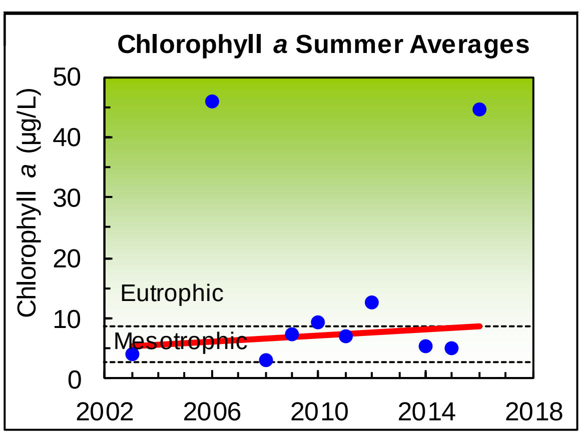
Chlorophyll a (Algae)

Algae are tiny plant-like organisms that are essential for a healthy lake. Fish and other lake life depend on algae as the basis for their food supply. However, excessive growths of algae, called algae blooms, can cloud the water, form unsightly scums, and sometimes release toxins. Excess nutrients, such as phosphorus, are the main cause of nuisance algae growth in a lake. Chlorophyll *a* measurements are one method for tracking the amount of algae in a lake.

Chlorophyll *a* data for Bryant Lake has been collected from 2003 to 2016, with only a single sample in two of those years. The 2003 to 2016 long-term summer average is 14 µg/l. In 2006 and 2016 the summer average was three times higher than any other year – at 46 µg/l and 45 µg/l respectively. The 2006 samples was likely taken during a severe algae bloom. The 2016 average was highly influenced by one sample at 79 µg/l, also likely taken during a severe algae bloom. Overall, averages indicate moderate to dense algae growth. Given the limited data, there does not appear to be any trend in chlorophyll *a* values in the lake. However, moderate to high levels of algae have been measured regularly at Bryant Lake, and occasional algae blooms have been observed.



SHORELINE CONDITION

The lake shoreline condition is important in understanding the overall lake health. Frequently, lake shorelines are modified either through removal of natural vegetation and/or the installation of bulkheads or other hardening structures. This type 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.

Bryant Lake has the least developed shoreline of all lowland lakes in Snohomish County. There are no homes directly on the lake, there are no docks, and the shoreline vegetation is 100% intact, although some of the plant community is dominated by non-native species. Intact vegetation means the shoreline is primarily bordered by tall grasses, trees and shrubs. There is also a moderate amount (about 43 pieces) of large wood still remaining in the lake. These old logs and branches are valuable for fish and wildlife habitat.

BRYANT LAKE

SUMMARY

Trophic State

All lakes go through a process of enrichment by nutrients and sediment. In this process, known as eutrophication, nutrients and sediment contribute to the ever-increasing growth of algae and aquatic plants. Over thousands of years, lakes will gradually fill up with organic matter and sediments.

Lakes can be classified by their degree of eutrophication, also known as their trophic state. There are three primary trophic states for lakes—oligotrophic, mesotrophic, and eutrophic—as well as intermediate states. Oligotrophic lakes are usually deep, with clear water, low nutrient concentrations, and few aquatic plants and algae. Mesotrophic lakes are richer in nutrients and produce more algae and aquatic plants. Eutrophic lakes are often shallow and characterized by abundant algae and plants, high nutrient concentrations, limited water clarity, and low dissolved oxygen in the bottom waters.

The trophic state classification of a lake does not necessarily indicate good or bad water quality because eutrophication is a natural process. However, human activities that contribute sediment and excess nutrients to a lake can dramatically accelerate the eutrophication process and result in declining water quality.

Based on the long-term monitoring data, Bryant Lake may be classified as a eutrophic lake, with low water clarity, high phosphorus levels, and moderate to high levels of algae. This appears to be the natural condition for this shallow, kettle lake.

Condition and Trends

Overall, Bryant Lake is in healthy condition for a eutrophic lake. In the 2003 State of the Lakes Report, the targets of maintaining water clarity and phosphorus levels were identified. With five additional years of data, there have been no significant changes in water clarity or in phosphorus concentrations in the upper waters. In contrast, the long-term average of phosphorus in the bottom waters has been increasing in recent years, and has a statistically significant trend toward higher phosphorus levels.

Regular monitoring of the lake should continue in order to determine if phosphorus levels in the bottom waters and chlorophyll *a* levels will continue to increase.

The primary threat to Bryant Lake's water quality is the possibility of an increase in nutrients from new development or other human activities in the watershed, such as agriculture. Bryant Lake is more susceptible to nutrient pollution given its large watershed size. However, the wetlands surrounding the lake should help filter inputs if additional development occurs. In order to protect the healthy condition of the lake, measures should be taken to control nutrients in the watershed. To find out more about the causes and problems of elevated lake nutrient levels and to obtain tips to improve lake water quality please visit www.lakes.surfacewater.info.

BRYANT LAKE

DATA SUMMARY FOR LAKE BRYANT						
		Water Clarity (Secchi depth	**Total Phosphorus (µg/L)**		**Total Nitrogen (µg/L)**	**Chlorophyll *a* (µg/L)**
Source	**Date**	**in meters)**	**Surface**	**Bottom**	**Surface**	**Surface**
Bortleson, et al, 1976	**8/6/1974**	0.6	29	33	-	-
Sumioka and Dion, 1985	**7/7/81**	0.9	10	10	-	11
SWM Staff or Volunteer	**1994**	1.6 - 2.6 (2.2) *n = 4*	-	-	-	5.5 - 6.4 (6.0) *n = 2*
SWM Staff or Volunteer	**1995**	1.2 - 1.3 (1.2) *n = 3*	-	-	-	13
SWM Staff	**1996**	0.6 - 0.7 (0.7) *n = 2*	29 - 31 (30) *n = 2*	53 - 73 (63) *n = 2*	-	-
SWM Staff	**1997**	0.8 - 1.1 (0.9) *n = 2*	26 - 36 (31) *n = 2*	47 - 97 (72) *n = 2*	-	-
SWM Staff	**8/11/98**	1.9	18	43	-	-
SWM Staff	**6/14/00**	1.1	22	32	-	-
SWM Staff	**7/24/03**	2.0	27	38	-	4.0
SWM Staff	**7/24/06**	0.8	40	196	-	46
Volunteer	**2008**	1.3 - 2.0 (1.7) *n=4*	15 - 32 (21) *n=4*	43 - 152 (85) *n=4*	-	2.1 - 4.3 (3.1) *n=4*
Volunteer	**2009**	2.2 - 2.4 (2.3) *n = 3*	15 - 17 (16) *n = 3*	233 - 296 (262) *n = 3*	-	4.0 - 9.8 (7.4) *n = 3*
Volunteer	**2010**	1 - 1.5 (1.2) *n = 4*	14 - 43 (25) *n = 4*	54 - 153 (100) *n = 4*	-	6.4 - 13 (9.3) *n = 4*
Volunteer	**2011**	1 - 2.0 (1.4) *n = 4*	19 - 29 (24) *n = 4*	51 - 205 (120) *n = 4*	-	2.7 - 16 (7.0) *n = 4*
Volunteer	**2012**	1.1 - 1.6 (1.3) *n = 4*	18 - 29 (25) *n = 4*	35 - 123 (80) *n = 4*	-	4.3 - 22 (13) *n = 4*

BRYANT LAKE

DATA SUMMARY FOR LAKE BRYANT						
Source	**Date**	**Water Clarity (Secchi depth in meters)**	**Total Phosphorus (µg/L)**		**Total Nitrogen (µg/L)**	**Chlorophyll *a* (µg/L)**
			Surface	**Bottom**	**Surface**	**Surface**
SWM Staff	**2014**	1.3 - 2.2 (1.7) *n = 4*	14 - 21 (19) *n = 4*	58 - 237 (149) *n = 4*	405 - 851 (637) *n = 4*	3.7 - 7.5 (5.3) *n = 4*
Volunteer	**2015**	*1.9 - 2.9* *(2.3)* *n = 4*	*6 - 18* *(12)* *n = 4*	*59 - 214* *(132)* *n = 4*	*465 - 691* *(557)* *n = 3*	*3.2 - 7.2* *(4.9)* *n = 4*
Volunteer	**2016**	1.1 - 2.0 (1.5) *n = 4*	26 - 62 (37) *n = 4*	89 - 190 (154) *n = 4*	739 - 1,260 (890) *n = 4*	10 - 79 (45) *n = 4*
Long Term Avg		**1.5** **(1994-2016)**	**25** **(1996-2016)**	**109** **(1996-2016)**	**707** **(2014-2016)**	**14** **(2003-2016)**
TRENDS		**None**	**None**	**Increasing**	**NA**	**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.