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 2010. 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.

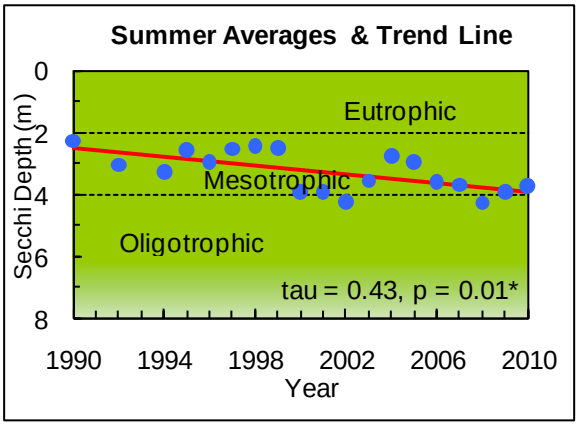
Panther Lake has a maximum depth of 11 meters (36 feet) and an average depth of 7.0 meters (23 feet). The Panther Lake watershed, including the drainage from Flowing Lake and Storm Lake, is large—nearly 30 times the size of the lake. This means that there is more potential for the lake to receive pollution 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 *a* 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.

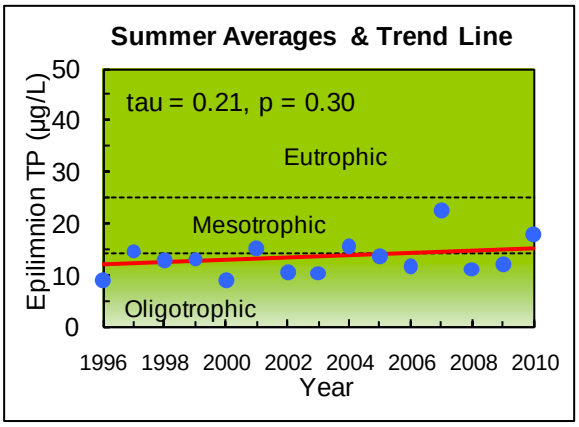
Water Clarity

Water clarity in Panther Lake is moderate, with a long-term 1990 to 2010 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 2010, there has been statistically significant trend toward increasing water clarity. However, there has also been considerable variation in annual averages in some years, ranging from a low of 2.8 meters 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 2010 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 and a somewhat high average of 18 µg/l in 2010, phosphorus levels in the epilimnion have been relatively stable, with no apparent increasing or decreasing statistical trend.



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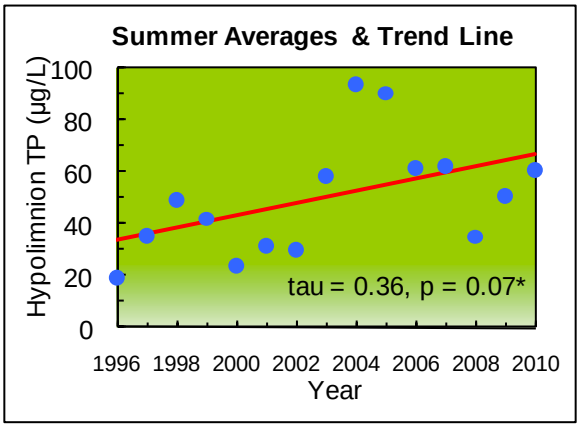
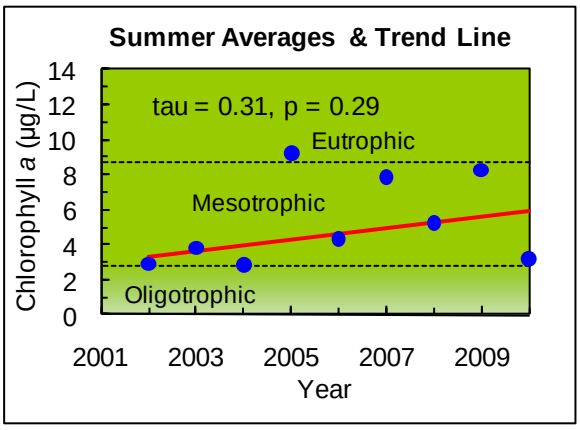
Summertime phosphorus levels in the hypolimnion (bottom waters) are moderate to high, variable, and apparently increasing. The long-term summer average is 50 µg/l. Between 1996 and 2010 there has been a statistically significant trend toward increasing phosphorus levels in the hypolimnion, with concentrations 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 and 2010 averages were closer to the long-term average.



Chlorophyll a (Algae)

Chlorophyll *a* values show moderate levels of algae, with a 2002 – 2010 long-term summer average of 5.3 µg/l. Chlorophyll *a* levels are quite variable from year to year. The average for 2010 was fairly low, indicating less algal growth. Overall, no long-term trends are evident. Algal blooms have been noted on occasion in Panther Lake, but generally have not created serious impacts for lake users. At this time it 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 variations in water color are offsetting the effects of increased algae on water clarity.



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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 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, higher chlorophyll *a* values in some years indicate that more nutrients are available. 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. If this change continues and more algal growth occurs, 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.

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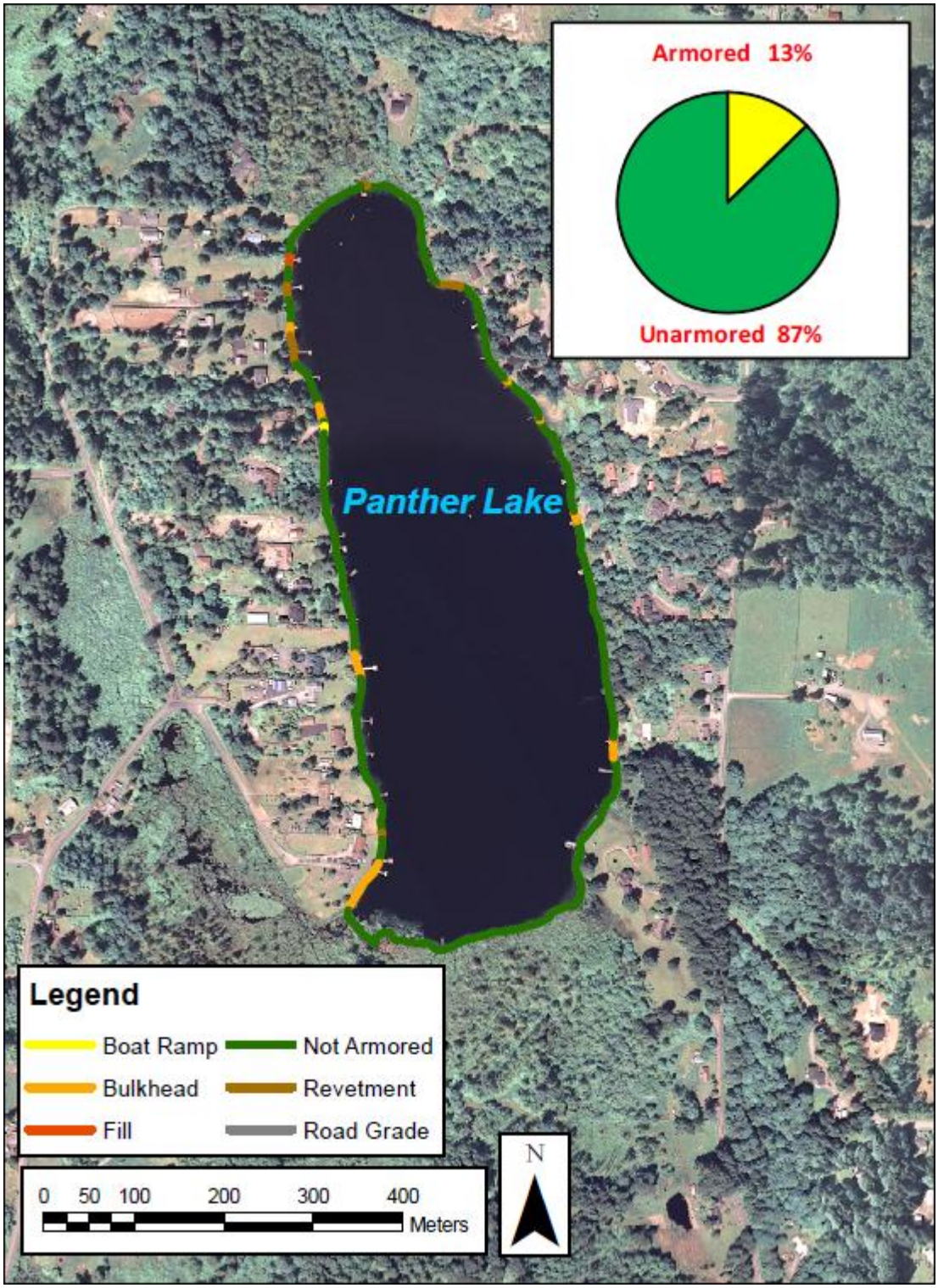
2009 Shoreline Survey Results



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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*
SWM Staff or Volunteer	**2006**	3.1 - 3.9 (3.6) *n = 8*	7 - 23 (12) *n = 4*	33 - 115 (62) *n = 4*	2.1 - 9.9 (4.3) *n = 4*

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DATA SUMMARY FOR PANTHER LAKE					
		Water Clarity (Secchi depth	**Total Phosphorus (*ug*/l)**		**Chlorophyll *a* (*ug*/l)**
Source	**Date**	**in meters)**	**Surface**	**Bottom**	**Epilimnion**
SWM Staff or Volunteer	**2007**	3.2 - 4.3 (3.7) *n = 5*	11 - 53 (23) *n = 4*	31 - 127 (62) *n = 4*	5.9 - 10 (7.9) *n = 4*
SWM Staff or Volunteer	**2008**	3.4 - 5 (4.3) *n = 4*	11 - 11 (11) *n = 2*	27 - 45 (35) *n = 3*	1.9 - 11 (5.3) *n = 3*
SWM Staff or Volunteer	**2009**	2.8 - 4.8 (3.9) *n = 9*	10 - 14 (12) *n = 4*	23 - 102 (51) *n = 4*	3.7 - 14 (8.3) *n = 4*
SWM Staff or Volunteer	**2010**	3.0 - 4.6 (3.7) *n = 12*	12 - 28 (18) *n = 4*	41 - 103 (61) *n = 4*	2.1 - 4.8 (3.2) *n = 4*
Long Term Avg		**3.3 (1990-2010)**	**13 (1996-2010)**	**50 (1996-2010)**	**5.3 (2002-2010)**
TRENDS		**Increasing**	**None**	**Increasing**	**None**

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.