

MEADOW LAKE

REPORT DESCRIPTION

This report is an annual update to the 2003 [State of the Lakes Report](#) that includes water quality data collected from 2003 through 2008. For additional background on the information provided here or to find out more about Meadow Lake visit www.lakes.surfacewater.info or call Snohomish County Surface Water Management (SWM) at 425-388-3464.

LAKE DESCRIPTION

Meadow Lake is a small, bog lake located four miles north of Monroe. The lake covers 12 acres and has a maximum depth of 6.4 meters. An intermittent stream, Ghost Horse Creek, feeds the lake. Meadow Lake drains to French Creek, which flows into the Snohomish River.

As a bog, the lake is completely surrounded by a dense wetland. These shoreline wetlands give the lake a unique ecology and are important for filtering pollution before it enters the lake. The wetlands also mean that the two dozen homes around the lake are set far back on higher ground, so they have less potential for impacting the lake. The entire watershed for the lake is very large and still relatively undeveloped.

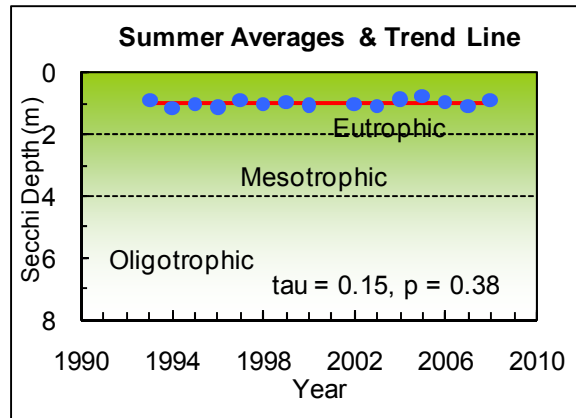
LAKE CONDITIONS

The following graphs illustrate the summer averages and trend lines (in red) for water clarity and total phosphorus for Meadow 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

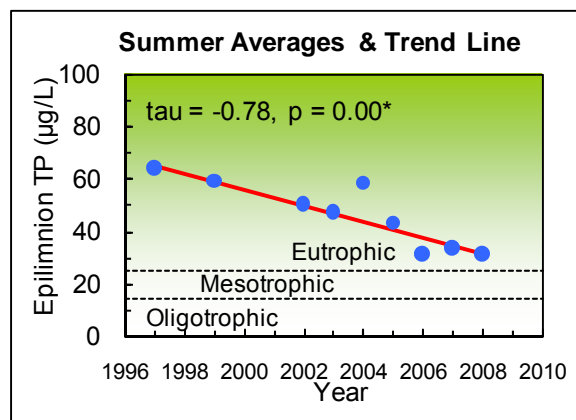
Overall, water clarity in Meadow Lake is low, with a long-term average of 1.0 meters and little year-to-year variation. This is due, in large part, to the dark color of the water, which is a natural result of humic substances coming from the surrounding wetlands. There has been no significant trend in

water clarity in Meadow Lake during the 1993-2008 period.



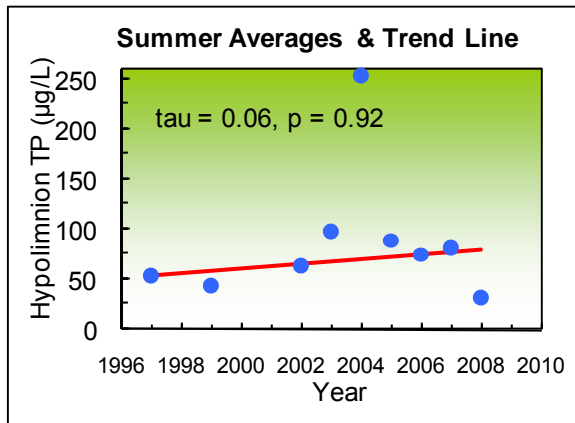
Total Phosphorus (key nutrient for algae)

Total phosphorus concentrations in the epilimnion (upper waters) are high. The 1997-2008 long-term summer average is 46 µg/l. During 2006 to 2008, the summer averages were substantially lower than the long-term average. In fact, between 1997 and 2008, there has been a statistically significant decrease in total phosphorus in the epilimnion. However, in 1997 and 1999, there was only one sample taken each year. So, these may not be completely representative of the full summer conditions and may inflate the averages from earlier years to make the trend appear stronger than it really is. More years of data are needed to confirm that this decreasing trend is continuing.



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Summertime phosphorus in the hypolimnion (bottom waters) is also high, with a long-term 1997-2008 average of 88 µg/l. The average phosphorus concentration in 2004 was more than 2.5 times the long-term average. The average dropped dramatically in 2008, so there is no evidence of a statistical trend. High phosphorus levels in the bottom waters indicate a release of nutrients from bottom sediments during periods of low dissolved oxygen, which could lead to increased algae growth.



Chlorophyll a (Algae)

No chlorophyll *a* data are available for Meadow Lake, so the levels of algae are unknown. However, volunteers have reported few instances of substantial algae, so it appears that algae growth in the lake is low. This may be due to the dark color of the water which limits the availability of light for algae.

Aquatic Plants

Meadow Lake supports moderate amounts of rooted aquatic plants. Because the dark water color reduces the light available for plant growth, aquatic plants are restricted to a narrow band around the shoreline.

Meadow Lake contains an infestation of European frog-bit, a non-native invasive aquatic plant. The plant has spread around the lake shore and into the adjacent wetlands. There are currently no viable options for controlling this plant. It is important to monitor the frog-bit and prevent its spread to other lakes where it could cause more impacts. All boats or equipment used in Meadow Lake should be carefully inspected and cleaned of plant debris prior to use in a different waterbody.

Lake Water Levels

Meadow Lake is surrounded by wetlands, so water levels are critical in maintaining the health of the wetlands. There is a series of beaver dams along the outlet channel of the lake. Some dams are many years old, and some are more recent. These dams play an important role in regulating the water level in the lake and surrounding wetlands. Water levels in the lake have dropped dramatically at times, including during 2008. It is unclear if these fluctuations are related to changed beaver activity or to illegal human disturbance of the old beaver dams. In any case, fluctuating water levels are a concern.

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SUMMARY

Trophic State

Based on low water clarity, abundant aquatic plants, and high phosphorus concentrations, Meadow Lake may be classified as eutrophic.

Condition and Trends

The targets for Meadow Lake, as stated in the 2003 State of the Lakes Report, are to maintain stable water clarity and phosphorus concentrations. Meadow Lake is meeting the target of maintaining water clarity at an average of 1.0 meters. The lake is also exceeding the epilimnion total phosphorus target of maintaining a long-term average of no more than 58 µg/l. The long-term average has decreased to 46 µg/l, and there is a significant trend toward decreasing phosphorus levels.

In contrast, Meadow Lake is not meeting the target of maintaining stable hypolimnion phosphorus levels. The long-term average has increased from 53 µg/l to 88 µg/l. Although there is no statistical trend, there is a concern that build-up of phosphorus in the bottom waters could lead to more algae growth.

In spite of somewhat higher phosphorus levels in the hypolimnion and the infestation of frog-bit, Meadow Lake is in healthy condition. However, the lake is at risk of future declines in water quality because of on-going and potential residential development throughout its very large watershed. Nutrients enter the lake through stormwater runoff from the watershed. Development and increased human activity typically increase nutrient runoff through sources including: fertilizers, pet wastes, and erosion from construction and land clearing. Nutrients may also directly enter the lake through poorly maintained septic systems. Care must be taken to mitigate the impacts of these land use changes 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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DATA SUMMARY FOR MEADOW LAKE				
Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus (ug/l)	
			Surface	Bottom
Sumioka and Dion, 1985	7/7/81	0.9	20	10
Volunteer	1993	0.7 - 1.1 (0.9) n = 9	-	-
Volunteer	1994	1.0 - 1.4 (1.2) n = 6	-	-
Volunteer	1995	0.9 - 1.2 (1.0) n = 5	-	-
Volunteer	1996	1.0 - 1.4 (1.1) n = 4	-	-
SWM Staff or Volunteer	1997	0.8 - 1.1 (0.9) n = 3	64	53
Volunteer	1998	0.9 - 1.2 (1.0) n = 4	-	-
SWM Staff or Volunteer	1999	0.9 - 1.1 (1.0) n = 3	59	44
Volunteer	2000	1.1 (1.1) n = 3	-	-
Volunteer	2002	0.8 - 1.3 (1.0) n = 4	35 - 75 (50) n = 4	30 - 128 (63) n = 4
Volunteer	2003	1.0 - 1.2 (1.1) n = 3	31 - 63 (47) n = 2	66 - 130 (98) n = 2
Volunteer	2004	0.5 - 1.0 (0.9) n = 4	51 - 71 (58) n = 4	54 - 743 (254) n = 4
Volunteer	2005	0.5 - 1.1 (0.8) n = 7	27 - 56 (43) n = 3	62 - 135 (88) n = 3
SWM Staff or Volunteer	2006	0.9 - 1.1 (1.0) n = 4	22 - 39 (31) n = 3	37 - 118 (75) n = 3
SWM Staff or Volunteer	2007	1.0 - 1.2 (1.1) n = 6	30 - 37 (33) n = 3	62 - 92 (82) n = 3

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Source	Date	Water Clarity (Secchi depth in meters)	Total Phosphorus ($\mu\text{g/l}$)	
			Surface	Bottom
Volunteer	2008	0.7 - 1 (0.9) $n = 4$	22 - 36 (31) $n = 3$	19 - 43 (31) $n = 3$
Long Term Avg		1.0 (1993-2008)	46 (1997-2008)	88 (1997-2008)
TRENDS		None	Decreasing	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.
- "Surface" samples are from 1 meter depth and "bottom" samples are from 1-2 meters above the bottom.