5.9 LARGE LAKES

(Surface Area > 500 Acres)

Ashley
Dickey
Echo
Flathead
Lindbergh
Little Bitterroot
Mary Ronan
Swan
Tally
Upper Stillwater
Whitefish
**Ashley Lake**  
**Trophic Status:** Oligo-mesotrophic  
**Surface Area:** 2,850 acres  
**Maximum Depth:** 225 feet (68.6 meters)

Ashley Lake has a basin area of 21,488 acres. The catchment is composed of the Wallace formation belt series (59%), glacial lake deposits (26%) and the Ravalli group belt series (Ellis & Craft, 2008).

Ashley Lake is located in Flathead County at an elevation of 1,219 meters. Fish distribution records indicate a presence of kokanee, longnose sucker, pygmy whitefish, rainbow trout, westslope cutthroat trout, and yellow perch. The program has two monitoring locations on Ashley Lake (East and West). There is one motorized public access site located on the northeast side of the lake.

Temperature and oxygen profiles show that both monitoring sites on Ashley Lake were stratified during summer sampling. Hydrolab profiles indicate that the lake was mixed or weakly stratified during fall sampling dates.

Ashley Lake’s 2010, 2011, and 2016 average calcium concentration was 33.8mg/L classifying it as a high risk for zebra mussel colonization. The 2012 alkalinity level was reported at 130mg/L.

In 2011-2014, a EWM survey was conducted near the public access site yielding no suspect results. Northern milfoil was found near the boat ramp, and additional surveying is recommended based on lake size, ease of access, and level of recreational use.

Volunteers, Les Hart, Denise Lefaver, and Nancy Hart on Ashley Lake. Photo courtesy WLI.

Location:

- Ashley Lake East – 48.21303 N, 114.59737 W  
- Ashley Lake West – 48.20261 N, 114.62091 W
Ashley Lake East

A beautiful rainbow on Ashley Lake. Photo courtesy Denise LeFaver.

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Carlson's Trophic State Index (TSI)

- Hypereutrophic
- Eutrophic
- Mesotrophic
- Oligotrophic

Year

1995 2005 2015

Summer Temperature (°F)

- Incipient Lethal Temperature
- Avulsion
- Coastal Thermal Maximum

Year


Summer Dissolved Oxygen (mg/L)

- Anoxia
- Hypoxia
- Avulsion

Year

Ashley Lake West

Volunteers Denise and Nancy at Ashley Lake. Photo courtesy Denise LeFaver.
Dickey Lake
Trophic Status: Oligotrophic
Surface Area: 585 acres
Maximum Depth: 67 feet (20.4 meters)

Dickey Lake is located in Lincoln County in the Kootenai National Forest (Fortine Ranger District) at an elevation of 975 meters. Surrounding land ownership is USFS and private. Fish stocking records indicate a presence of kokanee and rainbow trout. Native fish present are largescale sucker and mountain whitefish.

Temperature and oxygen profiles show that Dickey Lake was weakly stratified or stratified during summer sampling. Temperature profiles indicate that the lake has been within the avoidance threshold range for salmonids at depths of up to 8 meters during July and August. Oxygen profiles suggest that it has been in the avoidance concentration thresholds for salmonids at the benthic interface. Hydrolab profiles show that Dickey Lake was mixed or weakly stratified during fall sampling dates.

Dickey Lake’s 2011/2016 average calcium concentration was 33.3mg/L classifying it as a high risk for zebra mussel colonization. The 2012 alkalinity level was reported at 140mg/L.

In 2011, 2012, and 2014, EWM surveys were conducted near the public access site yielding no suspect results. Very few macrophytes were represented in the littoral zone during the survey. In 2015, Dickey Lake ranked highest among large lakes for total phosphorus.

Rainbow view from the Dickey Lake public boat launch. Photo courtesy Justin Brewer.
**Echo Lake**

_Trophic Status: Meso-oligotrophic_  
_Surface Area: 695 acres_  
_Maximum Depth: 71 feet (21.6 meters)_

Echo Lake has a basin area of 12,935 acres. The drainage area is a composite of alluvium (52%), Grinnel argillite belt series (26%), Piegan group belt series (7%), glacial till (5%) and the Appekunny argillite belt series (3%) (Ellis & Craft, 2008).

Echo Lake is located in Flathead County at an elevation of 914 meters. Fish distribution records indicate a presence of brook trout, kokanee, lake whitefish, largemouth bass, northern pike, pumpkinseed, rainbow trout, and yellow perch.

Echo Lake experienced severe flooding during the spring/summer of 2011. A “no wake” speed restriction was placed on the lake to keep lakeshore homes from incurring additional flood damage. Several homes were still underwater during the early winter site visit in late November of 2011. In 2012 and 2013 the water elevation of Echo Lake was still high relative to previous years.

Temperature and oxygen profiles show that Echo Lake was stratified during summer sampling. Historic temperature profiles indicate that the lake has been within the avoidance threshold range for salmonids at depths of up to 6 meters during July and August. Oxygen profiles show that Echo Lake has been between avoidance and anoxic concentration thresholds for salmonids at depths greater than 14 meters. Anoxia has been observed at depths greater than 19 meters. When anoxic conditions occur at the benthic interface, an oxidation reduction potential exists where nutrients stored in the sediment can be liberated back into the water column given the right conditions. Hydrolab profiles show that the lake was mixed or weakly stratified during fall sampling dates.

Echo Lake consistently ranks among the highest of large lakes for total phosphorus, total persulfate nitrogen and chlorophyll (\(a\)). Echo Lake’s 2010, 2011 and 2016 average calcium concentration was the highest among large lakes at 37.3mg/L classifying it as a high risk for zebra mussel colonization. The 2012 alkalinity level was reported at 150mg/L.

During 2011 and 2012, there was only one public access site due to flooding and repair of the causeway. A EWM survey was conducted near the county public access site yielding no suspect results. Northern milfoil was found near the boat ramp, and additional surveying is recommended based on lake size, ease of access, and level of recreational use. In 2015, Echo Lake ranked second highest among large lakes for chlorophyll (\(a\)).
Location: 48.12237 N, 114.03438 W
**Flathead Lake**

Trophic Status: Oligotrophic  
Surface Area: 122,425 acres  
Maximum Depth: 368 feet (112.2 meters)

Flathead Lake has a basin area of 4,522,476 acres. The geology of the Flathead Basin is a composite of numerous belt series formations: Appekunny argillite (4%), Grinnel argillite (6%), Missoula group (18%), Piegan group (10%), Ravalli group (4%), Siyeh limestone (3%) and Wallace formation (5%); alluvium (14%), undifferentiated Cambrian (3%), glacial (8%) and undifferentiated tertiary sedimentary rocks (5%). The geology includes the Canadian portion of the watershed, hence the slight overlap in conventional designation of formations. All geological formations that composed <3% of the total basin composition were not listed (Ellis & Craft, 2008).

Flathead Lake is located south of Kalispell between the Mission and Salish Mountain Ranges at an elevation of 913 meters. This is the largest lake in the study with multiple volunteers and sample sites. The program has had up to 16 monitoring locations on Flathead Lake. Currently, there are five monitoring locations on the lake and discussed in this report. Data for historical monitoring sites can be obtained by contacting WLI.

Curly-leaf pondweed (CLP) was discovered in Flathead Lake at Eagle Bend near Bigfork in the fall of 2011. Though these relatively small patches may be treated and possibly eradicated, every effort should be made to prevent the spread of CLP to other waterbodies. Additionally, flowering rush is present in excess of 2,000 surface acres on Flathead Lake and the spread of flowering rush to other waterbodies is a growing concern. Calcium concentrations collected in 2010, 2011 and 2016 ranged from a low of 22mg/L (Dayton) to a high of 27 mg/L (Mack Alley). The average calcium concentration for all Flathead lake samples was 24.3mg/L. The average alkalinity was reported at

*Volunteer Walt Curtis on Flathead Lake.  
Photo courtesy WLI.*
Flathead Lake (Conrad Point)
Location: 48.0072 N, 114.19223 W
Depth: 69 feet (21 meters)

Temperature and oxygen profiles show that Conrad Point was stratified or weakly stratified during summer sampling. The August temperature profile indicates that Conrad Point was within the avoidance threshold range for salmonids at depths of up to 7 meters.
Flathead Lake (Indian Bay)
Location: 47.80687 N, 114.17547 W
Depth: 95 feet (29 meters)

Temperature and oxygen profiles show that Indian Bay was stratified during summer sampling. The summer temperature profile shows that Indian Bay was
Flathead Lake (Mackinaw Alley)
Location: 47.832 N, 114.234 W
Depth: 95 feet (20 meters)

Temperature and oxygen profiles show that Mackinaw Alley was stratified during summer sampling. The summer temperature and dissolved oxygen profiles show that Mackinaw Alley is outside the avoidance threshold ranges for salmonids.
Flathead Lake (Skidoo Bay)
Location: 47.756986 N, 114.0550485 W
Depth: 76 feet (23 meters)

Temperature and oxygen profiles show that Skidoo was stratified during summer sampling. The summer temperature profile indicates that the bay was within the avoidance threshold range for salmonids at depths of up to 11 meters.
Flathead Lake (Woods Bay)
Location: 47.989168 N, 114.051703 W
Depth: 177 feet (54 meters)

Temperature and oxygen profiles show that Woods Bay was stratified during summer sampling. Summer temperature are within the avoidance thresholds for salmonids to about ten meters.
Flathead Lake (Yellow Bay)
Location: 47.87163 N, 114.03154 W
Depth: 79 feet (24 meters)

Temperature and oxygen profiles show that Yellow Bay was stratified during summer sampling, 2013. The summer temperature profile indicates that the bay was within the avoidance threshold range for salmonids at depths of up to 9 meters.
Lindbergh Lake
Trophic Status: Oligotrophic
Surface Area: 832 acres
Maximum Depth: 121 feet (36.9 meters)

Lindbergh Lake is located in the headwaters of the Swan Range on the eastern side of the Mission Mountain Range south of Condon, at an elevation of 1,341 meters. Fish distribution records indicate a presence of bull trout, kokanee, lake trout, largescale sucker, longnose sucker, mountain whitefish, northern pike minnow, pygmy whitefish, rainbow trout, westslope cutthroat trout, and yellow perch.

There is one motorized public access site at the north end of the lake. Temperature and oxygen profiles show that Lindbergh Lake was stratified or weakly stratified during summer sampling dates. The 2006 oxygen concentration was extremely low relative to other summer sampling dates. Hydrolab profiles show that the lake was weakly stratified during the October sampling date and mixed during the November sampling date.

Lindbergh Lake’s 2011/2016 average calcium concentration was 5.4mg/L classifying it as a low risk for zebra mussel colonization. The 2012 alkalinity level was reported at 15mg/L.

Volunteers Dave, Judd and Geoff help monitor Lindbergh Lake. Photo courtesy WLI.
Location: 47.38825 N, 113.73553 W
**Little Bitterroot Lake**

**Trophic Status:** Oligotrophic  
**Surface Area:** 2,970 acres  
**Maximum Depth:** 246 feet (75 meters)

Little Bitterroot Lake has a basin area of 21,987 acres. The catchment of Little Bitterroot Lake is composed of the Wallace formation belt series (31%), alluvium (28%), Picard formation belt series (17%), and the Ravalli group belt series (11%) (Ellis & Craft, 2008).

Little Bitterroot Lake is located in Flathead County at an elevation of 1,218 meters, and is surrounded primarily by private land ownership. Fish distribution records indicate a presence of kokanee, longnose sucker, peamouth chub, pygmy whitefish, rainbow trout, westslope cutthroat, and yellow perch.

Temperature and oxygen profiles show that Little Bitterroot Lake was stratified during all summer sampling dates. Temperature profiles indicate that the lake has been within the avoidance threshold range for salmonids at depths of up to 5 meters during August.

Little Bitterroot Lake’s 2010, 2011, and 2016 average calcium concentration was 13.2mg/L classifying it as a low risk for zebra mussel colonization. The 2012 alkalinity level was reported at 49mg/L.

In 2011 and 2012 a EWM survey was conducted on Little Bitterroot near the public access yielding no suspect results. Additional surveying is recommended based on lake size, level of recreational use, and ease of access.

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*2013 WLI intern Logan Seipel from University of Wisconsin, Steven’s Point (right) and volunteers Lauren and Craig Shotnik. Photo courtesy WLI.*
Location: 48.125527 N, 114.716626 W
Lake Mary Ronan
Trophic Status: Meso-eutrophic
Surface Area: 1,513 acres
Maximum Depth: 47 feet (14.3 meters)

Lake Mary Ronan has a basin area of 18,977 acres. The geology of the drainage area is dominated by the Ravalli group belt series (87%) with the remainder split between the Wallace formation belt series (4%) and glacial till (1%) (Ellis & Craft, 2008).

Lake Mary Ronan is located in Lake County at an elevation of 1.131 meters. Fish distribution records indicate a presence of kokanee, largemouth bass, pumpkinseed, rainbow trout, westslope cutthroat trout, and yellow perch. There is one motorized public access site located on the east side of the lake.

Water Chemistry Samples were not collected at Lake Mary Ronan East during the summer of 2011. The lake is 303d listed for Chlorophyll (α).

There are two monitoring locations on the lake. The east site is closer to the shoreline where there are houses, and the west site is located more mid-lake. Lake Mary Ronan west and east continue to rank highest among large lakes for total phosphorus, total nitrogen, and chlorophyll (α). The lake’s 2010, 2011, and 2016 average calcium concentration was 16.2mg/L classifying it as a low risk for zebra mussel colonization. The 2012 alkalinity level was reported at 54mg/L.

In 2011, a EWM survey was conducted at many locations including the public access site yielding no suspect results. Additional surveying is recommended based on nutrient levels, lake size, recreational use, and the amount of macrophytes observed during the initial survey. All Hydrolab profiles show that Lake Mary Ronan was mixed during summer sampling.
Lake Mary Ronan (East)
Location: 47.936712 N, 114.396049 W
Depth: 49 feet (15 meters)

Temperature and oxygen profiles show that Lake Mary Ronan East was stratified during summer sampling dates. Temperature profiles indicate that Mary Ronan East has been within the avoidance threshold range for salmonids at depths of up to 6 meters during August. Oxygen profiles show that Mary Ronan East has been between avoidance and anoxic concentration thresholds for salmonids at depths greater than 6 meters. Anoxia has been observed at depths greater than 8 meters. When anoxic conditions occur at the benthic interface an oxidation reduction potential exists and nutrients stored in the sediment can be liberated back into the water column given the right conditions.
Lake Mary Ronan (West)
Location: 47.9259 N, 114.40219
Depth: 43 feet (13 meters)

Temperature and oxygen profiles show that Lake Mary Ronan West was stratified during summer sampling dates. Temperature profiles indicate that this site has been within the avoidance threshold range for salmonids at depths of up to 6 meters during July and August. Oxygen profiles suggest that Mary Ronan West has been between avoidance and anoxic concentration thresholds for salmonids at depths greater than 8 meters. Anoxia has been observed at depths greater than 9 meters. When anoxic conditions occur at the benthic interface an oxidation reduction potential exists and nutrients stored in the sediment can be liberated back into the water column given the right conditions.
Swan Lake
Trophic Status: Oligotrophic
Surface Area: 3,276 acres
Maximum Depth: 133 feet (40.5 meters)

Swan Lake has a basin area of 421,612 acres. The basin area is composed of alluvium (36%) and the Piegan group (30%), Missoula group (15%), Grinnel argillite (13%) and Appekunny argillite (4%) belt series (Ellis & Craft, 2008).

Swan Lake is located between the Mission and Swan Ranges in northwest Montana at an elevation of 975 meters and a basin area of 421,612 acres. Fish distribution records indicate a presence of brook stickleback, brook trout, bull trout, kokanee, lake trout, largescale sucker, longnose sucker, mountain whitefish, northern pike, northern pike minnow, peamouth, pumpkinseeds, pygmy whitefish, rainbow trout, redside shiner, westslope cutthroat trout, and yellow perch. There is one motorized public access site located on the east side of the lake. The program has two monitoring locations on Swan Lake.

Of all sites monitored, North Basin is the only site that shows strong stratification during summer monitoring. South Basin also has significantly less oxygen at depths greater than 20 meters, which is likely influenced by the Swan River. More detailed information can be found about Swan Lake in Swan Lake Water Quality Investigation (Koopal, 2014).

Swan Lake’s 2011/2016 average calcium concentration was 24.8mg/L classifying it as a moderate risk for zebra mussel colonization. The 2012 alkalinity level was reported at 82mg/L.

A visual survey was conducted for EWM in 2011 yielding no suspect results. Northern milfoil was found near the public access. In 2012 WLI found a suspect fragment floating mid-lake. The sample was sent to Montana Department of Agriculture. The lab was unable to extract DNA from the sample because it was too degraded.
**Swan Lake (North Basin)**

Location: 47.942975 N, 113.878581 W
Depth: 134 feet (41 meters)

Temperature and oxygen profiles show that North Basin was stratified or weakly stratified during summer sampling dates. The North Basin remains strongly oligotrophic. Oxygen profiles indicate that the site does not meet the avoidance concentration thresholds for salmonids.
Swan Lake (South Basin)
Location: 47.925127 N, 113.859575 W
Depth: 125 feet (38 meters)

Temperature and oxygen profiles show that South Basin was weakly stratified during summer sampling dates. Oxygen profiles indicate that the site has been at avoidance concentration thresholds for salmonids at depths greater than 34 meters.
Tally Lake
Trophic Status: Oligotrophic
Surface Area: 1,211 acres
Maximum Depth: 446 feet (136 meters)

Tally Lake has a basin area of 115,260 acres. The basin is composed of the Wallace formation belt series (55%), Picard formation belt series (20%), alluvium (13%) and the Ravalli group belt series (Ellis & Craft, 2008).

Tally Lake is located west of Whitefish at an elevation of 1.219 meters in the Salish Mountain Range and is the second deepest natural lake in Montana at 136 meters. Fish distribution records indicate a presence of brook trout, bull trout, westslope cutthroat trout, kokanee, lake trout, largescale sucker, longnose sucker, northern pike, northern pike minnow, rainbow trout, and redside shiner. There is one motorized public access site located in the campground on the northeast end of the lake.

Temperature and oxygen profiles show that Tally Lake was stratified during summer sampling dates. Oxygen profiles indicate that the lake reaches avoidance concentration thresholds for salmonids at depths greater than 60 meters.

Tally Lake’s 201/2016 average calcium concentration was 24.9mg/L classifying it as a moderate risk for zebra mussel colonization. The 2012 alkalinity level was reported at 89mg/L.

Tally Lake is the subject of ongoing research by scientists at WLI.
Northwest Montana Lakes Volunteer Monitoring Network 2018 Program Summary

Location: 48.41216 N, 114.56009 W

Tally Lake
Carbon's Trophic State Index (TSI)

- Hypereutrophic
- Eutrophic
- Mesotrophic
- Oligotrophic

Year
1995 2005 2015

Tally Lake
Summer Temperature (F)

Tally Lake
Summer Dissolved Oxygen (mg/L)

Whitefish Lake Institute
**Upper Stillwater**
*Trophic Status: Oligotrophic*
*Surface Area: 592 acres*
*Maximum Depth: 22 feet (6.7 meters)*

Upper Stillwater Lake has a drainage area of 79,986 acres. The geology of the drainage basin encompasses alluvium (25%), and the Wallace formation (27%), Ravalli group (20%), and Piegan group (27%) of the belt series (Ellis & Craft, 2008).

Upper Stillwater Lake is located in Flathead County in the Flathead National Forest of the Tally Lake Ranger District at an elevation of 976 meters. Surrounding land ownership are State Trust Lands and USFS. The lake is stocked with westslope cutthroat. Fish distribution includes cutthroat trout, lake trout, northern pike, rainbow trout, and yellow perch. There is one motorized public access on the southwest side of the lake.

Temperature and oxygen profiles show that Upper Stillwater Lake was weakly stratified during summer sampling dates.

Upper Stillwater Lake’s 2010, 2011, and 2016 average calcium concentration was 36.1mg/L classifying it as a high risk for zebra mussel colonization. The 2012 alkalinity level was reported at 100mg/L.

In 2011-2014 EWM surveys were conducted at many locations including the public access site yielding no suspect results. Additional surveying is recommended based on lake size, recreational use, heavy fishing pressure, and the amount of macrophytes observed during the initial survey.

Volunteers Peter and Cheri Aronsson upon return from a summer sampling trip on Upper Stillwater Lake. Photo courtesy WLI.
Location: 48.583448 N, 114.628748 W
Upper Stillwater Lake

A macrophyte survey was conducted on Upper Stillwater Lake on August 25, 2016. A total of 81 sites were surveyed for plants/algae. No EWM was found in the 2016 macrophyte survey, but because northern milfoil is the most dominate plant, it indicates that Upper Stillwater has favorable habitat for EWM. The north side of the lake has dense macrophyte beds, and the channel to get through to the south side of the lake is impassable without some form of self propulsion. Areas where plants were not observed on the east side of the lake were manly comprised of deep shelves where the water exceeds 20 feet within a few feet of the shoreline.

Upper Stillwater Lake. Photo courtesy WLI.
**Whitefish Lake**

**Trophic Status:** Oligotrophic  
**Surface Area:** 3,315 acres  
**Maximum Depth:** 223 feet (68 meters)

Whitefish Lake has a basin area of 76,519 acres. The geology of the basin is largely composed of the Piegan group belt series (42%) and alluvium (43%), with smaller formations of Grinnel Argillite (8%) and Ravalli group (2%) belt series (Ellis & Craft, 2008).

Whitefish Lake is located in the town of Whitefish at the southern end of the Whitefish Mountain Range at an elevation of 911 meters. Fish distribution records indicate a presence of brook trout, bull trout, lake trout, lake whitefish, largescale sucker, longnose sucker, mountain whitefish, northern pike, northern pike minnow, peamouth, pygmy whitefish, redside shiner, westslope cutthroat, and yellow perch. There are two motorized public access sites on Whitefish Lake. One is located on the south end of the lake at City Beach and the other is located on the east side of the lake at Whitefish Lake State Park.

Temperature and oxygen profiles show that Whitefish Lake was evenly stratified during summer sampling dates. Temperature profiles indicate that the lake has bordered on the avoidance threshold range for salmonids at depths of up to 7 meters during August. Hydrolab profiles show that Whitefish Lake has been stratified during all October Sampling dates.

Whitefish Lake’s 2011/2016 average calcium concentration was 24.8mg/L classifying it as a moderate risk for zebra mussel colonization.

In 2011, an EWM survey was conducted at many locations including, Beaver Bay, Lazy Bay, State Park, the outfall of Viking Creek, and City Beach. In 2012, a concerned Whitefish resident believed there may have been EWM in the Lazy Bay channel. Further investigation proved that it was northern milfoil. No EWM was discovered during the surveys, however, additional surveying is recommended based on lake size, recreational use, and proximity/connectivity to Beaver Lake.

WLI has been collecting water quality data at two locations on Whitefish Lake since 2007. WLI additionally collects water chemistry and discharge data on the five major tributaries to Whitefish Lake. A detailed status report for Whitefish Lake and the Whitefish Lake watershed was made available by WLI to the public in 2015.