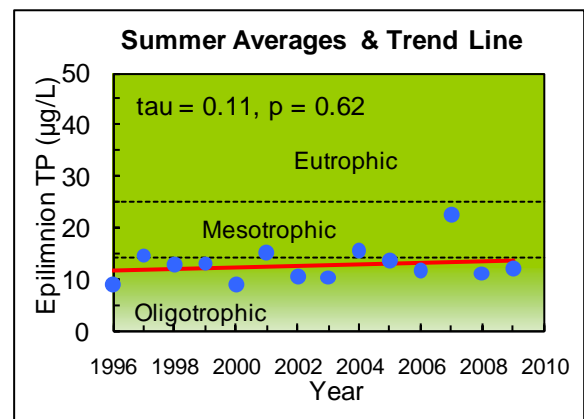
Water clarity in Panther Lake is moderate, with a long-term 1990 to 2009 summer average of 3.3 meters. The water clarity is affected somewhat by the relatively dark water that is produced from natural humic substances in the lake. The dark color does not harm water quality. Between 1990 and 2009,

there has been statistically significant trend toward increasing water clarity. How this might relate to changes in water color is unknown. However, there has also been considerable variation in annual averages in some years, ranging from a low of 2.8 in 2004 to a high of 4.3 meters in 2008. The variable water clarity may be a result of higher levels of algae in years with higher phosphorus levels.



Total Phosphorus (key nutrient for algae)

Total phosphorus concentrations in the epilimnion (upper waters) are low to moderate. The long-term 1996 to 2009 summer average phosphorus concentration is 13 µg/l. In 2007, the concentration was the highest on record, with an average of 23 µg/L, primarily due to a June reading of 53 µg/l. With the exception of 2007, phosphorus levels in the epilimnion have been relatively stable, with no apparent increasing or decreasing statistical trend.

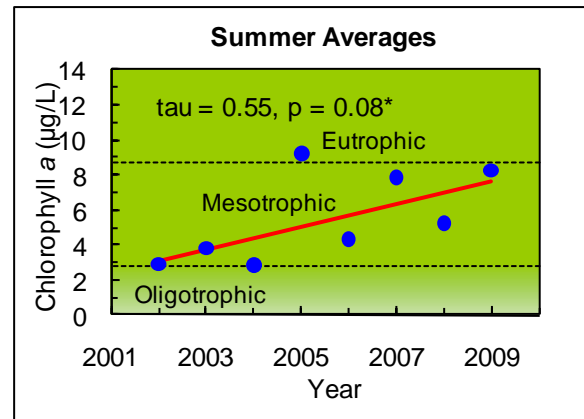
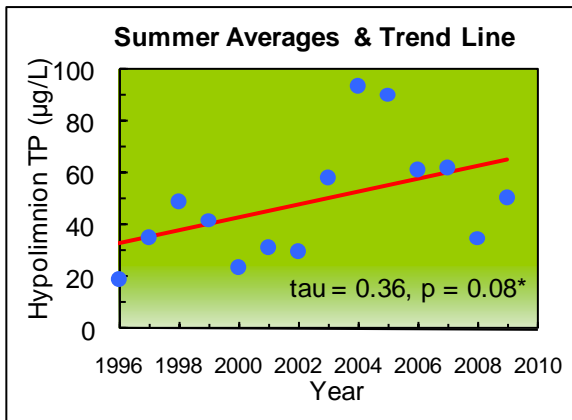


PANTHER LAKE

Summertime phosphorus levels in the hypolimnion (bottom waters) are high, variable, and increasing. The long-term summer average is 49 µg/l. Between 1996 and 2009 there has been a statistically significant trend toward increasing phosphorus levels in the hypolimnion, with concentrations reaching a peak in 2004 and 2005. Throughout each summer, phosphorus concentrations steadily increase in the bottom waters of the lake as the dissolved oxygen levels fall. This build-up is an indication of phosphorus being released from the bottom sediments and may be a sign of accelerated eutrophication. The summer average was lower in 2008, but there was no measurement in September when values are typically higher. The 2009 average was close to the long-term average.

Chlorophyll a (Algae)

Chlorophyll a values show moderate to high levels of algae, with a 2002 – 2009 long-term summer average of 5.6 µg/l. Chlorophyll a levels have been increasing, and the trend is now statistically significant with the inclusion of the 2009 data. The increasing chlorophyll a levels suggest that the build-up of phosphorus in the bottom waters is contributing to more algal growth. Algal blooms have been noted on occasion in Panther Lake, but generally have not created serious impacts for lake users. At this time it also does not appear that the increase in algae is affecting water clarity. This may be because of the types of algae that are present or because reductions in water color are offsetting the effects of increased algae on water clarity.



PANTHER LAKE

SHORELINE CONDITION

The Panther Lake shoreline was surveyed in 2008 (see map on page 4). The condition of the lake shoreline is important to understanding 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 alteration 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.

Panther Lake has moderate levels of shoreline development. Surveys conducted in 1973 identified 25 homes bordering the lake. The number of homes increased to 28 by the mid-90s. Although homes were not assessed in 2009, 32 docks were counted, indicating that shoreline development continues to slowly increase. The Panther Lake shoreline is still relatively intact compared to many lakes. Only 13% of the shoreline has been armored with bulkheads or wood revetments. However, the zone of native vegetation immediately adjacent to the shoreline has been significantly altered, with only 52% still classified as intact. There is still a substantial amount (about 111 pieces) of large wood remaining in the lake. These old logs and branches are valuable for fish and wildlife habitat.

Shoreline modifications leave the lake susceptible to pollution from the watershed, eliminate the buffer of native vegetation that can filter out pollution, and limit the amount of habitat available for fish and wildlife. The loss of native vegetation along the lake shore could also lead to shoreline erosion.

SUMMARY

Trophic State

Based on moderate water clarity and moderate to high phosphorus and chlorophyll *a* concentrations, Panther Lake may be classified as mesotrophic. The lake is moderately productive of aquatic plants and algae.

Condition and Trends

Panther Lake is exceeding the water clarity target set forth in the 2003 State of the Lakes Report of maintaining a long-term average of at least 3.1 meters. In fact, there is a significant trend towards increasing water clarity. The lake is also meeting the target for maintaining stable phosphorus concentrations in the epilimnion, although the long-term average has increased slightly.

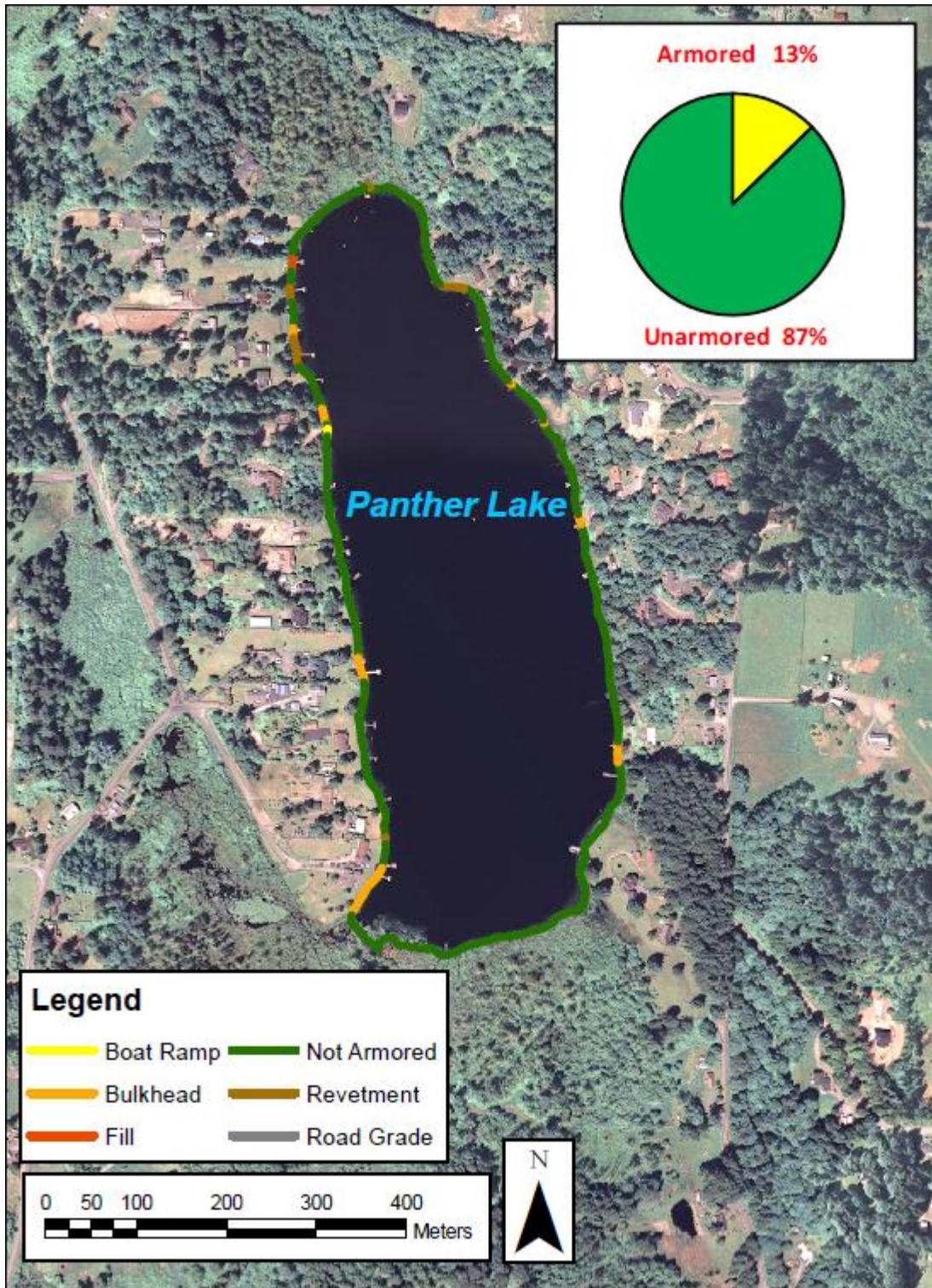
However, the increasing trend in phosphorus levels in the bottom waters means that the lake is not meeting the target of a maintaining a long-term average 33 µg/l in the hypolimnion. Also, increasing chlorophyll *a* values indicate additional algal growth is occurring. Higher nutrient and algae levels are likely a sign of accelerating eutrophication in the lake.

Overall, Panther Lake is in satisfactory condition. However, the lake is at risk of future water quality declines as indicated by the increasing phosphorus in the hypolimnion and more algal growth. If these changes continue, it is possible that use of the lake will be affected.

The primary threat to lake water quality is an increase of nutrients entering the lake through new development and other human activities in the watershed. Nutrients enter the lake through stormwater runoff from the watershed. Sources of nutrients include fertilizers, pet wastes, runoff from roofs and driveways, and erosion from construction and land clearing. Nutrients may also directly enter the lake through poorly maintained septic systems. Measures to control nutrients in the watershed should be taken now to prevent any future negative impacts to the lake. To find out more about ways to protect lake water quality and information on the causes and problems of elevated lake nutrient levels visit www.lakes.surfacewater.info.

PANTHER LAKE

2009 Shoreline Survey Results



PANTHER LAKE

DATA SUMMARY FOR PANTHER LAKE					
Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)		Chlorophyll a (ug/l)
			Surface	Bottom	Epilimnion
Bortleson, et al, 1976	8/3/73	2.1	13	51	-
DOE	1990	1.8 - 2.7 (2.3) n = 9	-	-	-
Volunteer	1992	2.5 - 3.6 (3.1) n = 4	-	-	-
DOE	1993	-	-	-	1.5 - 4.7 (3.1) n = 2
SWM Staff	1994	3.1 - 3.5 (3.3) n = 2	-	-	3.5 - 5.3 (4.4) n = 2
SWM Staff or Volunteer	1995	2.3 - 3.1 (2.6) n = 13	-	-	7.1
SWM Staff, Volunteer or DOE	1996	2.1 - 4.0 (3.0) n = 10	8 - 10 (9) n = 2	15 - 23 (19) n = 2	3.7 - 13 (8.5) n = 2
SWM Staff or Volunteer	1997	2.3 - 3.2 (2.5) n = 6	14 - 15 (15) n = 2	22 - 49 (36) n = 2	-
Volunteer	1998	2.1 - 2.8 (2.4) n = 4	6 - 18 (13) n = 4	30 - 75 (49) n = 4	-
SWM Staff or Volunteer	1999	2.3 - 3.0 (2.5) n = 4	11 - 17 (13) n = 4	26 - 77 (42) n = 4	-
SWM Staff	2000	3.3 - 4.6 (3.9) n = 4	4 - 14 (9) n = 4	8 - 46 (24) n = 4	-
SWM Staff	2001	3.4 - 4.8 (3.9) n = 4	6 - 29 (15) n = 4	18 - 44 (32) n = 4	-
SWM Staff or Volunteer	2002	3.1 - 5.2 (4.2) n = 21	9 - 14 (11) n = 4	14 - 49 (30) n = 4	0.5 - 3.7 (2.9) n = 4
SWM Staff or Volunteer	2003	3.0 - 5.0 (3.6) n = 12	8 - 12 (10) n = 4	23 - 87 (59) n = 4	1.9 - 6.4 (3.8) n = 4
SWM Staff or Volunteer	2004	2.1 - 3.5 (2.8) n = 19	10 - 24 (16) n = 4	26 - 183 (94) n = 4	2.7 - 3.2 (2.9) n = 4
SWM Staff or Volunteer	2005	2.0 - 3.9 (3.0) n = 18	10 - 19 (14) n = 4	28 - 184 (91) n = 4	1.1 - 23 (9.2) n = 4

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Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)		Chlorophyll a (ug/l)
			Surface	Bottom	Epilimnion
SWM Staff or Volunteer	2006	3.1 - 3.9 (3.6) <i>n</i> = 8	7 - 23 (12) <i>n</i> = 4	33 - 115 (62) <i>n</i> = 4	2.1 - 9.9 (4.3) <i>n</i> = 4
SWM Staff or Volunteer	2007	3.2 - 4.3 (3.7) <i>n</i> = 5	11 - 53 (23) <i>n</i> = 4	31 - 127 (62) <i>n</i> = 4	5.9 - 10 (7.9) <i>n</i> = 4
SWM Staff or Volunteer	2008	3.4 - 5 (4.3) <i>n</i> = 4	11 - 11 (11) <i>n</i> = 2	27 - 45 (35) <i>n</i> = 3	1.9 - 11 (5.3) <i>n</i> = 3
SWM Staff or Volunteer	2009	2.8 - 4.8 (3.9) <i>n</i> = 9	10 - 14 (12) <i>n</i> = 4	23 - 102 (51) <i>n</i> = 4	3.7 - 14 (8.3) <i>n</i> = 4
Long Term Avg		3.3 (1990-2009)	13 (1996-2009)	49 (1996-2009)	5.6 (2002-2009)
TRENDS		Increasing	None	Increasing	Increasing

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.