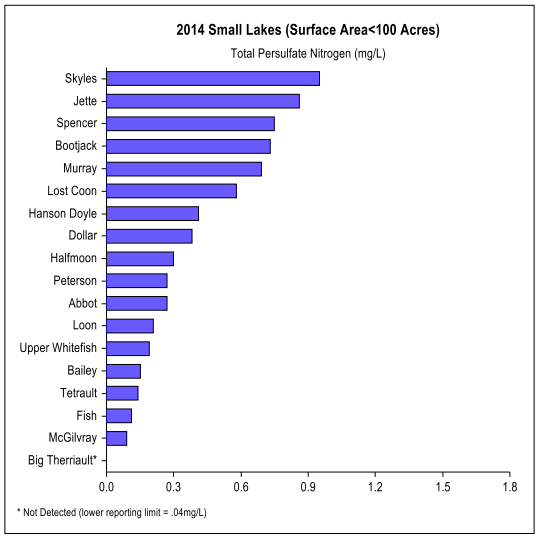
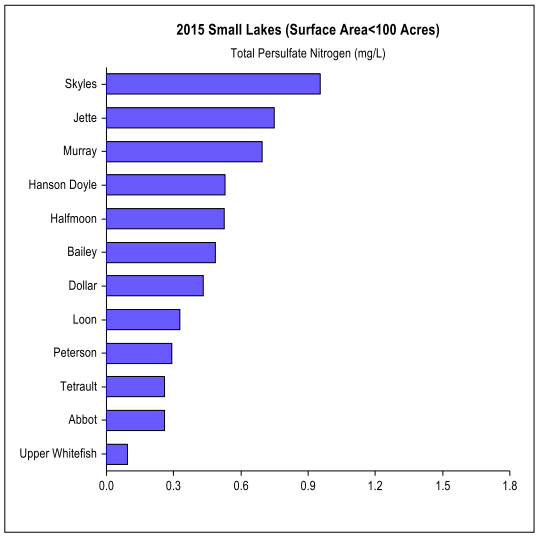
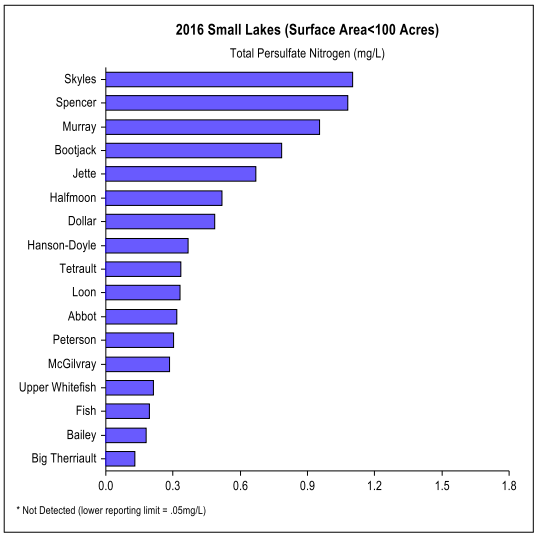
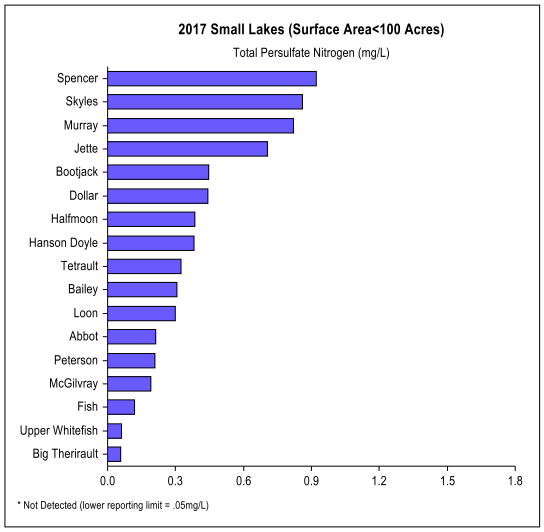
Appendix A

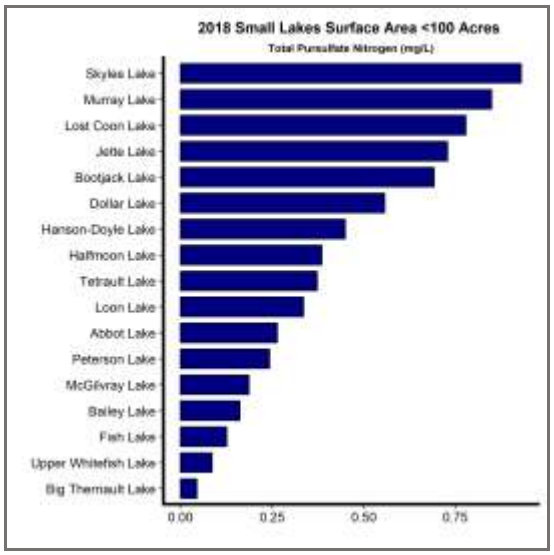
2014-2019 Water Chemistry Concentrations

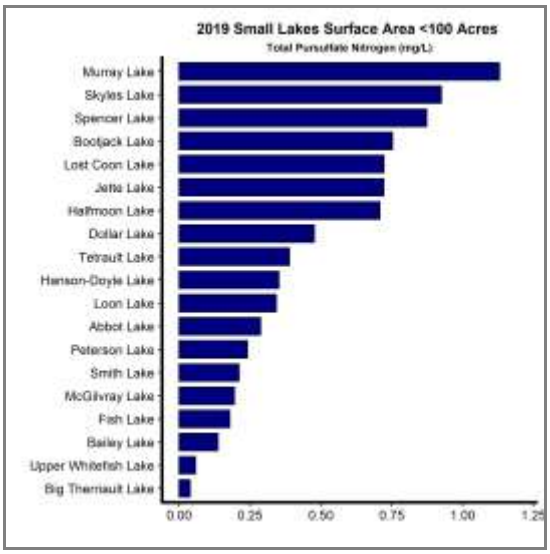

2014 Small Lakes (Surface Area<100 Acres)
Total Persulfate Nitrogen (mg/L)
Skyles
Jette
Spencer
Bootjack
Murray
Lost Coon
Hanson Doyle
Dollar
Halfmoon
Peterson
Abbot
Loon
Upper Whitefish
Bailey
Tetrault
Fish
McGilvray
Big Therriault*
0.0 0.3 0.6 0.9 1.2 1.5 1.8
* Not Detected (lower reporting limit = .04mg/L)

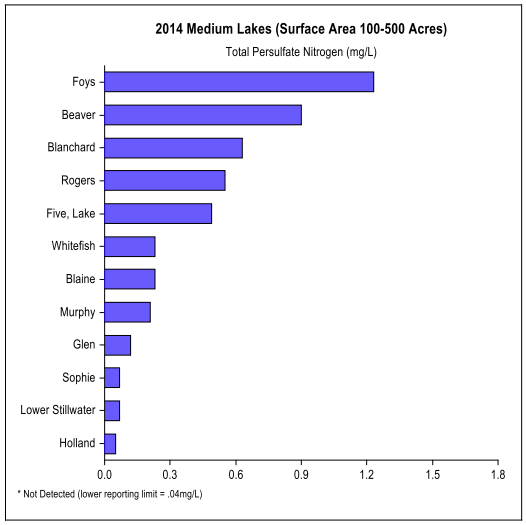

2015 Small Lakes (Surface Area<100 Acres)
Total Persulfate Nitrogen (mg/L)
Skyles
Jette
Murray
Hanson Doyle
Halfmoon
Bailey
Dollar
Loon
Peterson
Tetrault
Abbot
Upper Whitefish
0.0 0.3 0.6 0.9 1.2 1.5 1.8

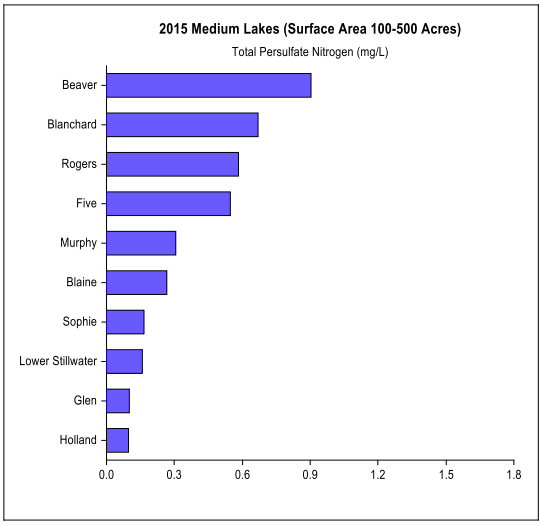

2016 Small Lakes (Surface Area<100 Acres)
Total Persulfate Nitrogen (mg/L)
Skyles
Spencer
Murray
Bootjack
Jette
Halfmoon
Dollar
Hanson-Doyle
Tetrault
Loon
Abbot
Peterson
McGilvray
Upper Whitefish
Fish
Bailey
Big Therriault
0.0 0.3 0.6 0.9 1.2 1.5 1.8
* Not Detected (lower reporting limit = .05mg/L)

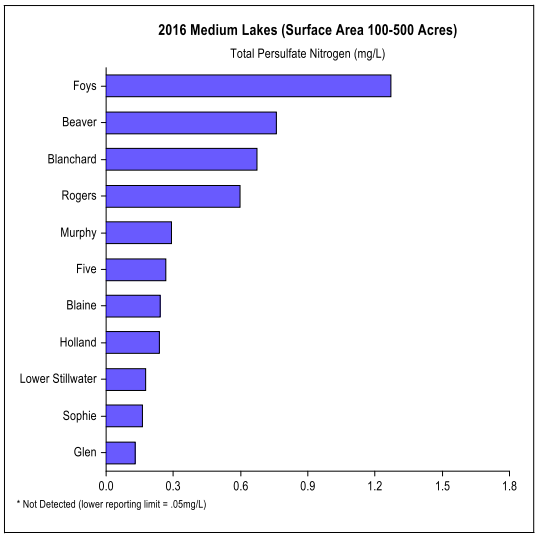

2017 Small Lakes (Surface Area<100 Acres)
Total Persulfate Nitrogen (mg/L)
Spencer
Skyles
Murray
Jette
Bootjack
Dollar
Halfmoon
Hanson Doyle
Tetrault
Bailey
Loon
Abbot
Peterson
McGilvray
Fish
Upper Whitefish
Big Therirault
0.0 0.3 0.6 0.9 1.2 1.5 1.8
* Not Detected (lower reporting limit = .05mg/L)

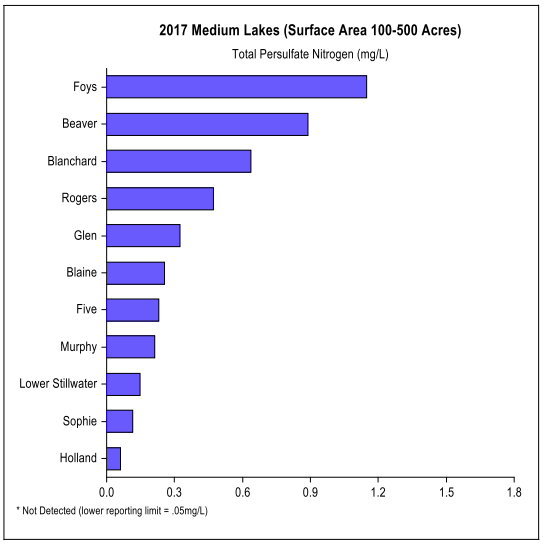

2018 Small Lakes Surface Area <100 Acres
Total Persulfate Nitrogen (mg/L)
Skyles Lake
Murray Lake
Lost Coon Lake
Jette Lake
Bootjack Lake
Dollar Lake
Hanson-Doyle Lake
Halfmoon Lake
Tetrault Lake
Loon Lake
Abbot Lake
Peterson Lake
McGilvray Lake
Bailey Lake
Fish Lake
Upper Whitefish Lake
Big Therriault Lake
0.00 0.25 0.50 0.75

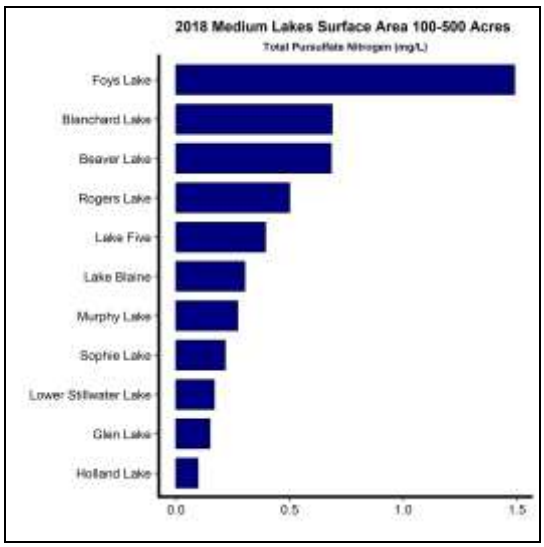

2019 Small Lakes Surface Area <100 Acres
Total Persulfate Nitrogen (mg/L)
Murray Lake
Skyles Lake
Spencer Lake
Bootjack Lake
Lost Coon Lake
Jette Lake
Halfmoon Lake
Dollar Lake
Tetrault Lake
Hanson-Doyle Lake
Loon Lake
Abbot Lake
Peterson Lake
Smith Lake
McGilvray Lake
Fish Lake
Bailey Lake
Upper Whitefish Lake
Big Therriault Lake
0.00 0.25 0.50 0.75 1.00

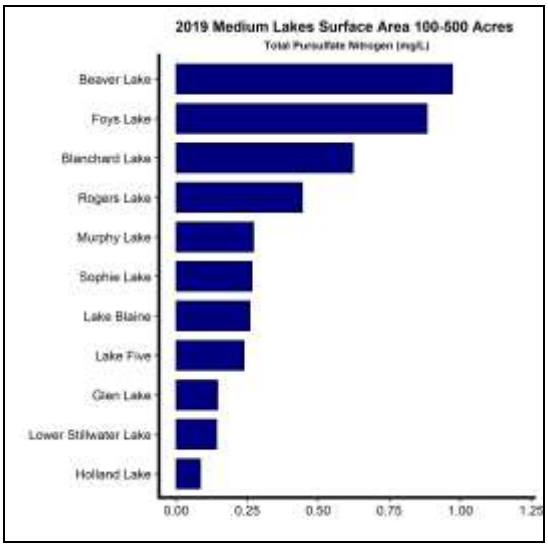

2014 Medium Lakes (Surface Area 100-500 Acres)
Total Persulfate Nitrogen (mg/L)
Foys
Beaver
Blanchard
Rogers
Five, Lake
Whitefish
Blaine
Murphy
Glen
Sophie
Lower Stillwater
Holland
0.0
0.3
0.6
0.9
1.2
1.5
1.8
* Not Detected (lower reporting limit = .04mg/L)

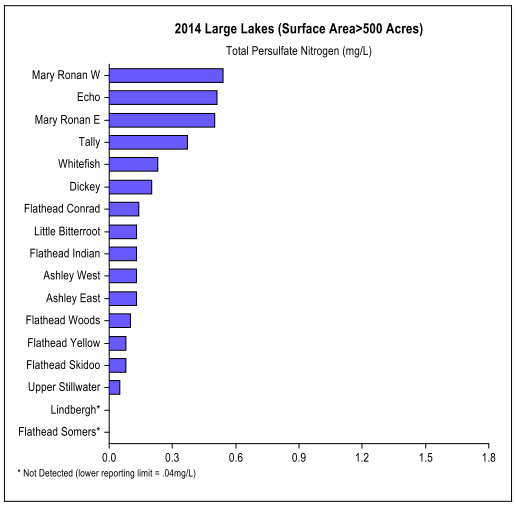

2015 Medium Lakes (Surface Area 100-500 Acres)
Total Persulfate Nitrogen (mg/L)
Beaver
Blanchard
Rogers
Five
Murphy
Blaine
Sophie
Lower Stillwater
Glen
Holland
0.0
0.3
0.6
0.9
1.2
1.5
1.8

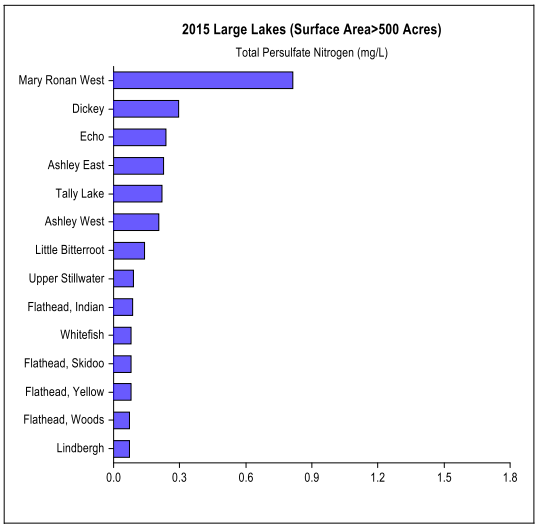

2016 Medium Lakes (Surface Area 100-500 Acres)
Total Persulfate Nitrogen (mg/L)
Foys
Beaver
Blanchard
Rogers
Murphy
Five
Blaine
Holland
Lower Stillwater
Sophie
Glen
0.0
0.3
0.6
0.9
1.2
1.5
1.8
* Not Detected (lower reporting limit = .05mg/L)

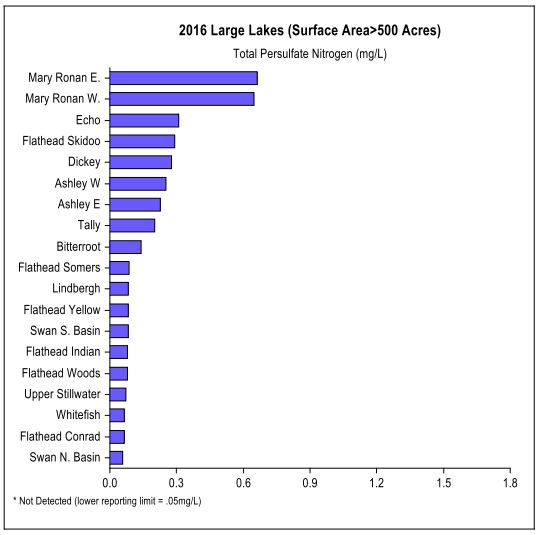

2017 Medium Lakes (Surface Area 100-500 Acres)
Total Persulfate Nitrogen (mg/L)
Foys
Beaver
Blanchard
Rogers
Glen
Blaine
Five
Murphy
Lower Stillwater
Sophie
Holland
0.0
0.3
0.6
0.9
1.2
1.5
1.8
* Not Detected (lower reporting limit = .05mg/L)

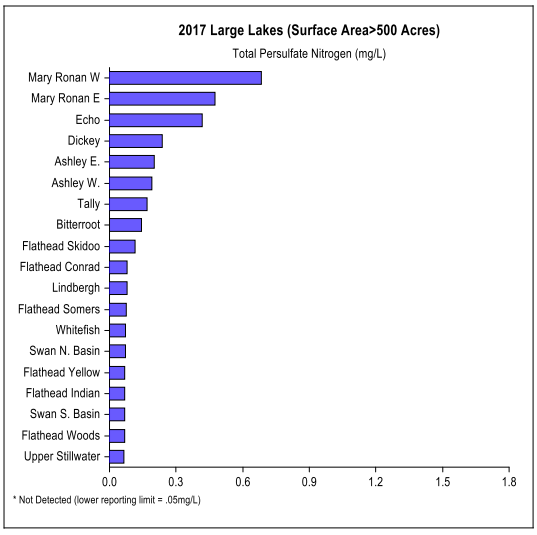

2018 Medium Lakes Surface Area 100-500 Acres
Total Persulfate Nitrogen (mg/L)
Foys Lake
Blanchard Lake
Beaver Lake
Rogers Lake
Lake Five
Lake Blaine
Murphy Lake
Sophie Lake
Lower Stillwater Lake
Glen Lake
Holland Lake
0.0
0.5
1.0
1.5

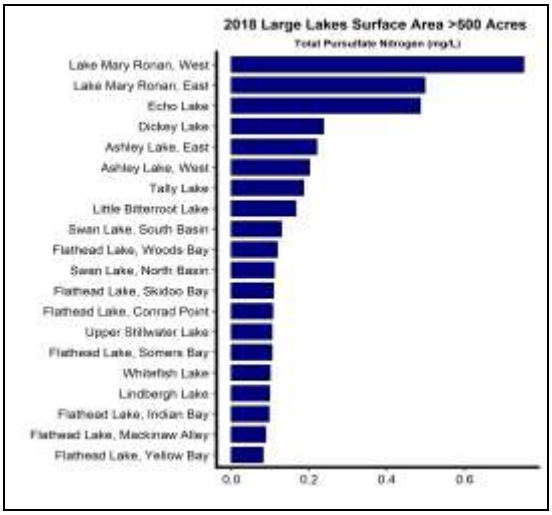

2019 Medium Lakes Surface Area 100-500 Acres
Total Persulfate Nitrogen (mg/L)
Beaver Lake
Foys Lake
Blanchard Lake
Rogers Lake
Murphy Lake
Sophie Lake
Lake Blaine
Lake Five
Glen Lake
Lower Stillwater Lake
Holland Lake
0.00
0.25
0.50
0.75
1.00
1.25

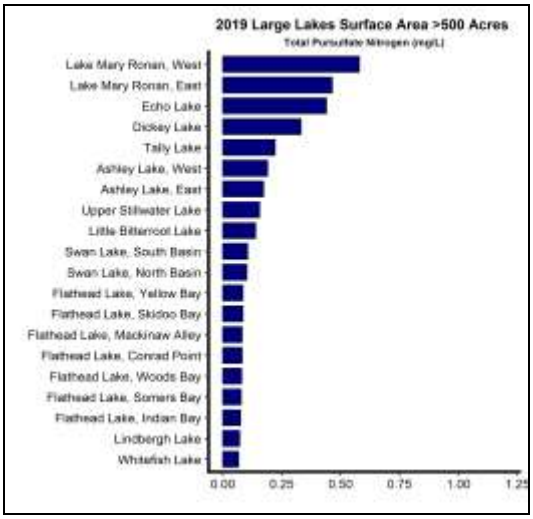

2014 Large Lakes (Surface Area>500 Acres)
Total Persulfate Nitrogen (mg/L)
Mary Ronan W
Echo
Mary Ronan E
Tally
Whitefish
Dickey
Flathead Conrad
Little Bitterroot
Flathead Indian
Ashley West
Ashley East
Flathead Woods
Flathead Yellow
Flathead Skidoo
Upper Stillwater
Lindbergh*
Flathead Somers*
0.0 0.3 0.6 0.9 1.2 1.5 1.8
* Not Detected (lower reporting limit = .04mg/L)

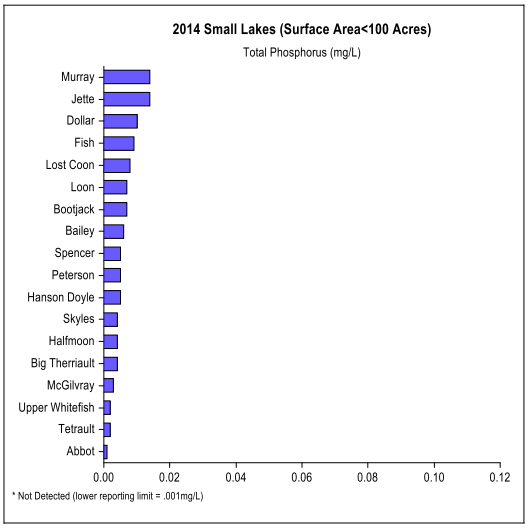

2015 Large Lakes (Surface Area>500 Acres)
Total Persulfate Nitrogen (mg/L)
Mary Ronan West
Dickey
Echo
Ashley East
Tally Lake
Ashley West
Little Bitterroot
Upper Stillwater
Flathead, Indian
Whitefish
Flathead, Skidoo
Flathead, Yellow
Flathead, Woods
Lindbergh
0.0 0.3 0.6 0.9 1.2 1.5 1.8

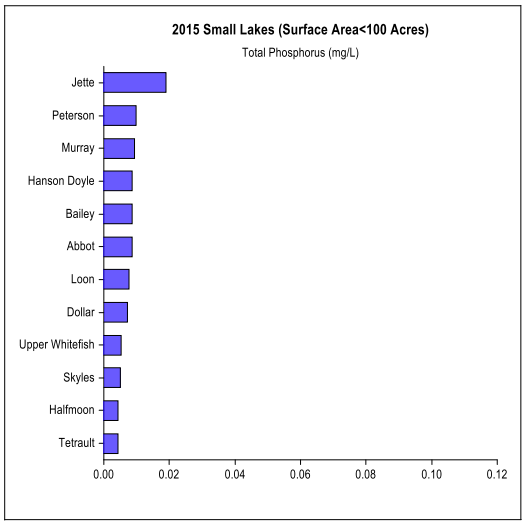

2016 Large Lakes (Surface Area>500 Acres)
Total Persulfate Nitrogen (mg/L)
Mary Ronan E.
Mary Ronan W.
Echo
Flathead Skidoo
Dickey
Ashley W
Ashley E
Tally
Bitterroot
Flathead Somers
Lindbergh
Flathead Yellow
Swan S. Basin
Flathead Indian
Flathead Woods
Upper Stillwater
Whitefish
Flathead Conrad
Swan N. Basin
0.0 0.3 0.6 0.9 1.2 1.5 1.8
* Not Detected (lower reporting limit = .05mg/L)

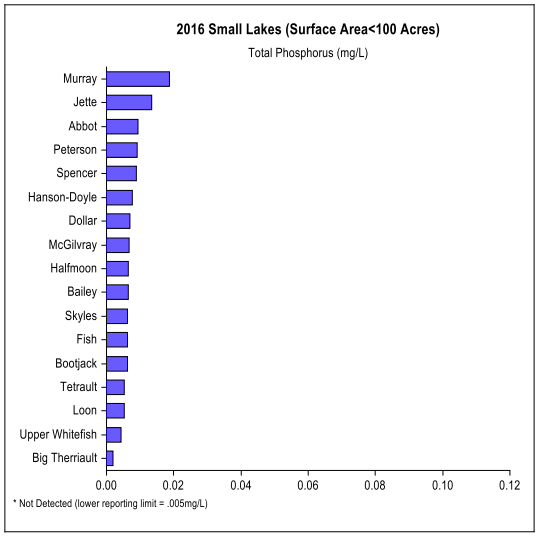

2017 Large Lakes (Surface Area>500 Acres)
Total Persulfate Nitrogen (mg/L)
Mary Ronan W
Mary Ronan E
Echo
Dickey
Ashley E.
Ashley W.
Tally
Bitterroot
Flathead Skidoo
Flathead Conrad
Lindbergh
Flathead Somers
Whitefish
Swan N. Basin
Flathead Yellow
Flathead Indian
Swan S. Basin
Flathead Woods
Upper Stillwater
0.0 0.3 0.6 0.9 1.2 1.5 1.8
* Not Detected (lower reporting limit = .05mg/L)

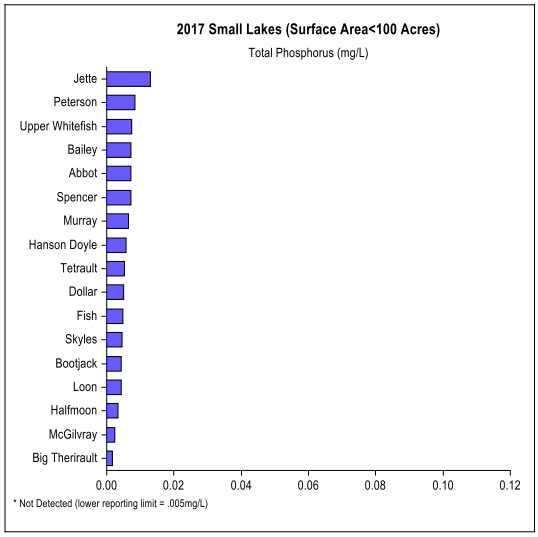

2018 Large Lakes Surface Area >500 Acres
Total Persulfate Nitrogen (mg/L)
Lake Mary Ronan, West
Lake Mary Ronan, East
Echo Lake
Dickey Lake
Ashley Lake, East
Ashley Lake, West
Tally Lake
Little Bitterroot Lake
Swan Lake, South Basin
Flathead Lake, Woods Bay
Swan Lake, North Basin
Flathead Lake, Skidoo Bay
Flathead Lake, Conrad Point
Upper Stillwater Lake
Flathead Lake, Somers Bay
Whitefish Lake
Lindbergh Lake
Flathead Lake, Indian Bay
Flathead Lake, Mackinaw Alley
Flathead Lake, Yellow Bay
0.0 0.2 0.4 0.6

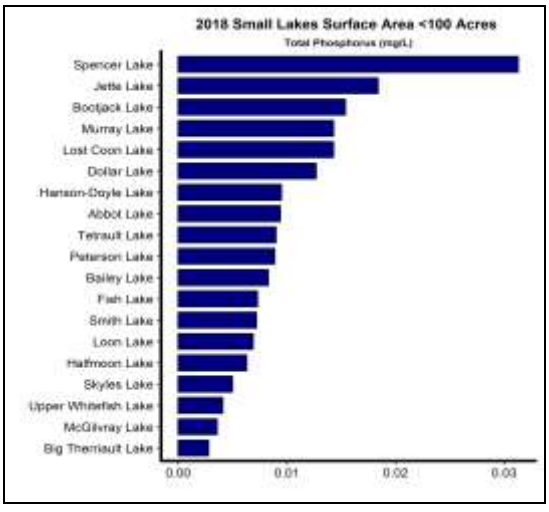

2019 Large Lakes Surface Area >500 Acres
Total Persulfate Nitrogen (mg/L)
Lake Mary Ronan, West
Lake Mary Ronan, East
Echo Lake
Dickey Lake
Tally Lake
Ashley Lake, West
Ashley Lake, East
Upper Stillwater Lake
Little Bitterroot Lake
Swan Lake, South Basin
Swan Lake, North Basin
Flathead Lake, Yellow Bay
Flathead Lake, Skidoo Bay
Flathead Lake, Mackinaw Alley
Flathead Lake, Conrad Point
Flathead Lake, Woods Bay
Flathead Lake, Somers Bay
Flathead Lake, Indian Bay
Lindbergh Lake
Whitefish Lake
0.00 0.25 0.50 0.75 1.00 1.25

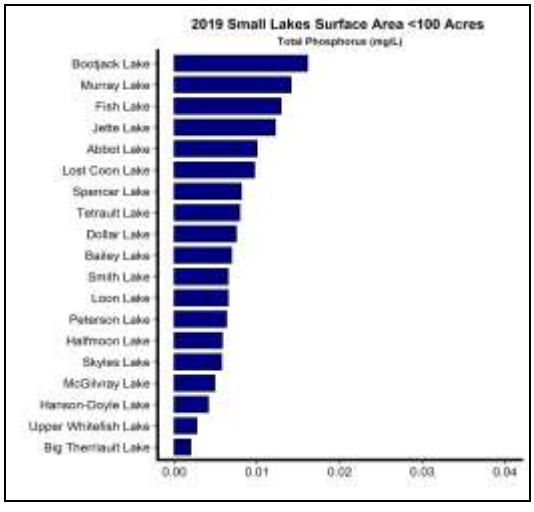

2014 Small Lakes (Surface Area<100 Acres)
Total Phosphorus (mg/L)
Murray
Jette
Dollar
Fish
Lost Coon
Loon
Bootjack
Bailey
Spencer
Peterson
Hanson Doyle
Skyles
Halfmoon
Big Therriault
McGilvray
Upper Whitefish
Tetrault
Abbot
0.00
0.02
0.04
0.06
0.08
0.10
0.12
* Not Detected (lower reporting limit = .001mg/L)

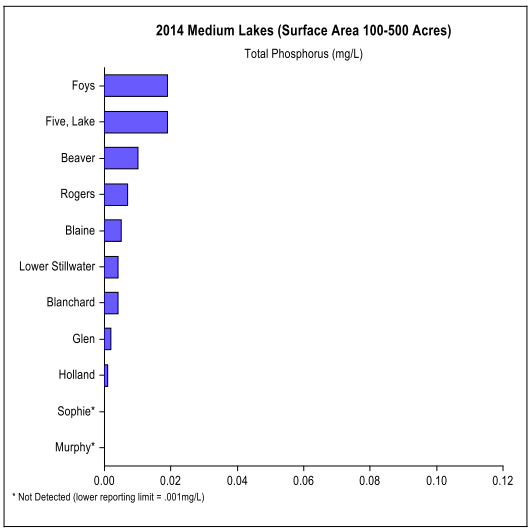

2015 Small Lakes (Surface Area<100 Acres)
Total Phosphorus (mg/L)
Jette
Peterson
Murray
Hanson Doyle
Bailey
Abbot
Loon
Dollar
Upper Whitefish
Skyles
Halfmoon
Tetrault
0.00
0.02
0.04
0.06
0.08
0.10
0.12

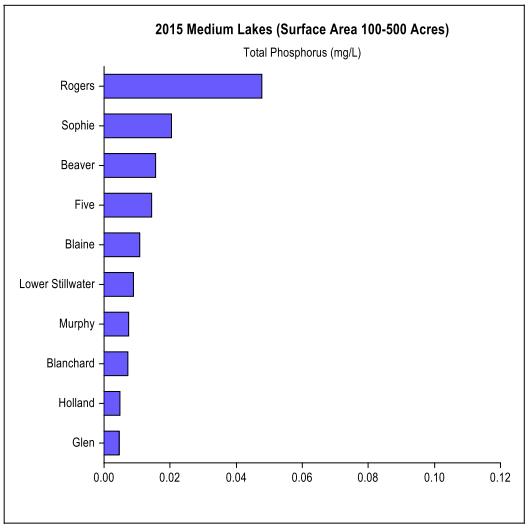

2016 Small Lakes (Surface Area<100 Acres)
Total Phosphorus (mg/L)
Murray
Jette
Abbot
Peterson
Spencer
Hanson-Doyle
Dollar
McGilvray
Halfmoon
Bailey
Skyles
Fish
Bootjack
Tetrault
Loon
Upper Whitefish
Big Therriault
0.00
0.02
0.04
0.06
0.08
0.10
0.12
* Not Detected (lower reporting limit = .005mg/L)

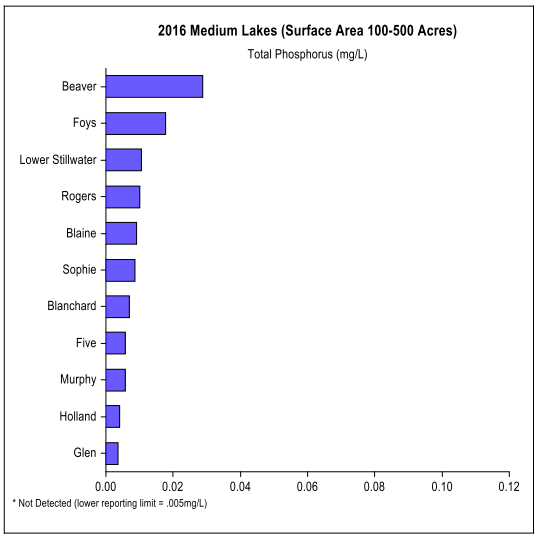

2017 Small Lakes (Surface Area<100 Acres)
Total Phosphorus (mg/L)
Jette
Peterson
Upper Whitefish
Bailey
Abbot
Spencer
Murray
Hanson Doyle
Tetrault
Dollar
Fish
Skyles
Bootjack
Loon
Halfmoon
McGilvray
Big Therriault
0.00
0.02
0.04
0.06
0.08
0.10
0.12
* Not Detected (lower reporting limit = .005mg/L)

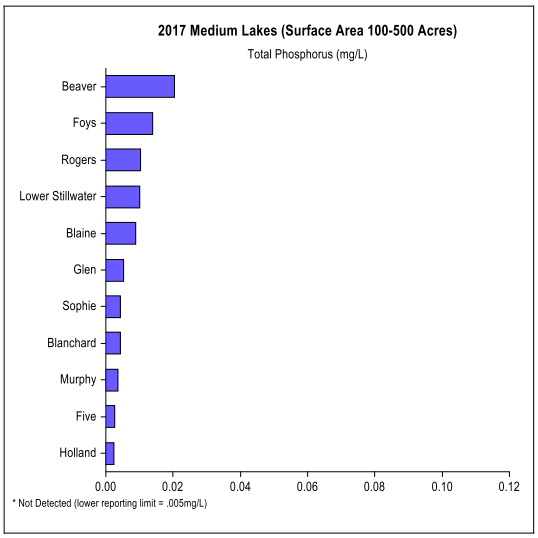

2018 Small Lakes Surface Area <100 Acres
Total Phosphorus (mg/L)
Spencer Lake
Jette Lake
Bootjack Lake
Murray Lake
Lost Coon Lake
Dollar Lake
Hanson-Doyle Lake
Abbot Lake
Tetrault Lake
Peterson Lake
Bailey Lake
Fish Lake
Smith Lake
Loon Lake
Halfmoon Lake
Skyles Lake
Upper Whitefish Lake
McGilvray Lake
Big Therriault Lake
0.00
0.01
0.02
0.03

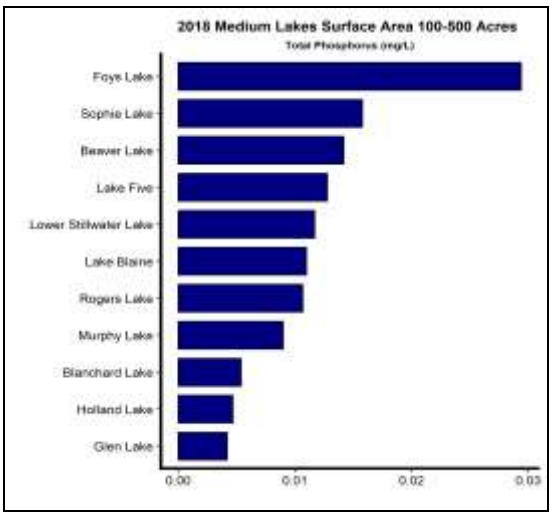

2019 Small Lakes Surface Area <100 Acres
Total Phosphorus (mg/L)
Bootjack Lake
Murray Lake
Fish Lake
Jette Lake
Abbot Lake
Lost Coon Lake
Spencer Lake
Tetrault Lake
Dollar Lake
Bailey Lake
Smith Lake
Loon Lake
Peterson Lake
Halfmoon Lake
Skyles Lake
McGilvray Lake
Hanson-Doyle Lake
Upper Whitefish Lake
Big Therriault Lake
0.00
0.01
0.02
0.03
0.04

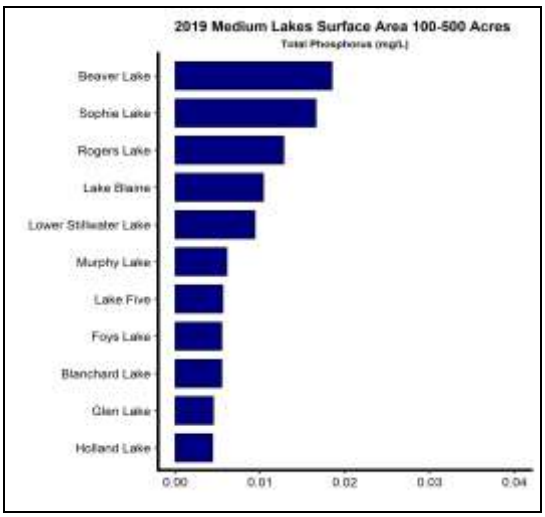

2014 Medium Lakes (Surface Area 100-500 Acres)
Total Phosphorus (mg/L)
Foys
Five, Lake
Beaver
Rogers
Blaine
Lower Stillwater
Blanchard
Glen
Holland
Sophie*
Murphy*
0.00
0.02
0.04
0.06
0.08
0.10
0.12
* Not Detected (lower reporting limit = .001mg/L)

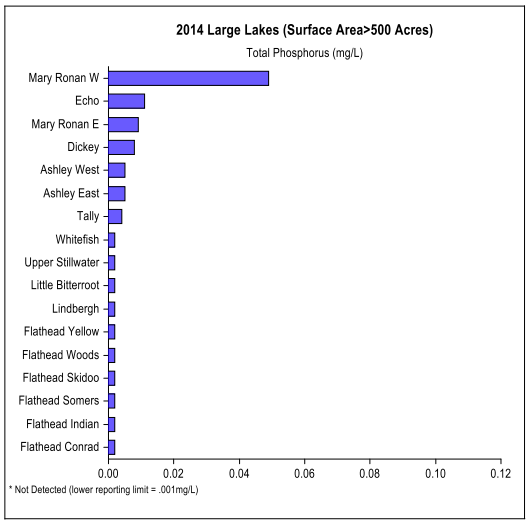

2015 Medium Lakes (Surface Area 100-500 Acres)
Total Phosphorus (mg/L)
Rogers
Sophie
Beaver
Five
Blaine
Lower Stillwater
Murphy
Blanchard
Holland
Glen
0.00
0.02
0.04
0.06
0.08
0.10
0.12

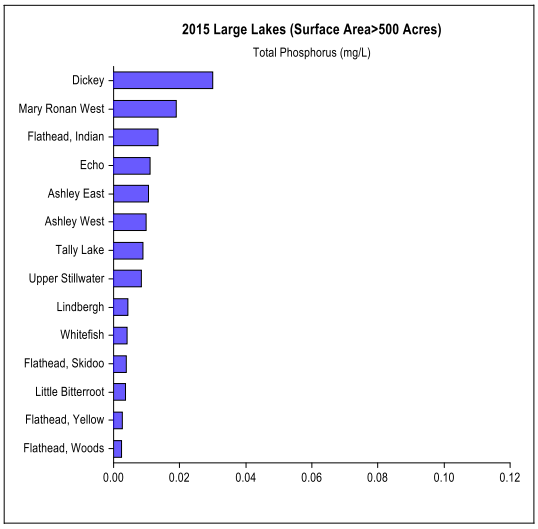

2016 Medium Lakes (Surface Area 100-500 Acres)
Total Phosphorus (mg/L)
Beaver
Foys
Lower Stillwater
Rogers
Blaine
Sophie
Blanchard
Five
Murphy
Holland
Glen
0.00
0.02
0.04
0.06
0.08
0.10
0.12
* Not Detected (lower reporting limit = .005mg/L)

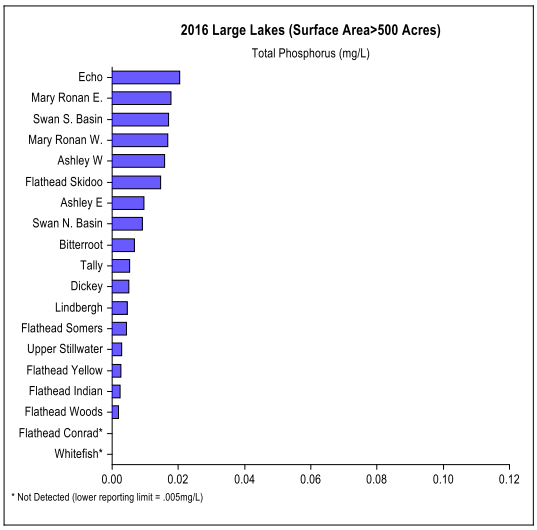

2017 Medium Lakes (Surface Area 100-500 Acres)
Total Phosphorus (mg/L)
Beaver
Foys
Rogers
Lower Stillwater
Blaine
Glen
Sophie
Blanchard
Murphy
Five
Holland
0.00
0.02
0.04
0.06
0.08
0.10
0.12
* Not Detected (lower reporting limit = .005mg/L)

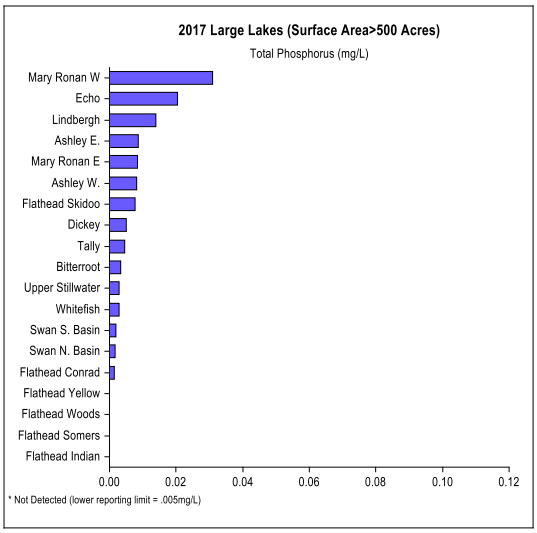

2018 Medium Lakes Surface Area 100-500 Acres
Total Phosphorus (mg/L)
Foys Lake
Sophie Lake
Beaver Lake
Lake Five
Lower Stillwater Lake
Lake Blaine
Rogers Lake
Murphy Lake
Blanchard Lake
Holland Lake
Glen Lake
0.00
0.01
0.02
0.03

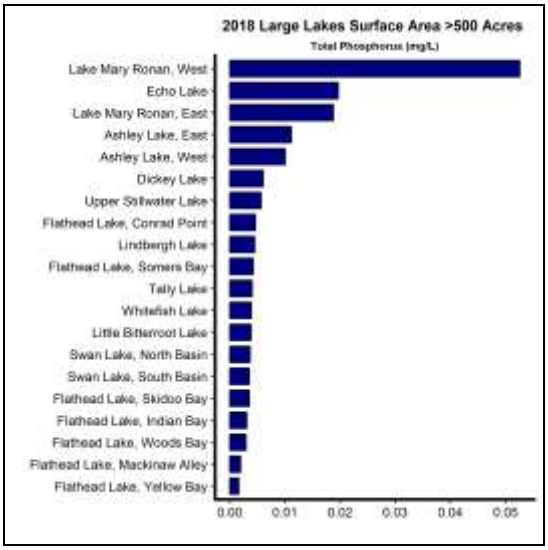

2019 Medium Lakes Surface Area 100-500 Acres
Total Phosphorus (mg/L)
Beaver Lake
Sophie Lake
Rogers Lake
Lake Blaine
Lower Stillwater Lake
Murphy Lake
Lake Five
Foys Lake
Blanchard Lake
Glen Lake
Holland Lake
0.00
0.01
0.02
0.03
0.04

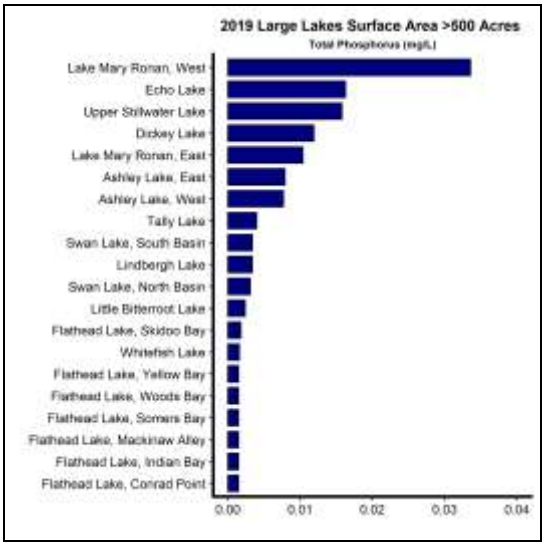

2014 Large Lakes (Surface Area>500 Acres)
Total Phosphorus (mg/L)
Mary Ronan W
Echo
Mary Ronan E
Dickey
Ashley West
Ashley East
Tally
Whitefish
Upper Stillwater
Little Bitterroot
Lindbergh
Flathead Yellow
Flathead Woods
Flathead Skidoo
Flathead Somers
Flathead Indian
Flathead Conrad
0.00 0.02 0.04 0.06 0.08 0.10 0.12
* Not Detected (lower reporting limit = .001mg/L)

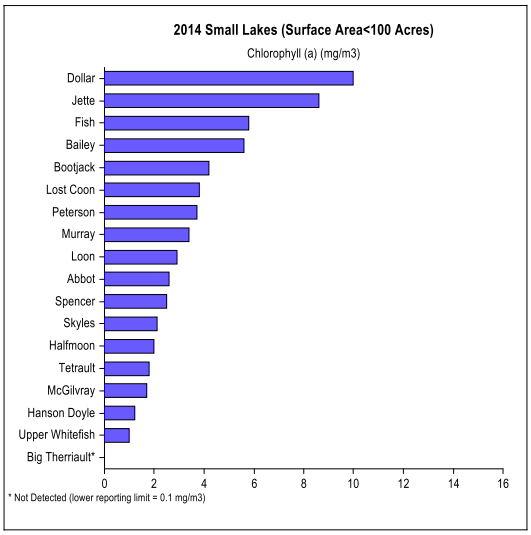

2015 Large Lakes (Surface Area>500 Acres)
Total Phosphorus (mg/L)
Dickey
Mary Ronan West
Flathead, Indian
Echo
Ashley East
Ashley West
Tally Lake
Upper Stillwater
Lindbergh
Whitefish
Flathead, Skidoo
Little Bitterroot
Flathead, Yellow
Flathead, Woods
0.00 0.02 0.04 0.06 0.08 0.10 0.12

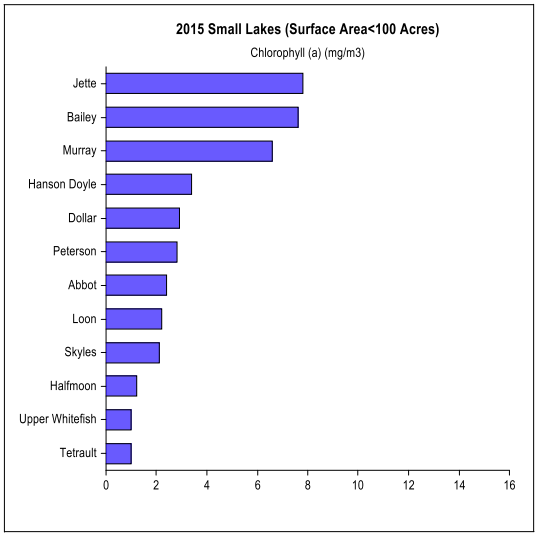

2016 Large Lakes (Surface Area>500 Acres)
Total Phosphorus (mg/L)
Echo
Mary Ronan E.
Swan S. Basin
Mary Ronan W.
Ashley W
Flathead Skidoo
Ashley E
Swan N. Basin
Bitterroot
Tally
Dickey
Lindbergh
Flathead Somers
Upper Stillwater
Flathead Yellow
Flathead Indian
Flathead Woods
Flathead Conrad*
Whitefish*
0.00 0.02 0.04 0.06 0.08 0.10 0.12
* Not Detected (lower reporting limit = .005mg/L)

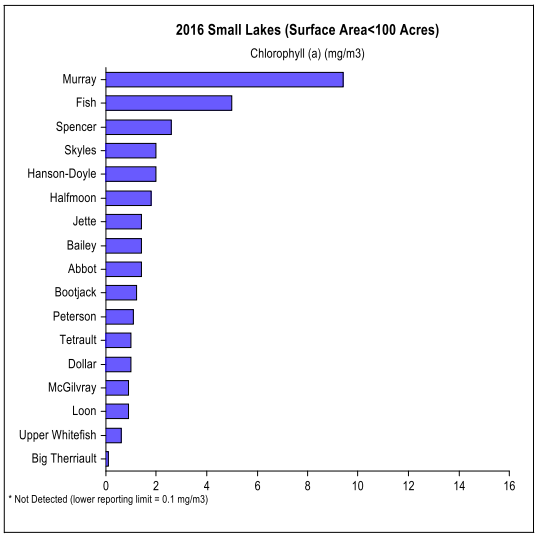

2017 Large Lakes (Surface Area>500 Acres)
Total Phosphorus (mg/L)
Mary Ronan W
Echo
Lindbergh
Ashley E.
Mary Ronan E
Ashley W.
Flathead Skidoo
Dickey
Tally
Bitterroot
Upper Stillwater
Whitefish
Swan S. Basin
Swan N. Basin
Flathead Conrad
Flathead Yellow
Flathead Woods
Flathead Somers
Flathead Indian
0.00 0.02 0.04 0.06 0.08 0.10 0.12
* Not Detected (lower reporting limit = .005mg/L)

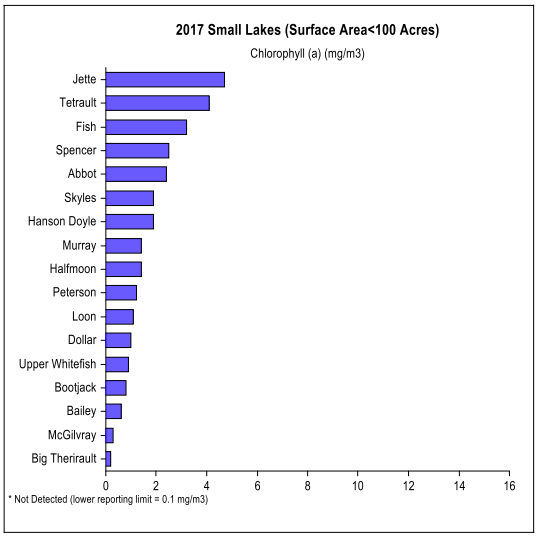

2018 Large Lakes Surface Area >500 Acres
Total Phosphorus (mg/L)
Lake Mary Ronan, West
Echo Lake
Lake Mary Ronan, East
Ashley Lake, East
Ashley Lake, West
Dickey Lake
Upper Stillwater Lake
Flathead Lake, Conrad Point
Lindbergh Lake
Flathead Lake, Somers Bay
Tally Lake
Whitefish Lake
Little Bitterroot Lake
Swan Lake, North Basin
Swan Lake, South Basin
Flathead Lake, Skidoo Bay
Flathead Lake, Indian Bay
Flathead Lake, Woods Bay
Flathead Lake, Mackinaw Alley
Flathead Lake, Yellow Bay
0.00 0.01 0.02 0.03 0.04 0.05

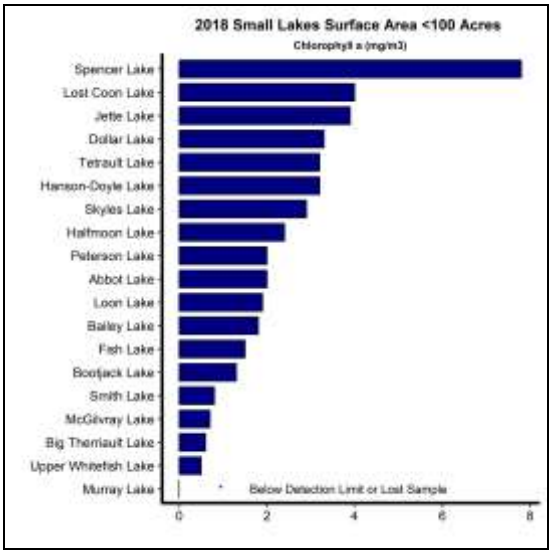

2019 Large Lakes Surface Area >500 Acres
Total Phosphorus (mg/L)
Lake Mary Ronan, West
Echo Lake
Upper Stillwater Lake
Dickey Lake
Lake Mary Ronan, East
Ashley Lake, East
Ashley Lake, West
Tally Lake
Swan Lake, South Basin
Lindbergh Lake
Swan Lake, North Basin
Little Bitterroot Lake
Flathead Lake, Skidoo Bay
Whitefish Lake
Flathead Lake, Yellow Bay
Flathead Lake, Woods Bay
Flathead Lake, Somers Bay
Flathead Lake, Mackinaw Alley
Flathead Lake, Indian Bay
Flathead Lake, Conrad Point
0.00 0.01 0.02 0.03 0.04

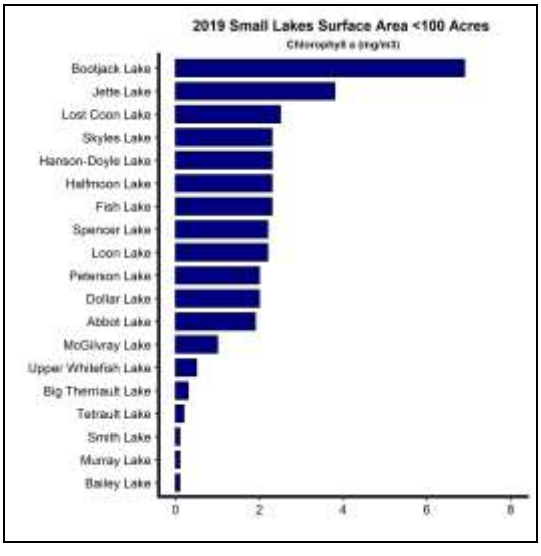

2014 Small Lakes (Surface Area<100 Acres)
Chlorophyll (a) (mg/m3)
Dollar
Jette
Fish
Bailey
Bootjack
Lost Coon
Peterson
Murray
Loon
Abbot
Spencer
Skyles
Halfmoon
Tetrault
McGilvray
Hanson Doyle
Upper Whitefish
Big Therriault*
0 2 4 6 8 10 12 14 16
* Not Detected (lower reporting limit = 0.1 mg/m3)

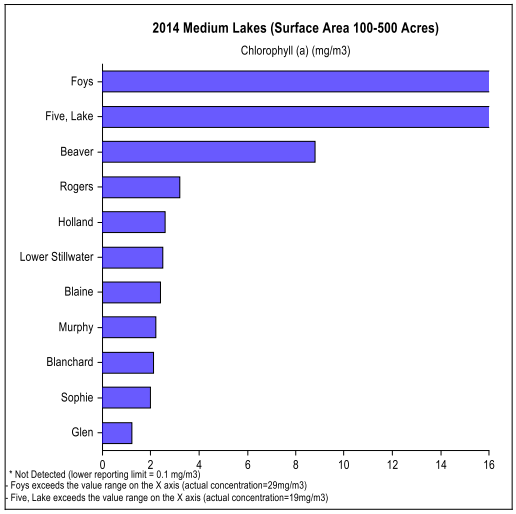

2015 Small Lakes (Surface Area<100 Acres)
Chlorophyll (a) (mg/m3)
Jette
Bailey
Murray
Hanson Doyle
Dollar
Peterson
Abbot
Loon
Skyles
Halfmoon
Upper Whitefish
Tetrault
0 2 4 6 8 10 12 14 16

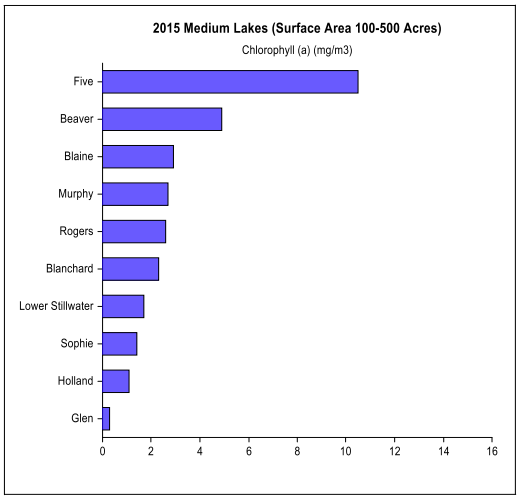

2016 Small Lakes (Surface Area<100 Acres)
Chlorophyll (a) (mg/m3)
Murray
Fish
Spencer
Skyles
Hanson-Doyle
Halfmoon
Jette
Bailey
Abbot
Bootjack
Peterson
Tetrault
Dollar
McGilvray
Loon
Upper Whitefish
Big Therriault
0 2 4 6 8 10 12 14 16
* Not Detected (lower reporting limit = 0.1 mg/m3)

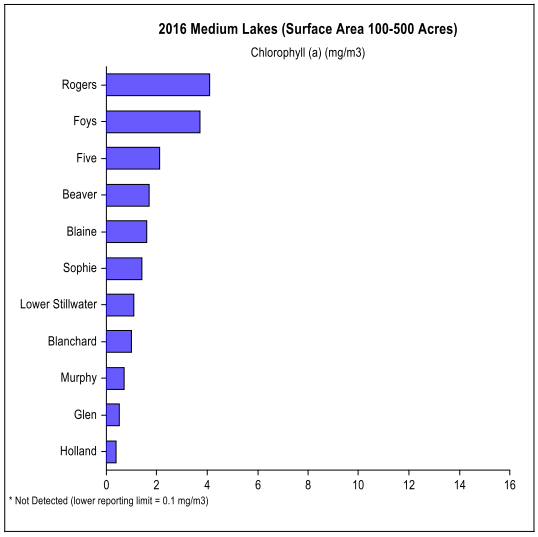

2017 Small Lakes (Surface Area<100 Acres)
Chlorophyll (a) (mg/m3)
Jette
Tetrault
Fish
Spencer
Abbot
Skyles
Hanson Doyle
Murray
Halfmoon
Peterson
Loon
Dollar
Upper Whitefish
Bootjack
Bailey
McGilvray
Big Therriault
0 2 4 6 8 10 12 14 16
* Not Detected (lower reporting limit = 0.1 mg/m3)

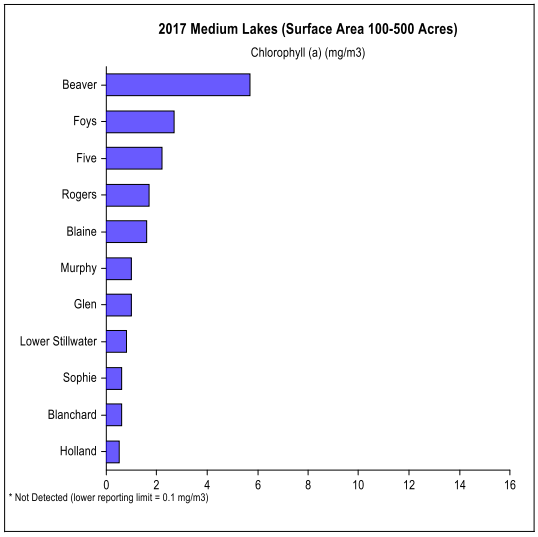

2018 Small Lakes Surface Area <100 Acres
Chlorophyll a (mg/m3)
Spencer Lake
Lost Coon Lake
Jette Lake
Dollar Lake
Tetrault Lake
Hanson-Doyle Lake
Skyles Lake
Halfmoon Lake
Peterson Lake
Abbot Lake
Loon Lake
Bailey Lake
Fish Lake
Bootjack Lake
Smith Lake
McGilvray Lake
Big Therriault Lake
Upper Whitefish Lake
Murray Lake
* Below Detection Limit or Lost Sample
0 2 4 6 8

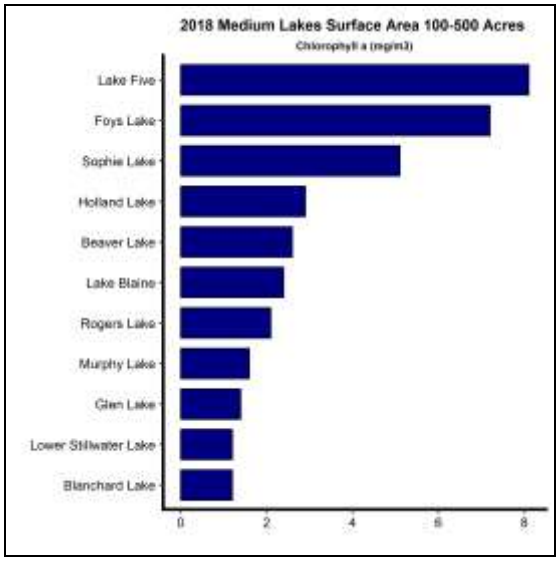

2019 Small Lakes Surface Area <100 Acres
Chlorophyll a (mg/m3)
Bootjack Lake
Jette Lake
Lost Coon Lake
Skyles Lake
Hanson-Doyle Lake
Halfmoon Lake
Fish Lake
Spencer Lake
Loon Lake
Peterson Lake
Dollar Lake
Abbot Lake
McGilvray Lake
Upper Whitefish Lake
Big Therriault Lake
Tetrault Lake
Smith Lake
Murray Lake
Bailey Lake
0 2 4 6 8

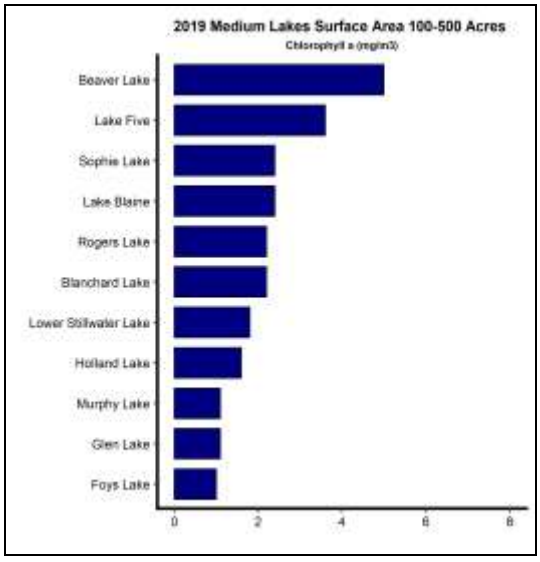

2014 Medium Lakes (Surface Area 100-500 Acres)
Chlorophyll (a) (mg/m3)
Foys
Five, Lake
Beaver
Rogers
Holland
Lower Stillwater
Blaine
Murphy
Blanchard
Sophie
Glen
0 2 4 6 8 10 12 14 16
* Not Detected (lower reporting limit = 0.1 mg/m3)
- Foys exceeds the value range on the X axis (actual concentration=29mg/m3)
- Five, Lake exceeds the value range on the X axis (actual concentration=19mg/m3)

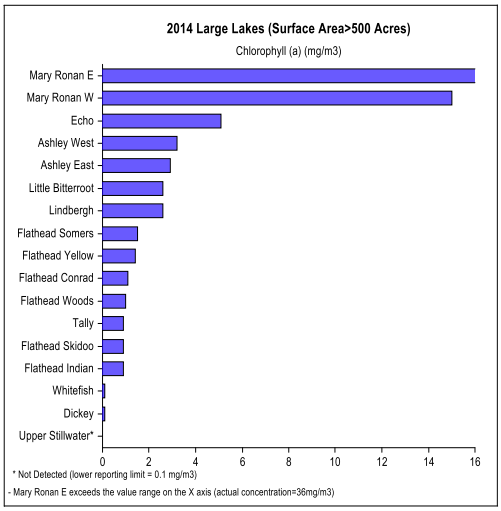

2015 Medium Lakes (Surface Area 100-500 Acres)
Chlorophyll (a) (mg/m3)
Five
Beaver
Blaine
Murphy
Rogers
Blanchard
Lower Stillwater
Sophie
Holland
Glen
0 2 4 6 8 10 12 14 16

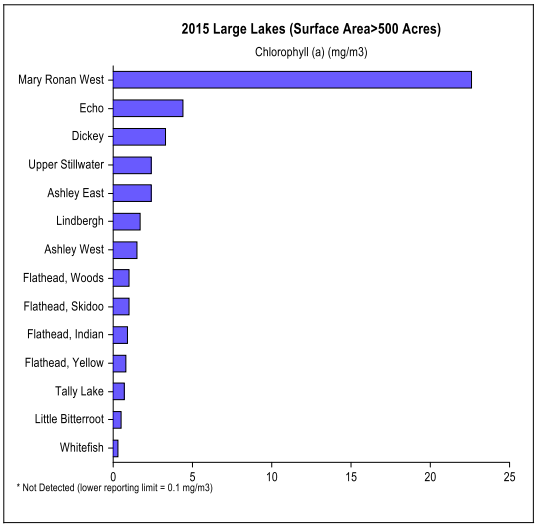

2016 Medium Lakes (Surface Area 100-500 Acres)
Chlorophyll (a) (mg/m3)
Rogers
Foys
Five
Beaver
Blaine
Sophie
Lower Stillwater
Blanchard
Murphy
Glen
Holland
0 2 4 6 8 10 12 14 16
* Not Detected (lower reporting limit = 0.1 mg/m3)

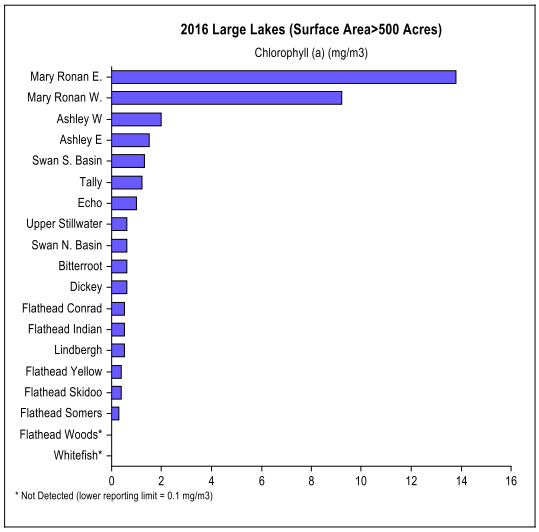

2017 Medium Lakes (Surface Area 100-500 Acres)
Chlorophyll (a) (mg/m3)
Beaver
Foys
Five
Rogers
Blaine
Murphy
Glen
Lower Stillwater
Sophie
Blanchard
Holland
0 2 4 6 8 10 12 14 16
* Not Detected (lower reporting limit = 0.1 mg/m3)

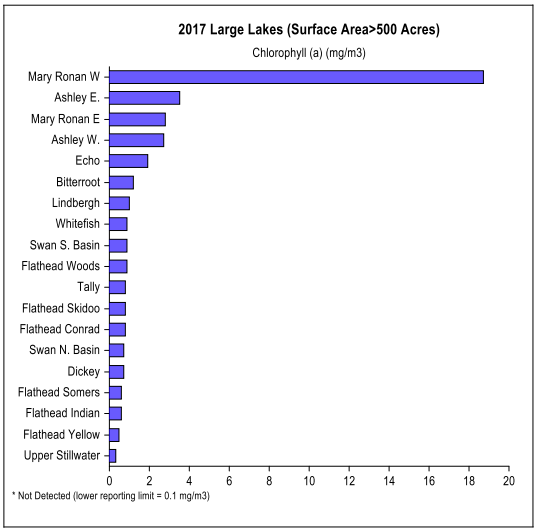

2018 Medium Lakes Surface Area 100-500 Acres
Chlorophyll a (mg/m3)
Lake Five
Foys Lake
Sophie Lake
Holland Lake
Beaver Lake
Lake Blaine
Rogers Lake
Murphy Lake
Glen Lake
Lower Stillwater Lake
Blanchard Lake
0 2 4 6 8

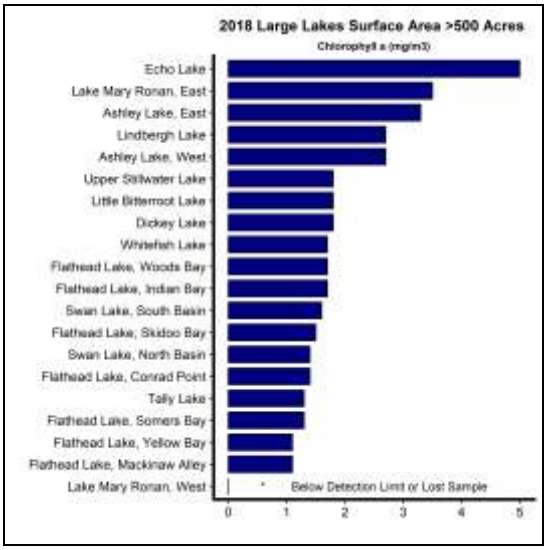

2019 Medium Lakes Surface Area 100-500 Acres
Chlorophyll a (mg/m3)
Beaver Lake
Lake Five
Sophie Lake
Lake Blaine
Rogers Lake
Blanchard Lake
Lower Stillwater Lake
Holland Lake
Murphy Lake
Glen Lake
Foys Lake
0 2 4 6 8

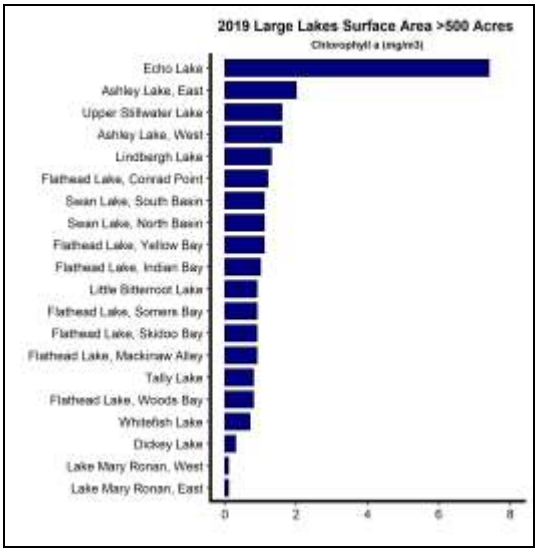

2014 Large Lakes (Surface Area>500 Acres)
Chlorophyll (a) (mg/m3)
Mary Ronan E
Mary Ronan W
Echo
Ashley West
Ashley East
Little Bitterroot
Lindbergh
Flathead Somers
Flathead Yellow
Flathead Conrad
Flathead Woods
Tally
Flathead Skidoo
Flathead Indian
Whitefish
Dickey
Upper Stillwater*
0 2 4 6 8 10 12 14 16
* Not Detected (lower reporting limit = 0.1 mg/m3)
- Mary Ronan E exceeds the value range on the X axis (actual concentration=36mg/m3)

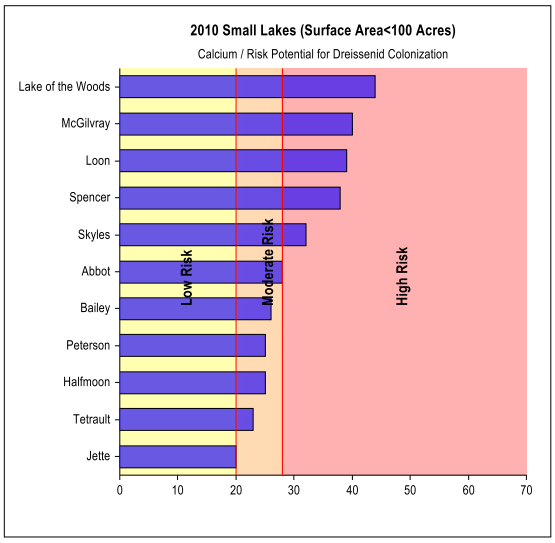

2015 Large Lakes (Surface Area>500 Acres)
Chlorophyll (a) (mg/m3)
Mary Ronan West
Echo
Dickey
Upper Stillwater
Ashley East
Lindbergh
Ashley West
Flathead, Woods
Flathead, Skidoo
Flathead, Indian
Flathead, Yellow
Tally Lake
Little Bitterroot
Whitefish
0 5 10 15 20 25
* Not Detected (lower reporting limit = 0.1 mg/m3)

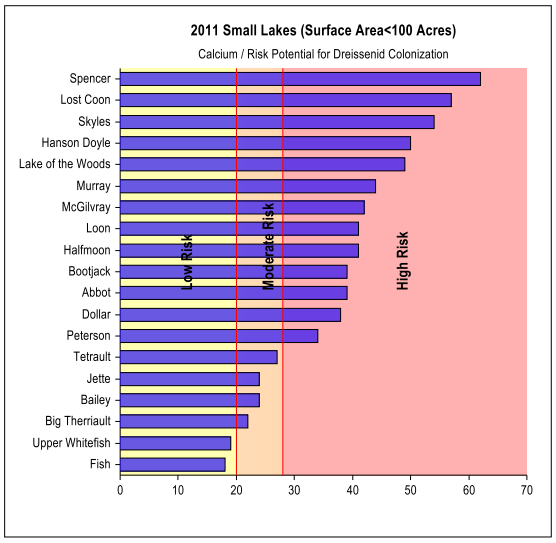

2016 Large Lakes (Surface Area>500 Acres)
Chlorophyll (a) (mg/m3)
Mary Ronan E.
Mary Ronan W.
Ashley W
Ashley E
Swan S. Basin
Tally
Echo
Upper Stillwater
Swan N. Basin
Bitterroot
Dickey
Flathead Conrad
Flathead Indian
Lindbergh
Flathead Yellow
Flathead Skidoo
Flathead Somers
Flathead Woods*
Whitefish*
0 2 4 6 8 10 12 14 16
* Not Detected (lower reporting limit = 0.1 mg/m3)

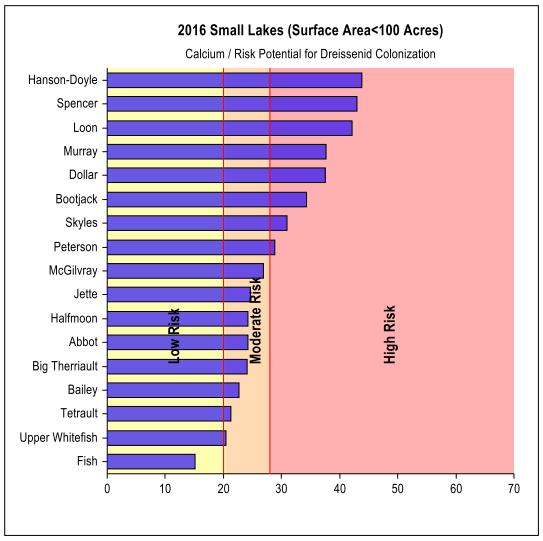

2017 Large Lakes (Surface Area>500 Acres)
Chlorophyll (a) (mg/m3)
Mary Ronan W
Ashley E.
Mary Ronan E
Ashley W.
Echo
Bitterroot
Lindbergh
Whitefish
Swan S. Basin
Flathead Woods
Tally
Flathead Skidoo
Flathead Conrad
Swan N. Basin
Dickey
Flathead Somers
Flathead Indian
Flathead Yellow
Upper Stillwater
0 2 4 6 8 10 12 14 16 18 20
* Not Detected (lower reporting limit = 0.1 mg/m3)

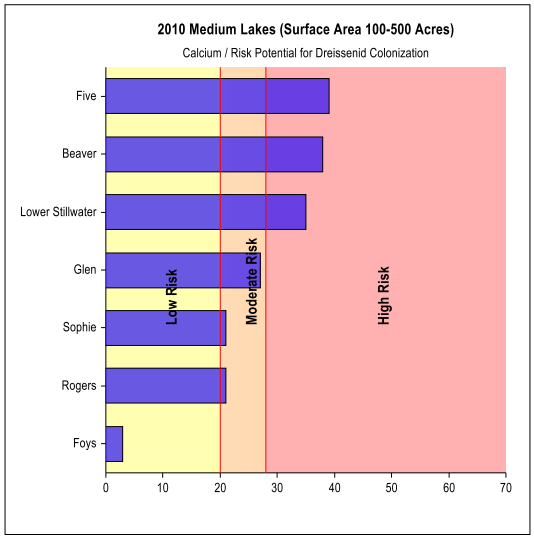

2018 Large Lakes Surface Area >500 Acres
Chlorophyll a (mg/m3)
Echo Lake
Lake Mary Ronan, East
Ashley Lake, East
Lindbergh Lake
Ashley Lake, West
Upper Stillwater Lake
Little Bitterroot Lake
Dickey Lake
Whitefish Lake
Flathead Lake, Woods Bay
Flathead Lake, Indian Bay
Swan Lake, South Basin
Flathead Lake, Skidoo Bay
Swan Lake, North Basin
Flathead Lake, Conrad Point
Tally Lake
Flathead Lake, Somers Bay
Flathead Lake, Yellow Bay
Flathead Lake, Mackinaw Alley
Lake Mary Ronan, West
* Below Detection Limit or Lost Sample
0 1 2 3 4 5

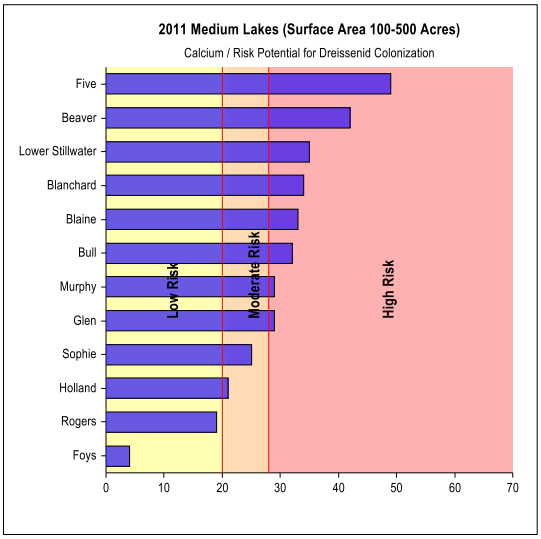

2019 Large Lakes Surface Area >500 Acres
Chlorophyll a (mg/m3)
Echo Lake
Ashley Lake, East
Upper Stillwater Lake
Ashley Lake, West
Lindbergh Lake
Flathead Lake, Conrad Point
Swan Lake, South Basin
Swan Lake, North Basin
Flathead Lake, Yellow Bay
Flathead Lake, Indian Bay
Little Bitterroot Lake
Flathead Lake, Somers Bay
Flathead Lake, Skidoo Bay
Flathead Lake, Mackinaw Alley
Tally Lake
Flathead Lake, Woods Bay
Whitefish Lake
Dickey Lake
Lake Mary Ronan, West
Lake Mary Ronan, East
0 2 4 6 8

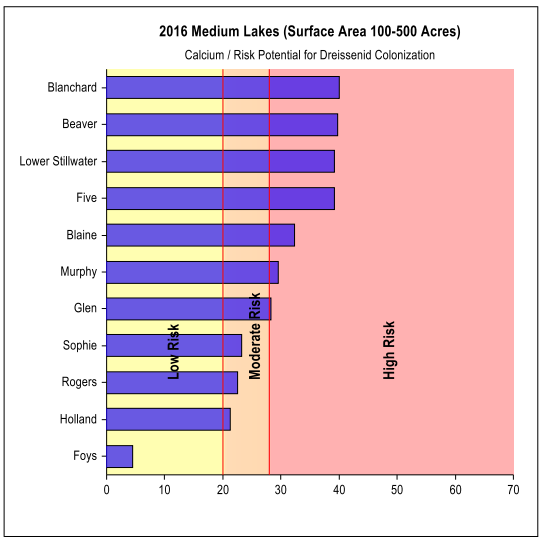

2010 Small Lakes (Surface Area<100 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Lake of the Woods
McGilvray
Loon
Spencer
Skyles
Abbot
Bailey
Peterson
Halfmoon
Tetrault
Jette
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70

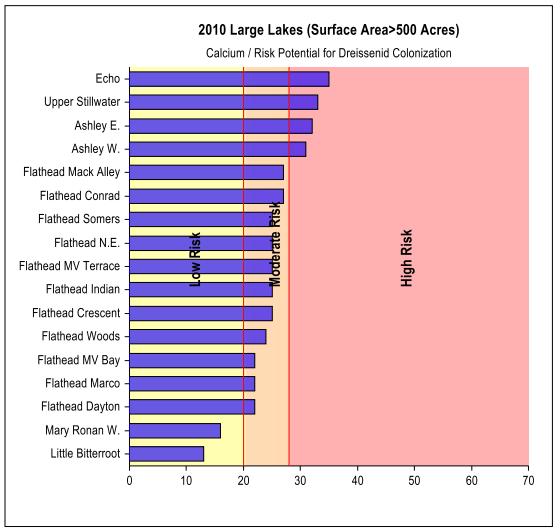

2011 Small Lakes (Surface Area<100 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Spencer
Lost Coon
Skyles
Hanson Doyle
Lake of the Woods
Murray
McGilvray
Loon
Halfmoon
Bootjack
Abbot
Dollar
Peterson
Tetrault
Jette
Bailey
Big Therriault
Upper Whitefish
Fish
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70

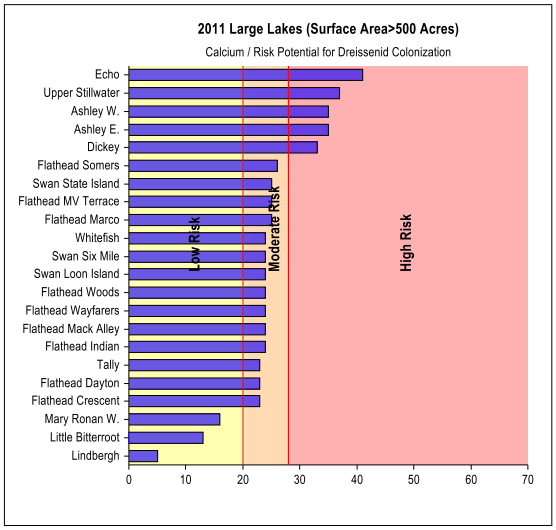

2016 Small Lakes (Surface Area<100 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Hanson-Doyle
Spencer
Loon
Murray
Dollar
Bootjack
Skyles
Peterson
McGilvray
Jette
Halfmoon
Abbot
Big Therriault
Bailey
Tetrault
Upper Whitefish
Fish
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70

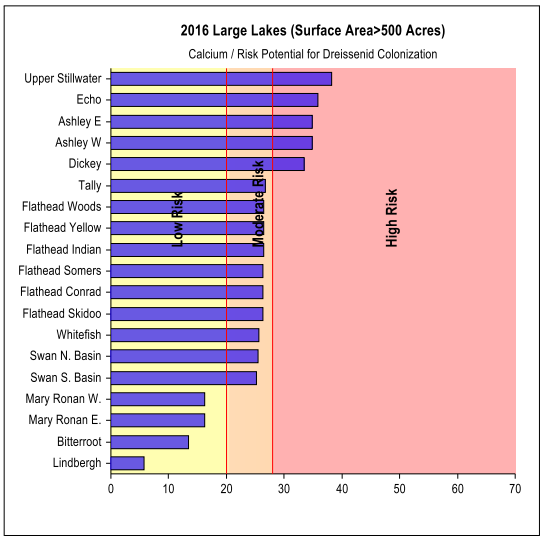

2010 Medium Lakes (Surface Area 100-500 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Five
Beaver
Lower Stillwater
Glen
Sophie
Rogers
Foys
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70

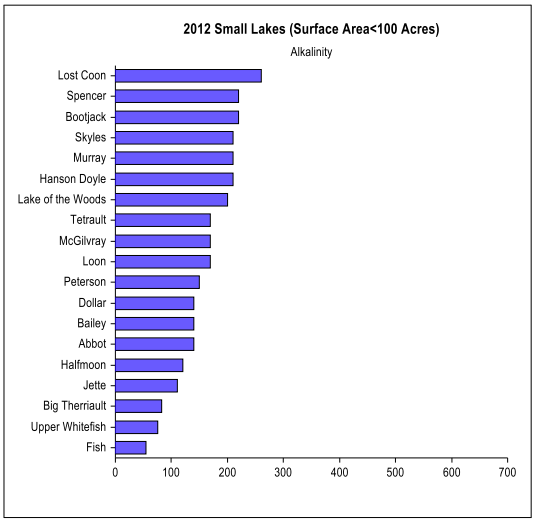

2011 Medium Lakes (Surface Area 100-500 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Five
Beaver
Lower Stillwater
Blanchard
Blaine
Bull
Murphy
Glen
Sophie
Holland
Rogers
Foys
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70

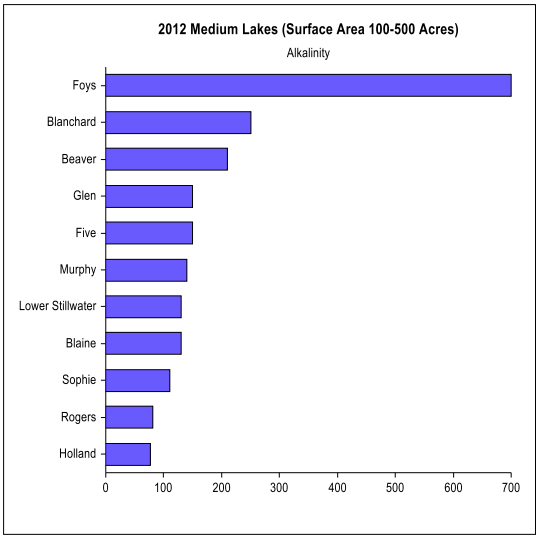

2016 Medium Lakes (Surface Area 100-500 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Blanchard
Beaver
Lower Stillwater
Five
Blaine
Murphy
Glen
Sophie
Rogers
Holland
Foys
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70

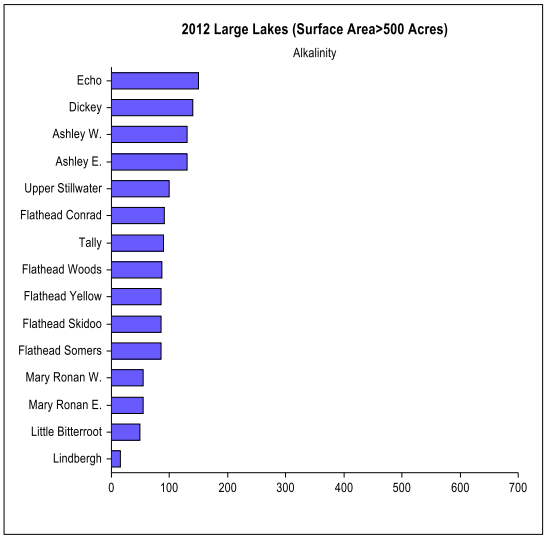

2010 Large Lakes (Surface Area>500 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Echo
Upper Stillwater
Ashley E.
Ashley W.
Flathead Mack Alley
Flathead Conrad
Flathead Somers
Flathead N.E.
Flathead MV Terrace
Flathead Indian
Flathead Crescent
Flathead Woods
Flathead MV Bay
Flathead Marco
Flathead Dayton
Mary Ronan W.
Little Bitterroot
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70


2011 Large Lakes (Surface Area>500 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Echo
Upper Stillwater
Ashley W.
Ashley E.
Dickey
Flathead Somers
Swan State Island
Flathead MV Terrace
Flathead Marco
Whitefish
Swan Six Mile
Swan Loon Island
Flathead Woods
Flathead Wayfarers
Flathead Mack Alley
Flathead Indian
Tally
Flathead Dayton
Flathead Crescent
Mary Ronan W.
Little Bitterroot
Lindbergh
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70


2016 Large Lakes (Surface Area>500 Acres)
Calcium / Risk Potential for Dreissenid Colonization
Upper Stillwater
Echo
Ashley E
Ashley W
Dickey
Tally
Flathead Woods
Flathead Yellow
Flathead Indian
Flathead Somers
Flathead Conrad
Flathead Skidoo
Whitefish
Swan N. Basin
Swan S. Basin
Mary Ronan W.
Mary Ronan E.
Bitterroot
Lindbergh
Low Risk
Moderate Risk
High Risk
0
10
20
30
40
50
60
70


2012 Small Lakes (Surface Area<100 Acres)
Alkalinity
Lost Coon
Spencer
Bootjack
Skyles
Murray
Hanson Doyle
Lake of the Woods
Tetrault
McGilvray
Loon
Peterson
Dollar
Bailey
Abbot
Halfmoon
Jette
Big Therriault
Upper Whitefish
Fish
0
100
200
300
400
500
600
700


2012 Medium Lakes (Surface Area 100-500 Acres)
Alkalinity
Foys
Blanchard
Beaver
Glen
Five
Murphy
Lower Stillwater
Blaine
Sophie
Rogers
Holland
0
100
200
300
400
500
600
700


2012 Large Lakes (Surface Area>500 Acres)
Alkalinity
Echo
Dickey
Ashley W.
Ashley E.
Upper Stillwater
Flathead Conrad
Tally
Flathead Woods
Flathead Yellow
Flathead Skidoo
Flathead Somers
Mary Ronan W.
Mary Ronan E.
Little Bitterroot
Lindbergh
0
100
200
300
400
500
600
700

Appendix B

Additional Hydrolab Parameters

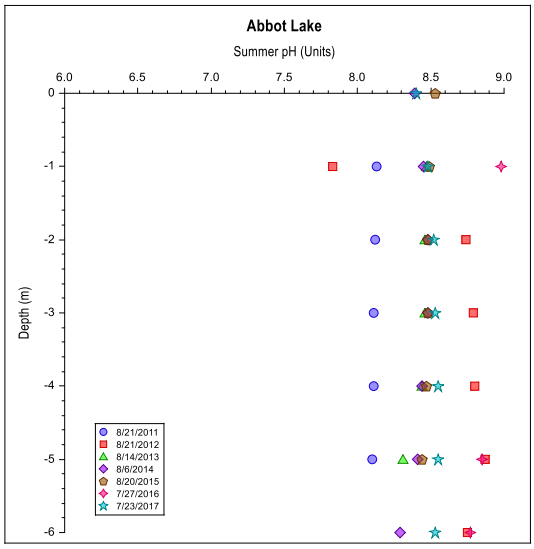
(Figures updated biennially)

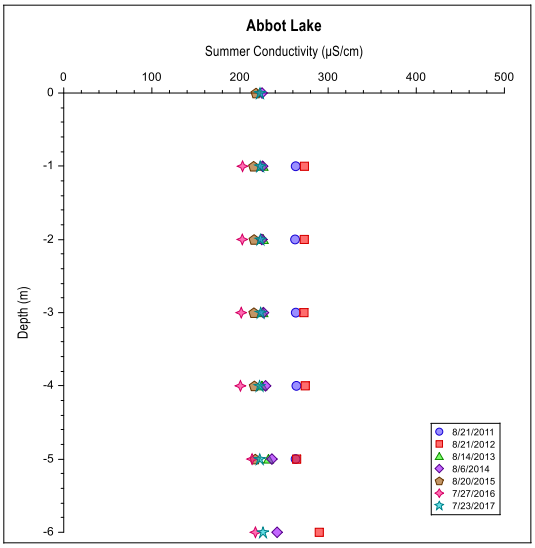
SMALL LAKES

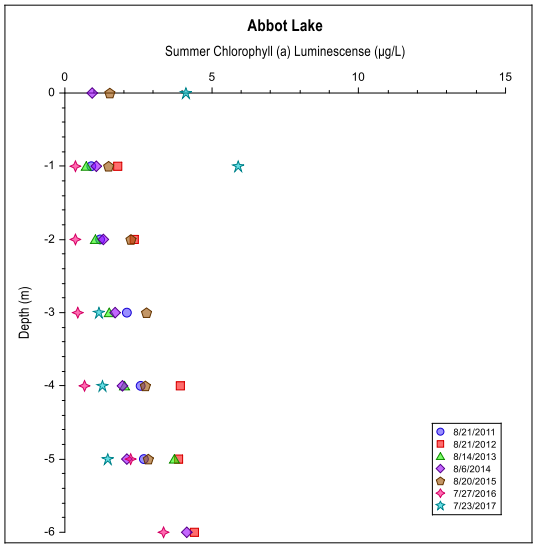
(Surface Area <100 Acres)

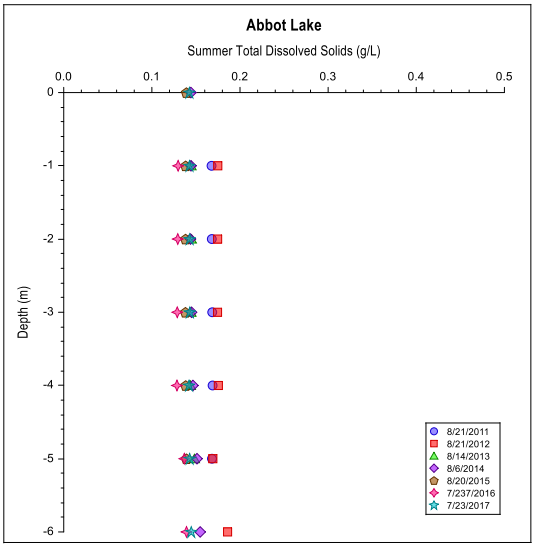
Abbot
Bailey
Big Therriault
Bootjack
Dollar
Fish
Halfmoon
Hanson-Doyle
Jette
Loon
Lost Coon
McGilvray
Murray
Peterson
Skyles
Spencer
Tetrault
Upper Whitefish

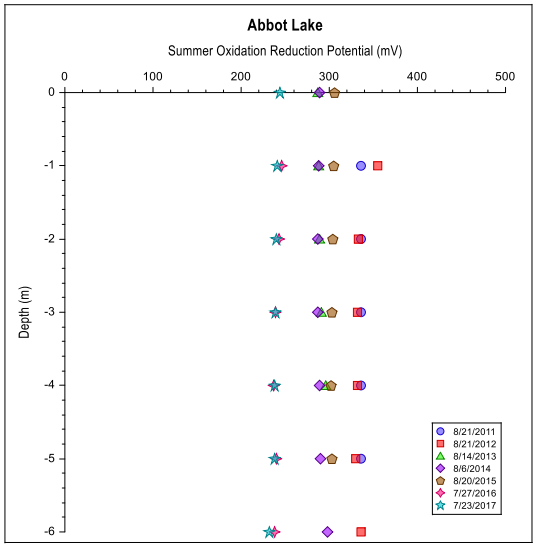
Abbot Lake Summer Hydrolab Profiles



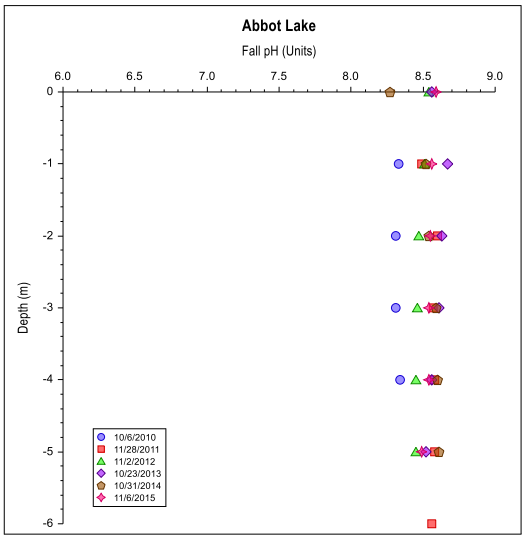


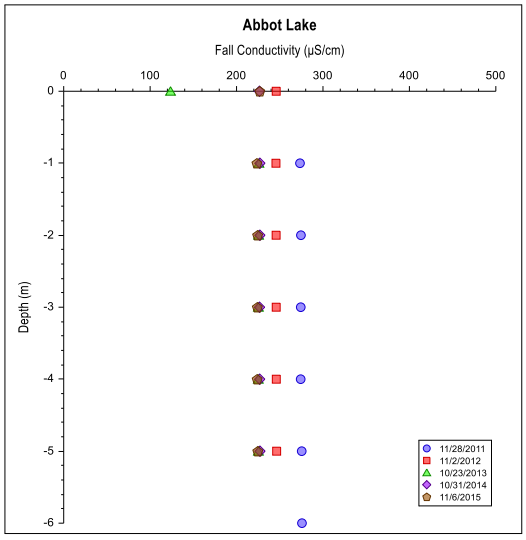


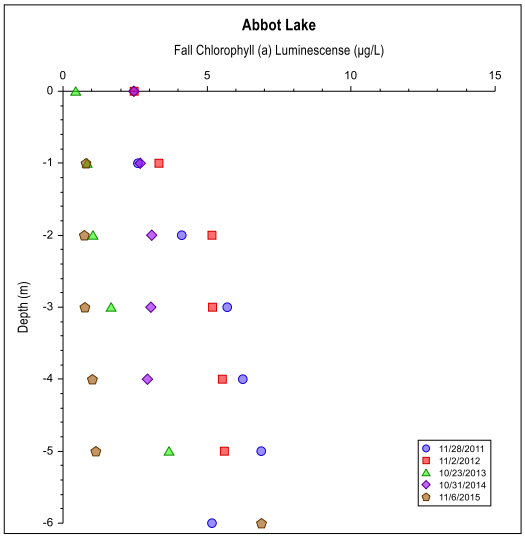


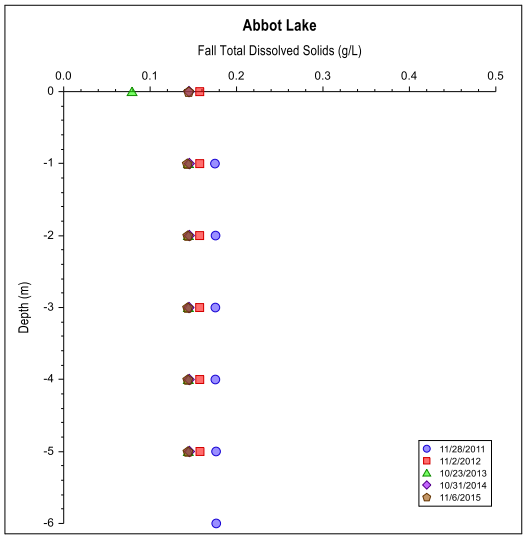


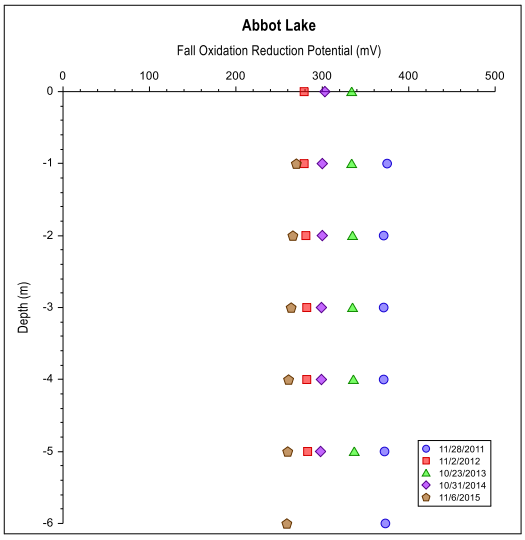
Abbot Lake Fall Hydrolab Profiles



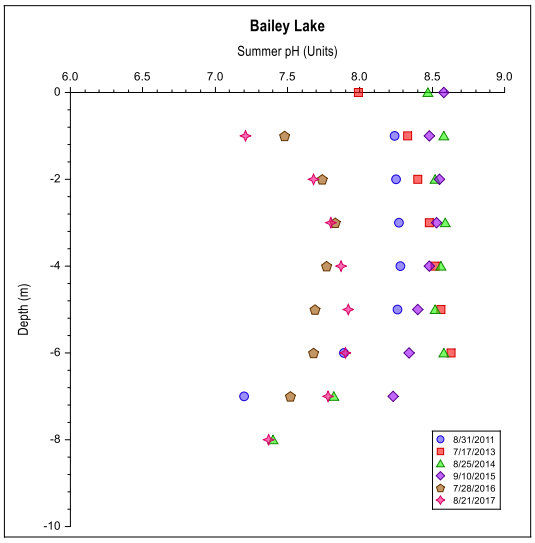


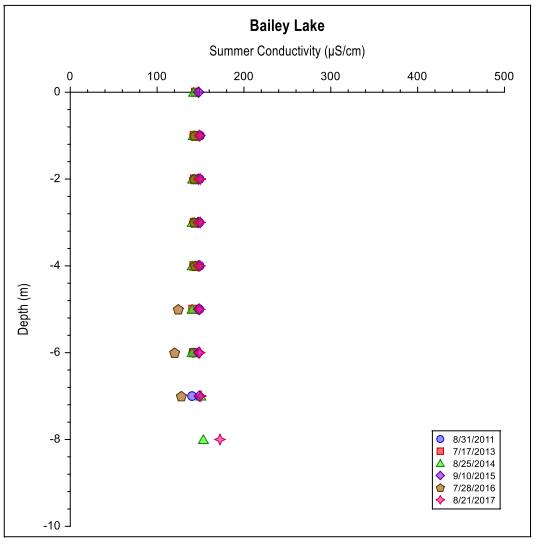


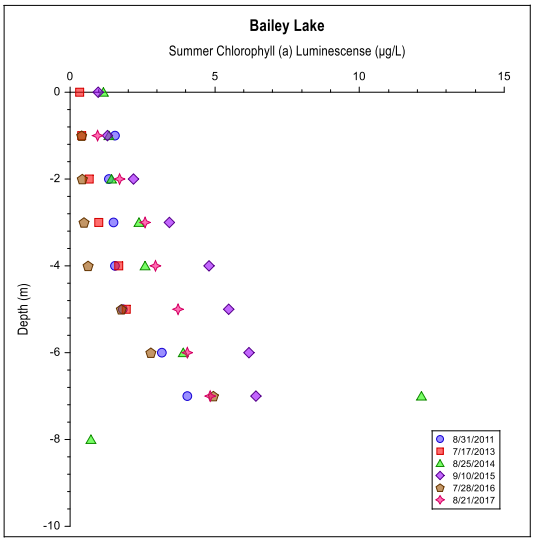


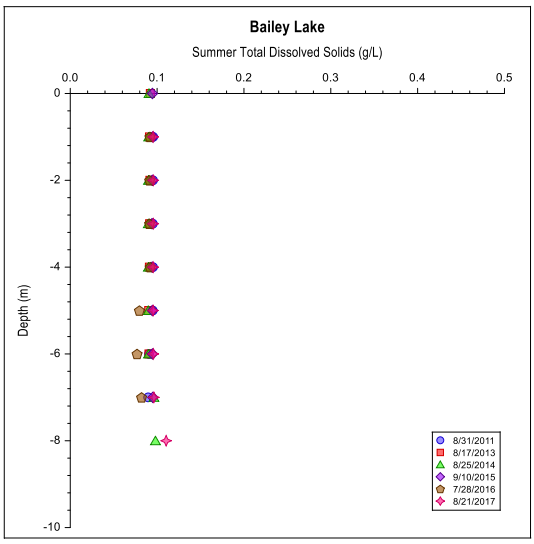


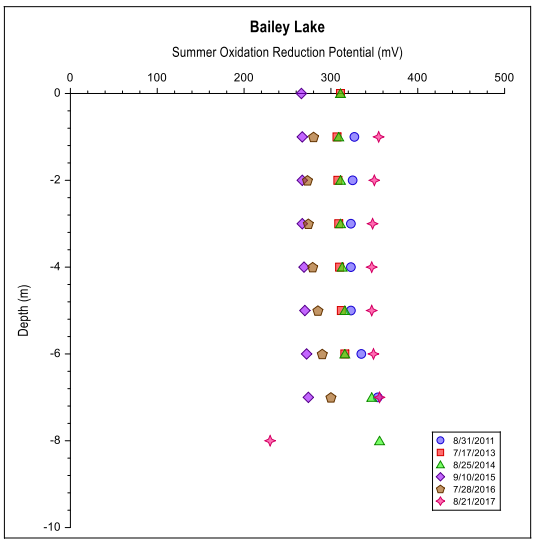
Bailey Lake Summer Hydrolab Profiles



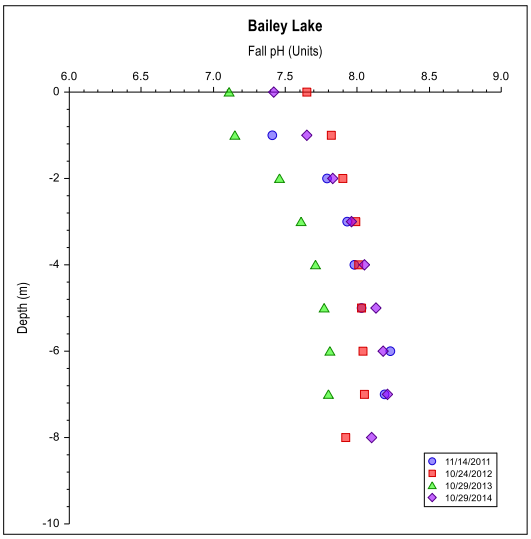


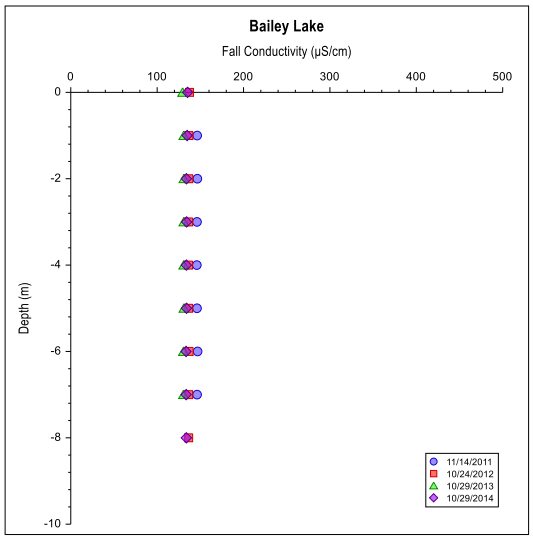


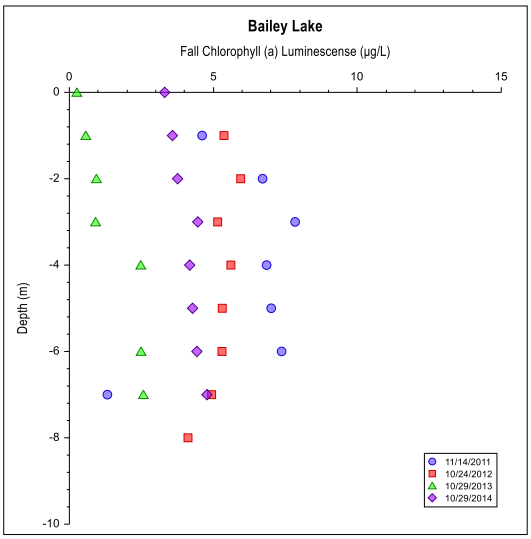


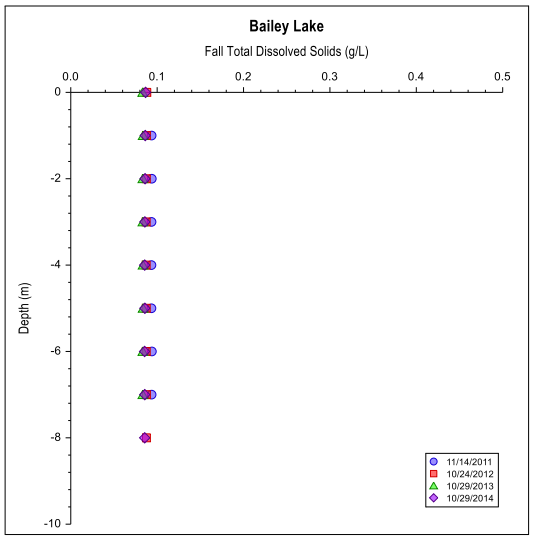


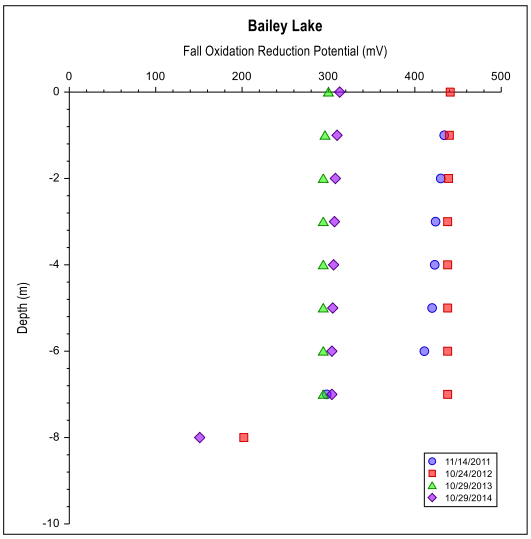
Bailey Lake Fall Hydrolab Profiles



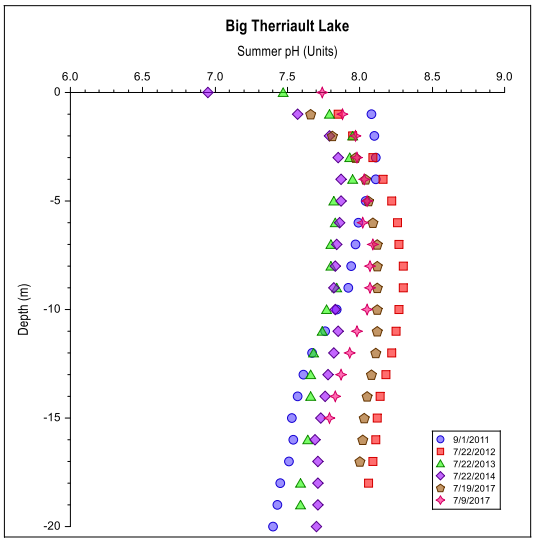


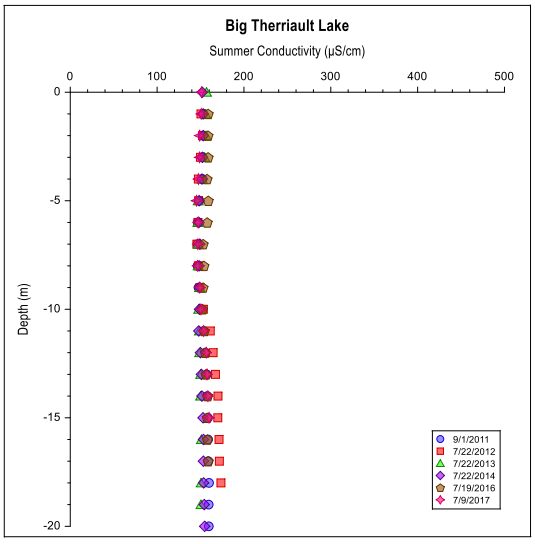


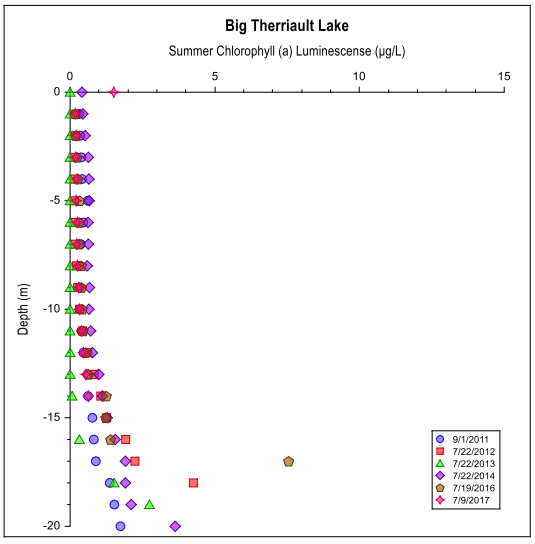


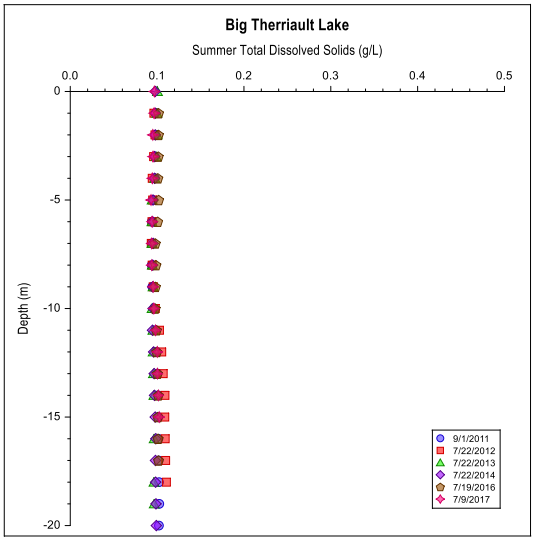


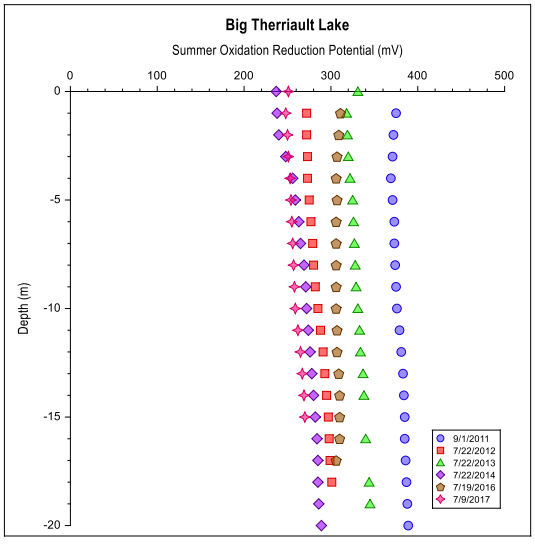
Big Therriault Lake Summer Hydrolab Profiles



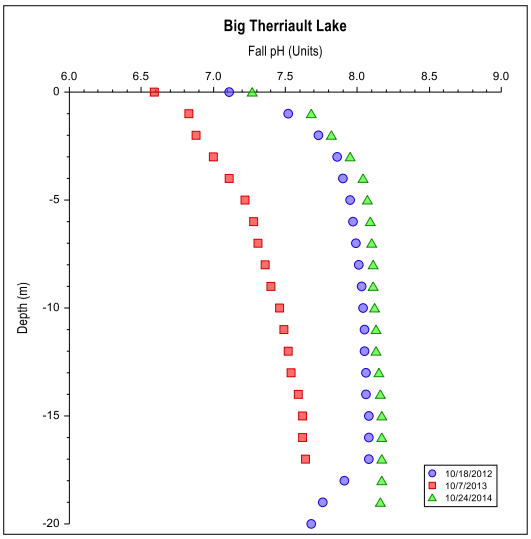


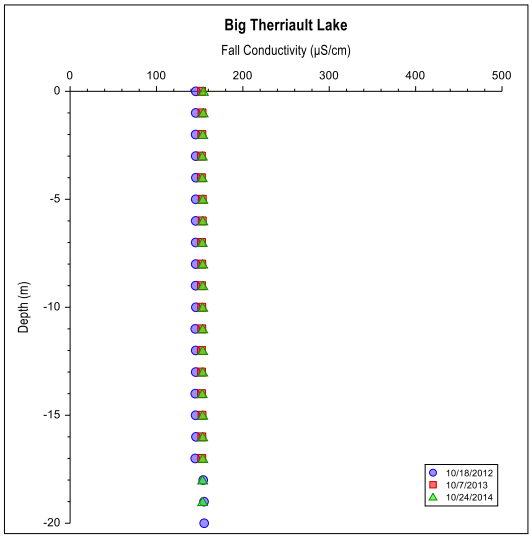


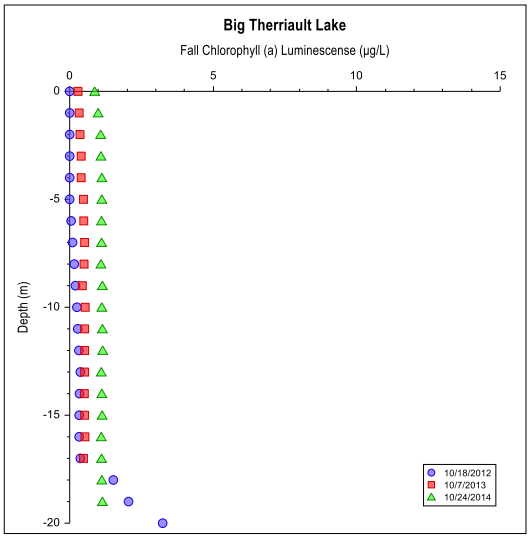


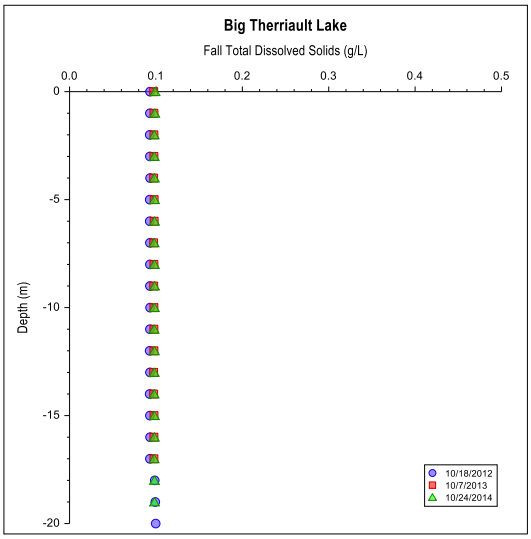


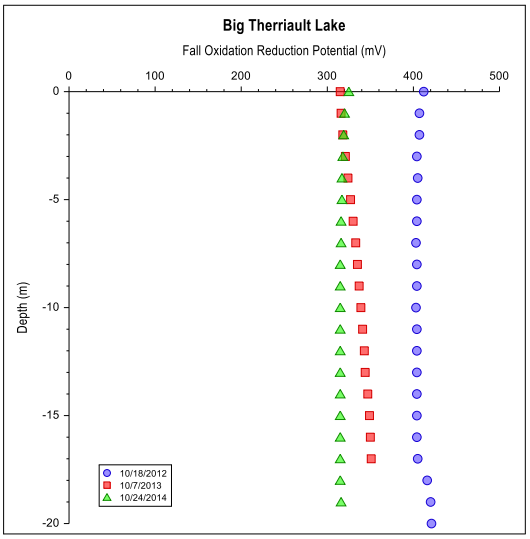
Big Therriault Lake Fall Hydrolab Profiles



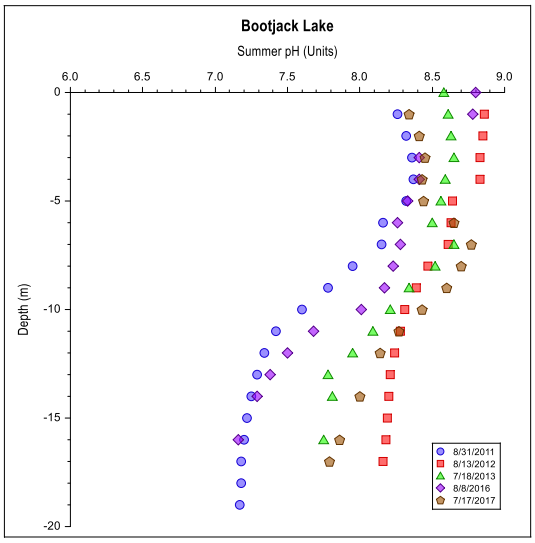


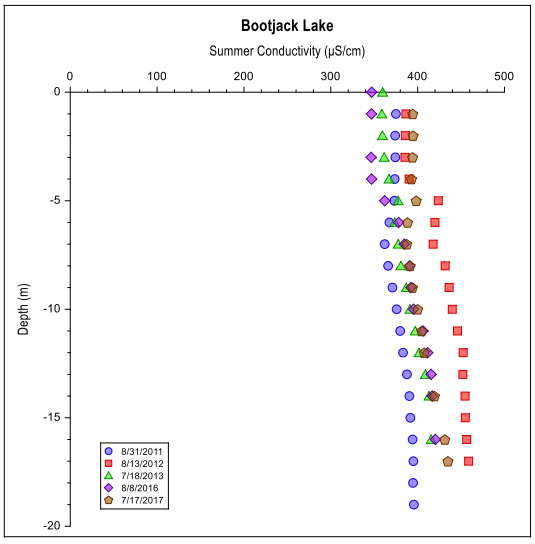


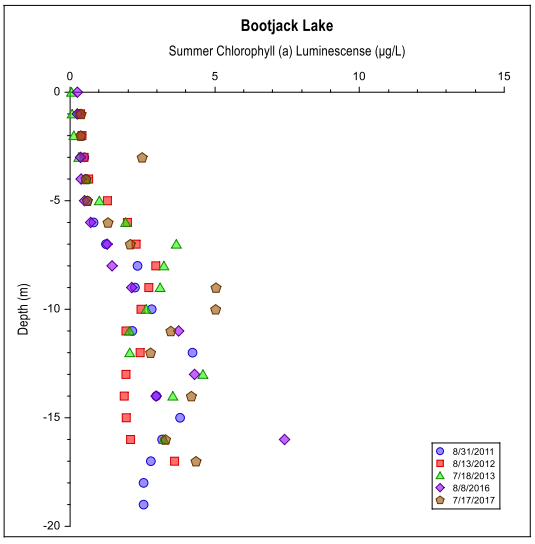


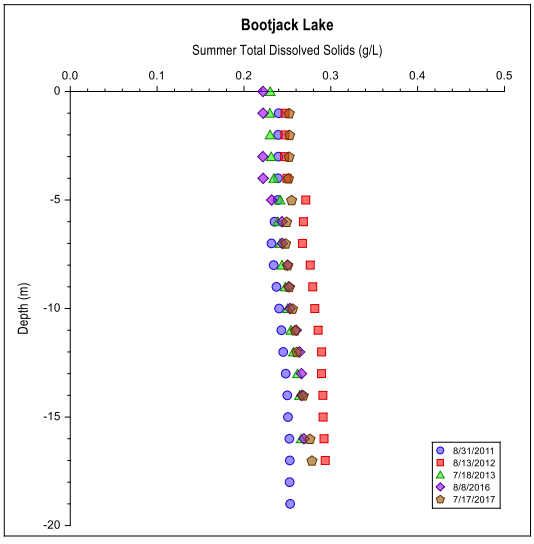


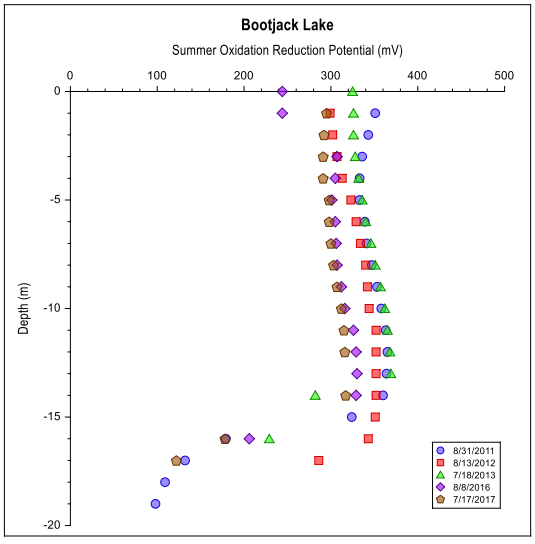
Bootjack Lake Summer Hydrolab Profiles



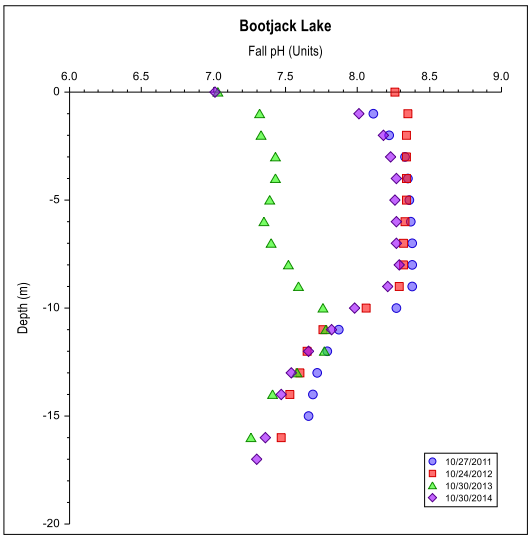


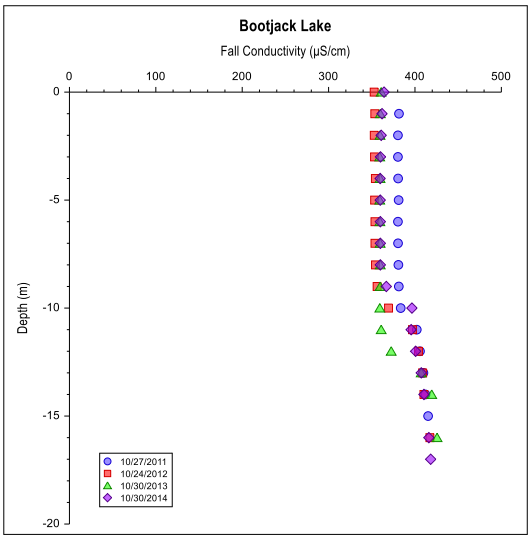


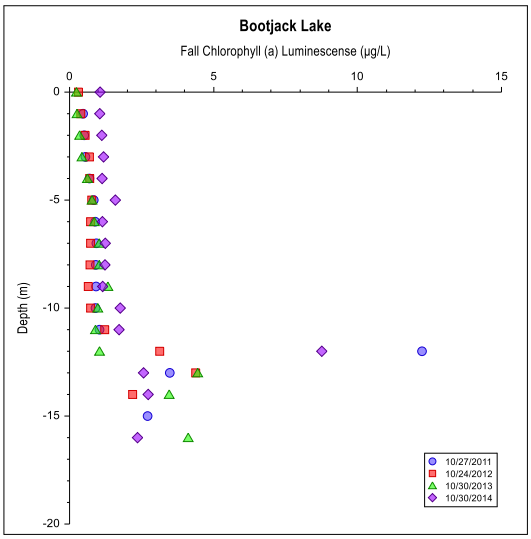


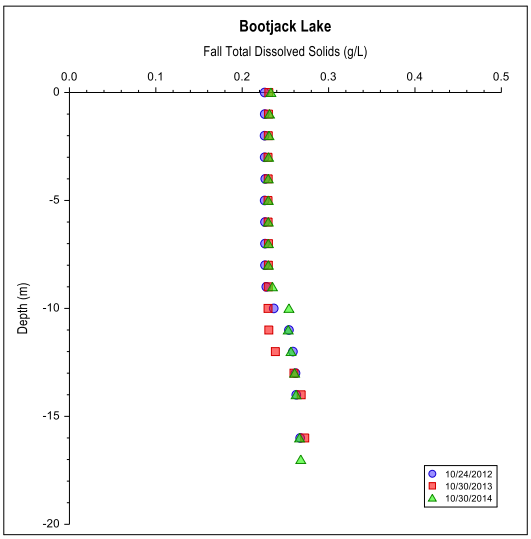


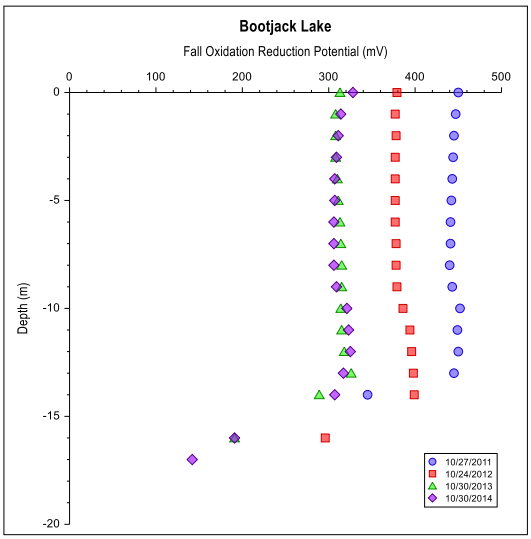
Bootjack Lake Fall Hydrolab Profiles



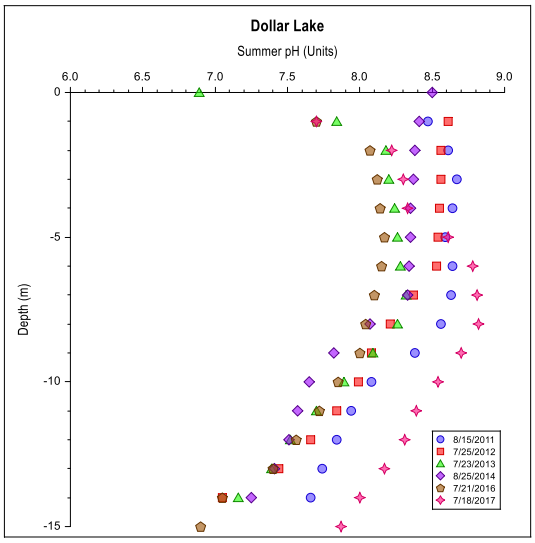


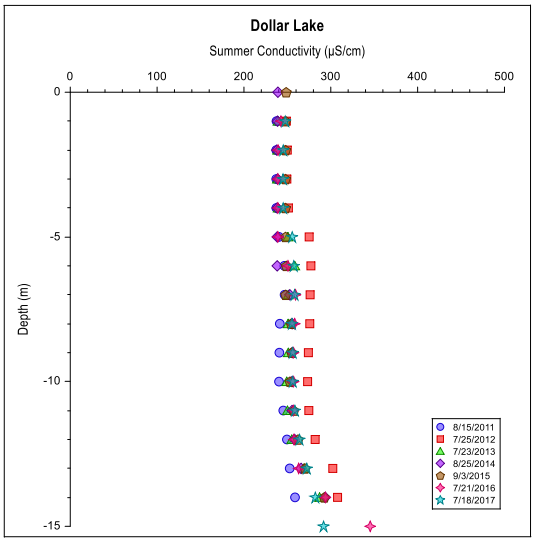


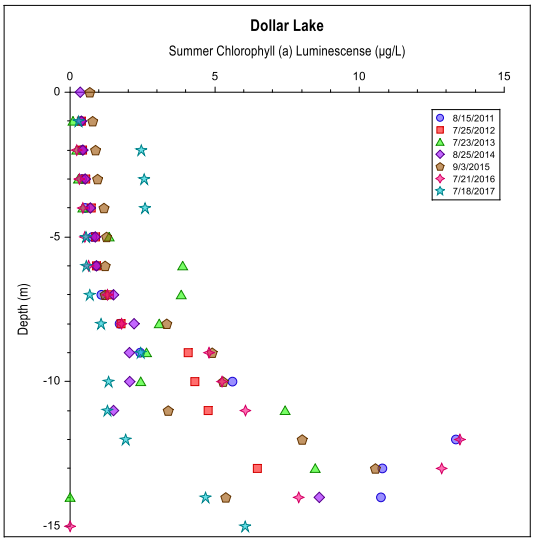


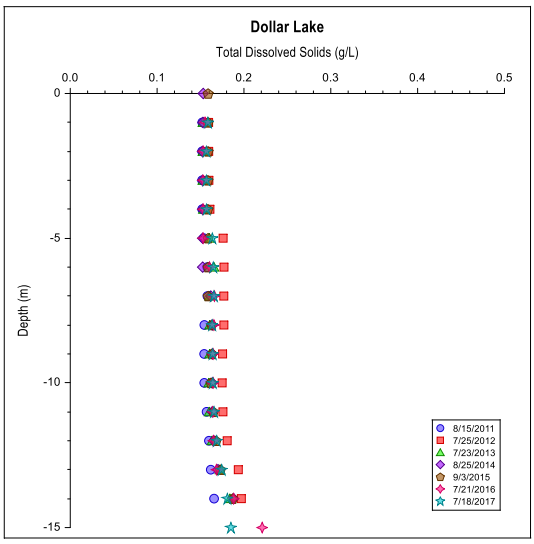


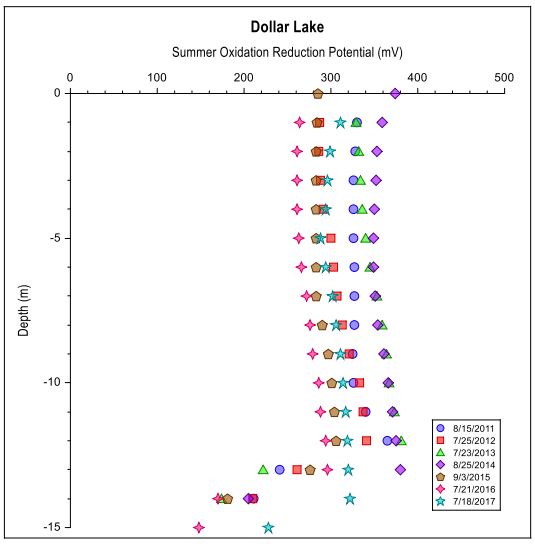
Dollar Lake Summer Hydrolab Profiles



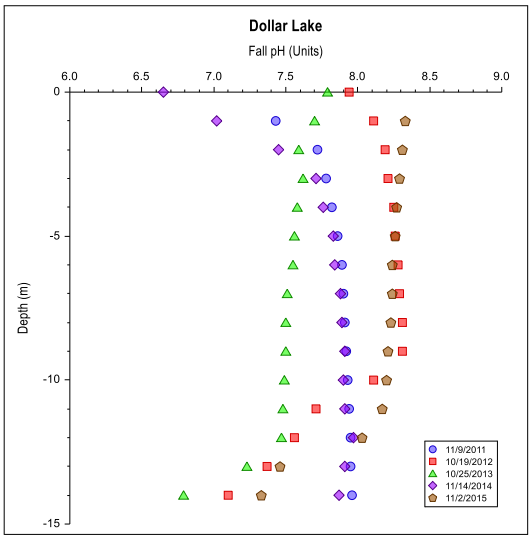


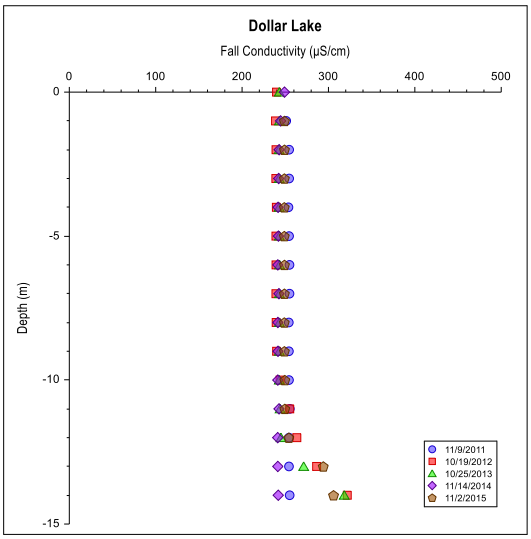


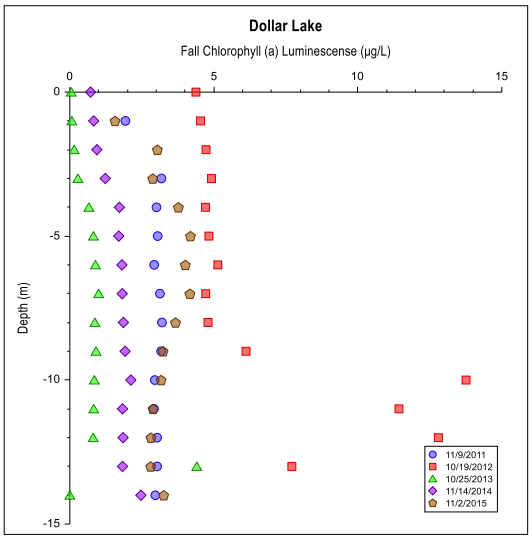


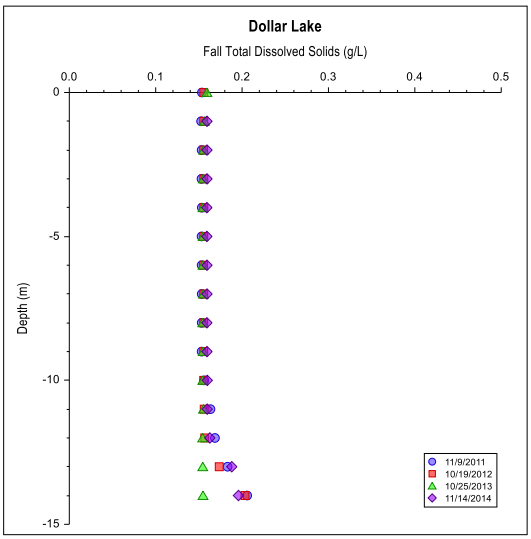


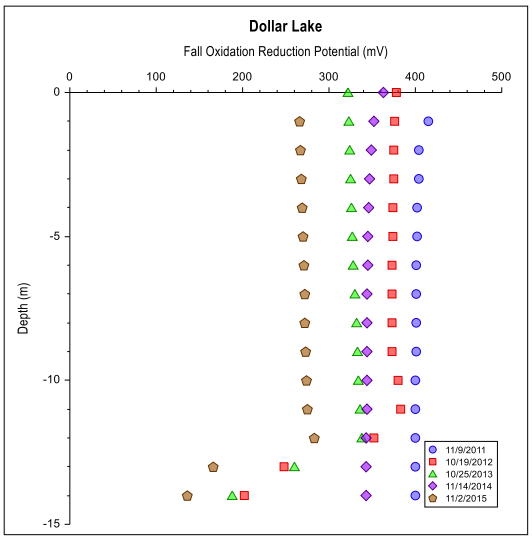
Dollar Lake Fall Hydrolab Profiles



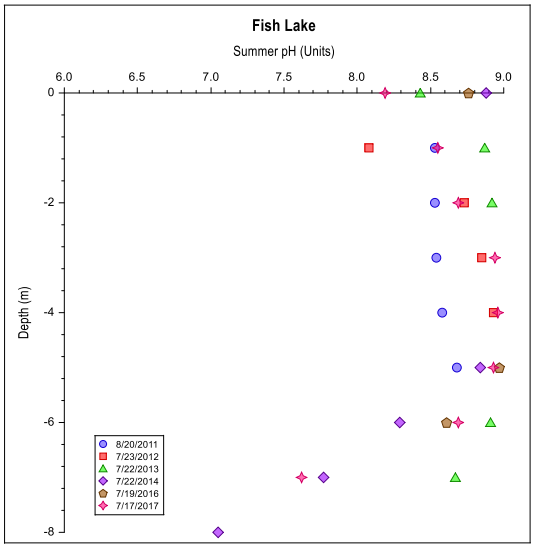


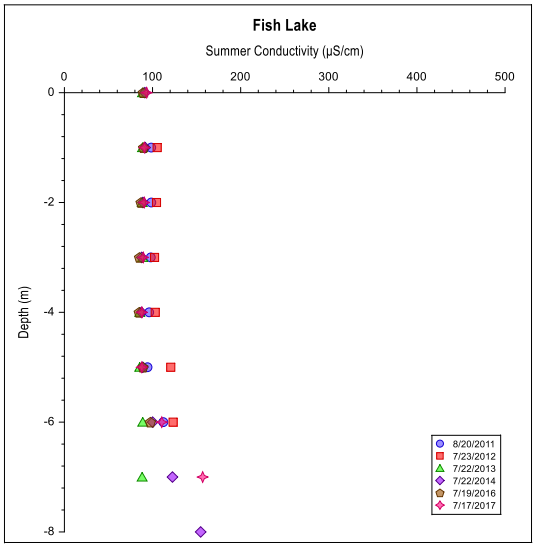


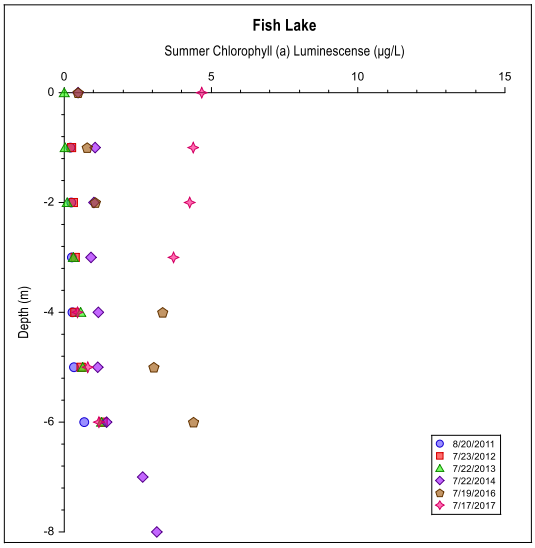


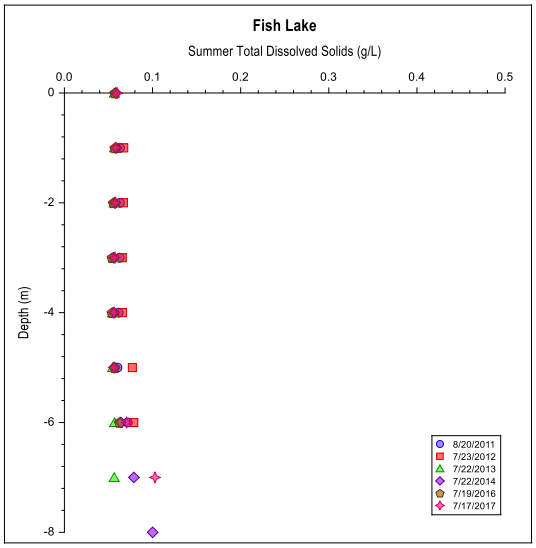


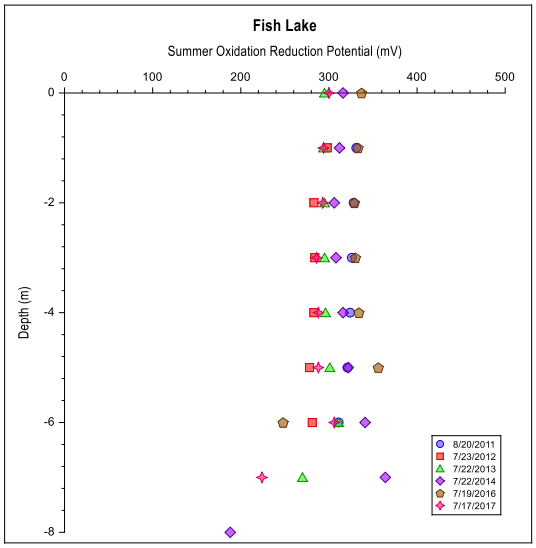
Fish Lake Summer Hydrolab Profiles



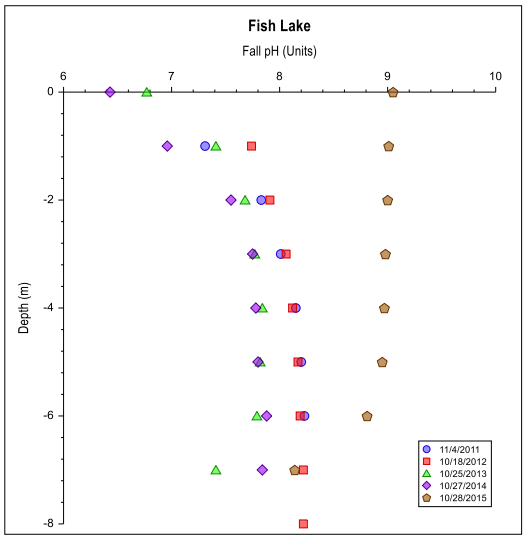


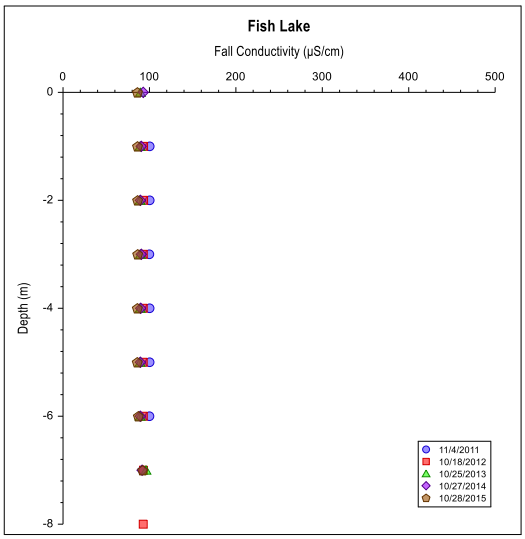


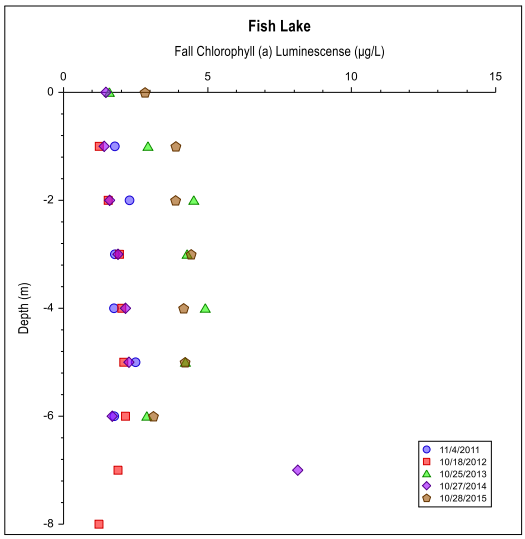


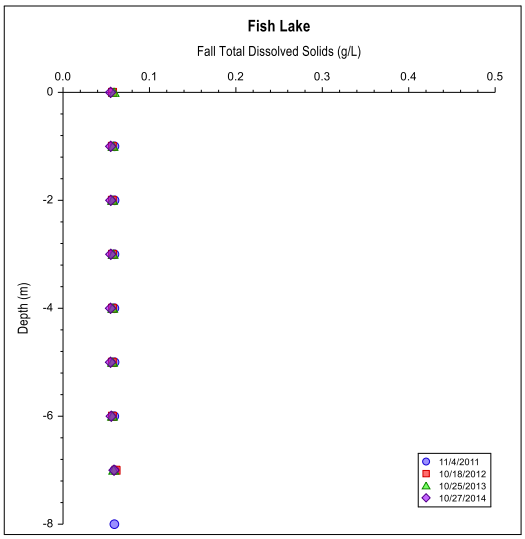


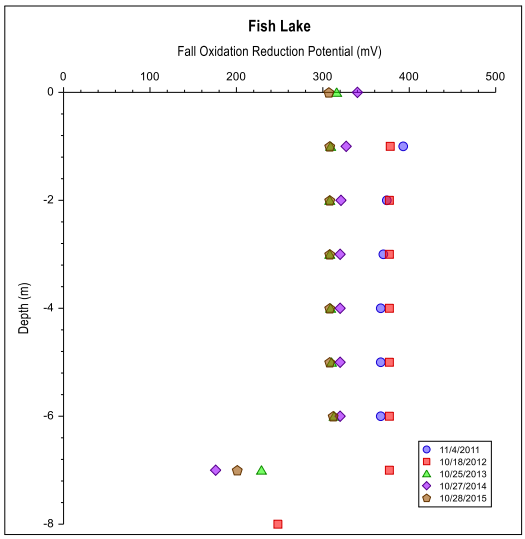
Fish Lake Fall Hydrolab Profiles



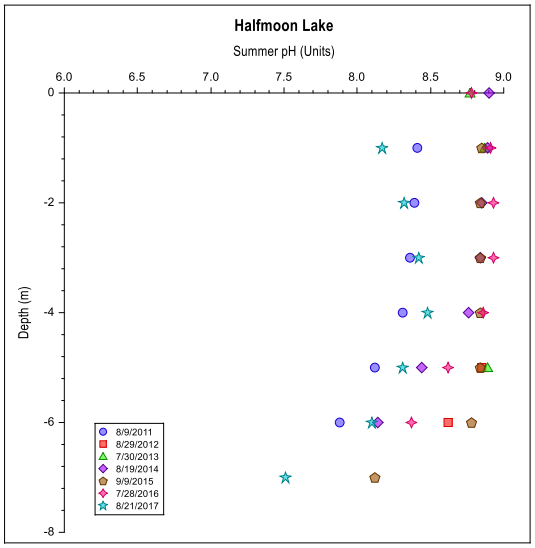


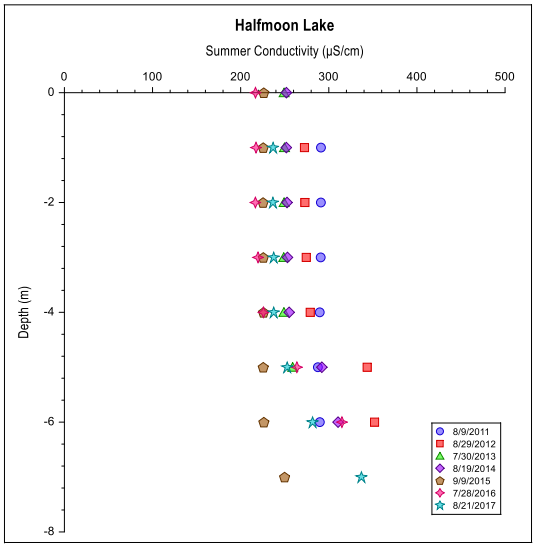


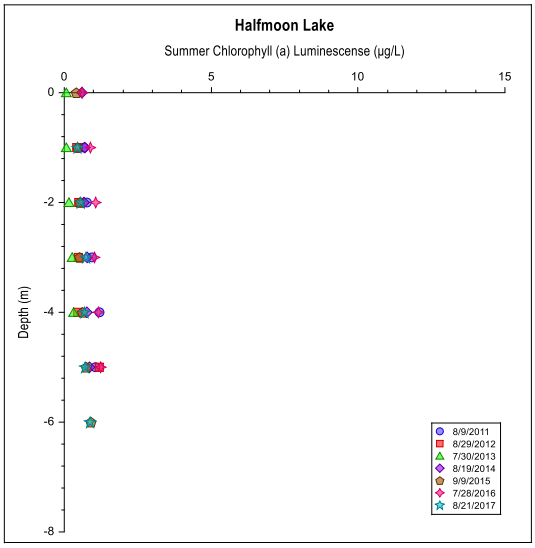


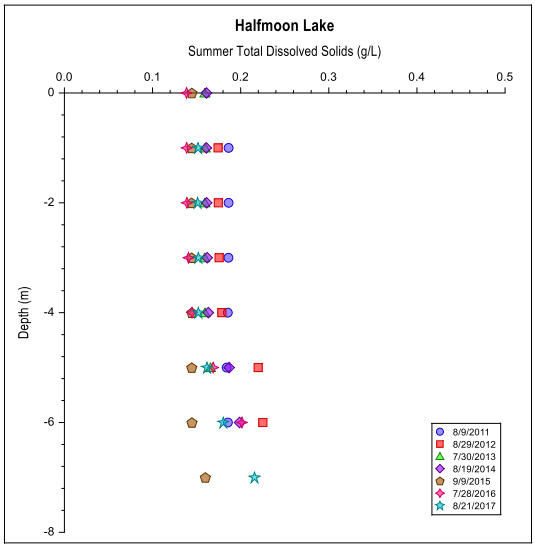


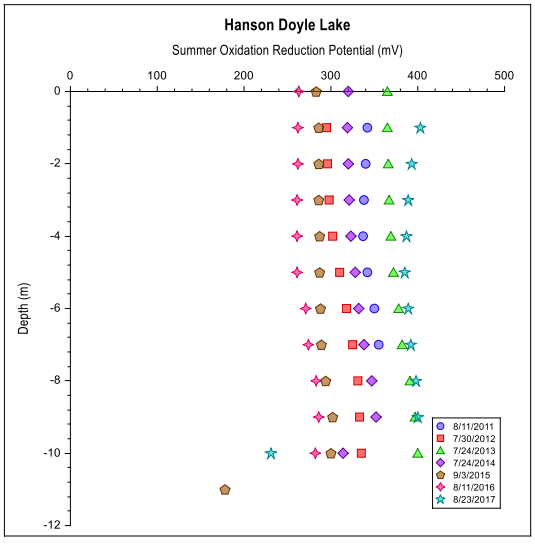
Halfmoon Lake Summer Hydrolab Profiles



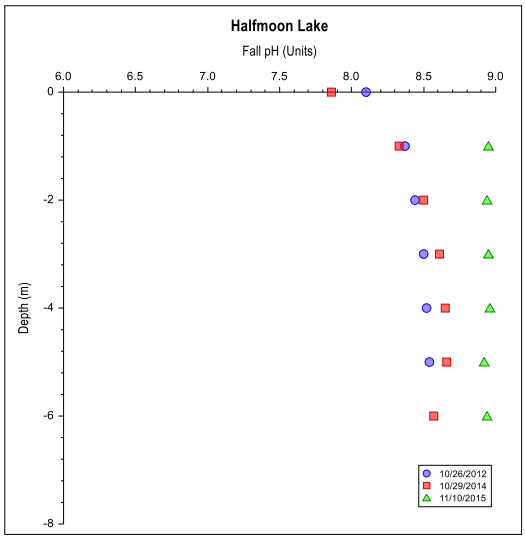


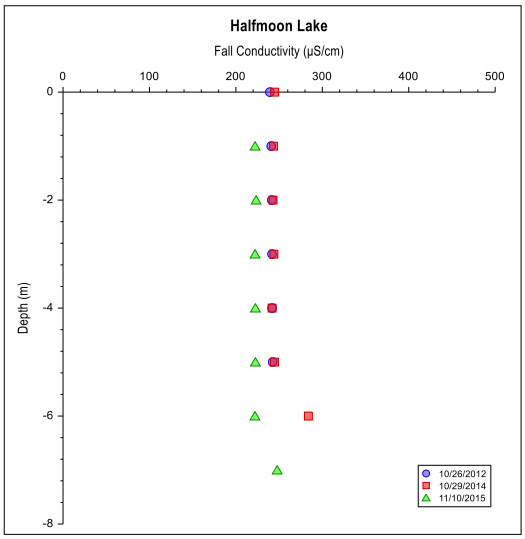


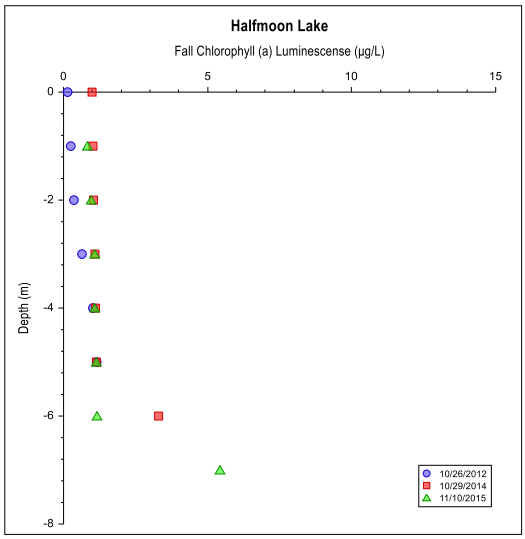


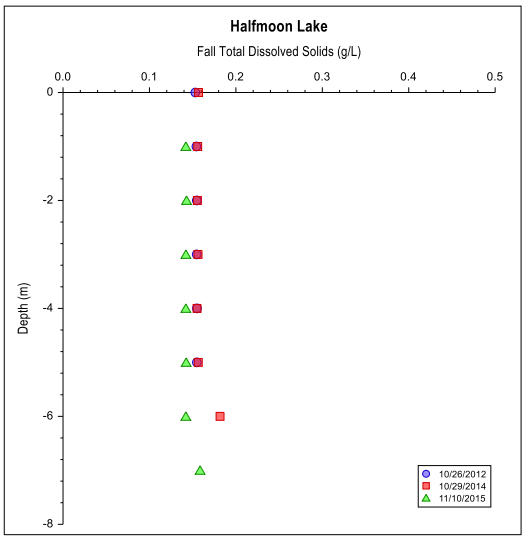


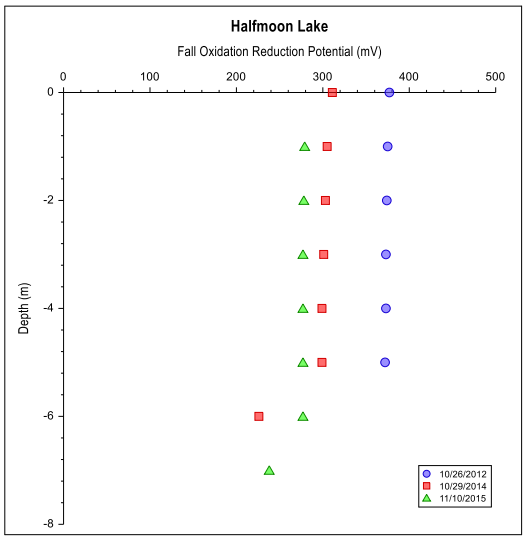
Halfmoon Lake Fall Hydrolab Profiles



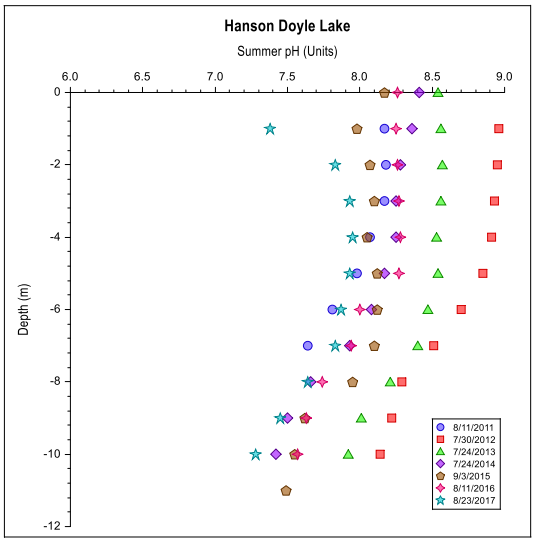


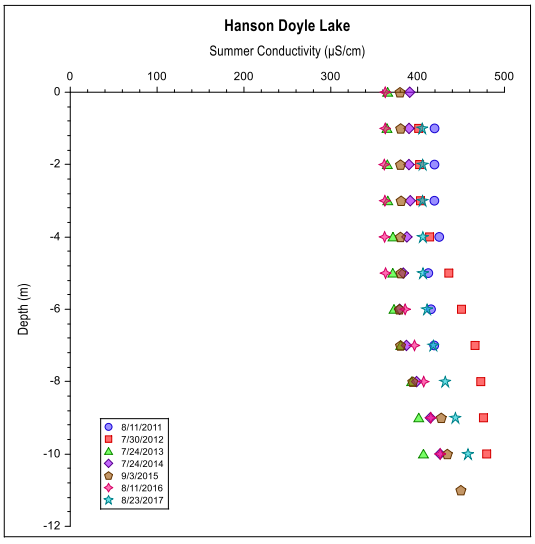


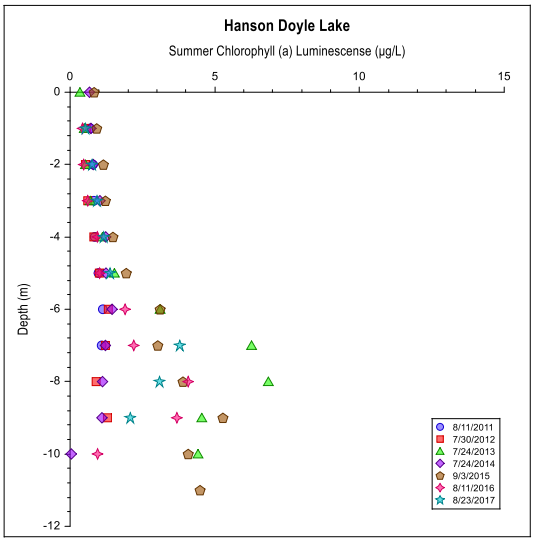


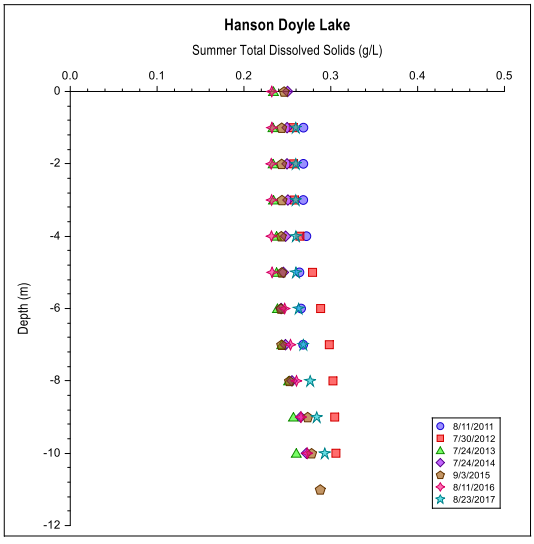


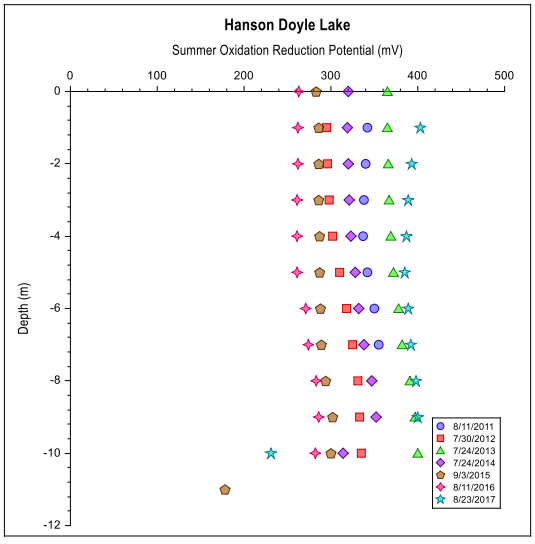
Hanson Doyle Lake Summer Hydrolab Profiles



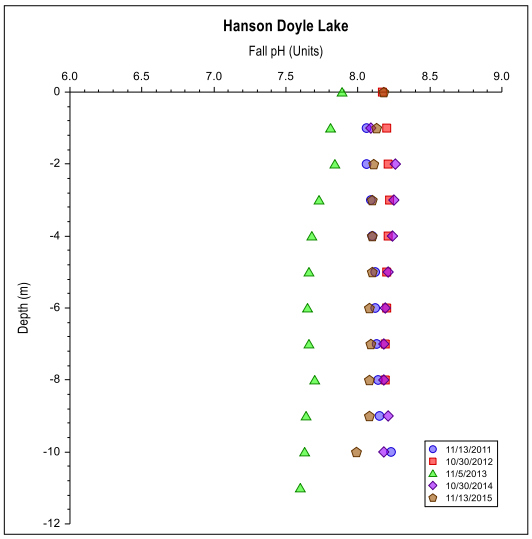


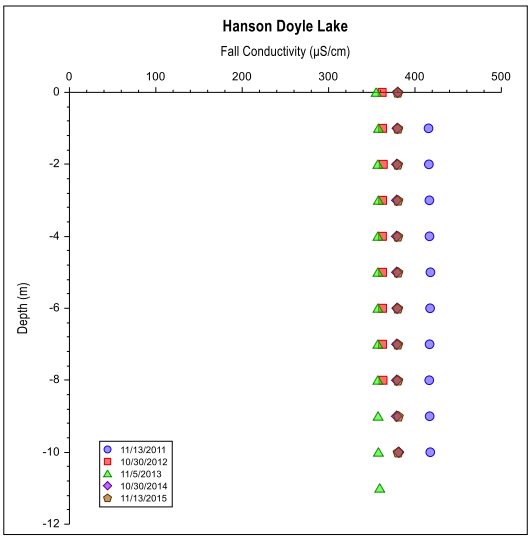


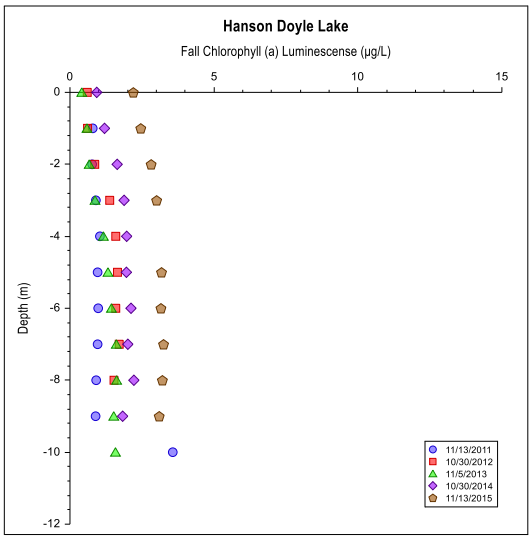


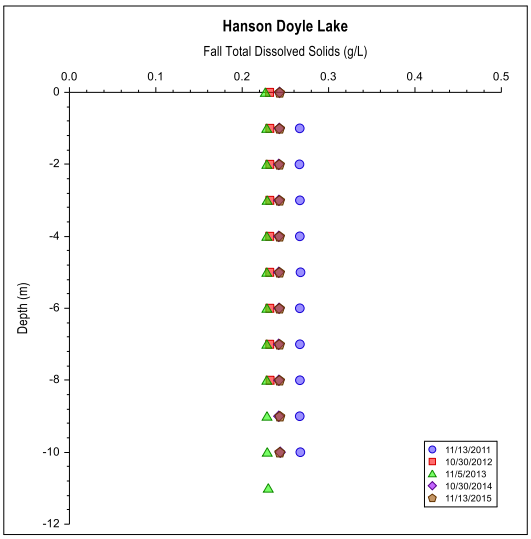


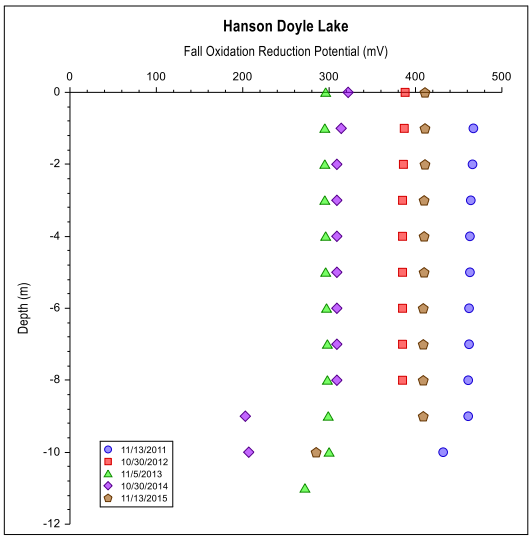
Hanson Doyle Lake Fall Hydrolab Profiles



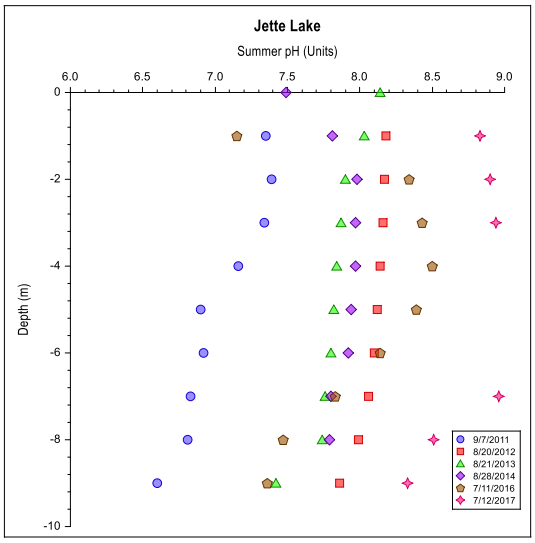


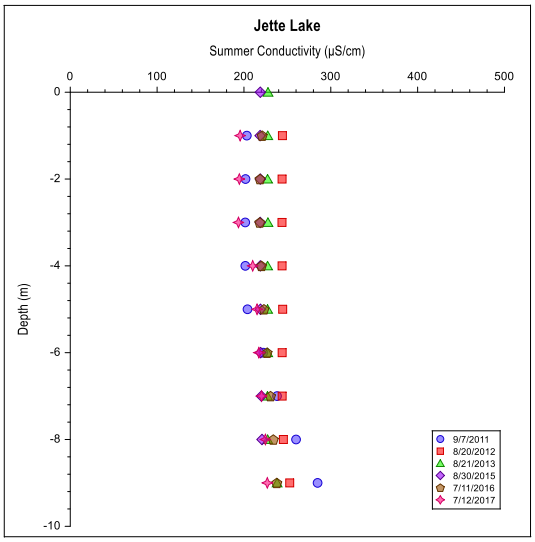


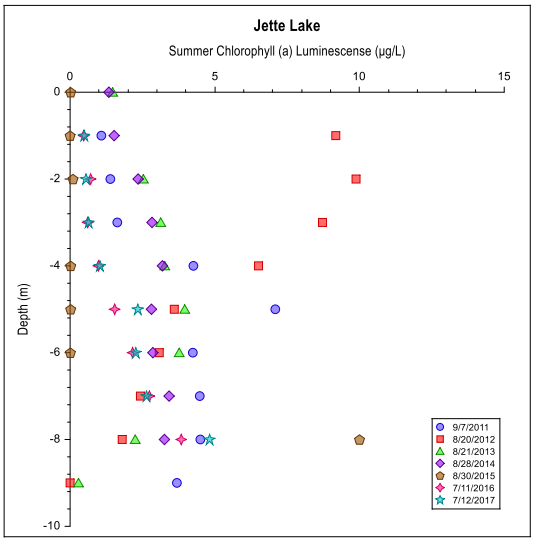


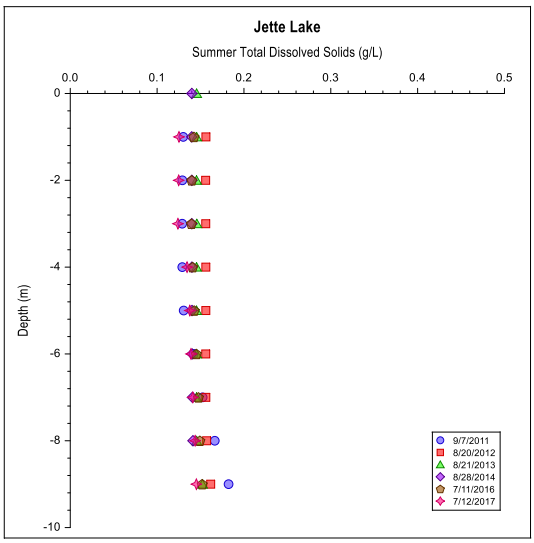


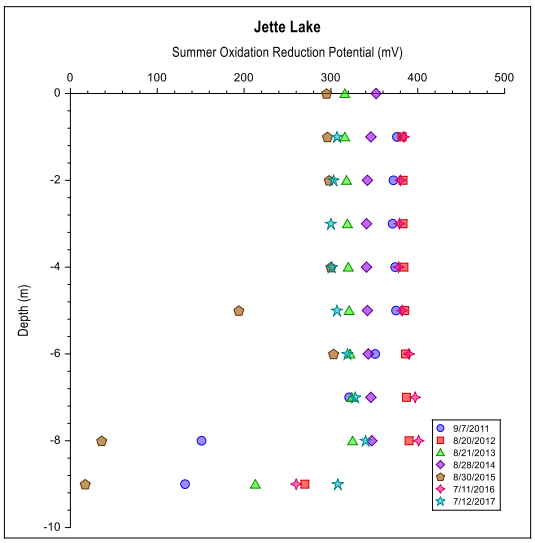
Jette Lake Summer Hydrolab Profiles



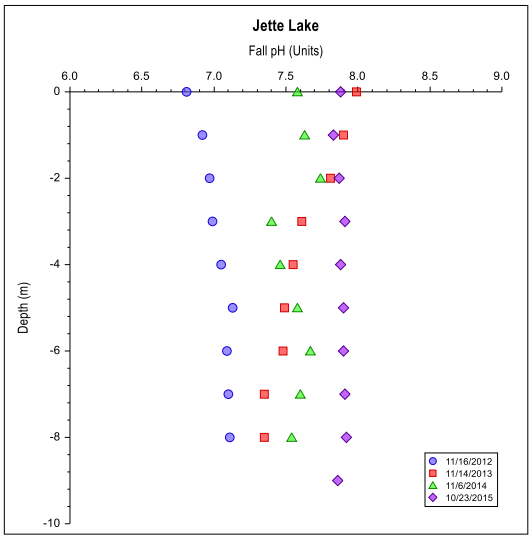


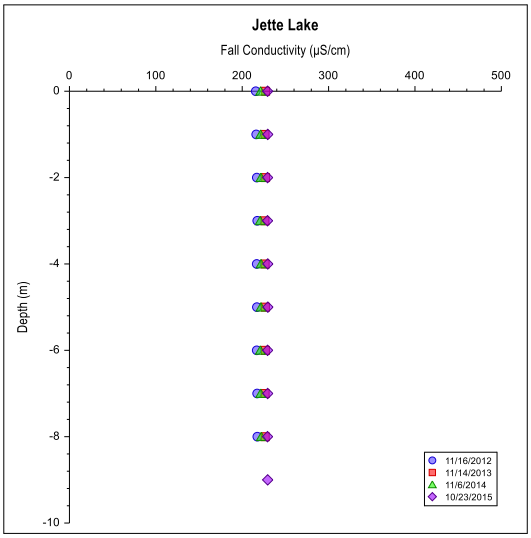


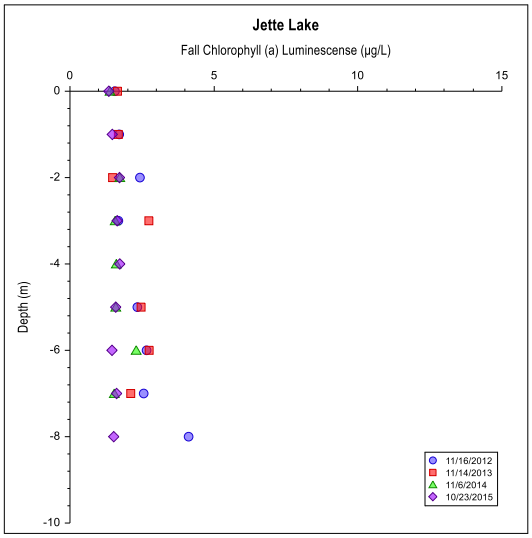


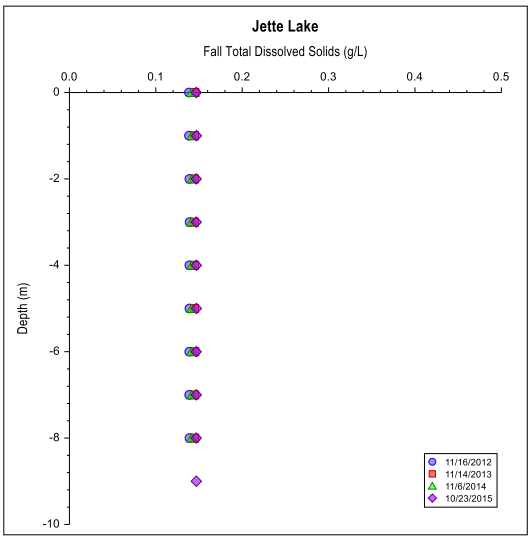


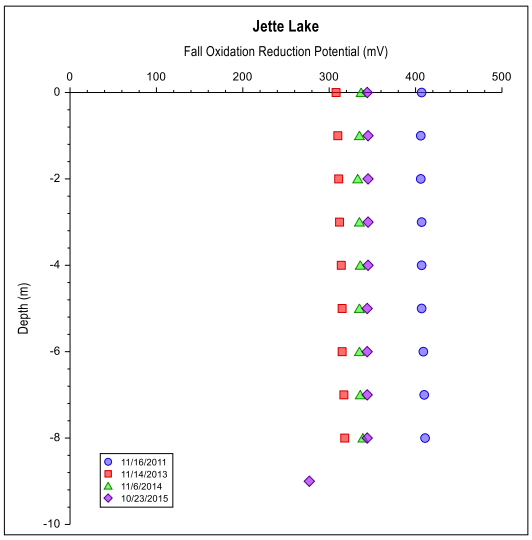
Jette Lake Fall Hydrolab Profiles



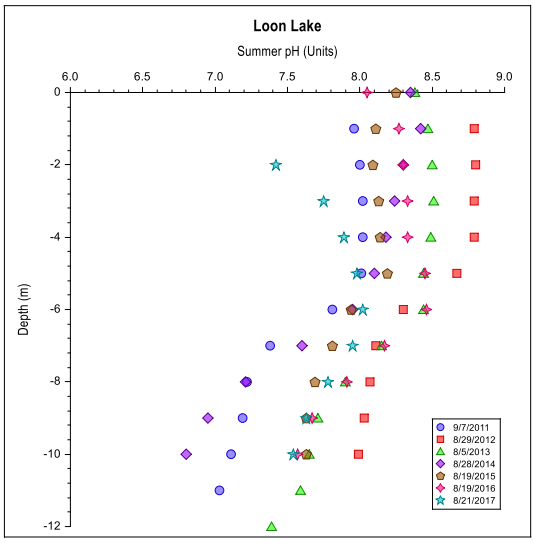


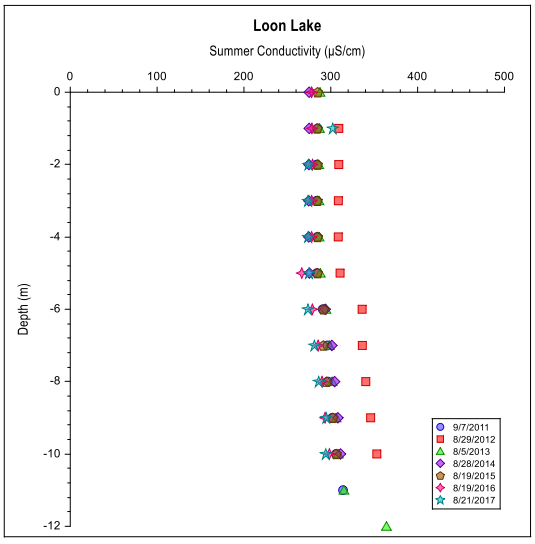


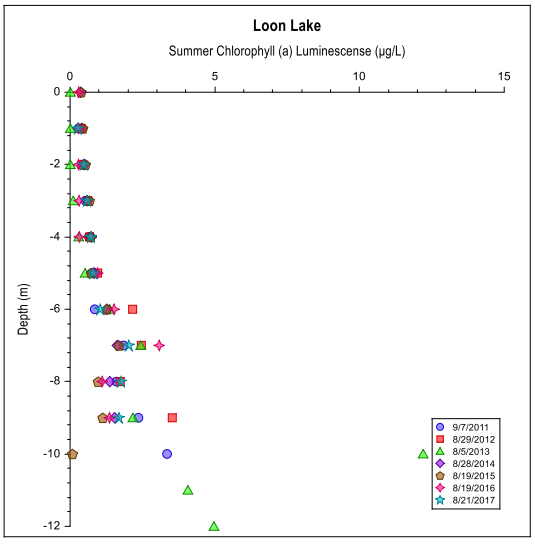


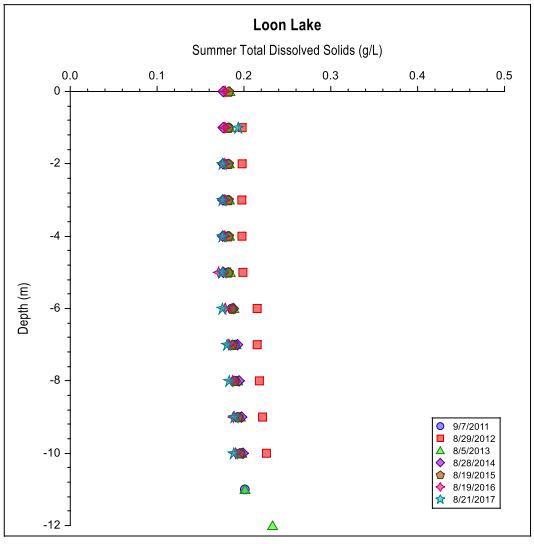


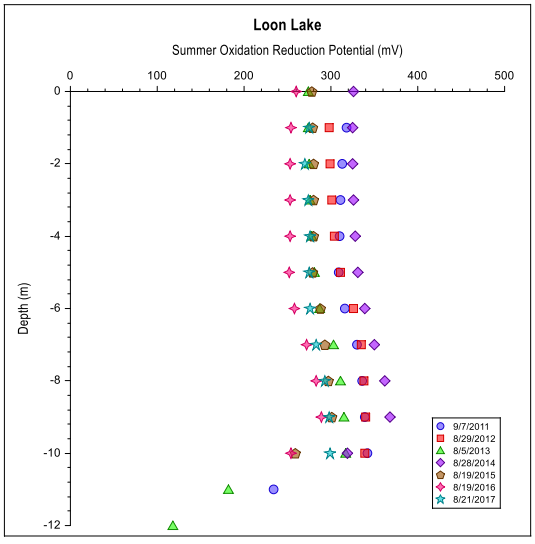
Loon Lake Summer Hydrolab Profiles



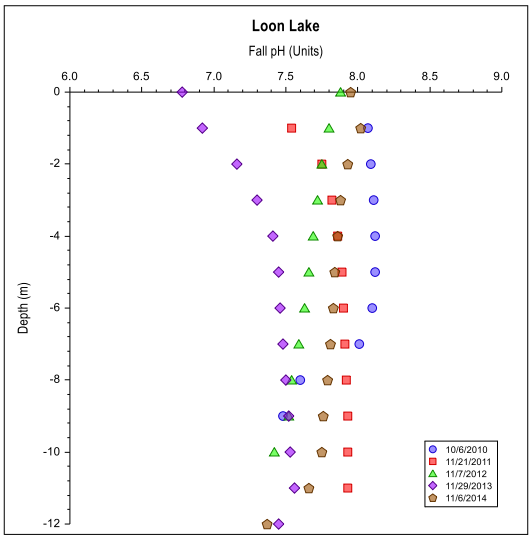


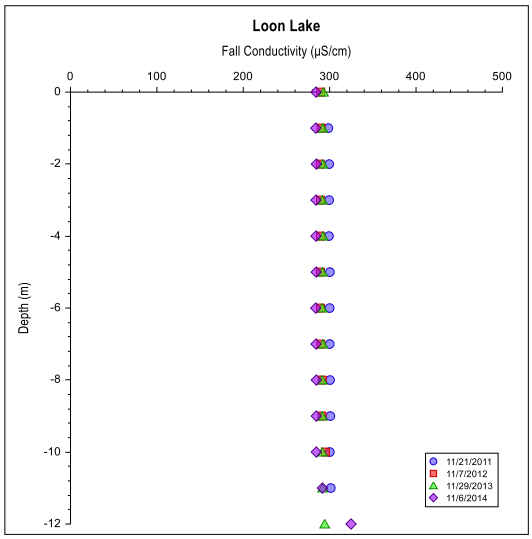


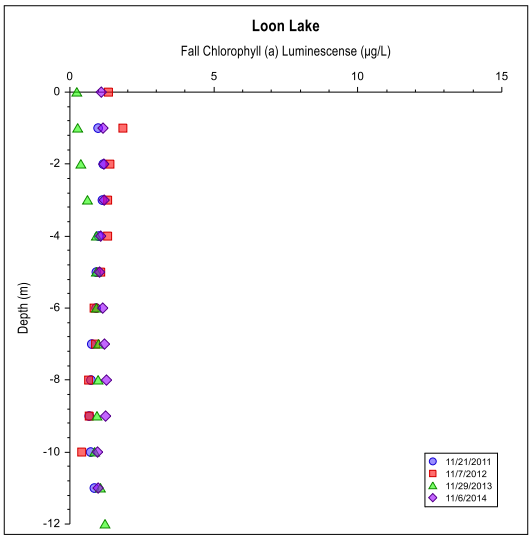


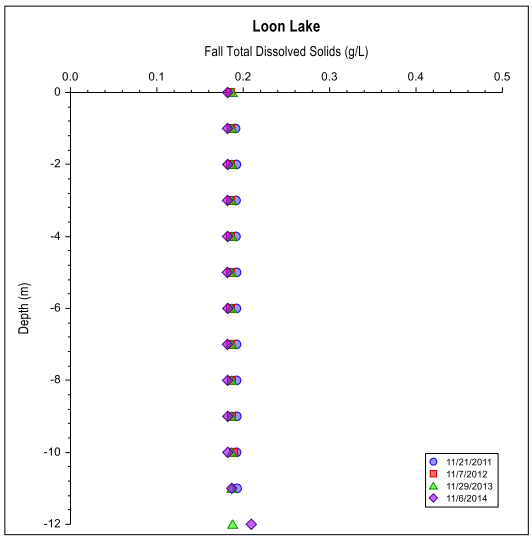


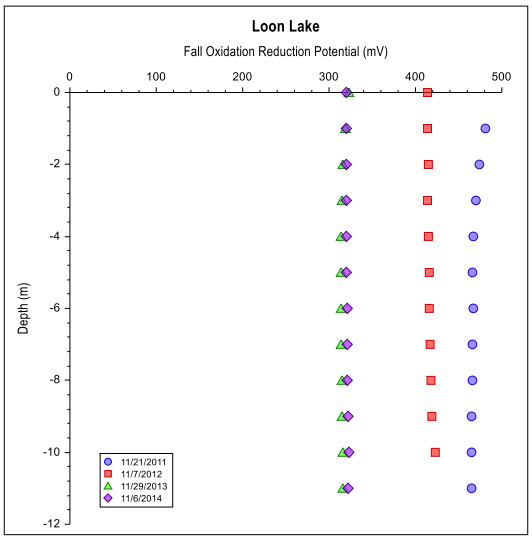
Loon Lake Fall Hydrolab Profiles



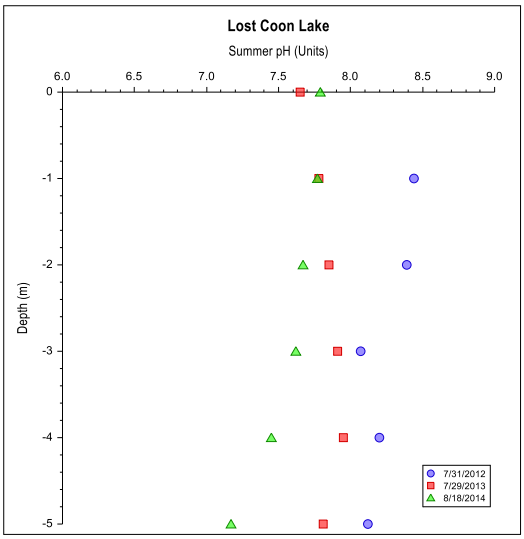


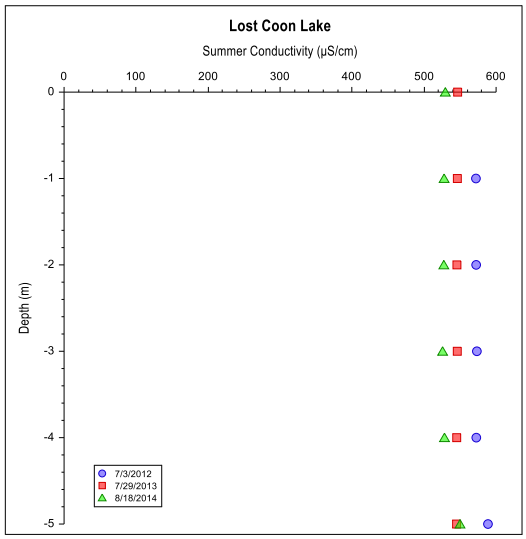


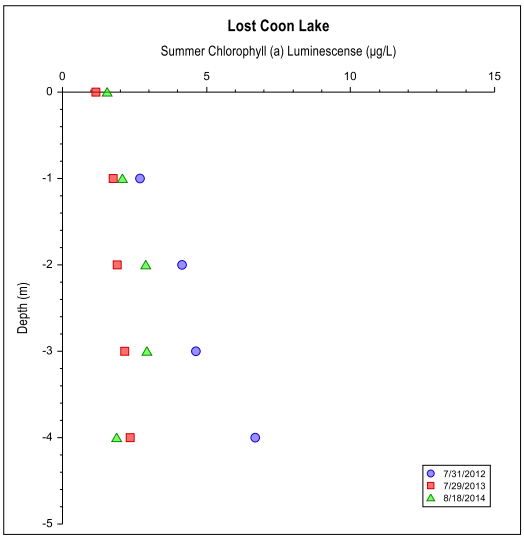


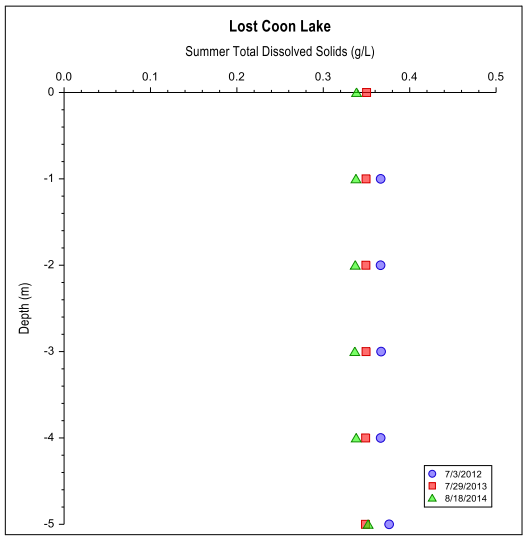


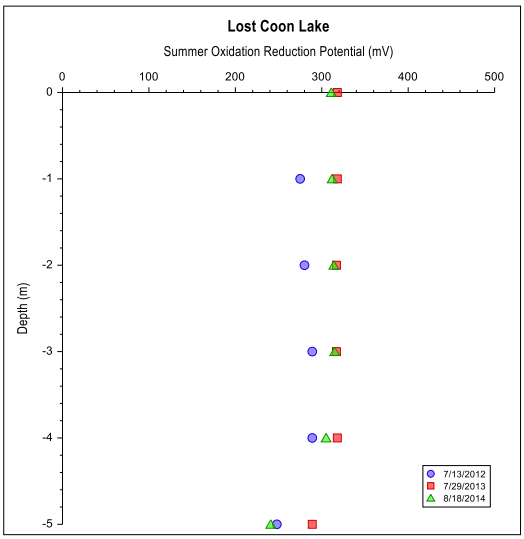
Lost Coon Lake Summer Hydrolab Profiles



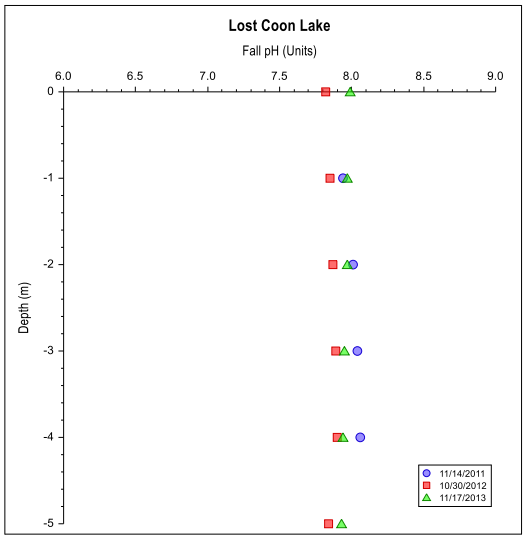


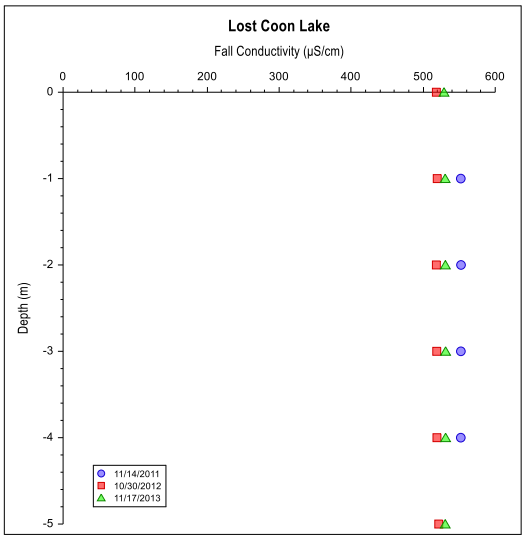


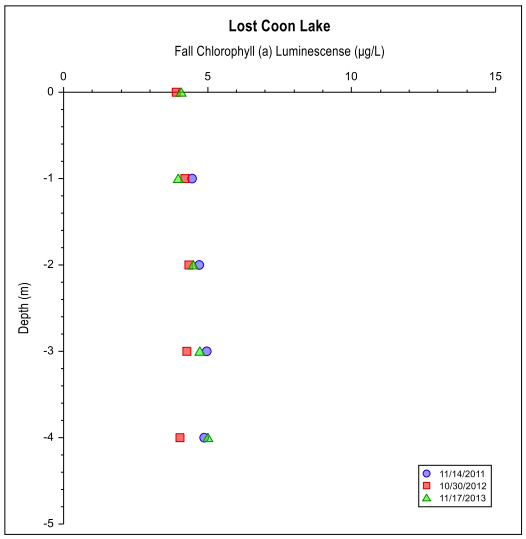


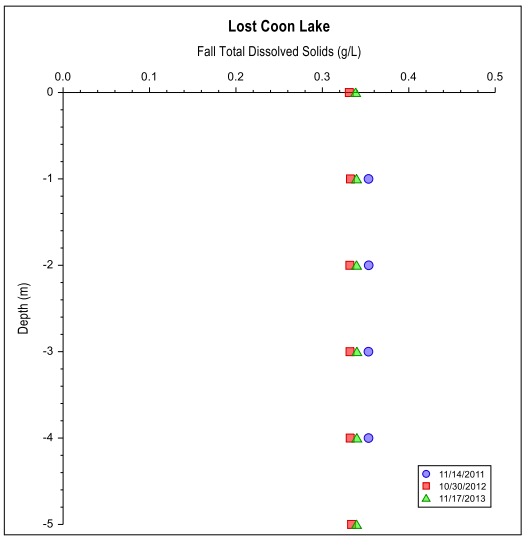


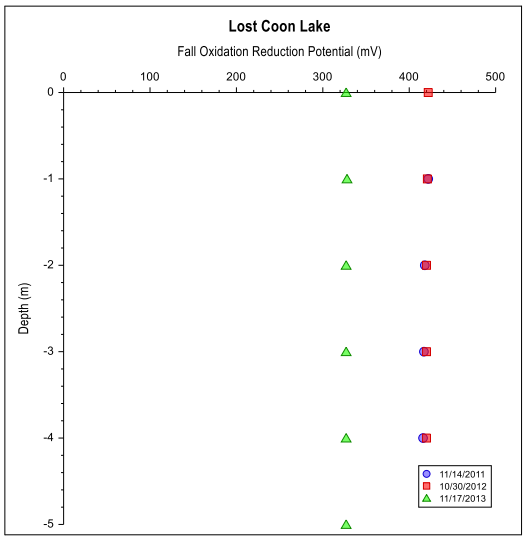
Lost Coon Lake Fall Hydrolab Profiles



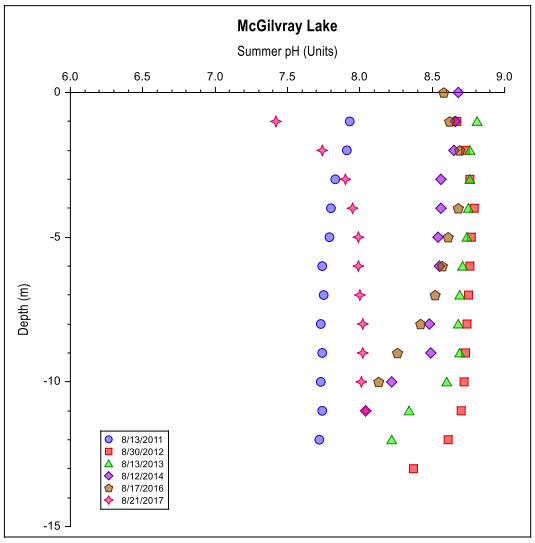


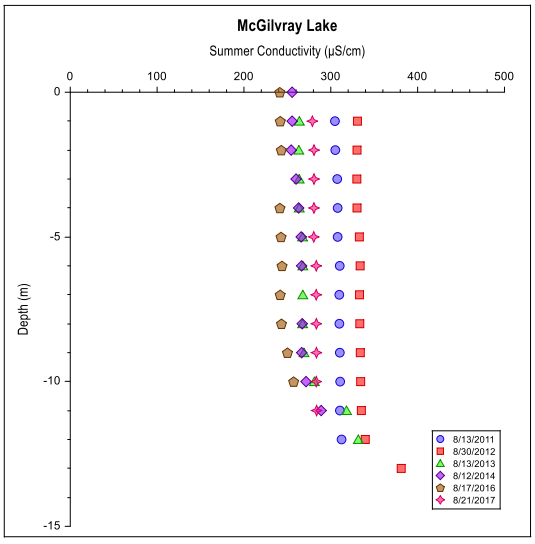


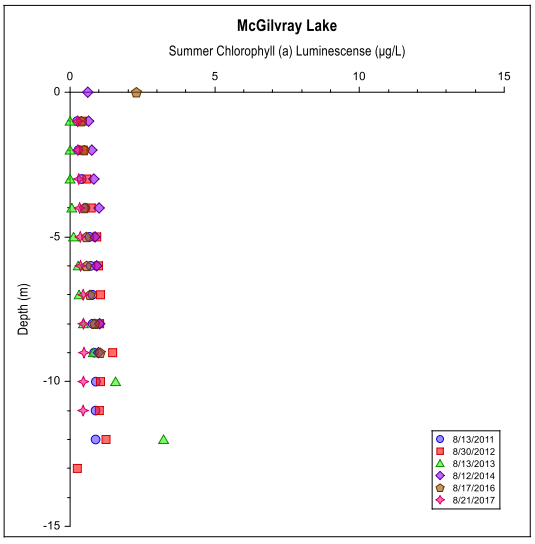


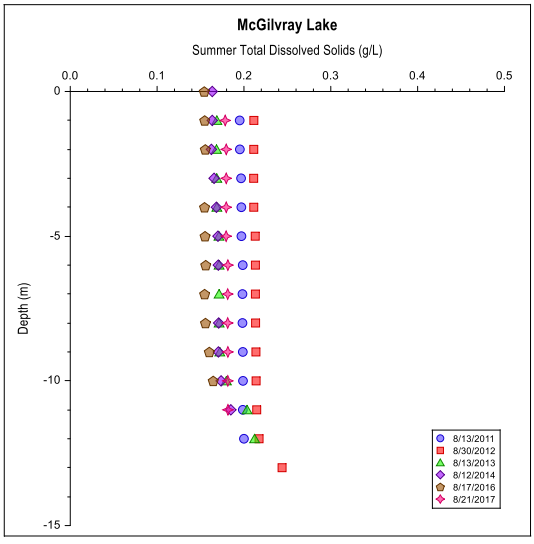


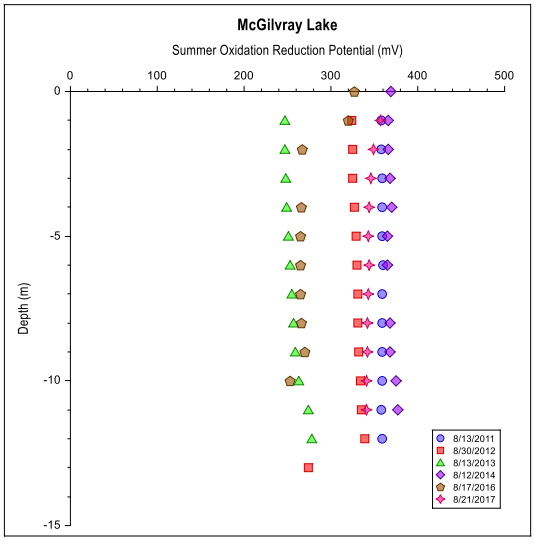
McGilvray Lake Summer Hydrolab Profiles



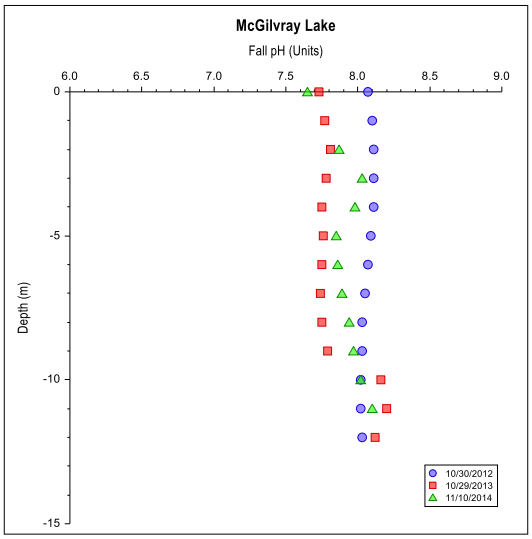


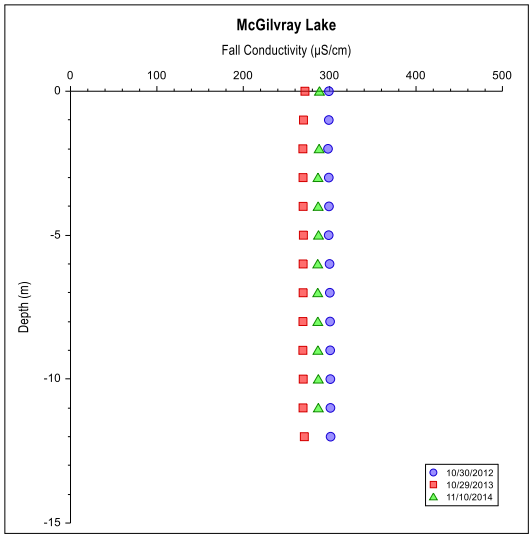


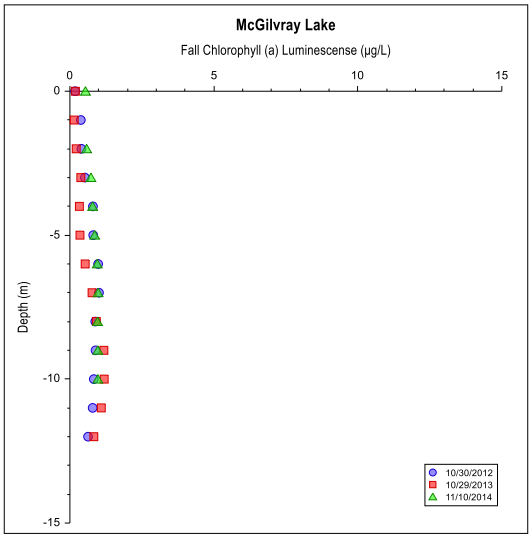


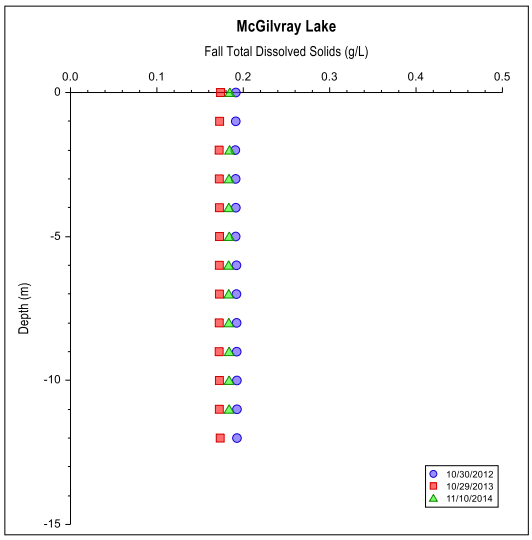


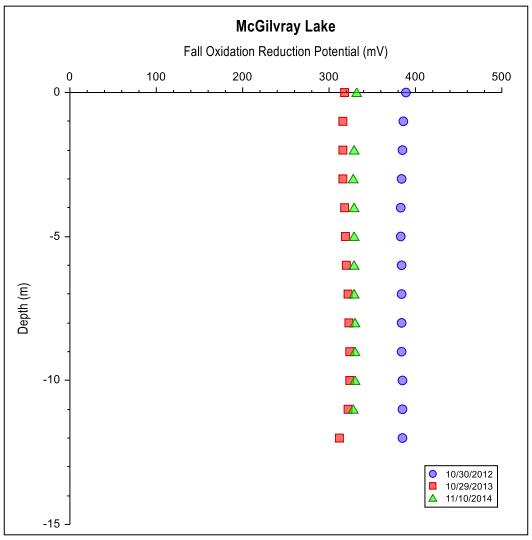
McGilvray Lake Fall Hydrolab Profiles



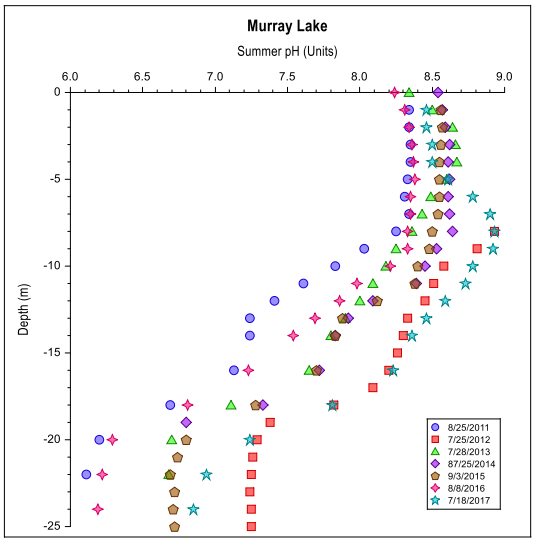


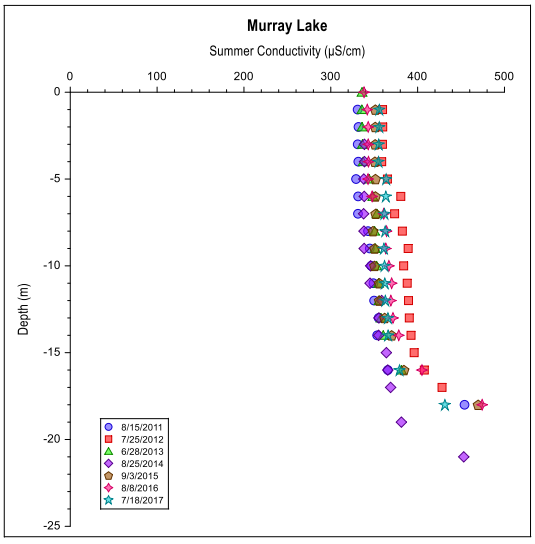


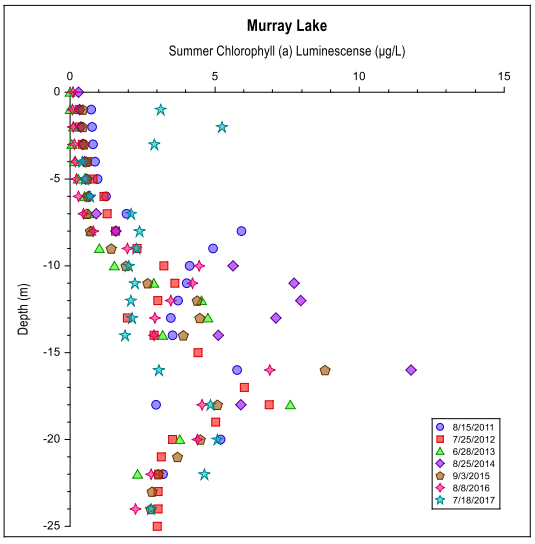


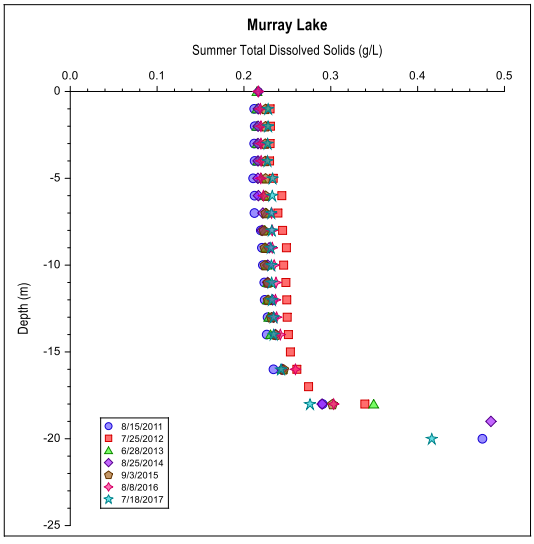


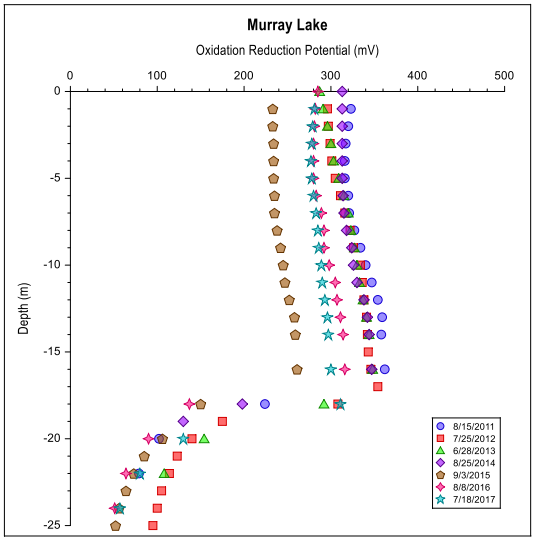
Murray Lake Summer Hydrolab Profiles



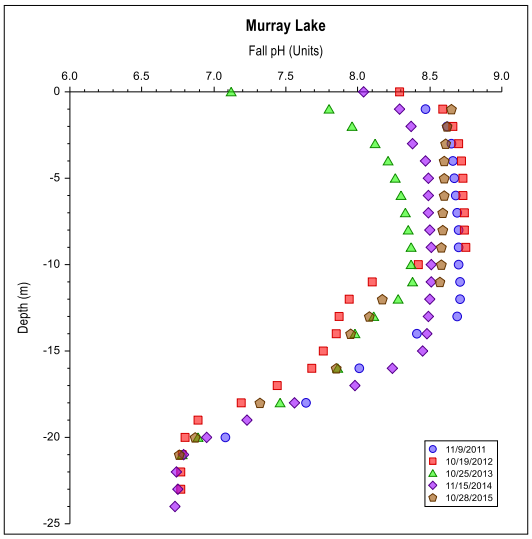


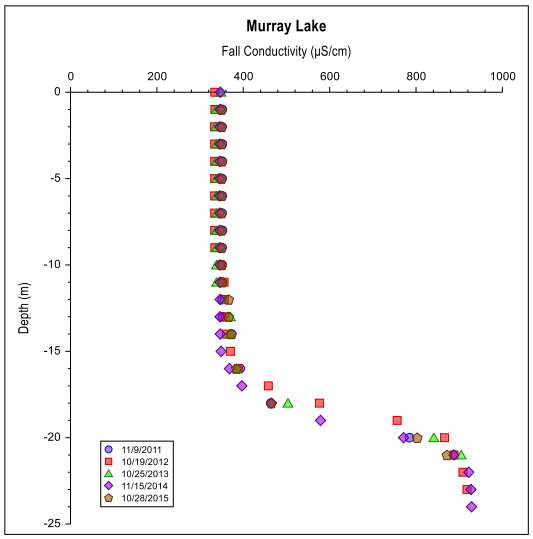


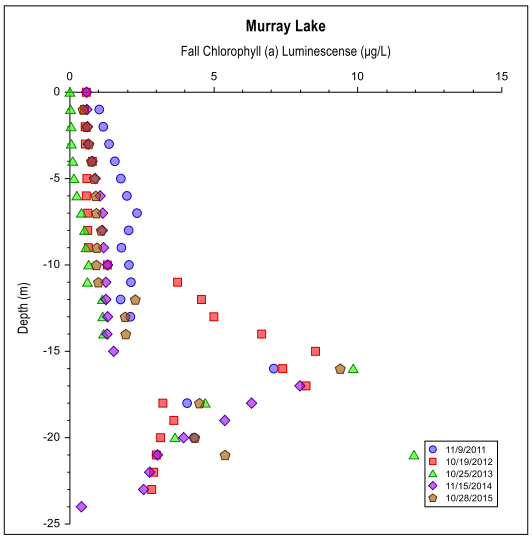


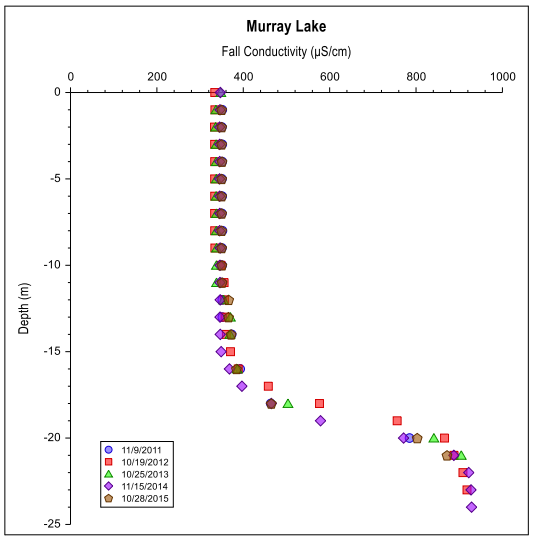


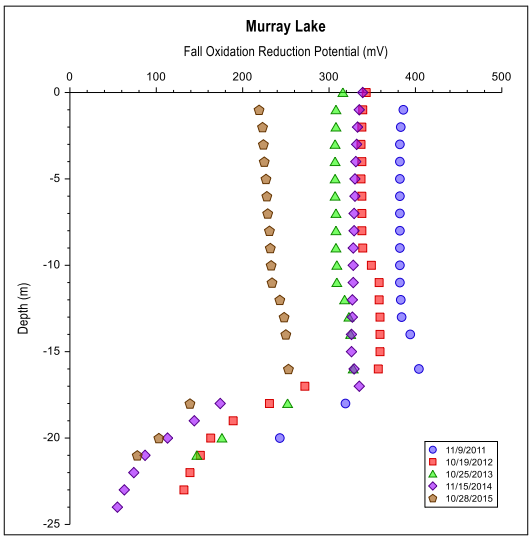
Murray Lake Fall Hydrolab Profiles



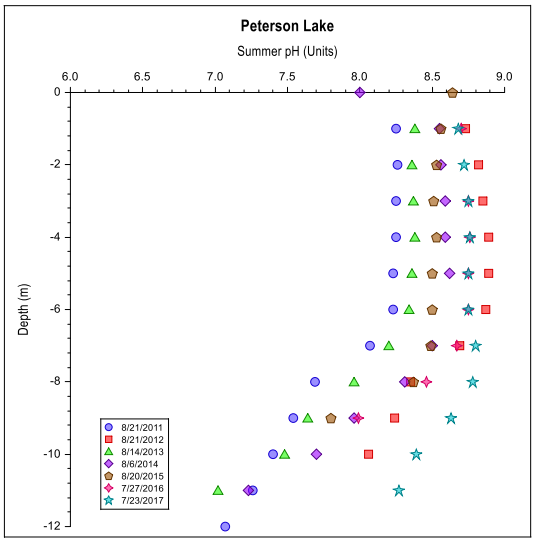


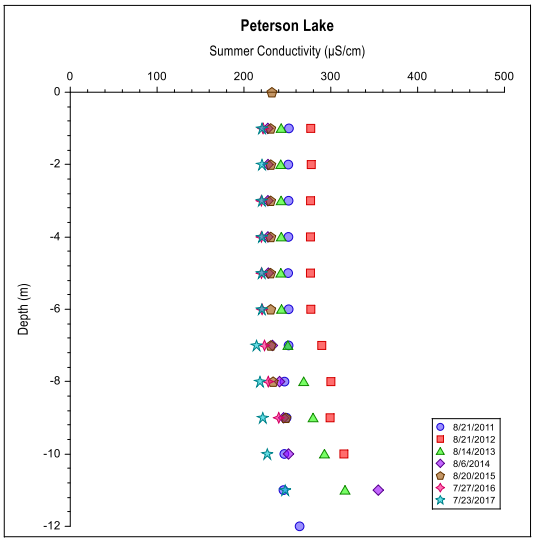


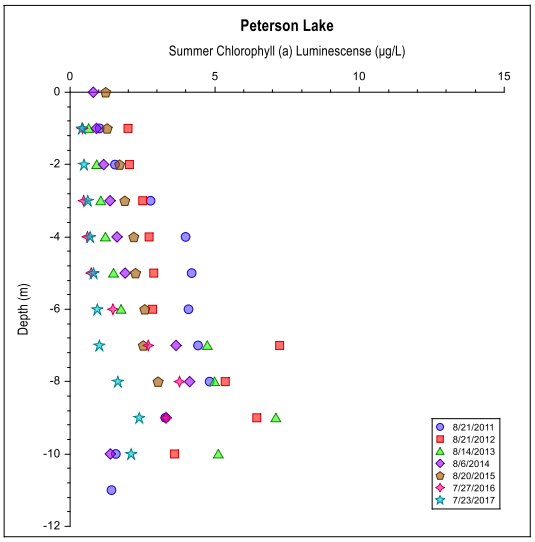


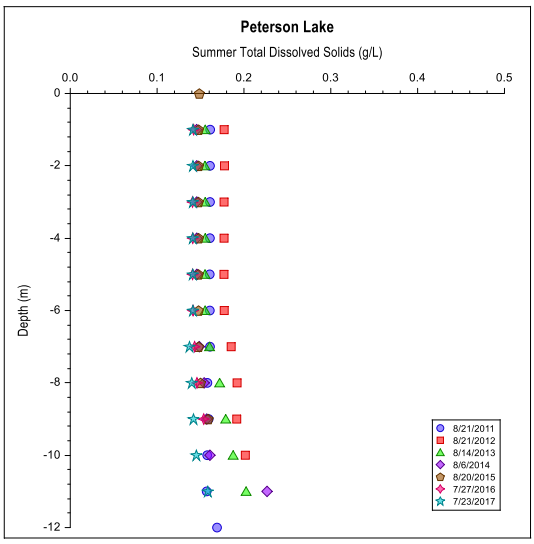


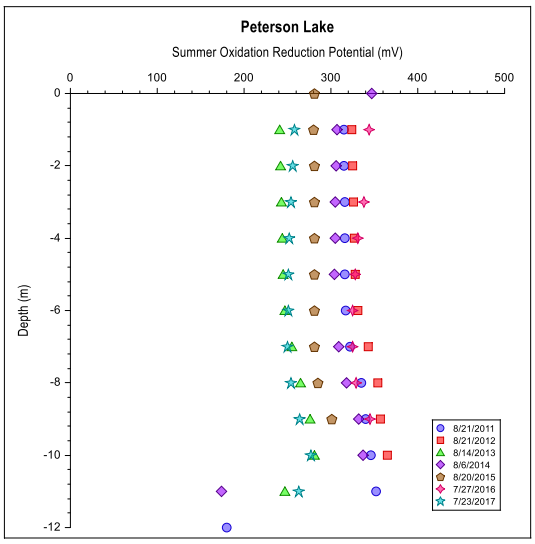
Peterson Lake Summer Hydrolab Profiles



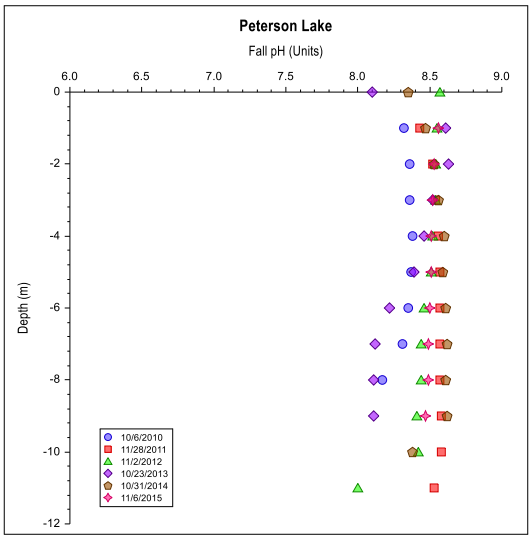


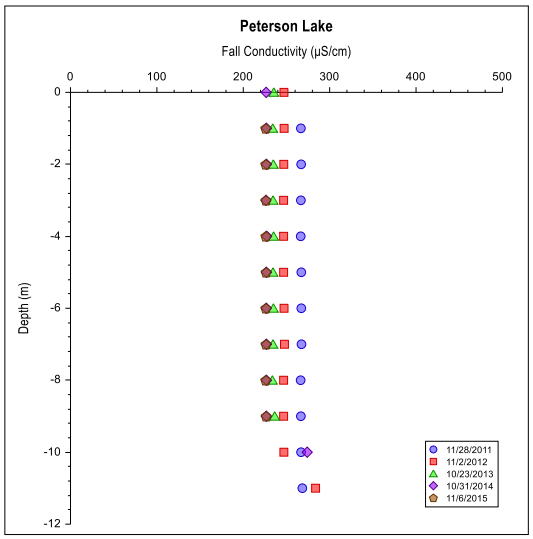


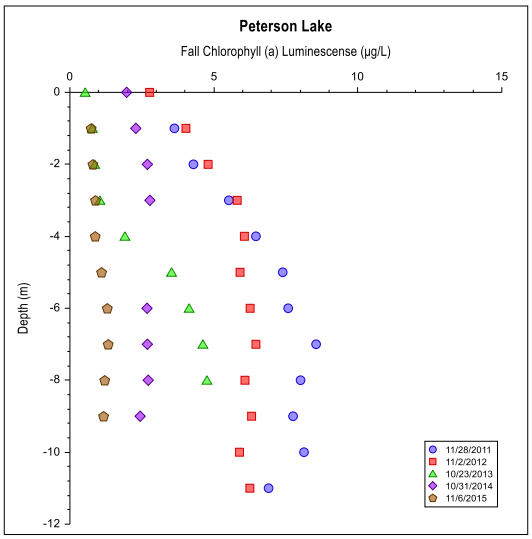


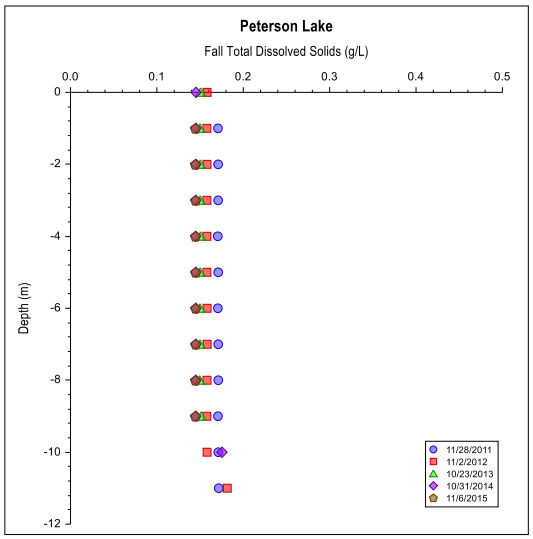


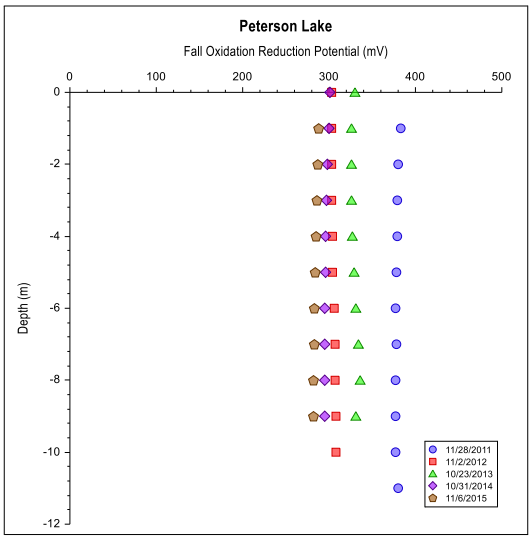
Peterson Lake Fall Hydrolab Profiles



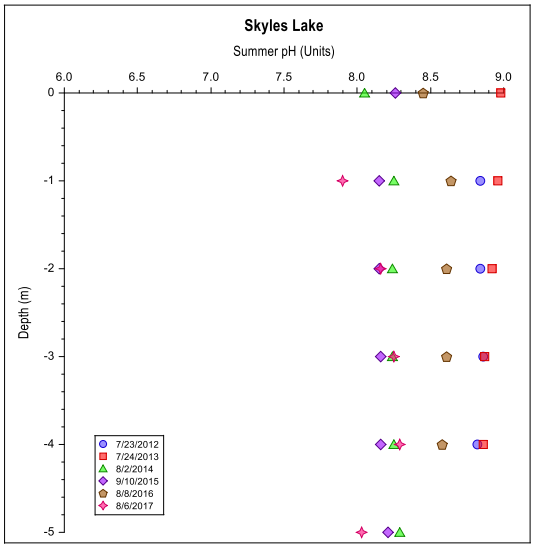


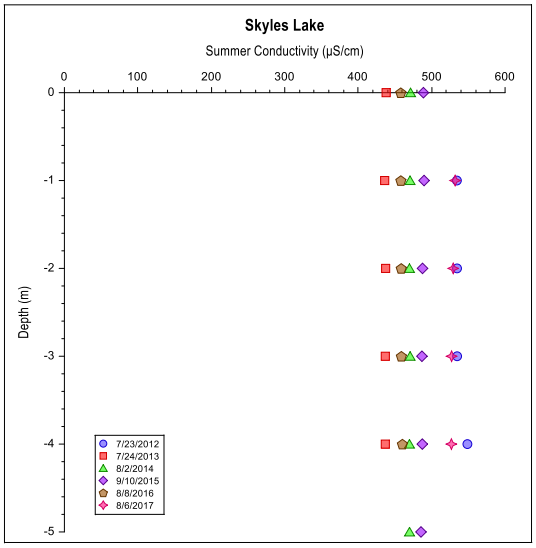


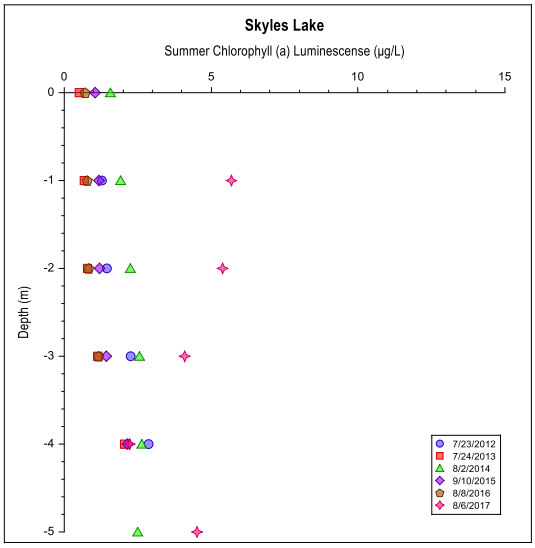


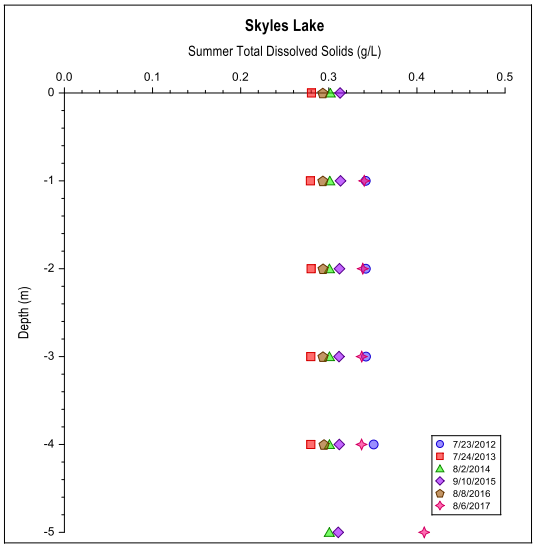


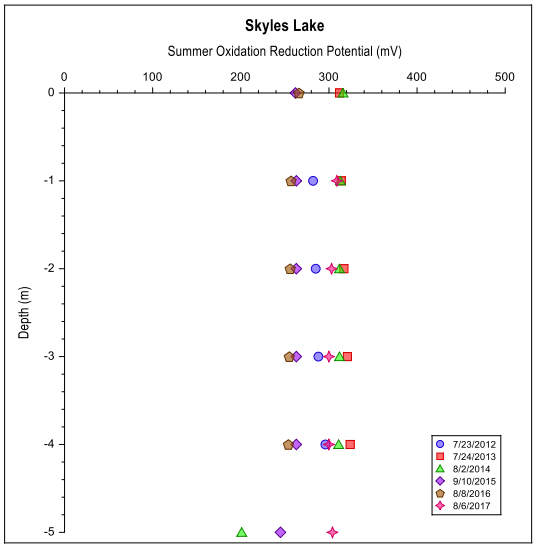
Skyles Lake Summer Hydrolab Profiles



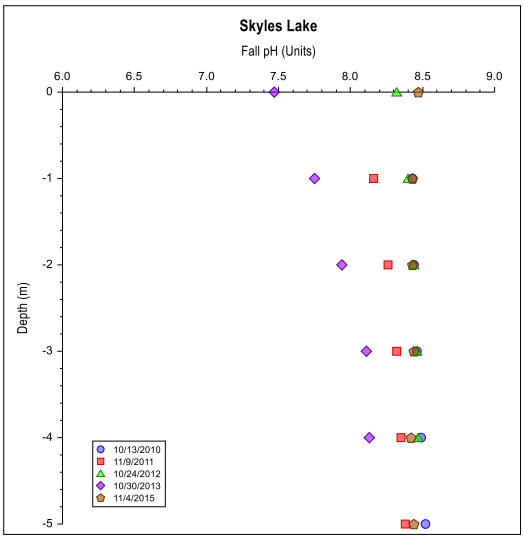


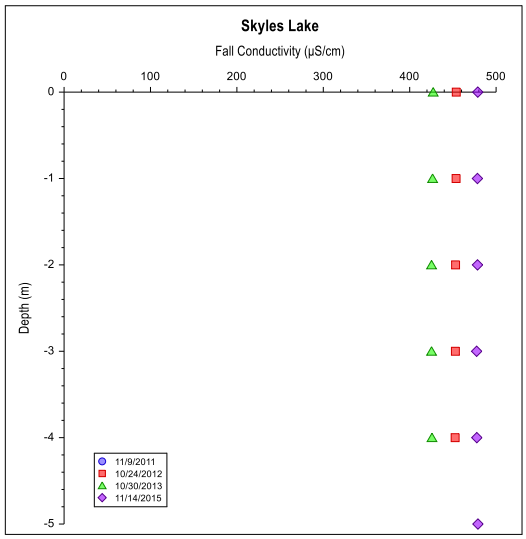


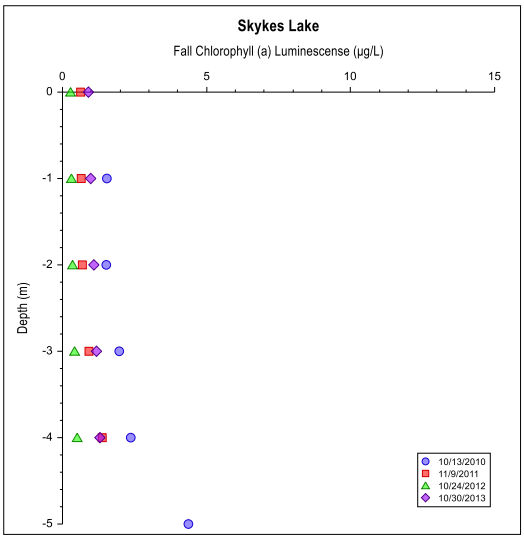


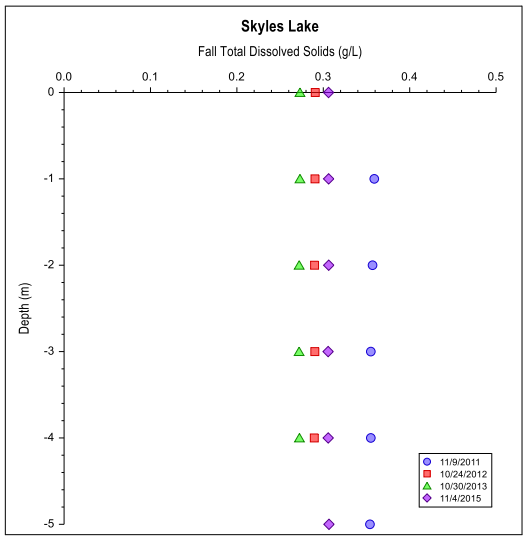


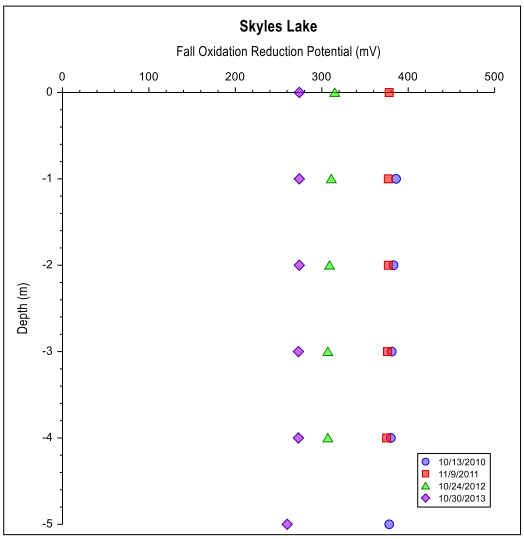
Skyles Lake Fall Hydrolab Profiles



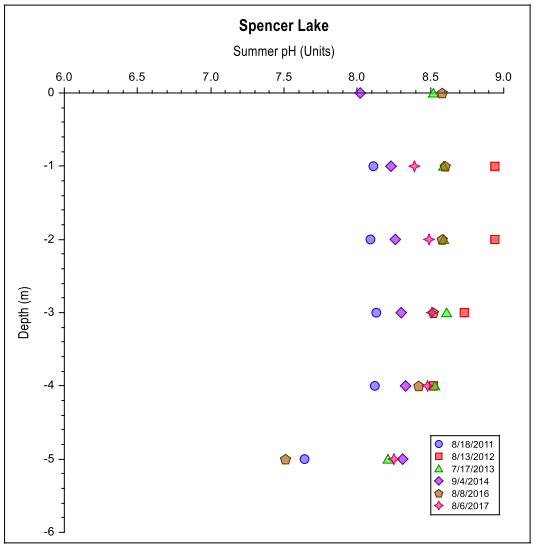


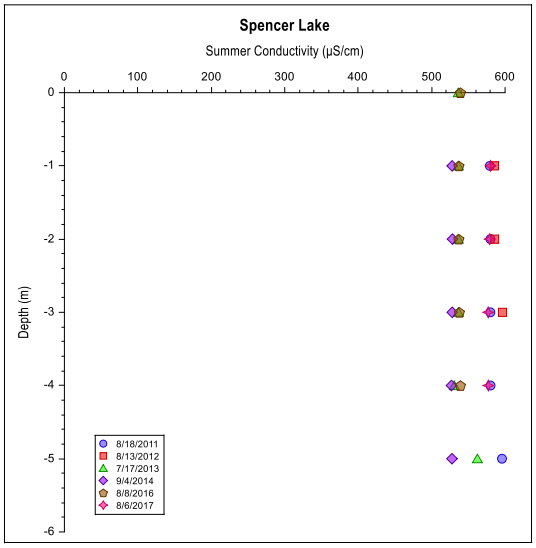


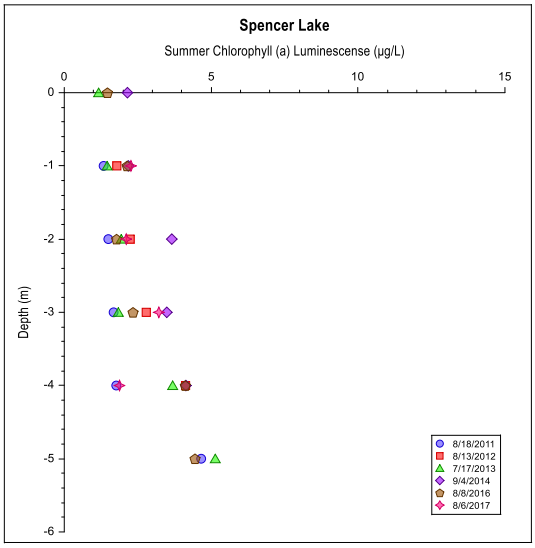


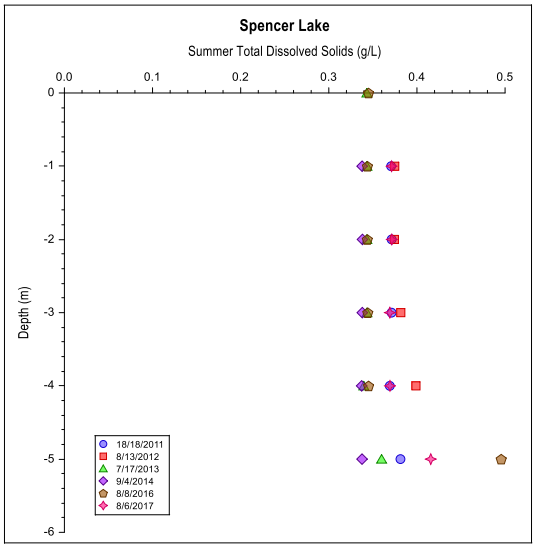


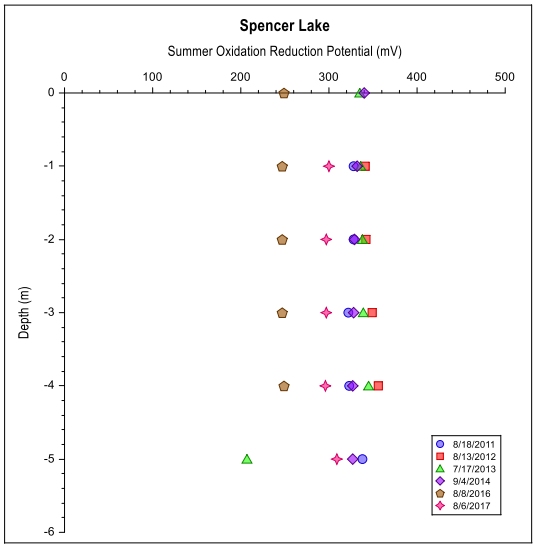
Spencer Lake Summer Hydrolab Profiles



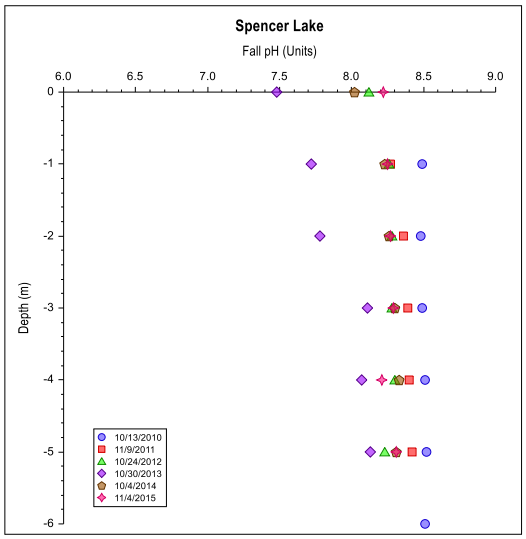


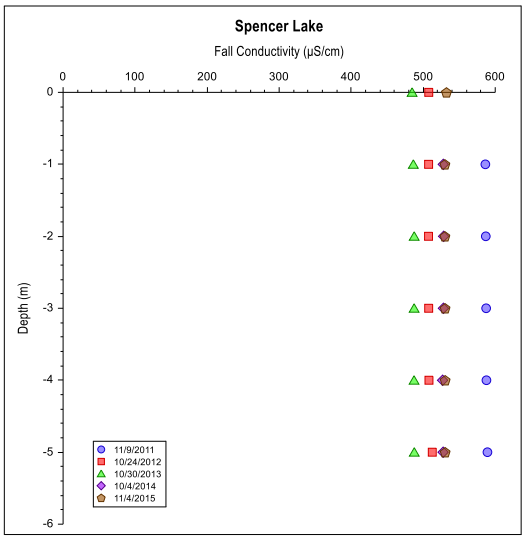


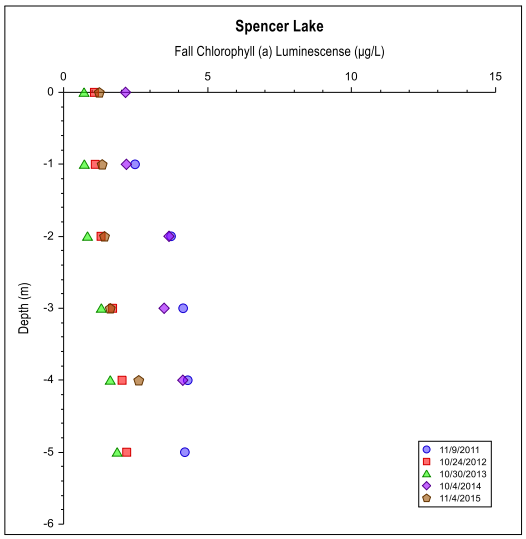


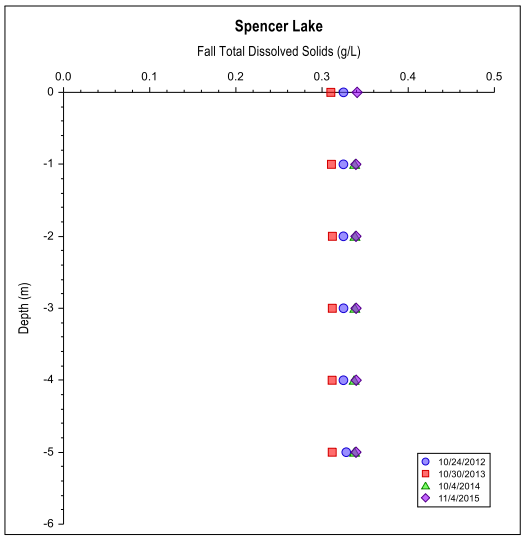


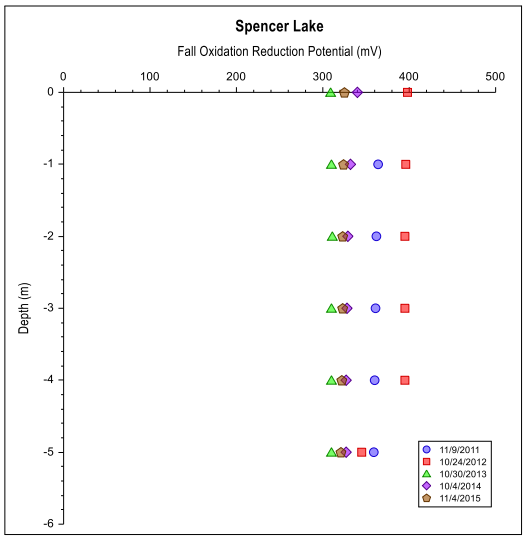
Spencer Lake Fall Hydrolab Profiles



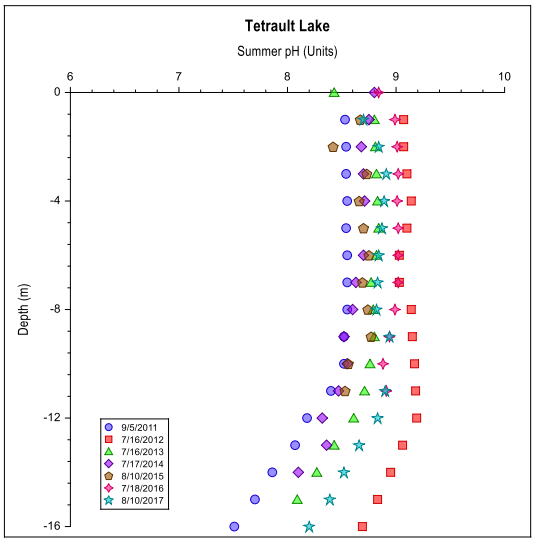


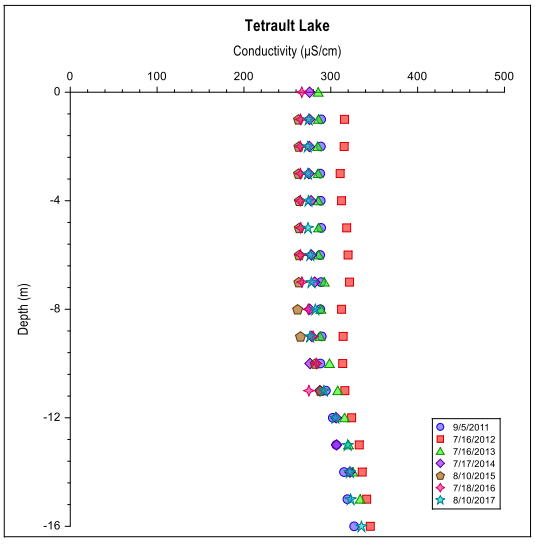


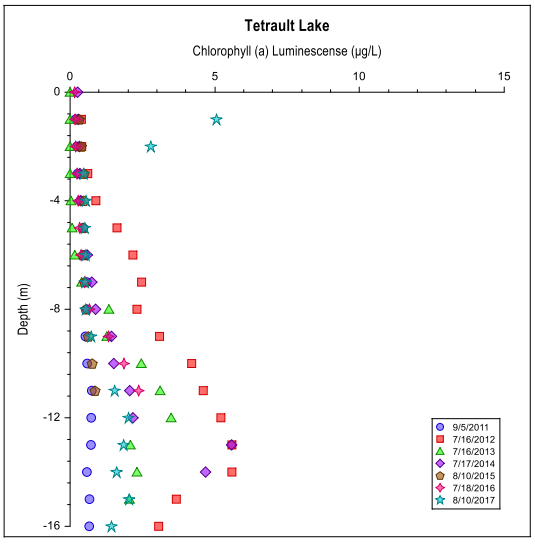


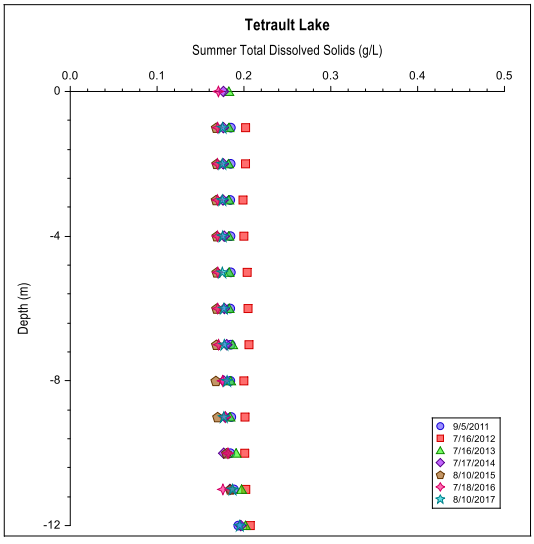


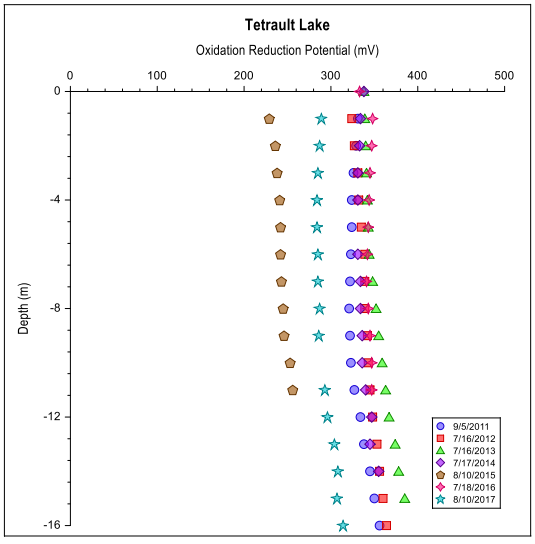
Tetrault Lake Summer Hydrolab Profiles



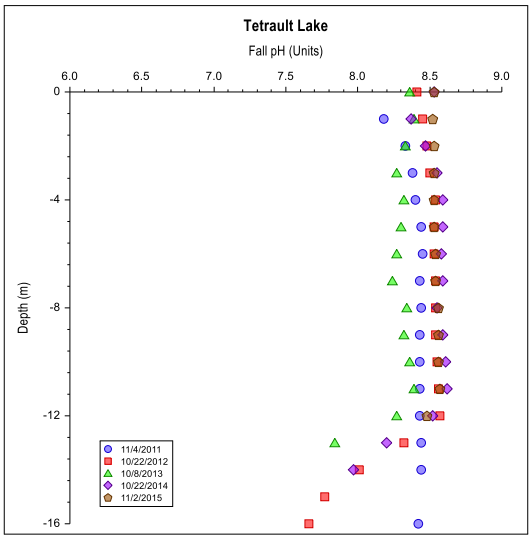


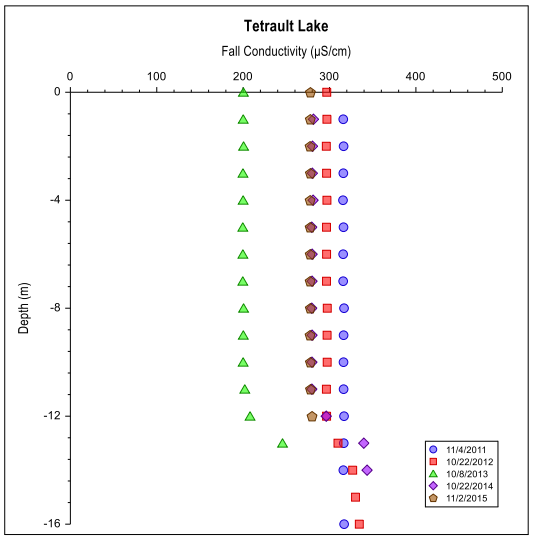


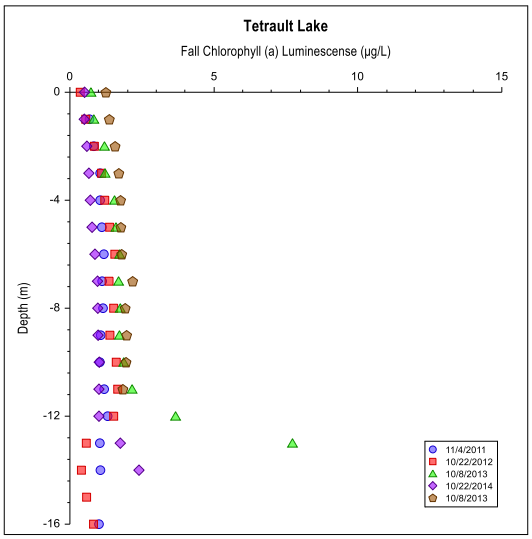


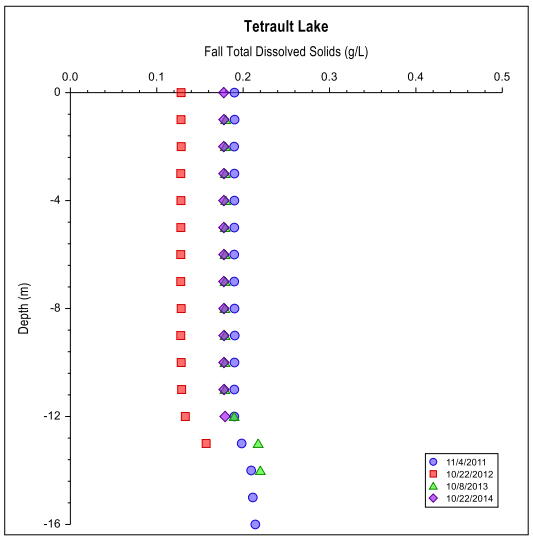


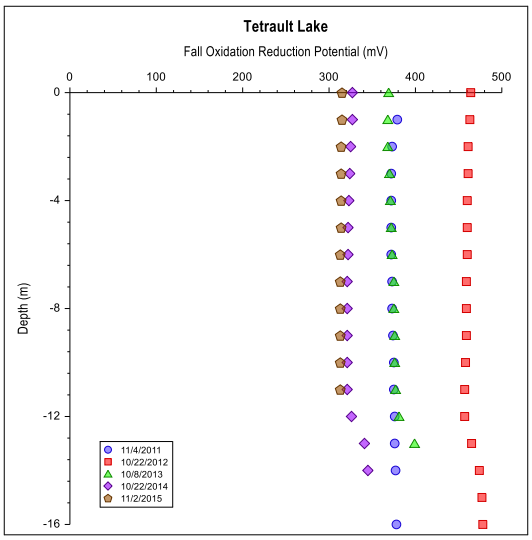
Tetrault Lake Fall Hydrolab Profiles



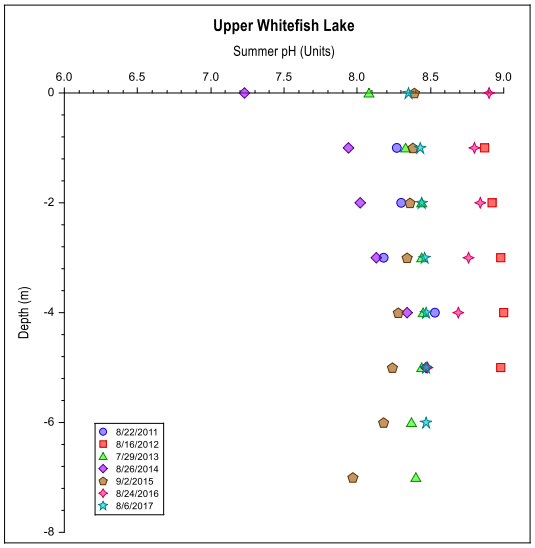


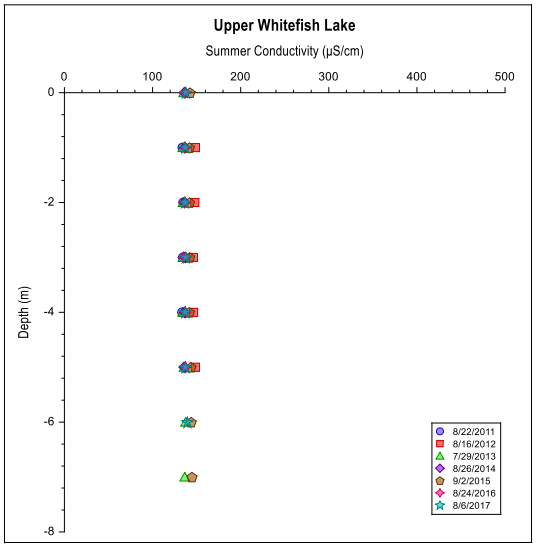


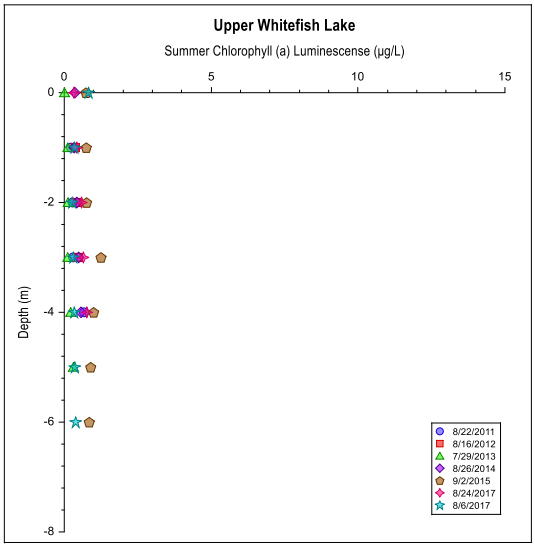


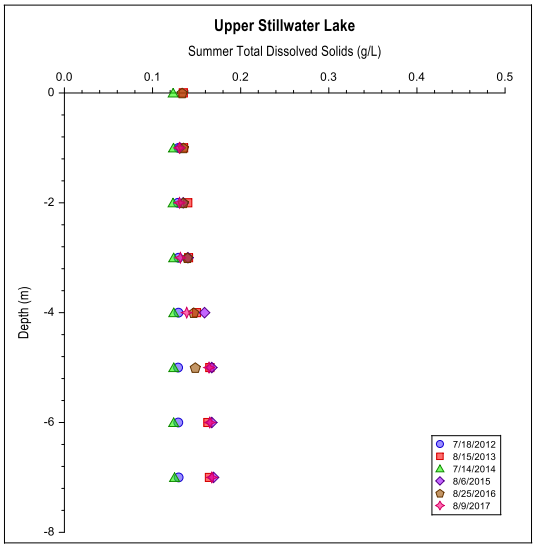


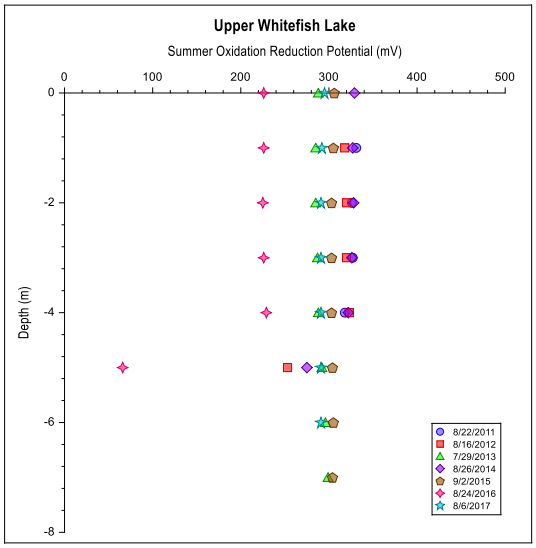
Upper Whitefish Lake Summer Hydrolab Profiles



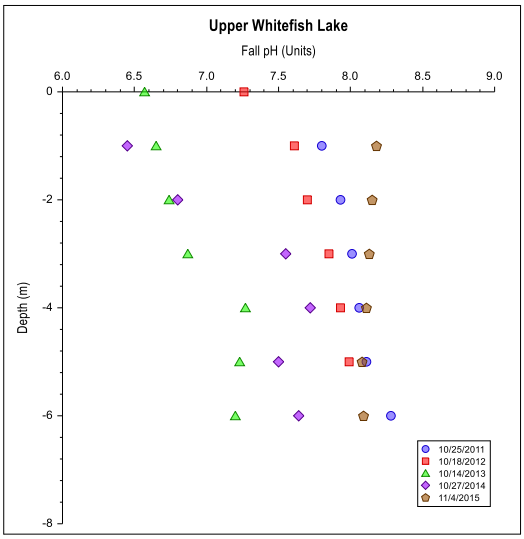


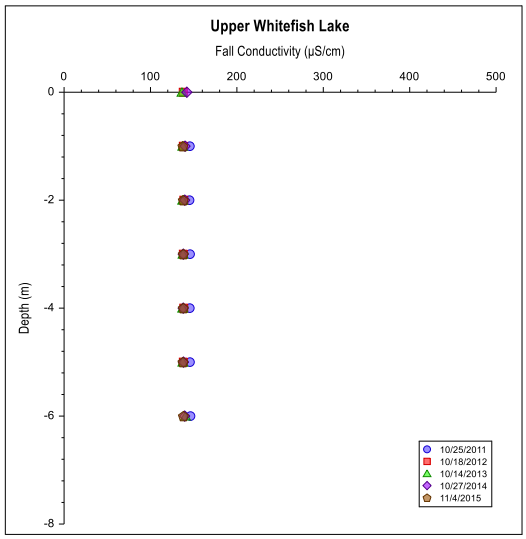


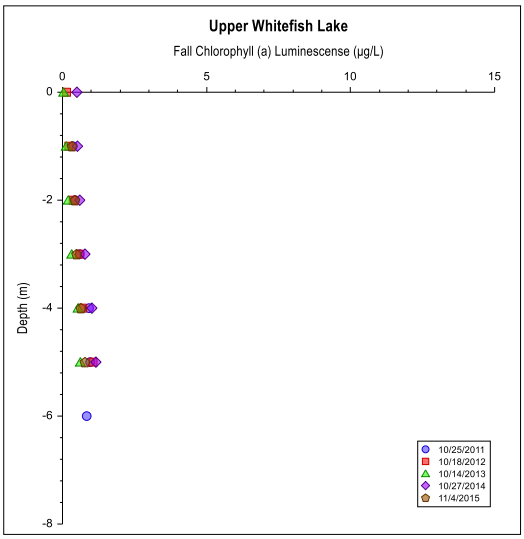


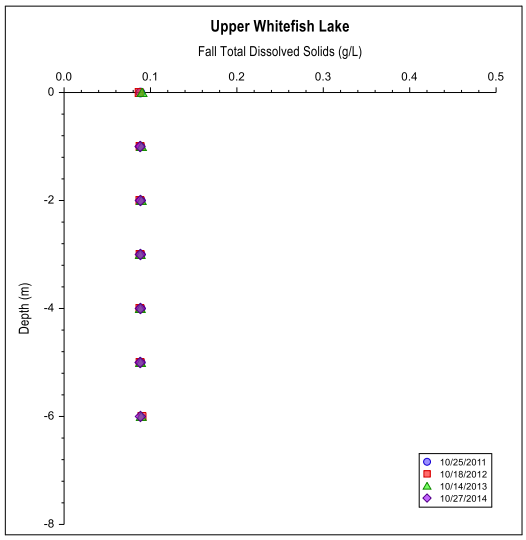


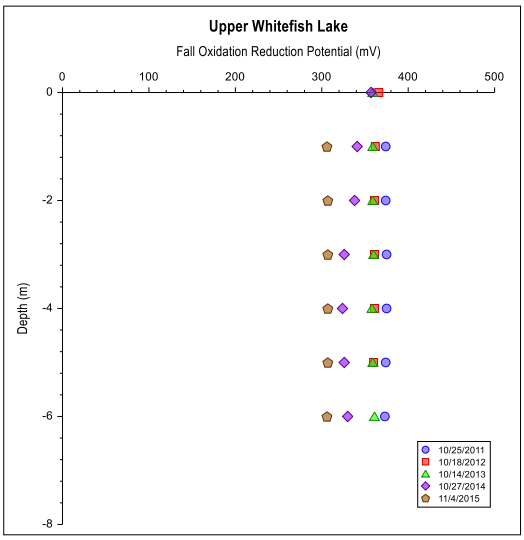
Upper Whitefish Lake Fall Hydrolab Profiles









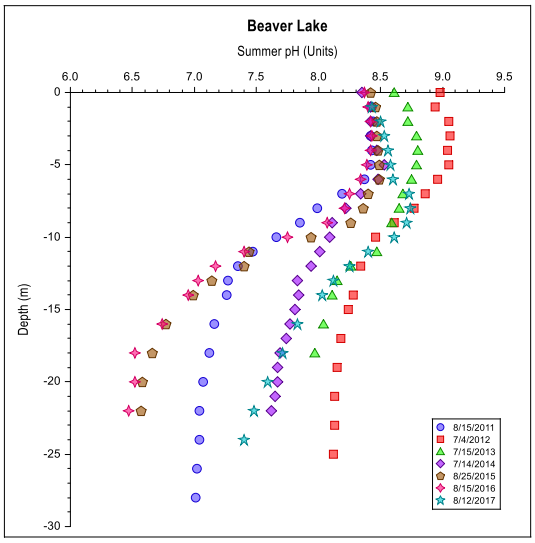


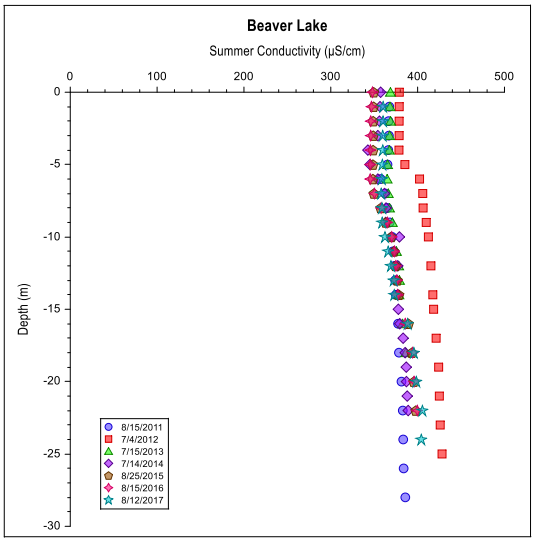
MEDIUM LAKES

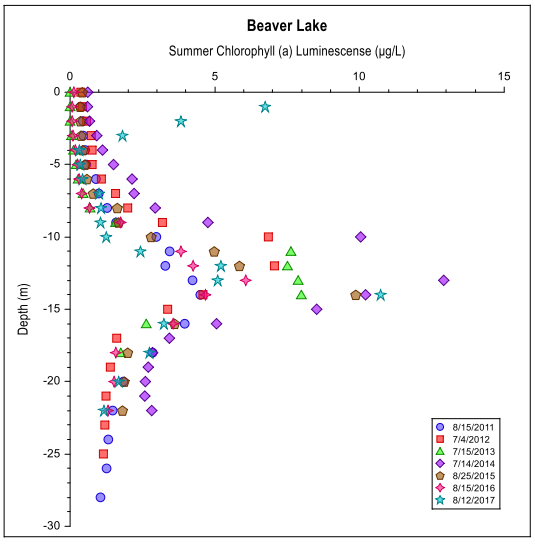
(Surface Area 100-500 Acres)

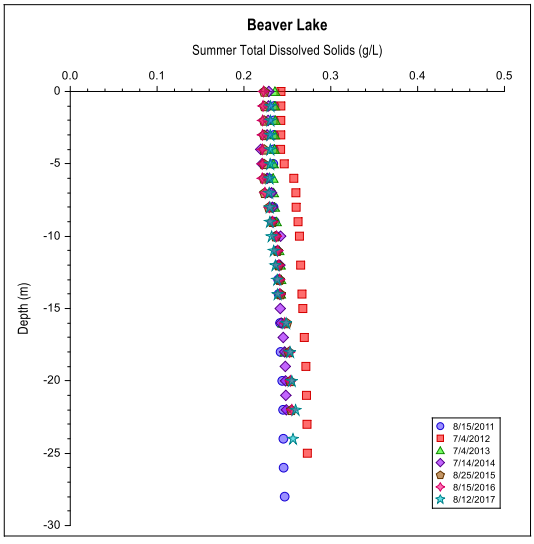
Beaver
Blaine
Blanchard
Five
Foys
Glen
Holland
Lower Stillwater
Murphy
Rogers
Sophie

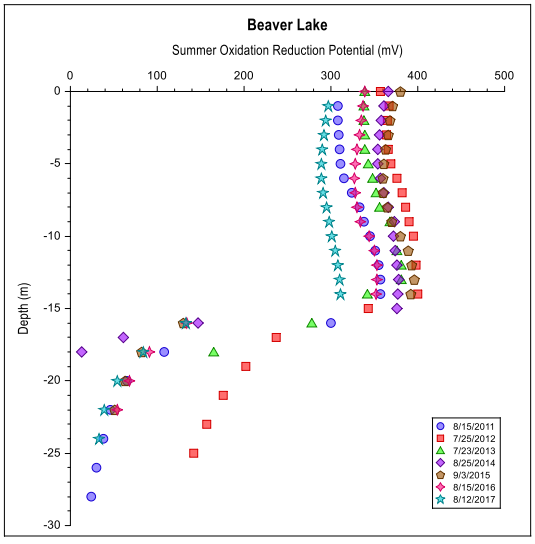
Beaver Lake Summer Hydrolab Profiles



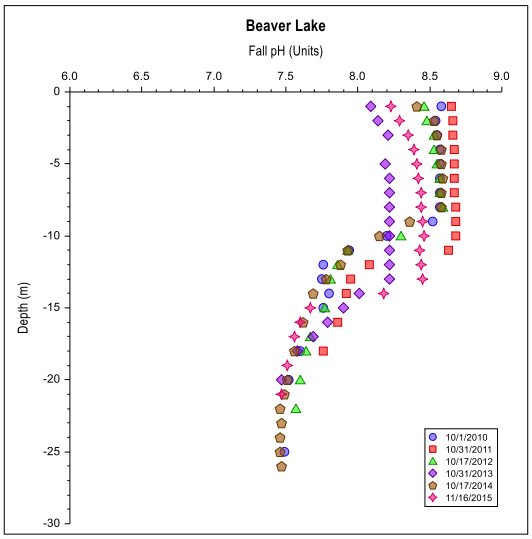


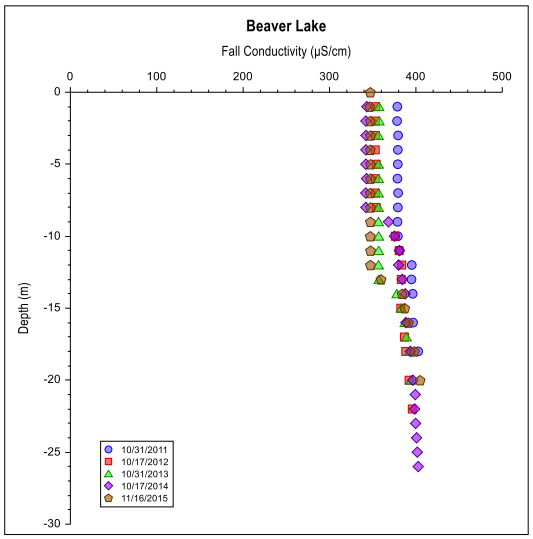


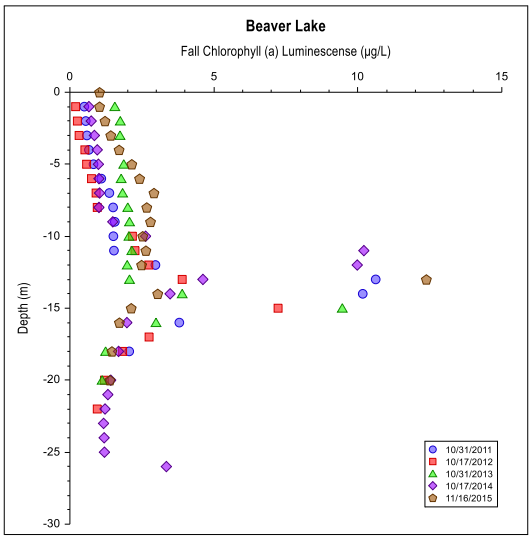


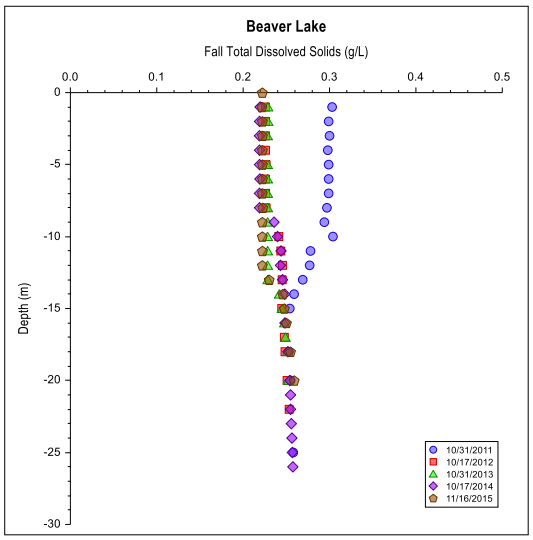


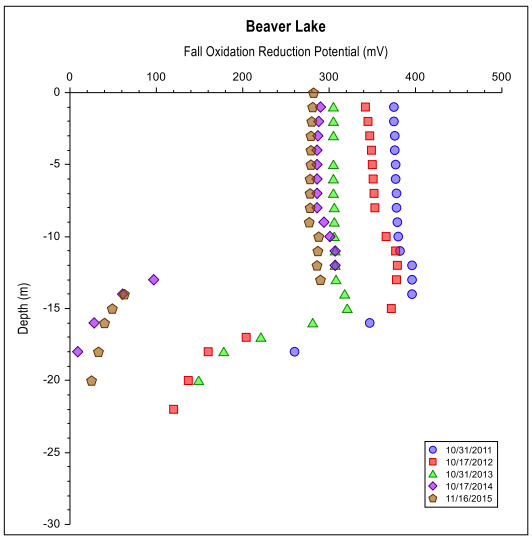
Beaver Lake Fall Hydrolab Profiles



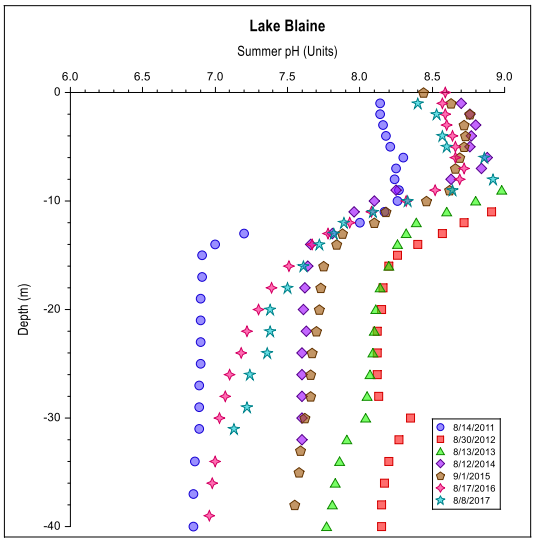


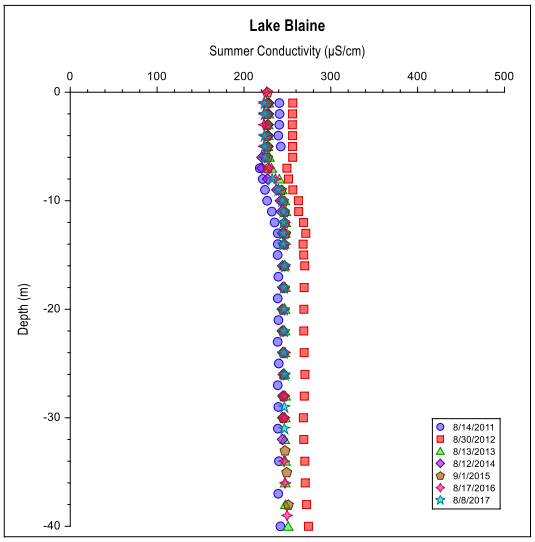


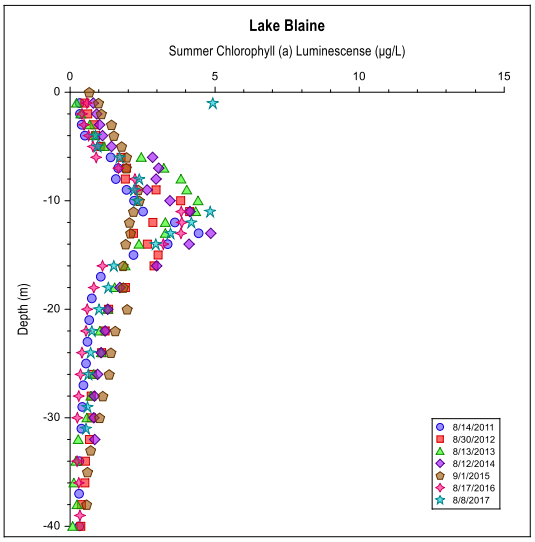


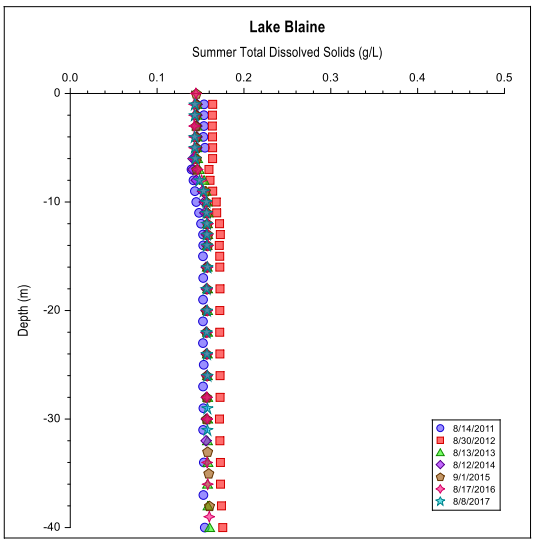


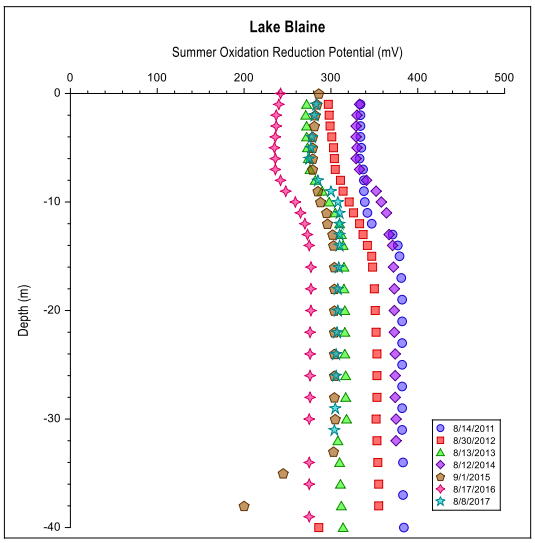
Lake Blaine Summer Hydrolab Profiles



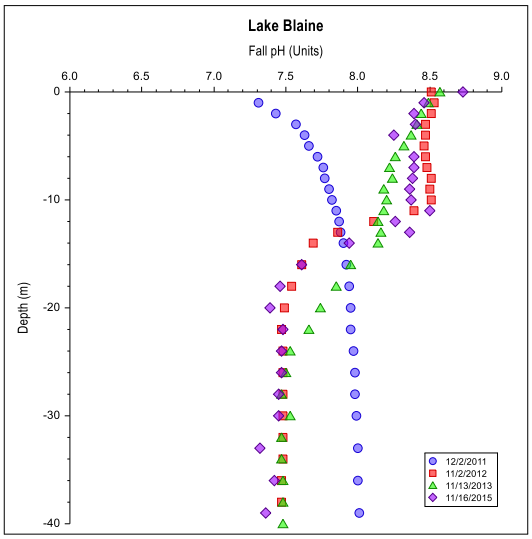


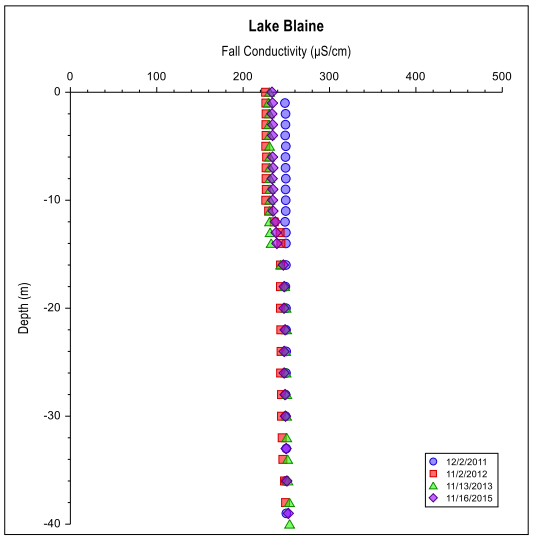


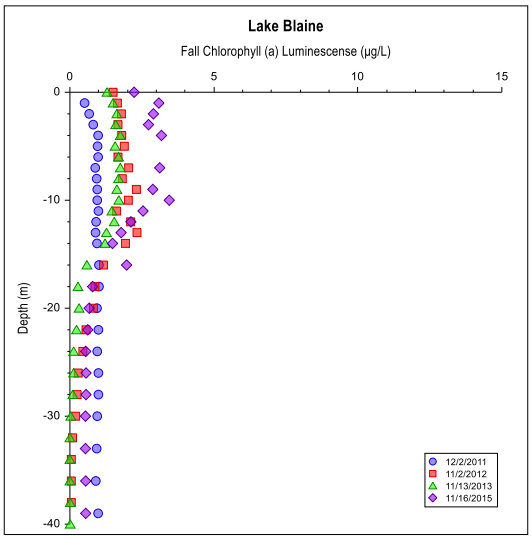


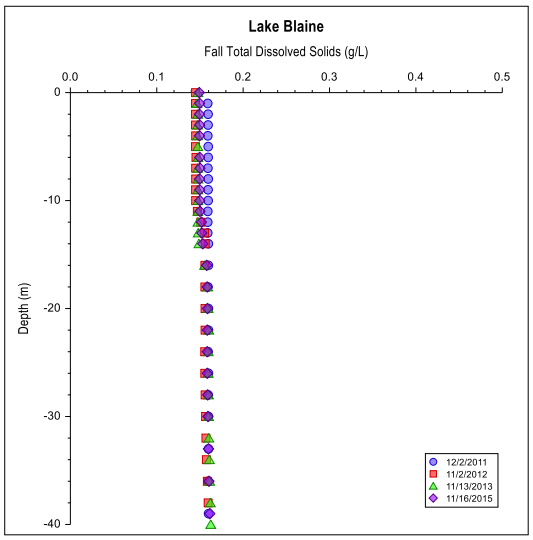


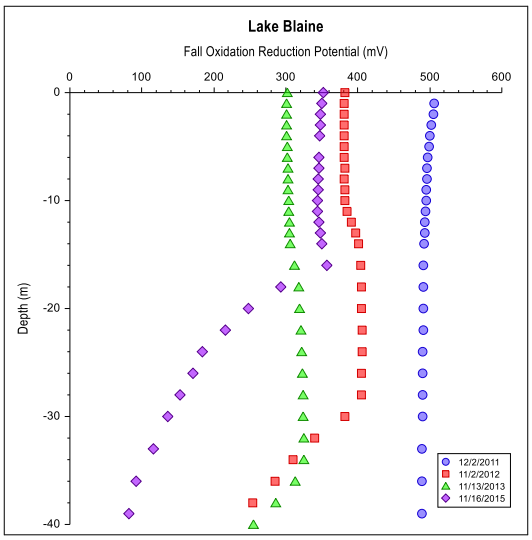
Lake Blaine Fall Hydrolab Profiles



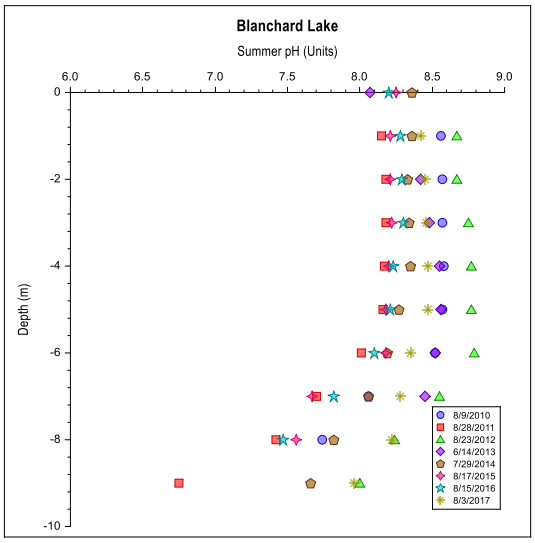


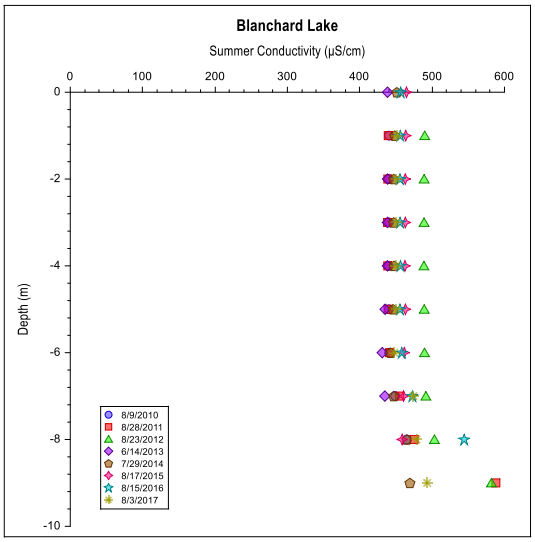


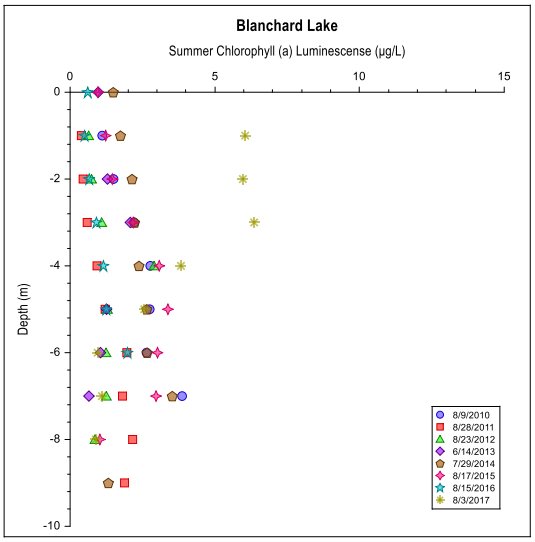


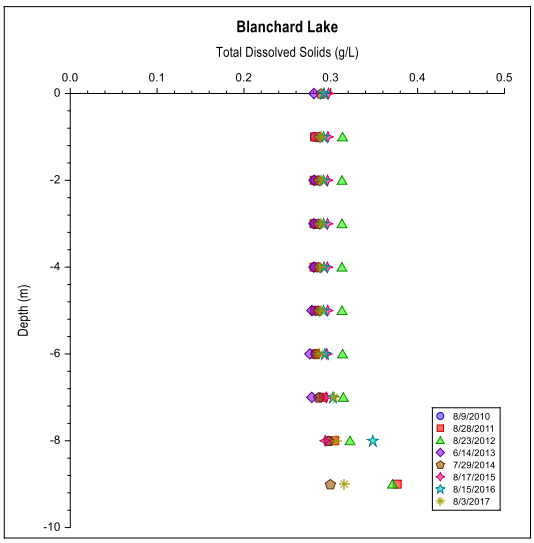


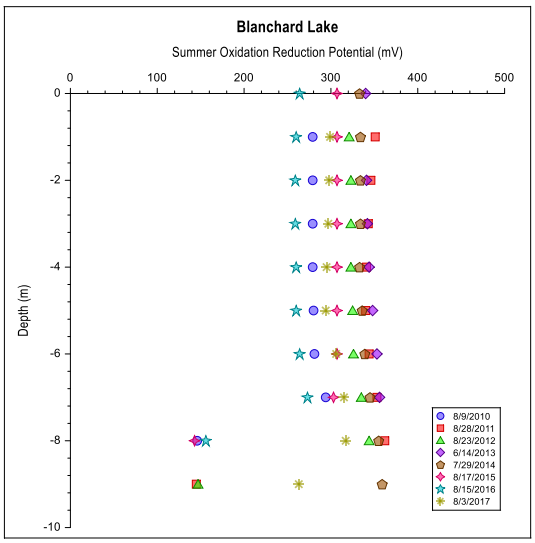
Blanchard Lake Summer Hydrolab Profiles



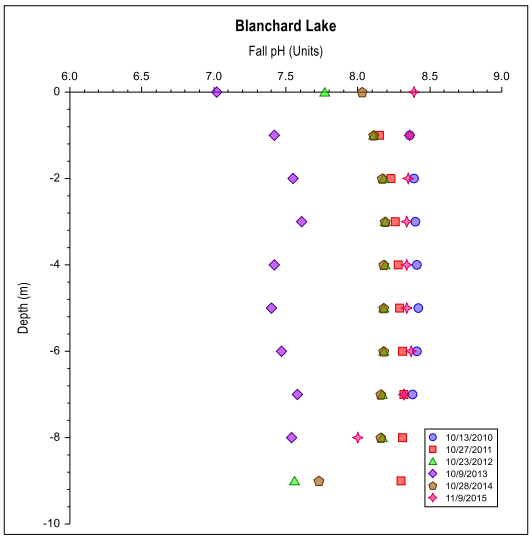


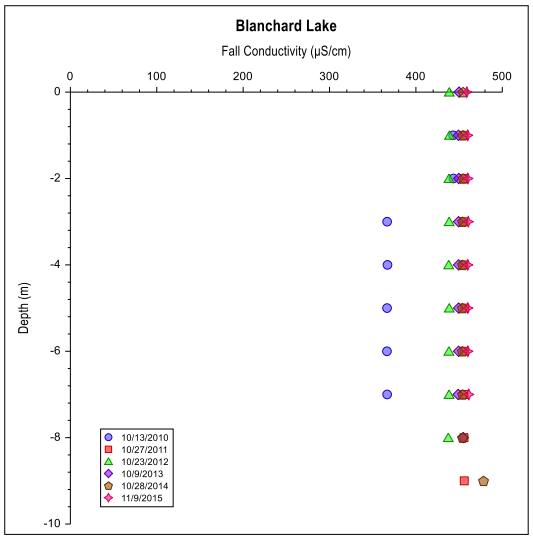


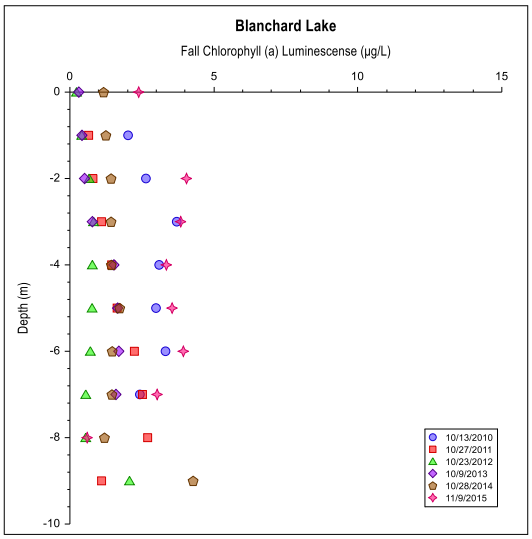


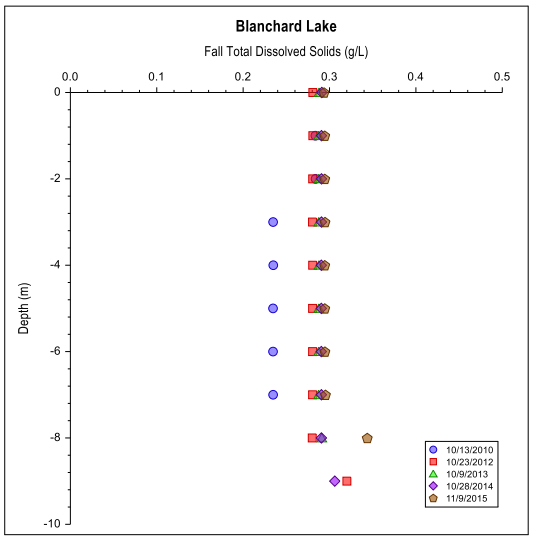


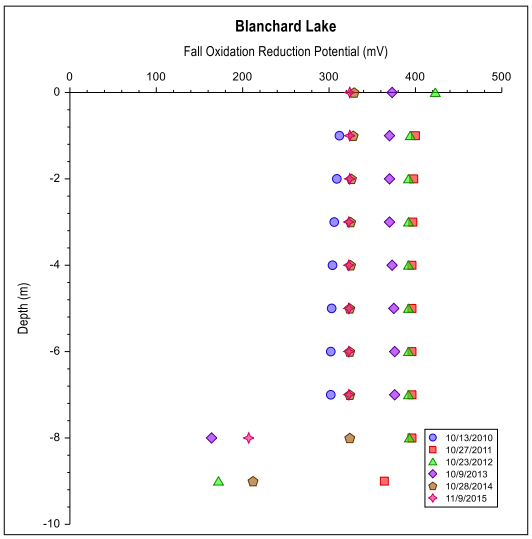
Blanchard Lake Fall Hydrolab Profiles



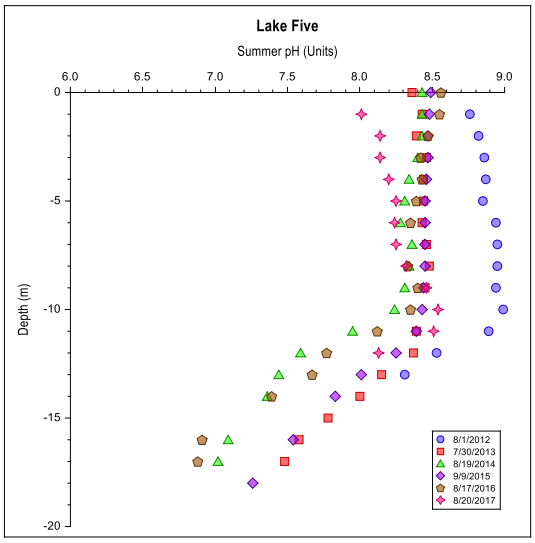


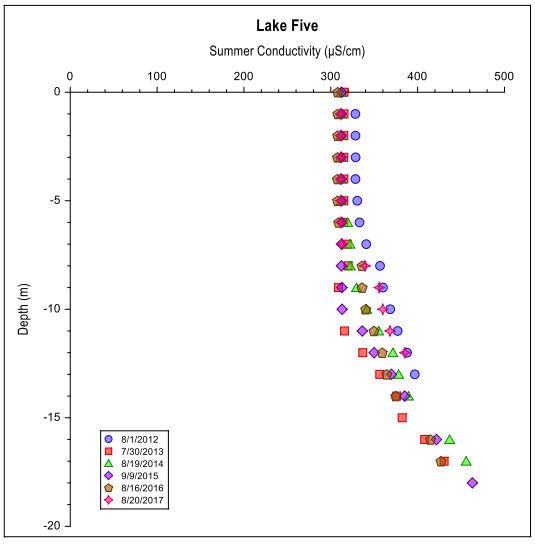


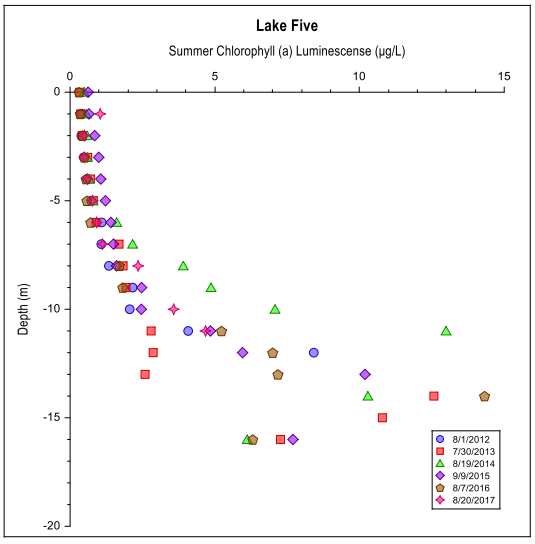


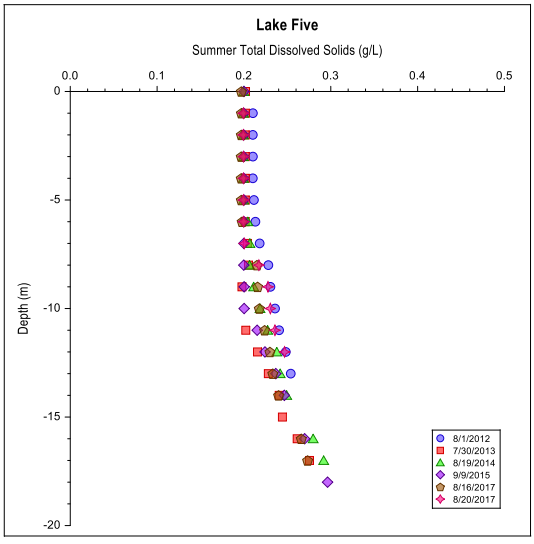


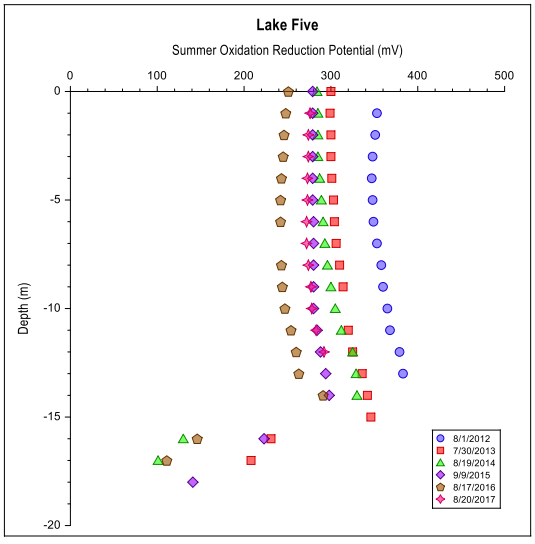
Lake Five Summer Hydrolab Profiles



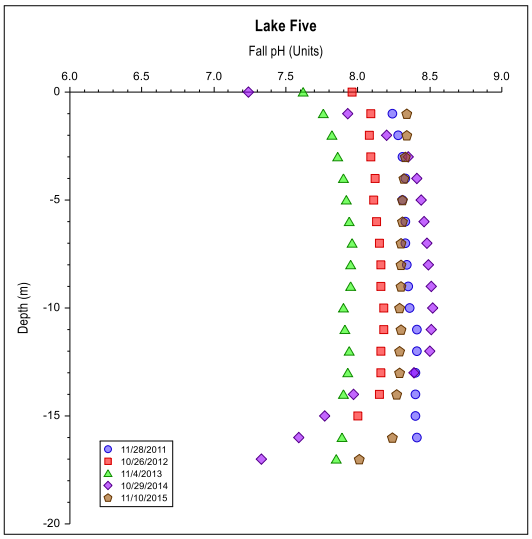


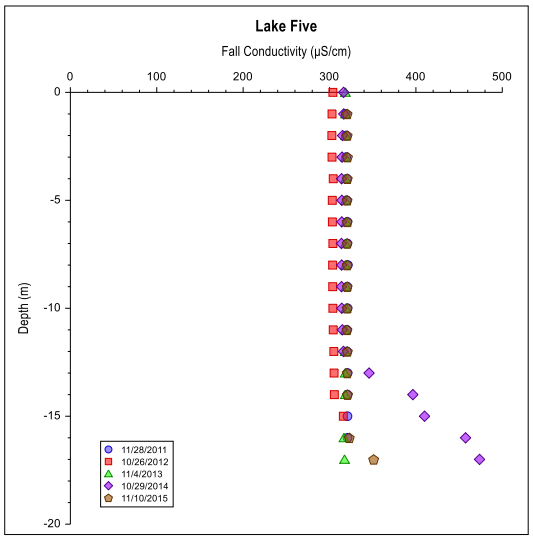


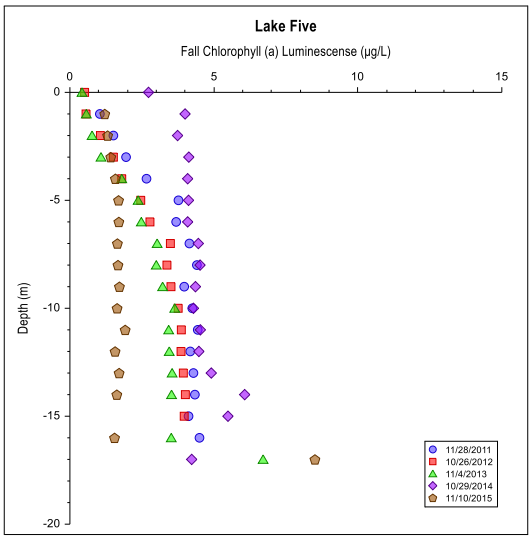


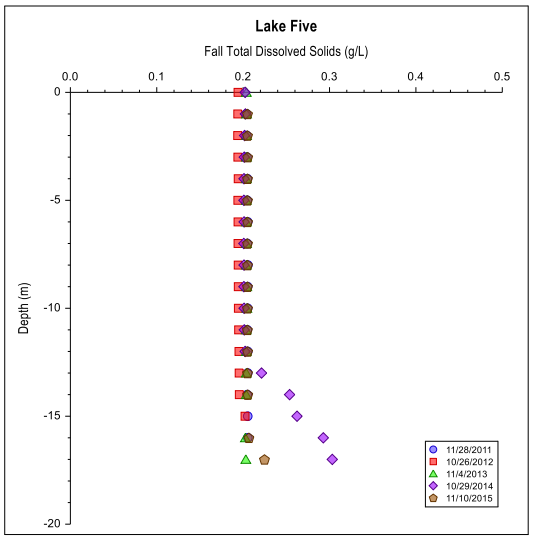


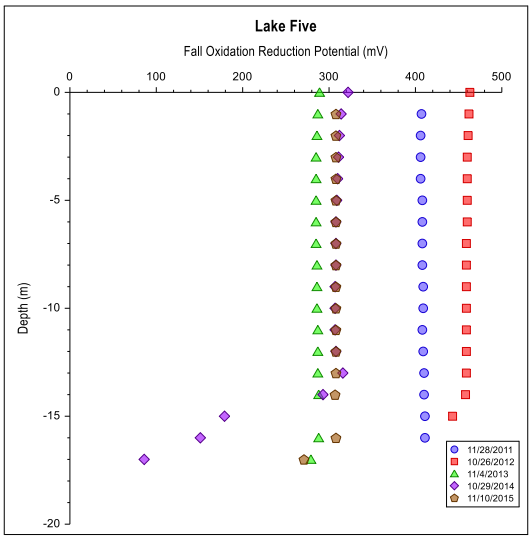
Lake Five Fall Hydrolab Profiles



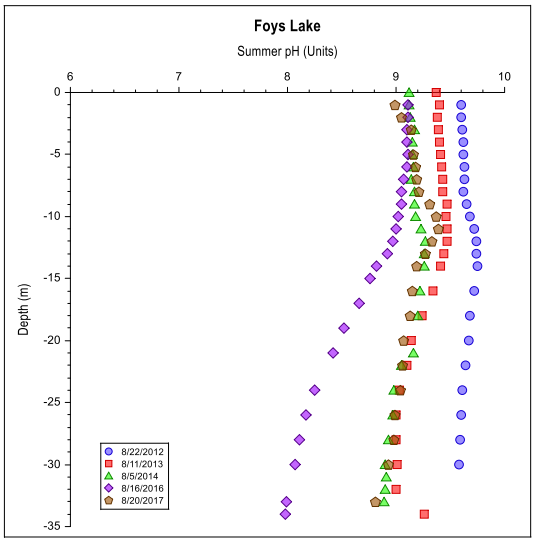


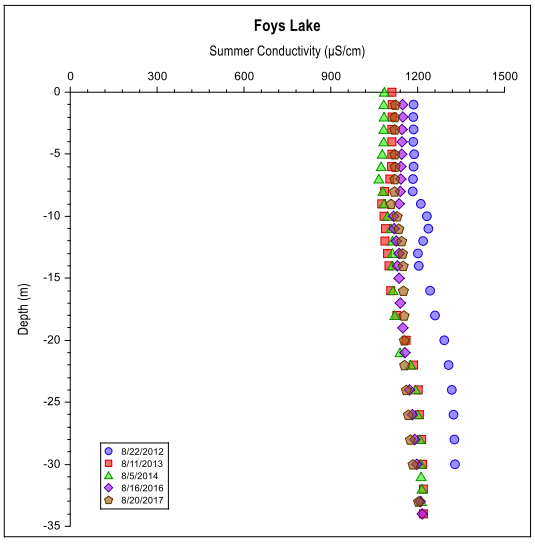


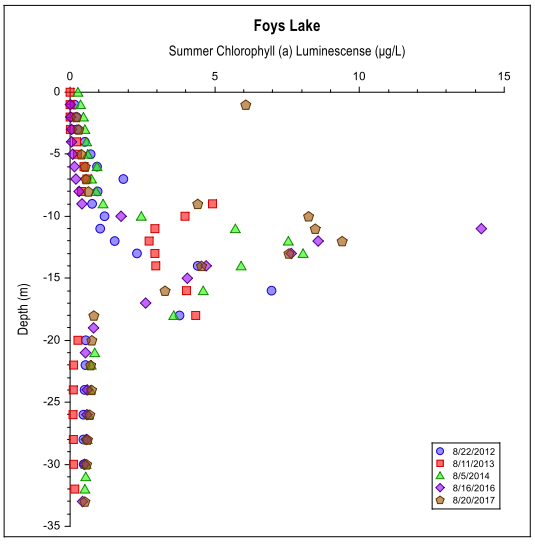


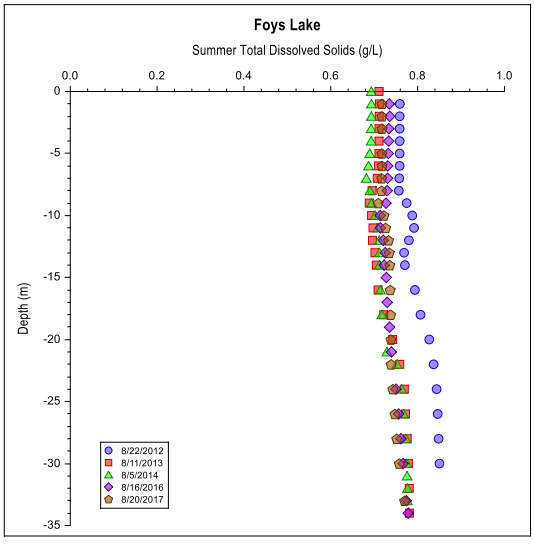


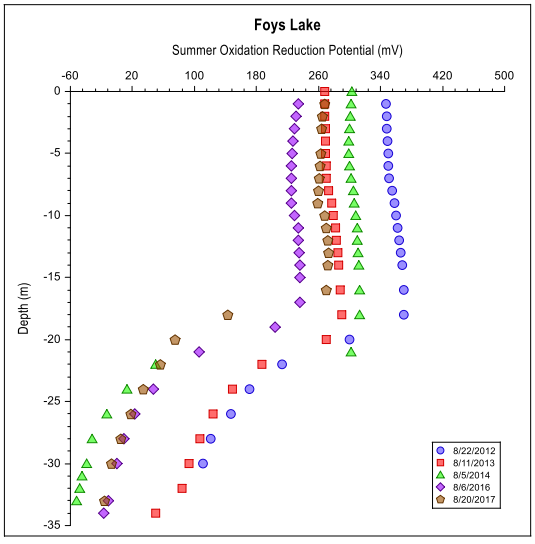
Foys Lake Summer Hydrolab Profiles



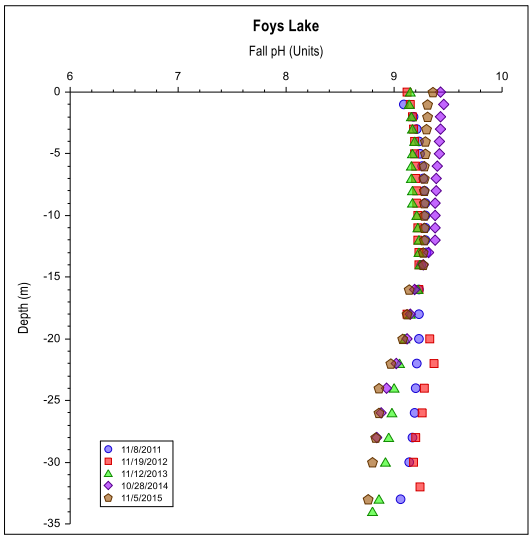


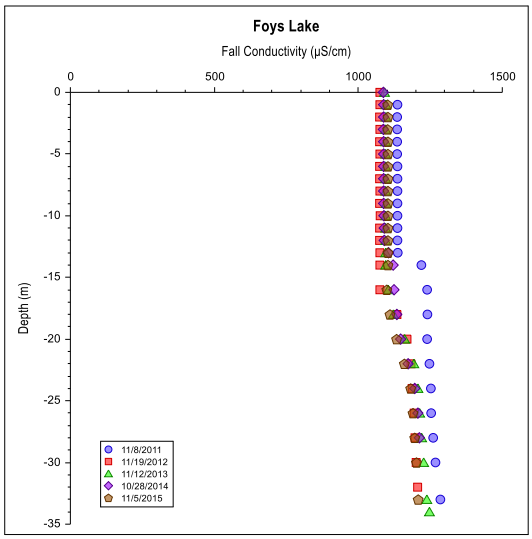


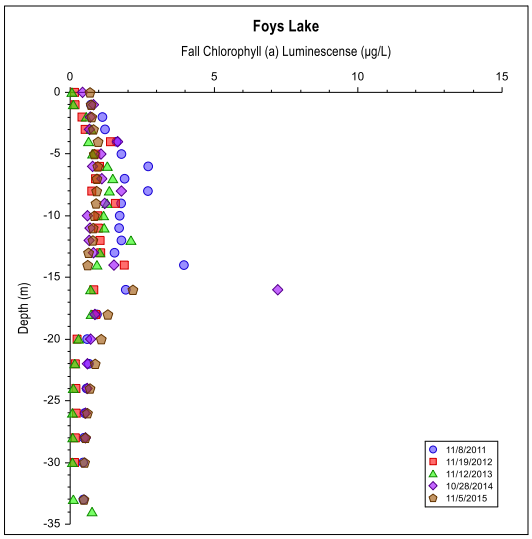


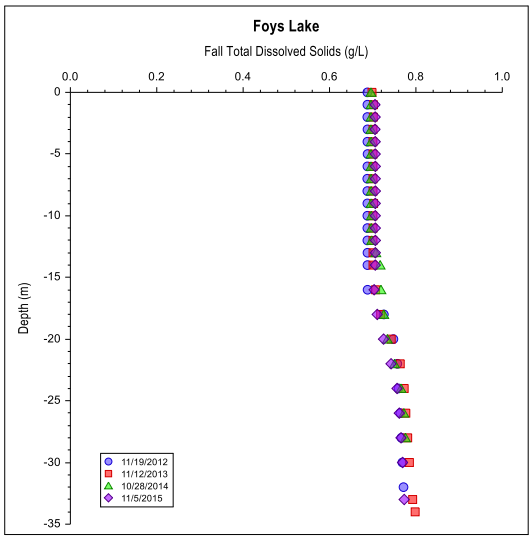


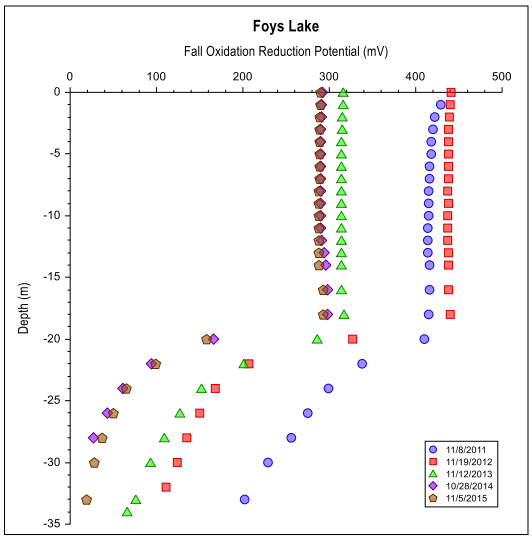
Foys Lake Falls Hydrolab Profiles



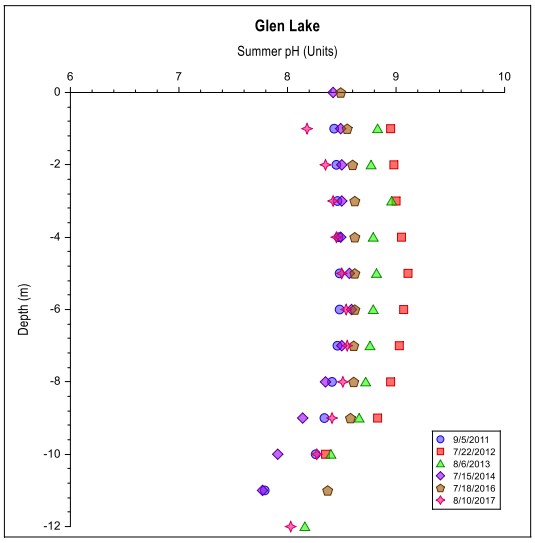


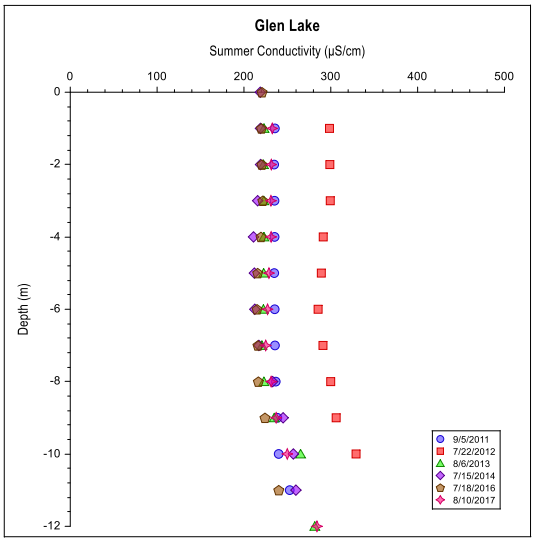


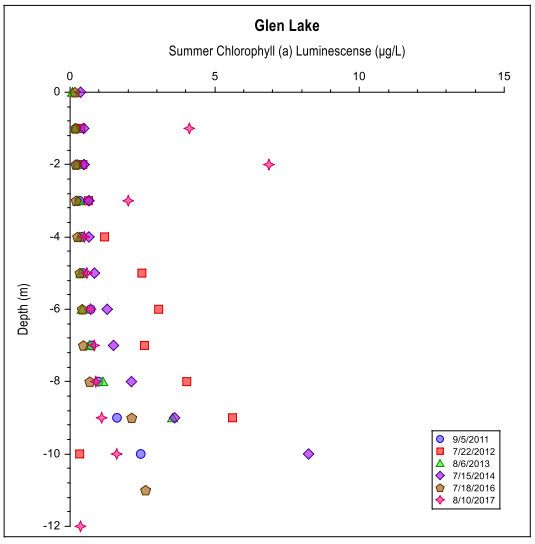


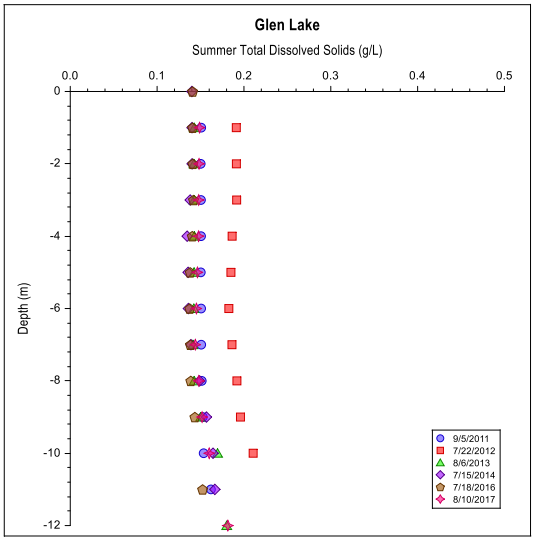


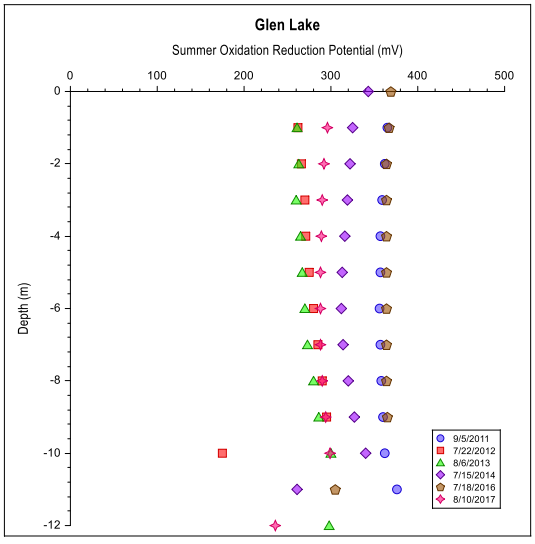
Glen Lake Summer Hydrolab Profiles



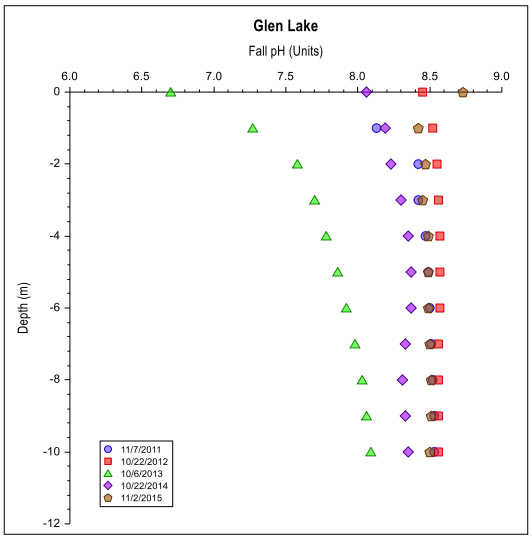


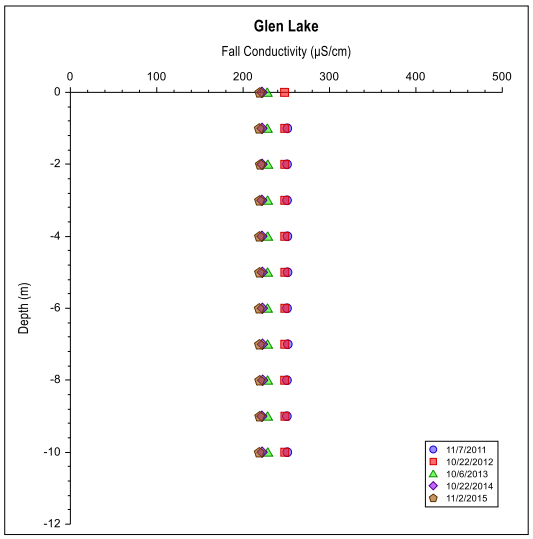


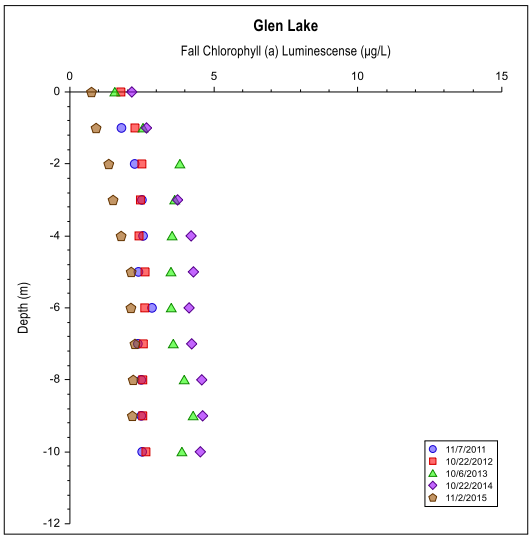


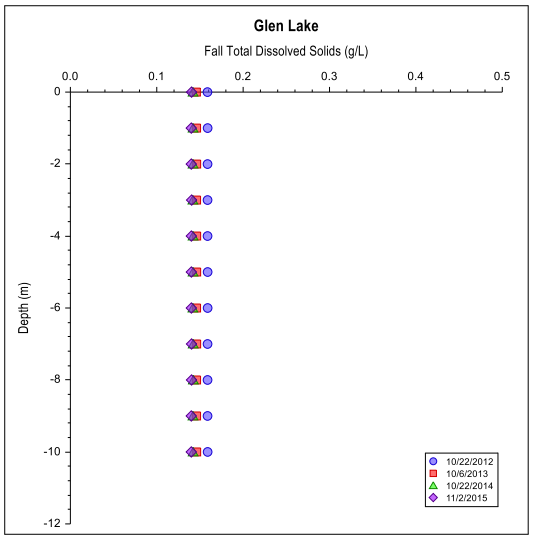


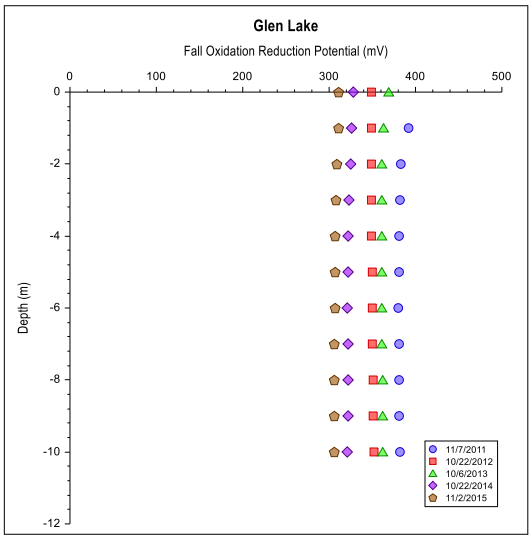
Glen Lake Fall Hydrolab Profiles



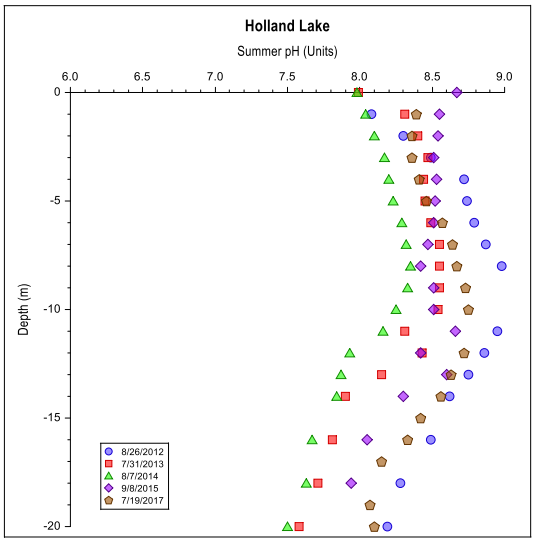


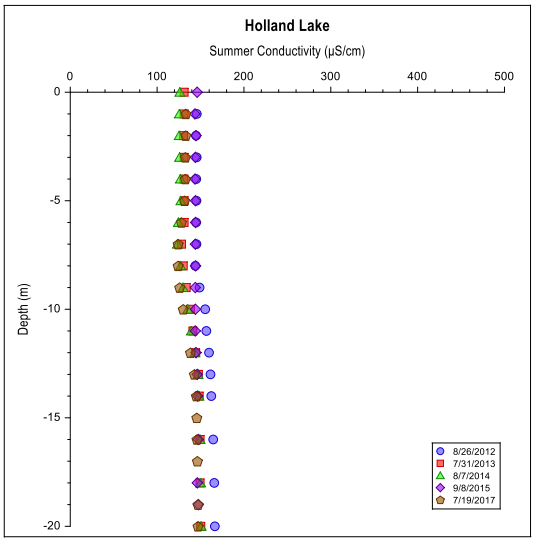


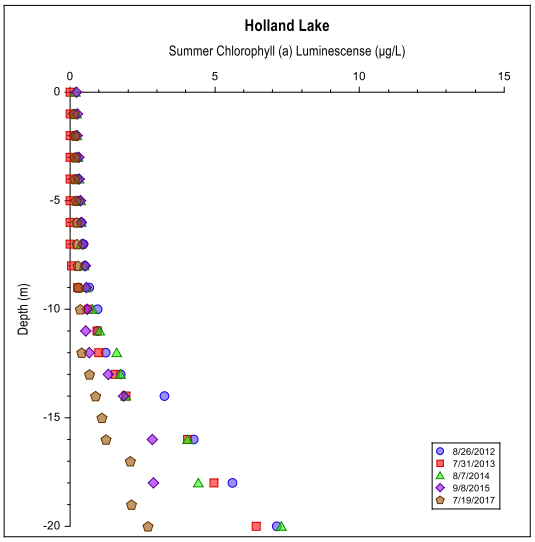


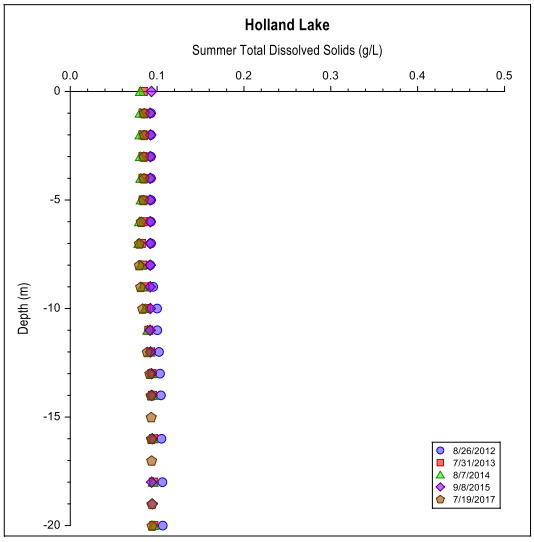


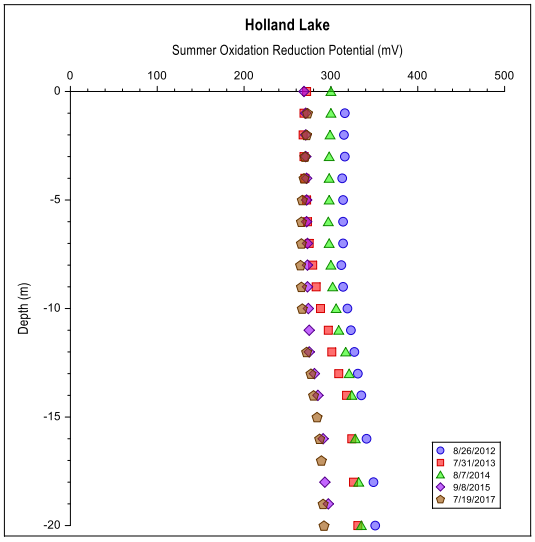
Holland Lake Summer Hydrolab Profiles



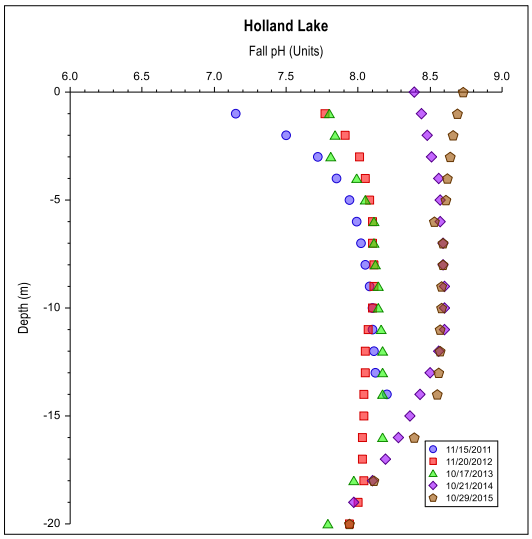


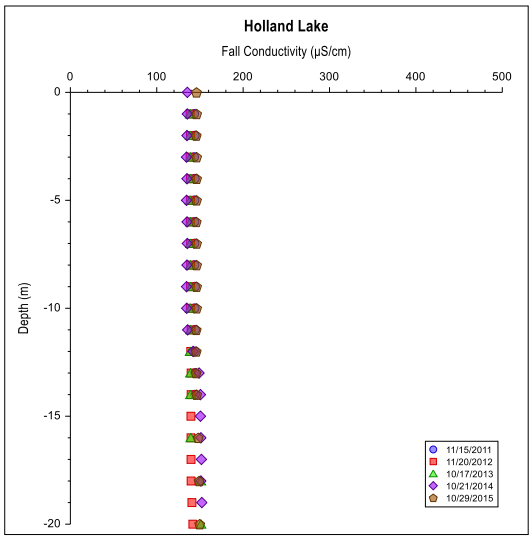


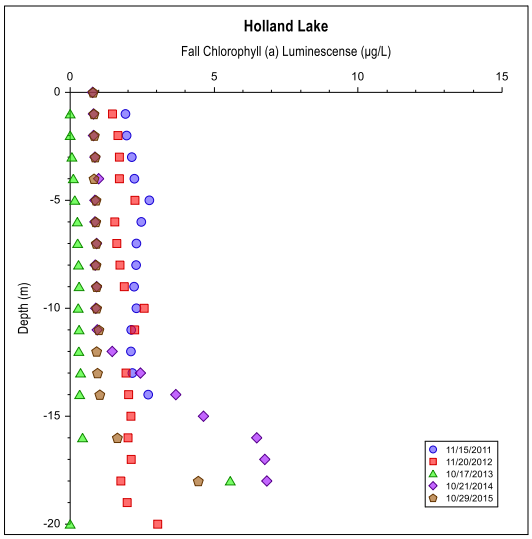


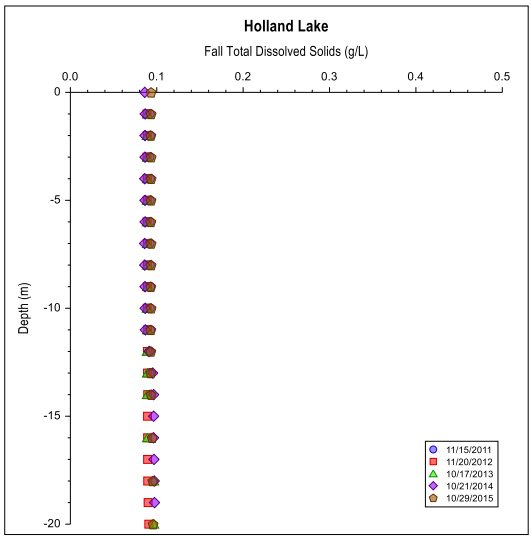


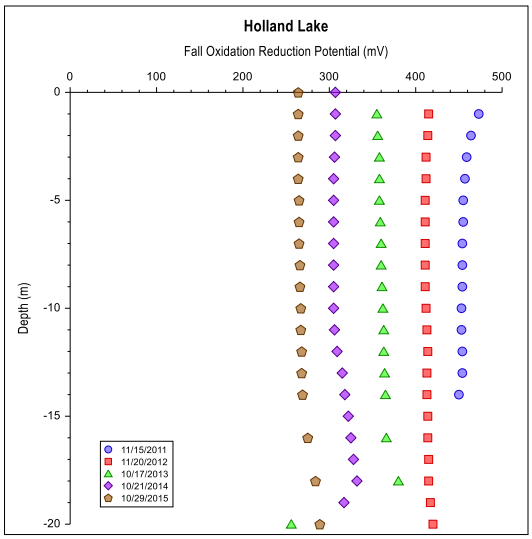
Holland Lake Fall Hydrolab Profiles



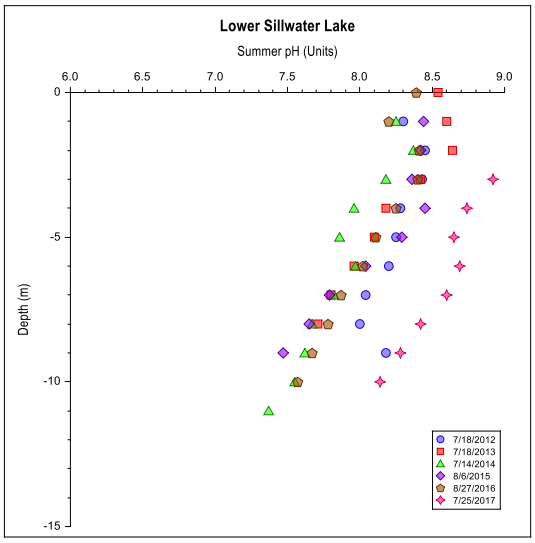


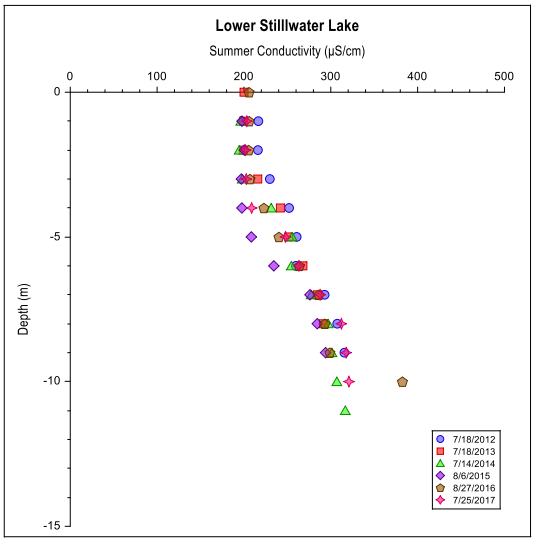


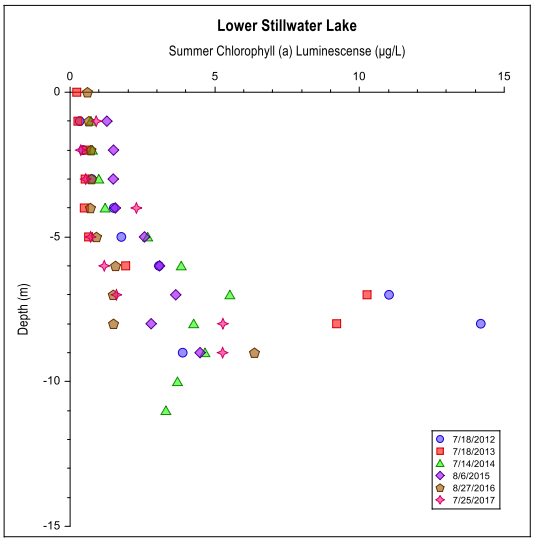


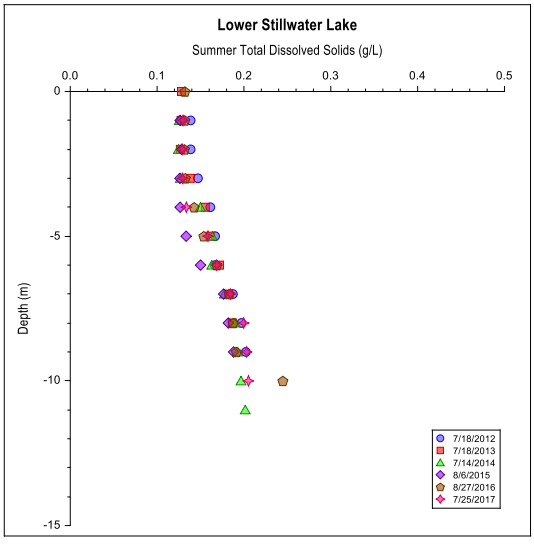


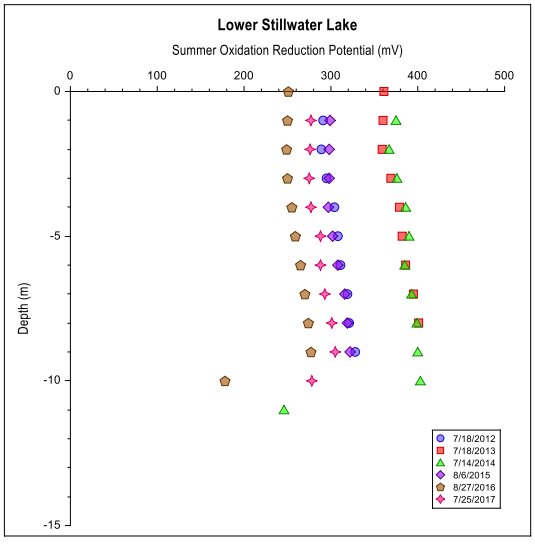
Lower Stillwater Lake Summer Hydrolab Profiles



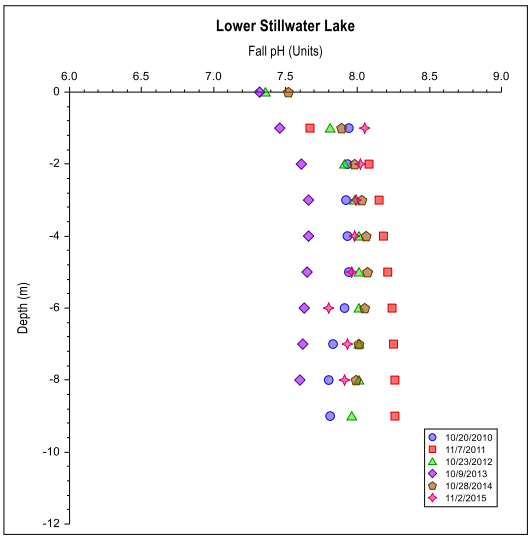


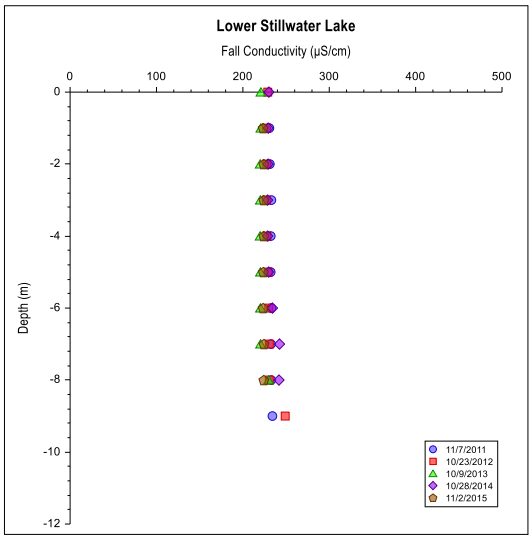


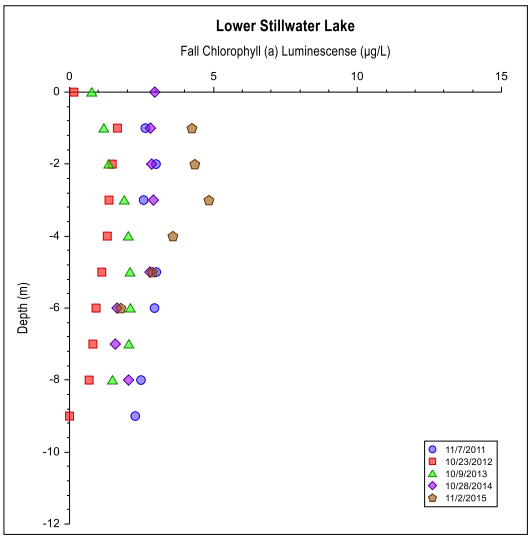


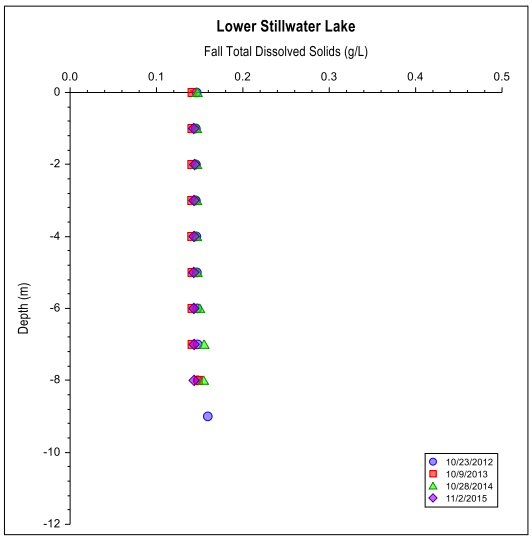


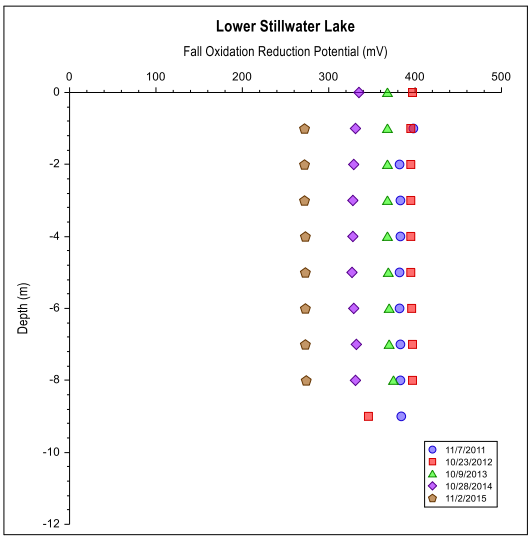
Lower Stillwater Lake Fall Hydrolab Profiles



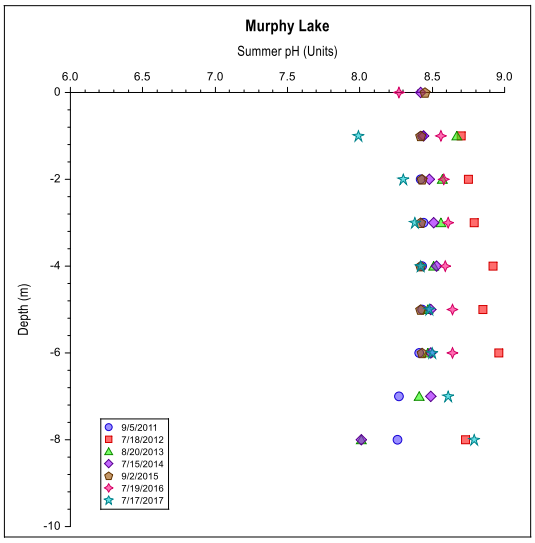


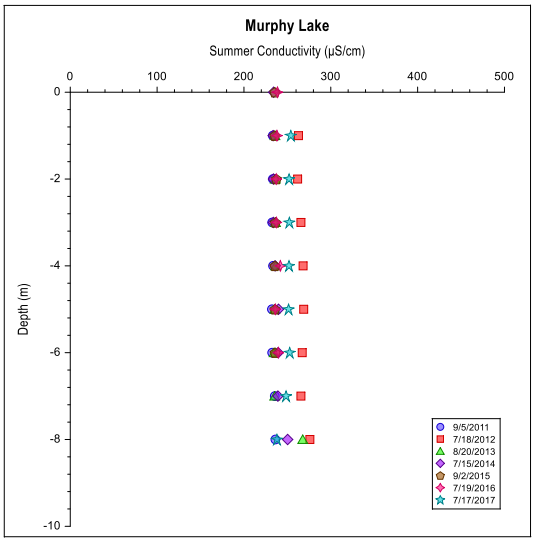


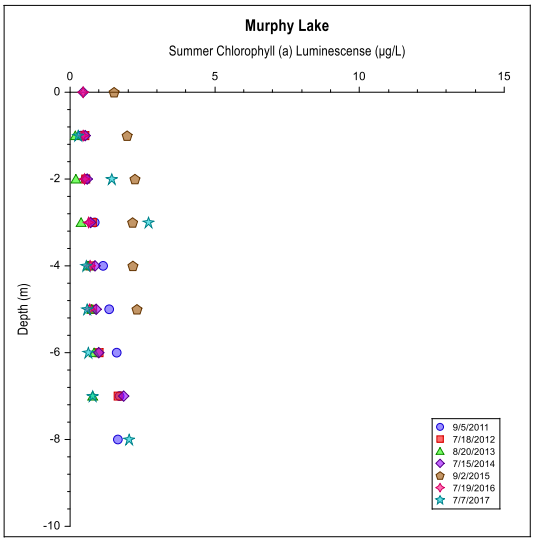


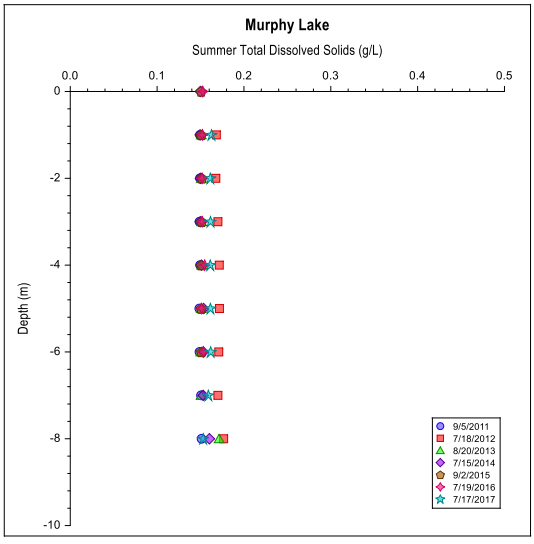


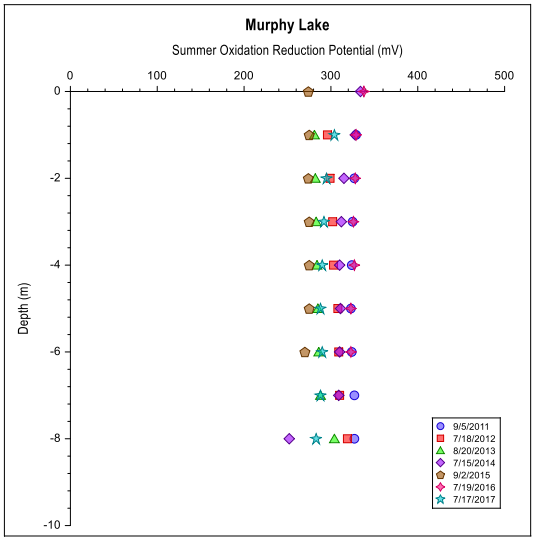
Murphy Lake Summer Hydrolab Profiles



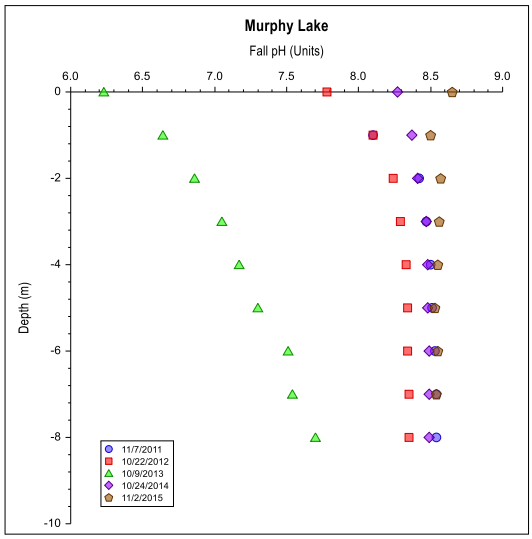


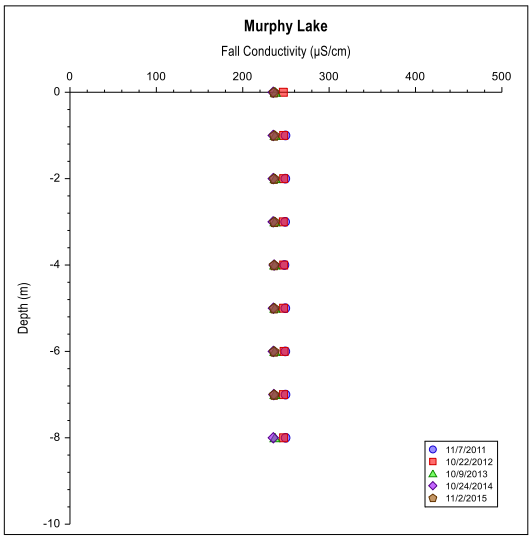


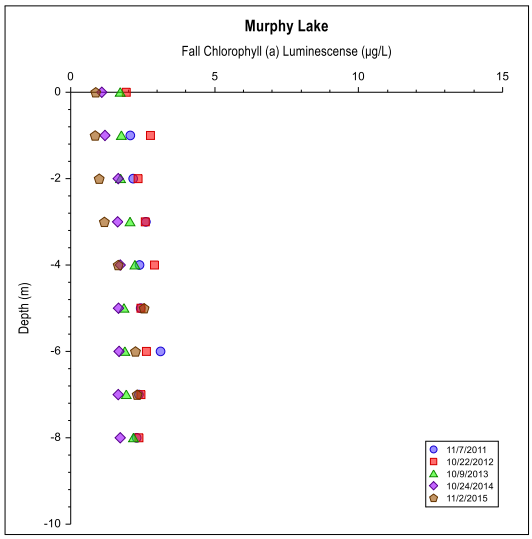


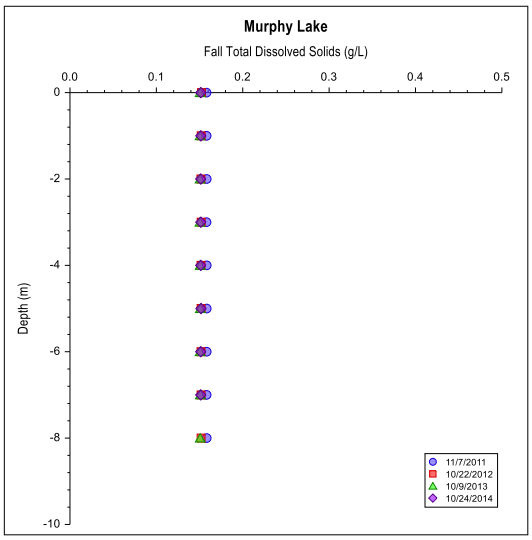


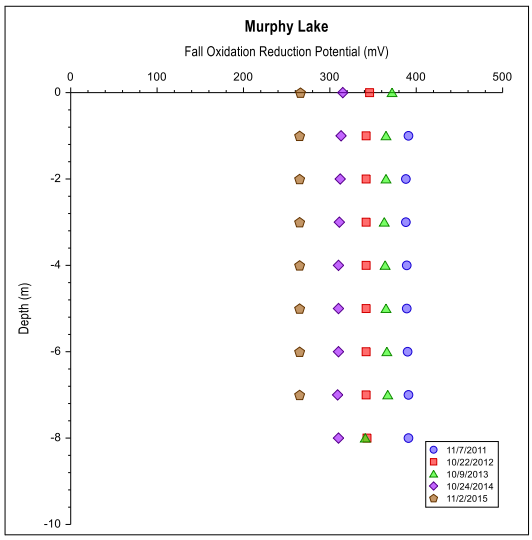
Murphy Lake Fall Hydrolab Profiles



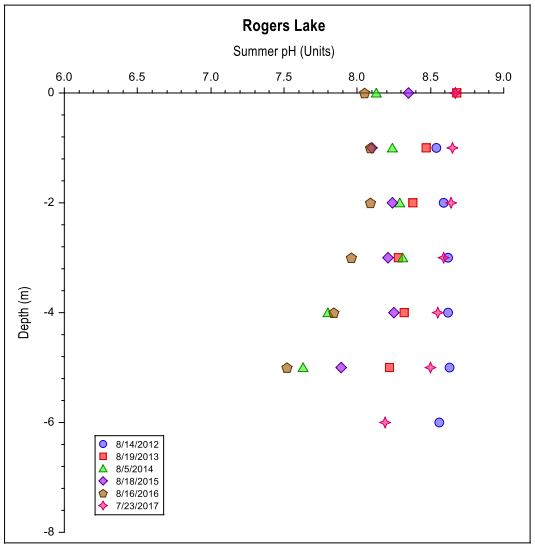


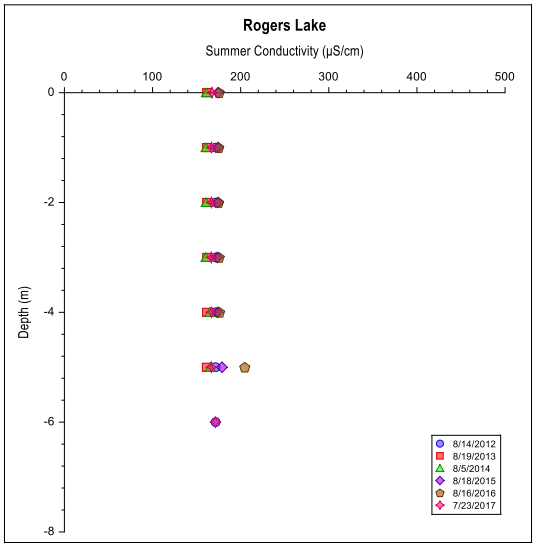


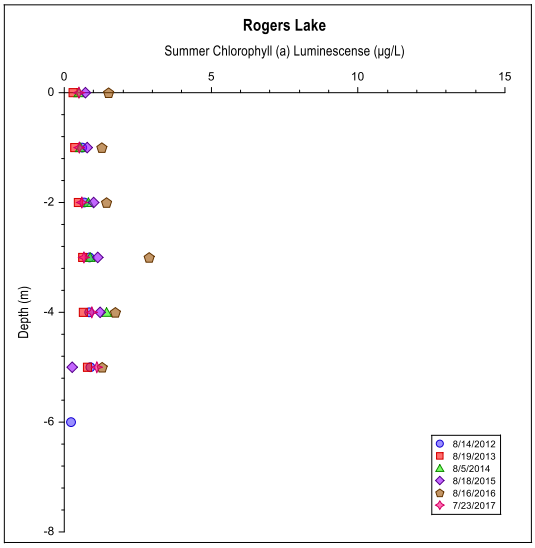


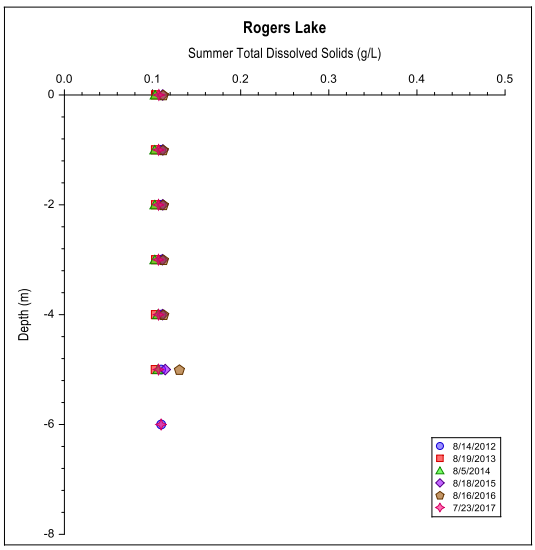


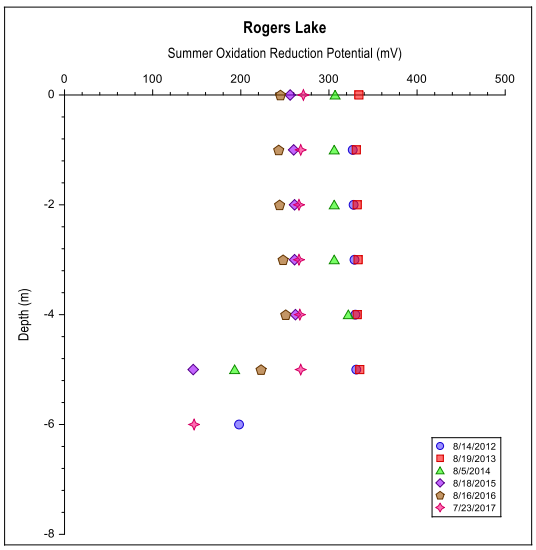
Rogers Lake Summer Hydrolab Profiles



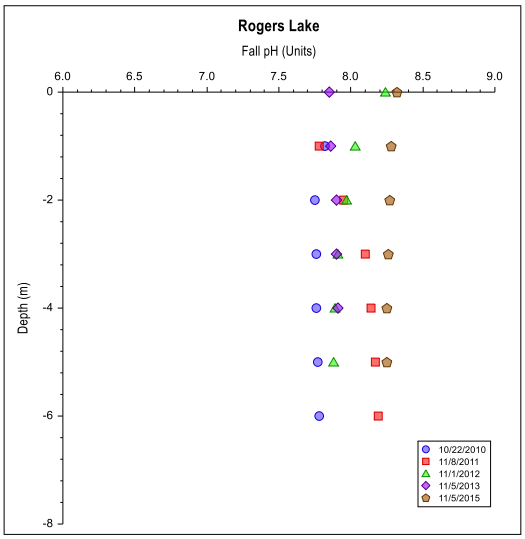


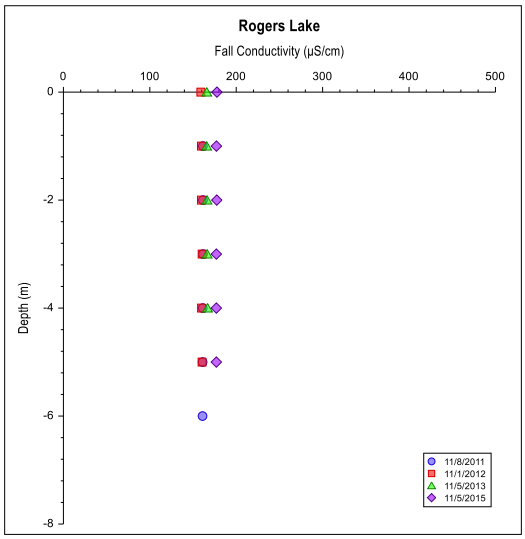


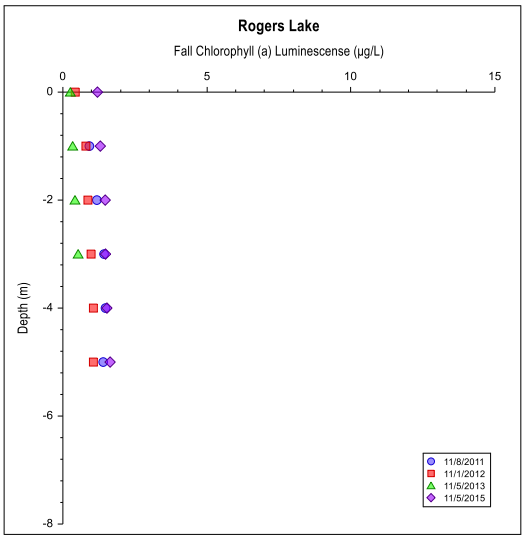


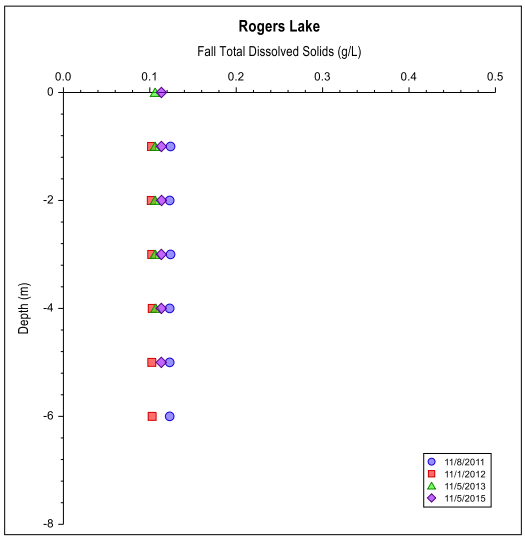


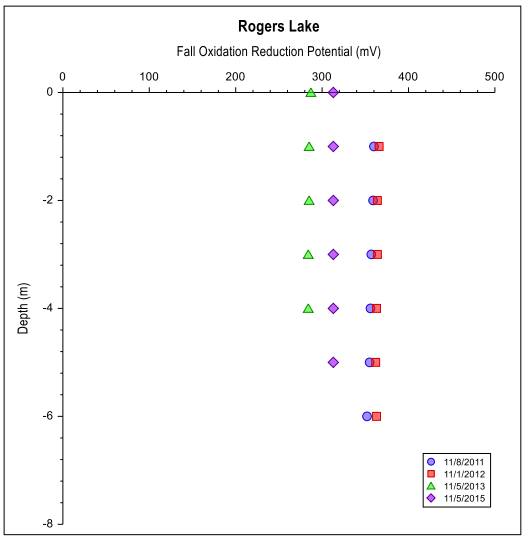
Rogers Lake Fall Hydrolab Profiles



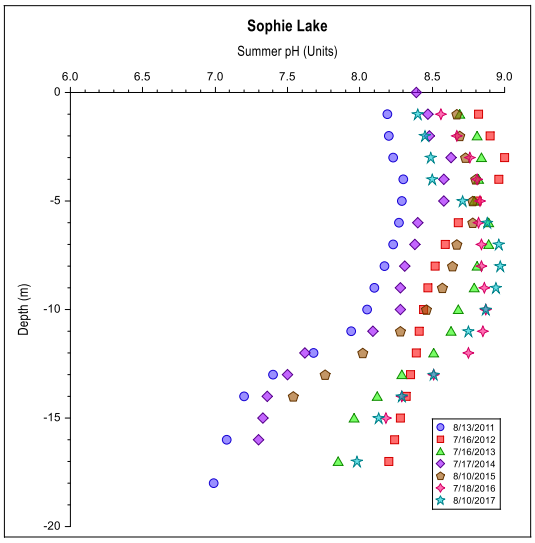


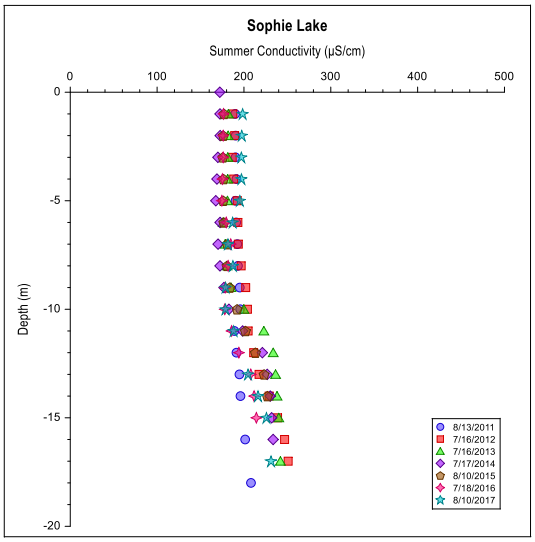


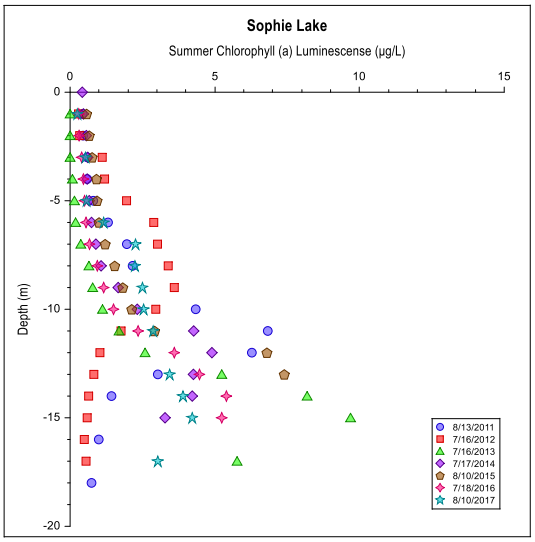


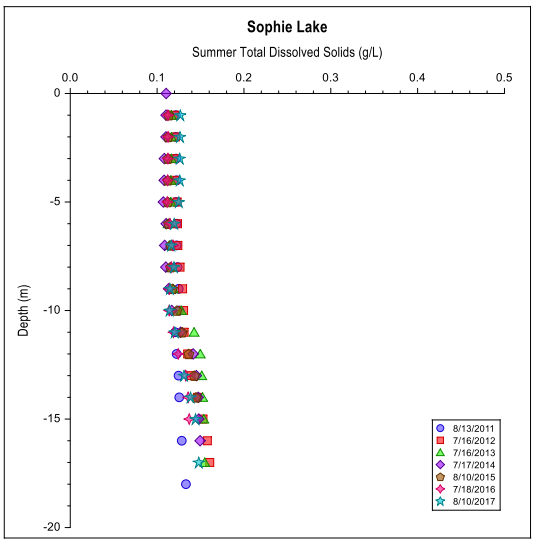


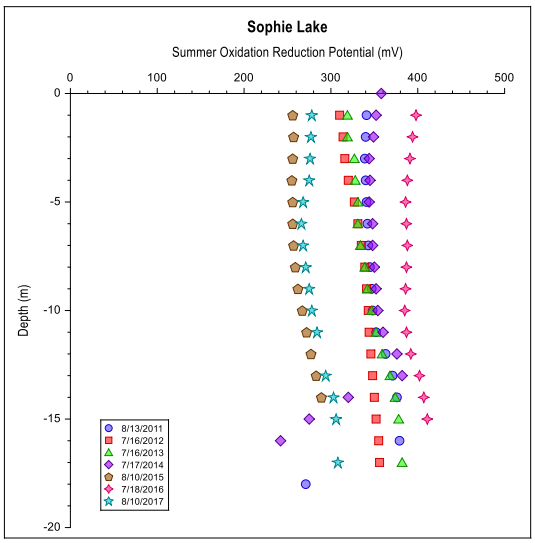
Sophie Lake Summer Hydrolab Profiles



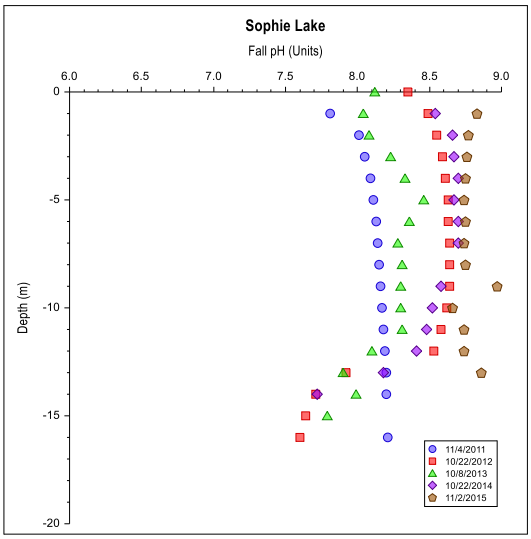


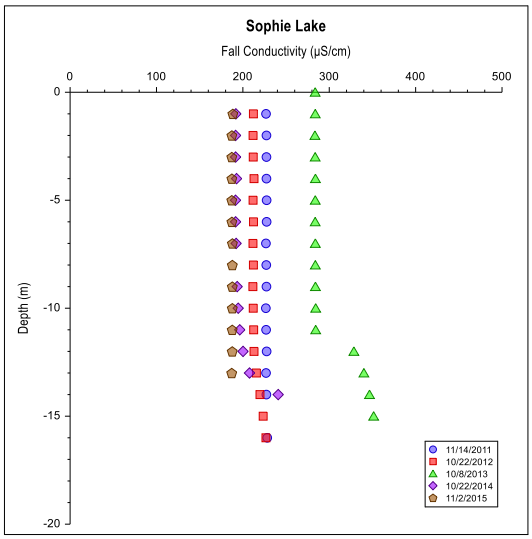


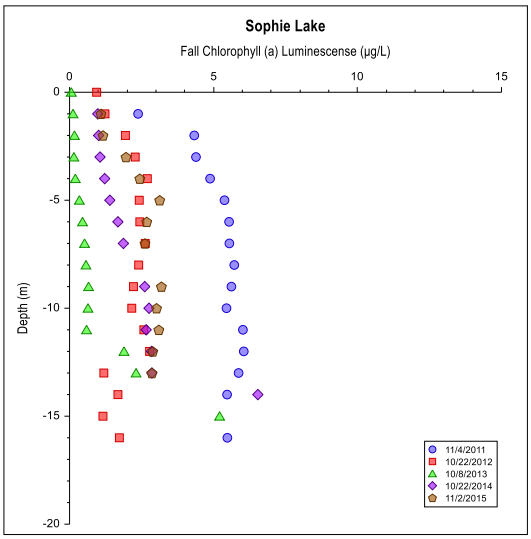


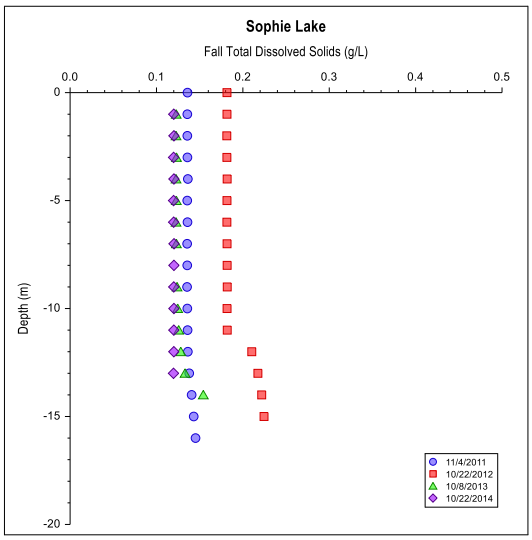


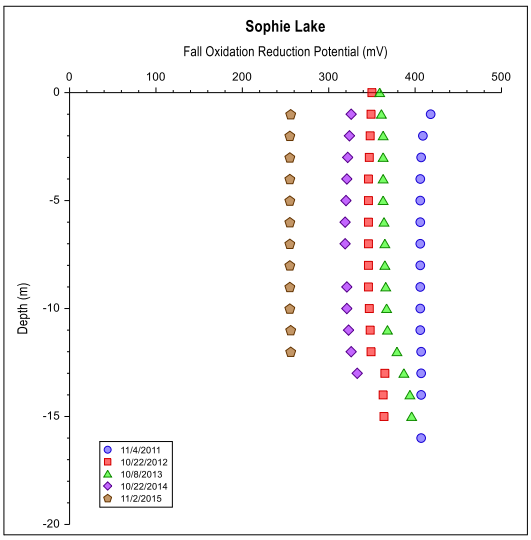
Sophie Lake Fall Hydrolab Profiles









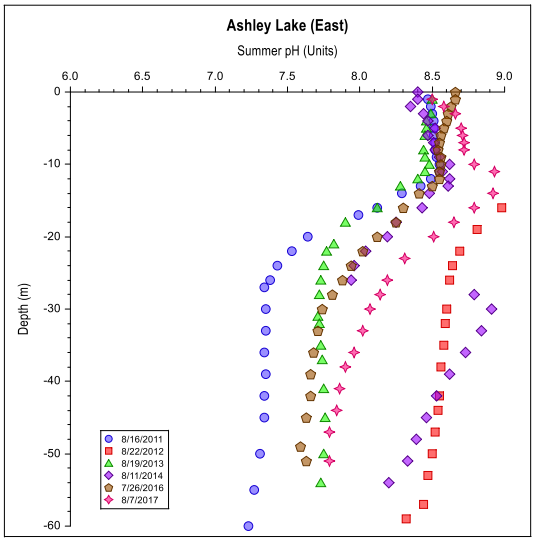


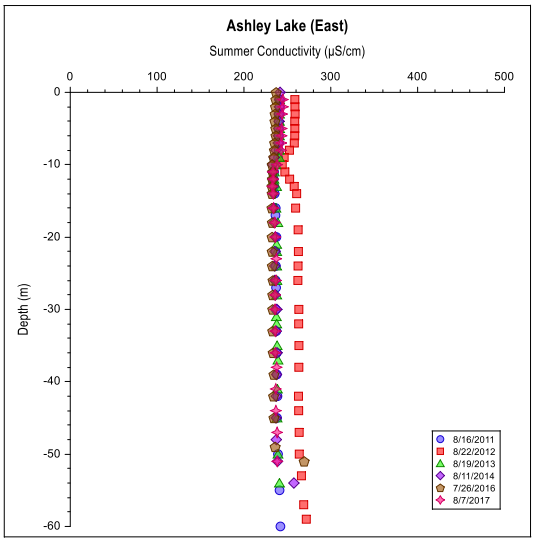
LARGE LAKES

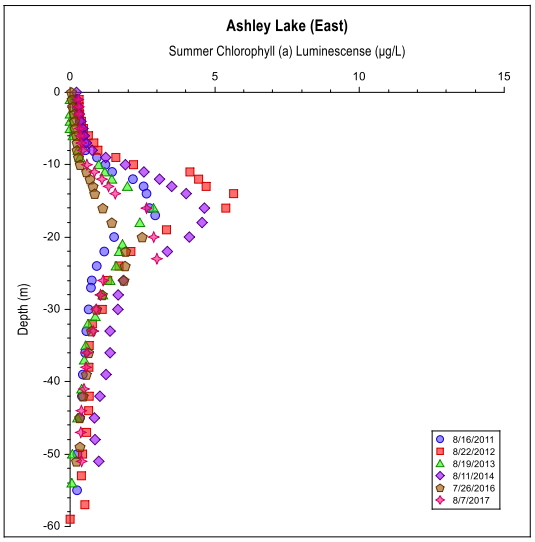
(Surface Area > 500 Acres)

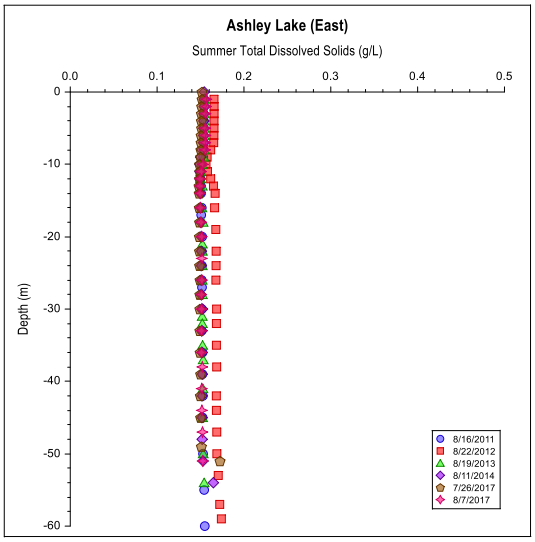
Ashley
Dickey
Echo
Flathead
Lindbergh
Little Bitterroot
Mary Ronan
Tally
Upper Stillwater
Whitefish

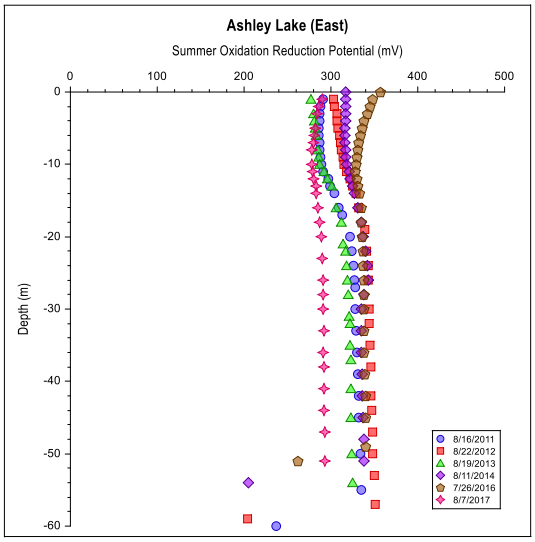
Ashley Lake Summer Hydrolab



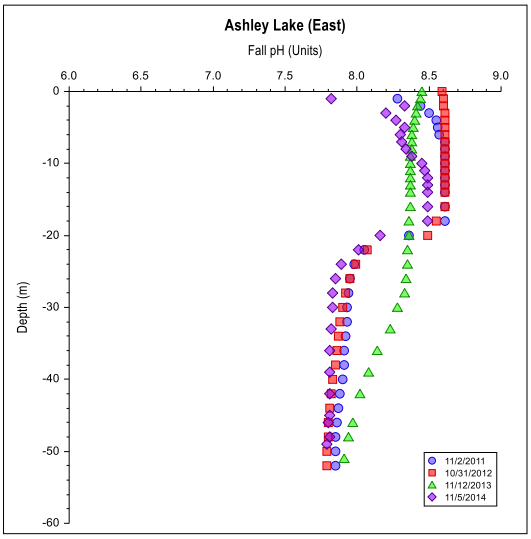


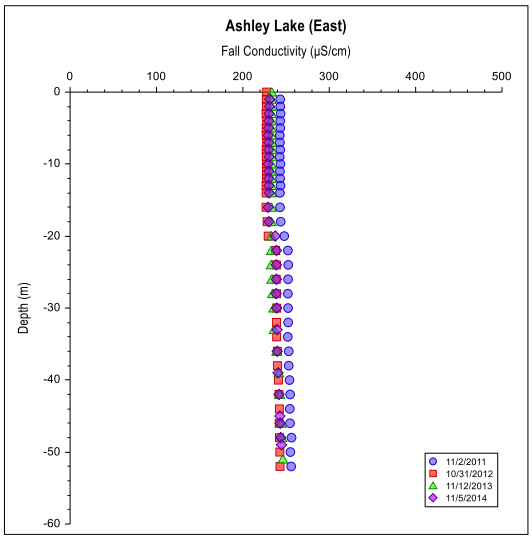


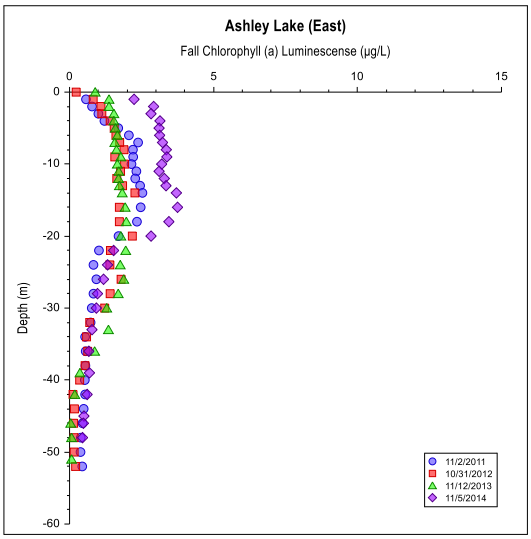


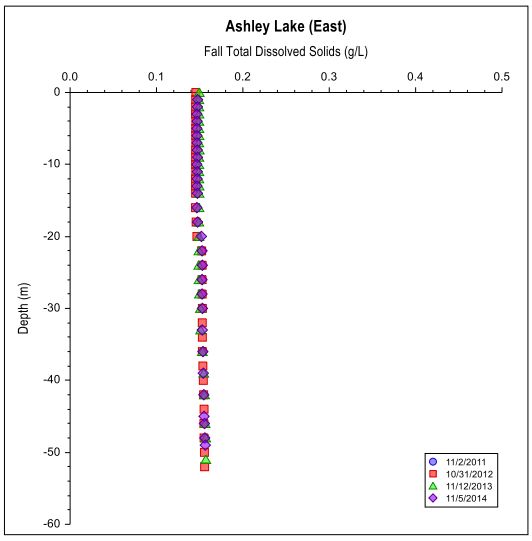


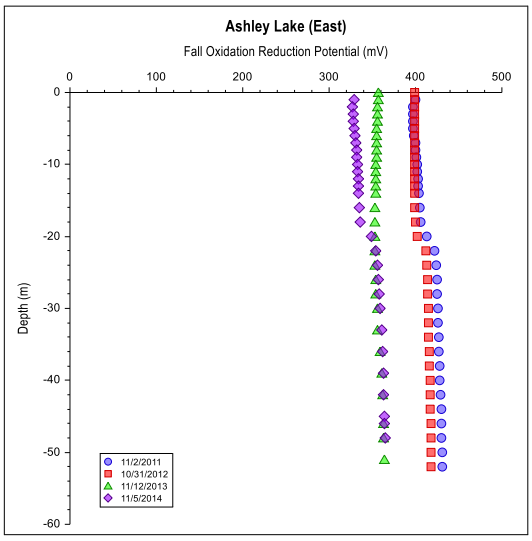
Ashley Lake (East) Fall Hydrolab Profiles



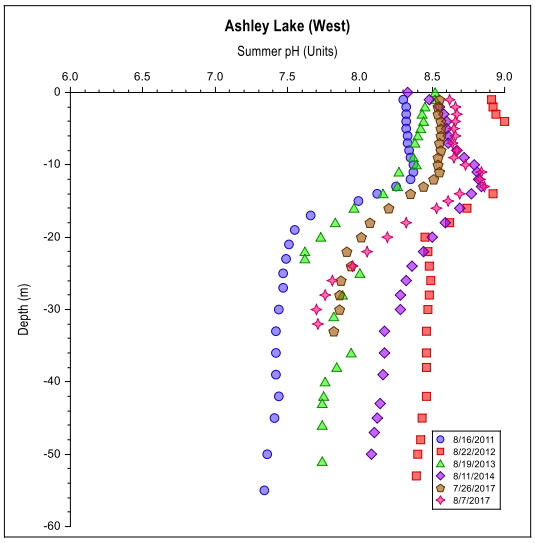


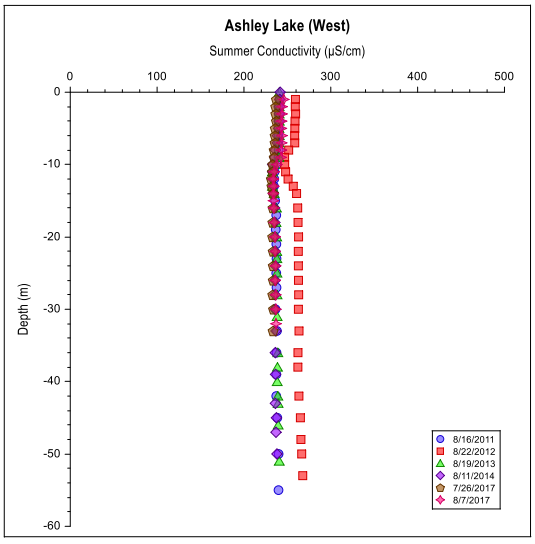


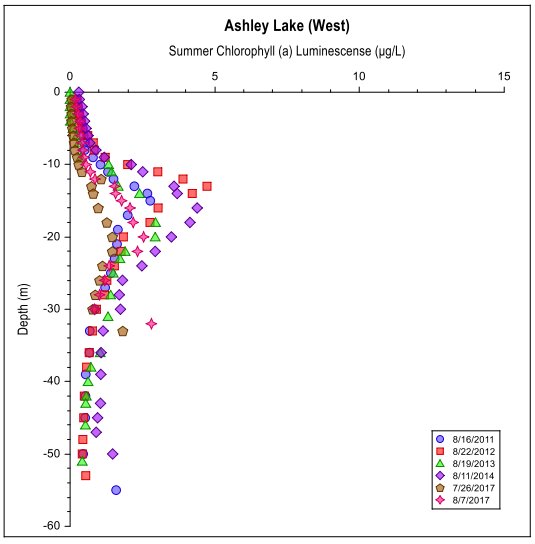


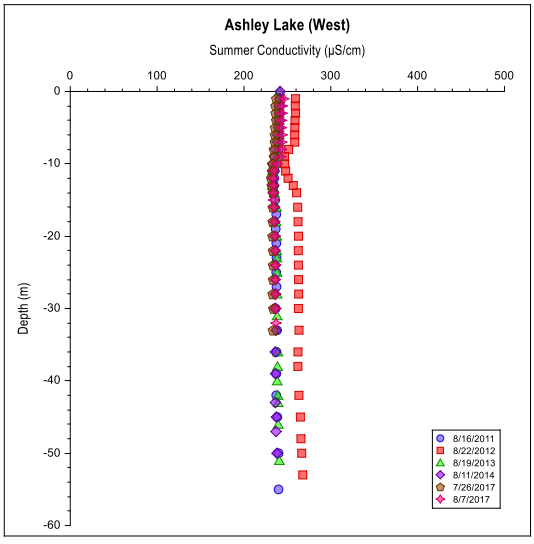


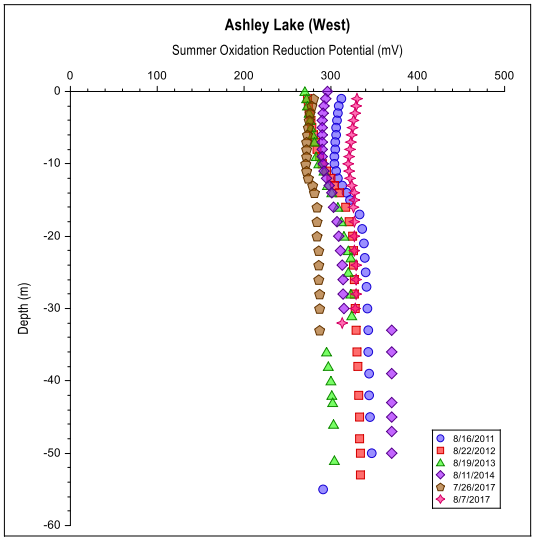
Ashley Lake (West) Summer Hydrolab Profiles



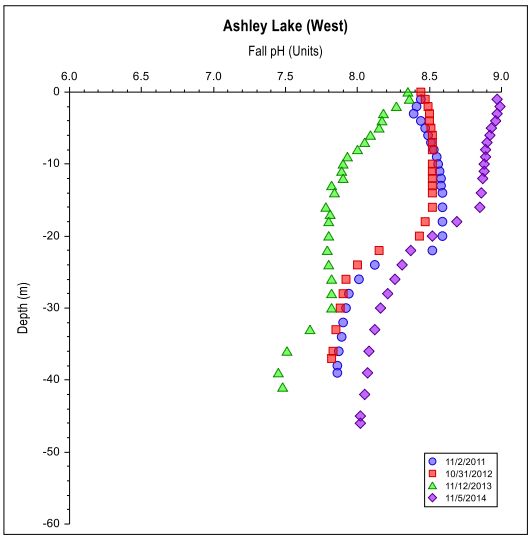


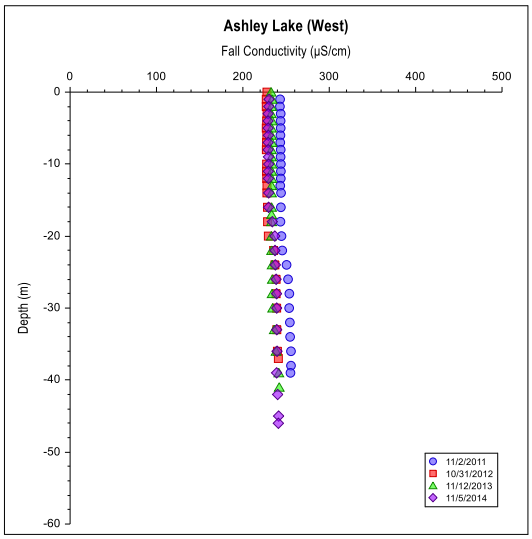


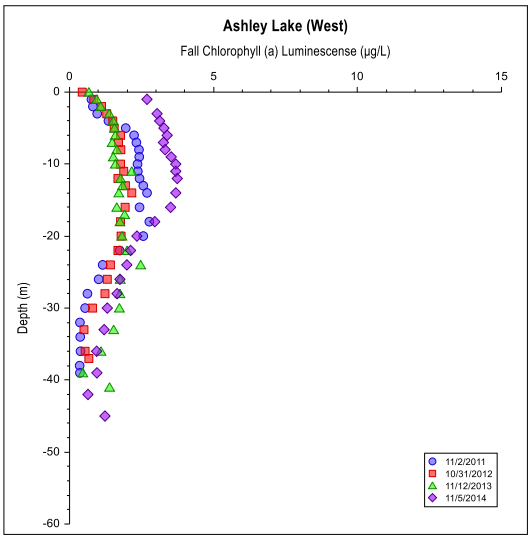


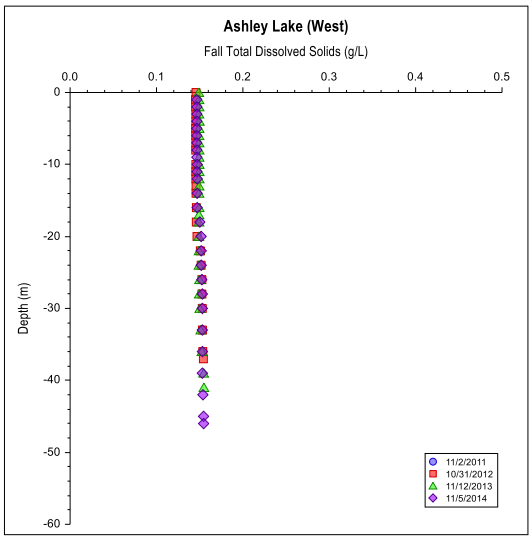


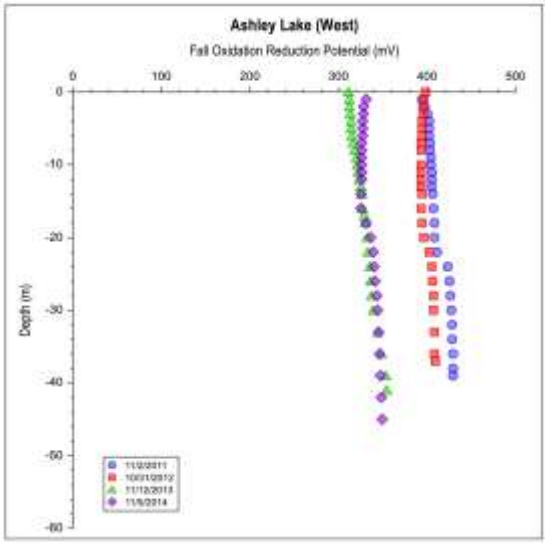
Ashley Lake (West) Fall Hydrolab Profiles



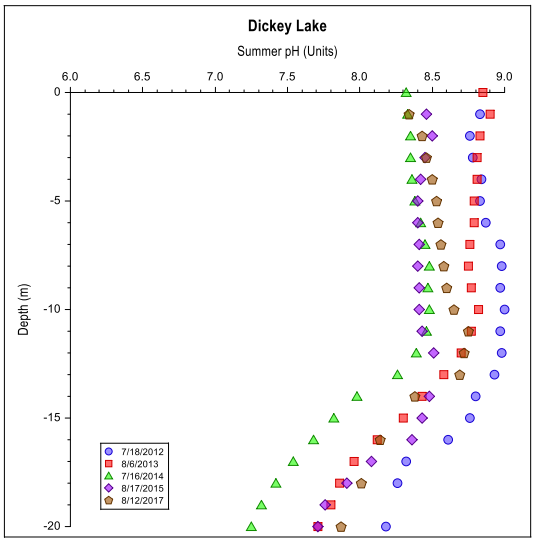


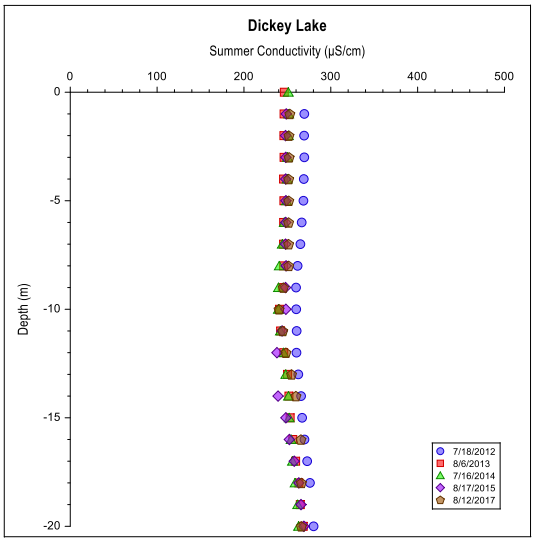


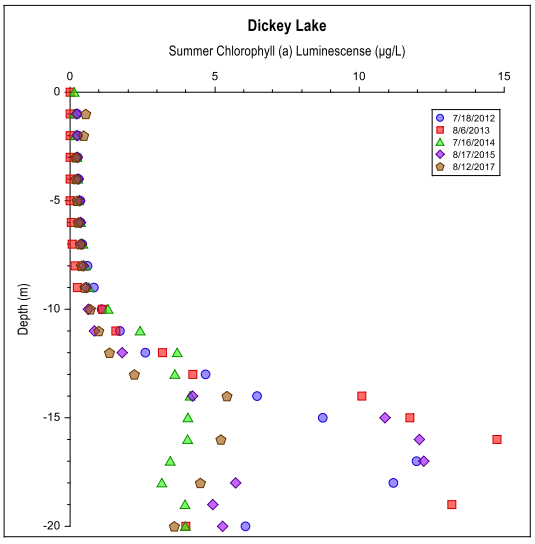


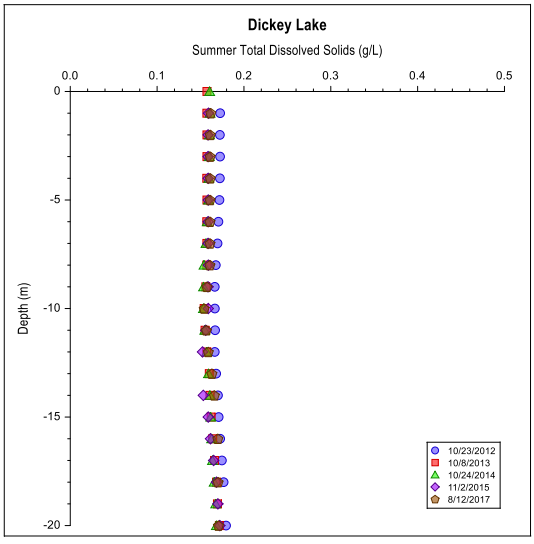


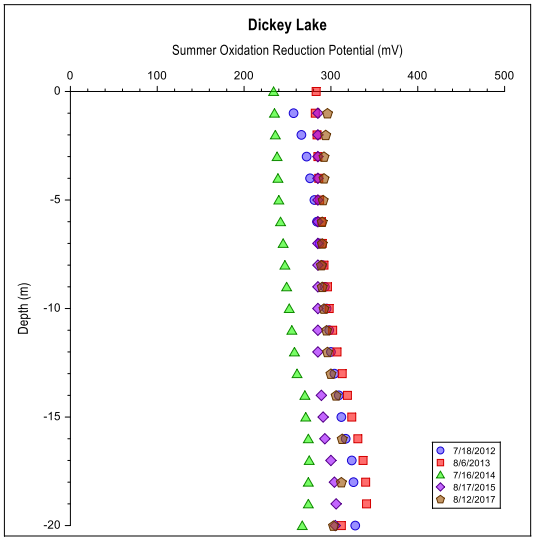
Dickey Lake Summer Hydrolab Profiles



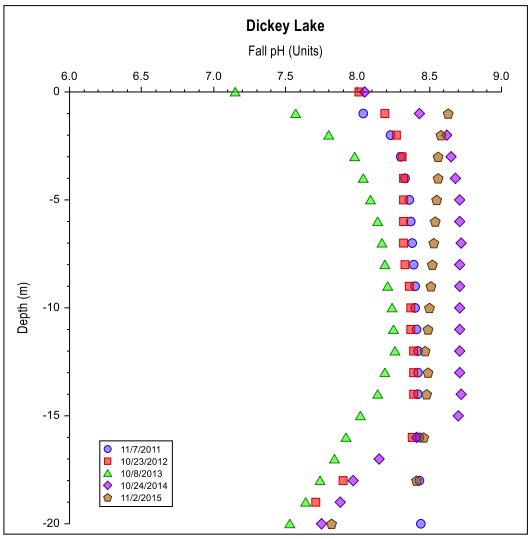


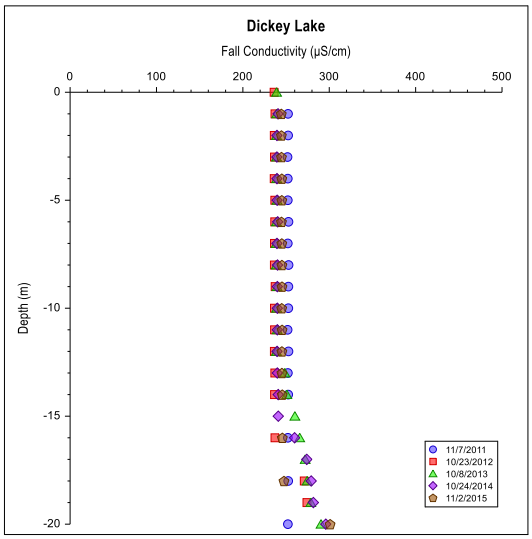


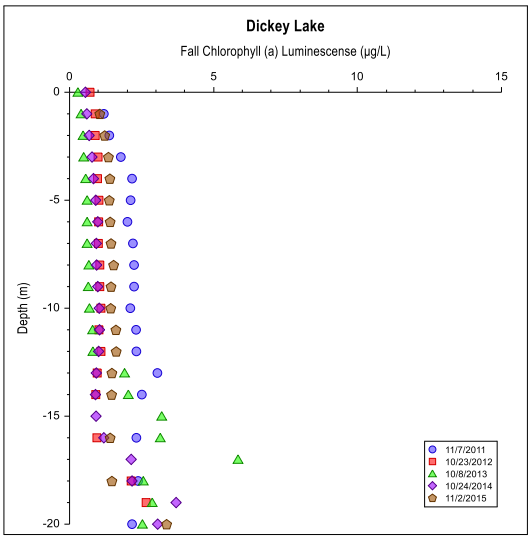


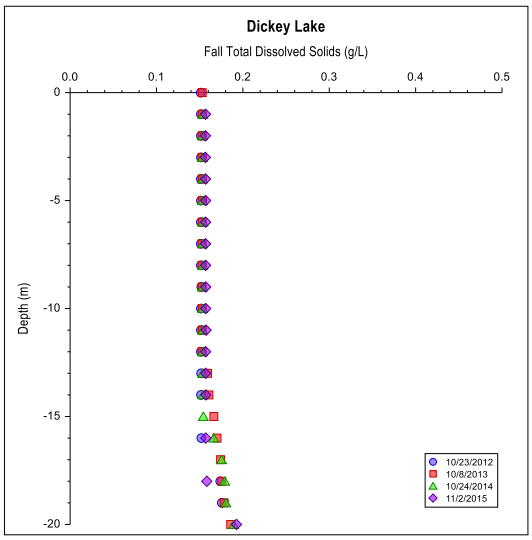


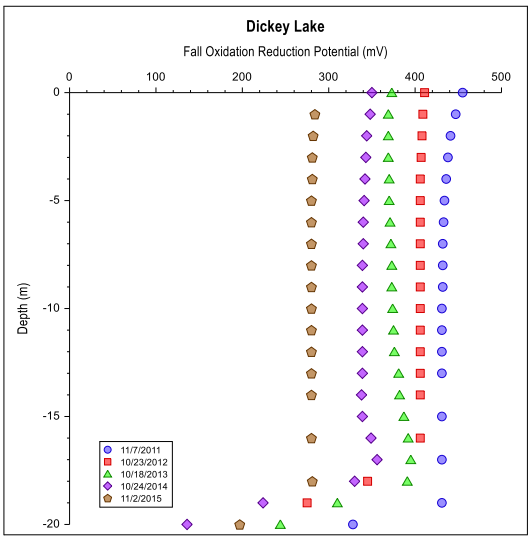
Dickey Lake Fall Hydrolab Profiles



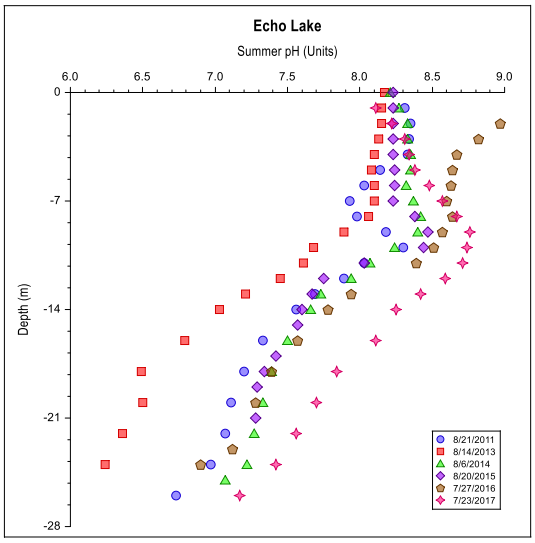


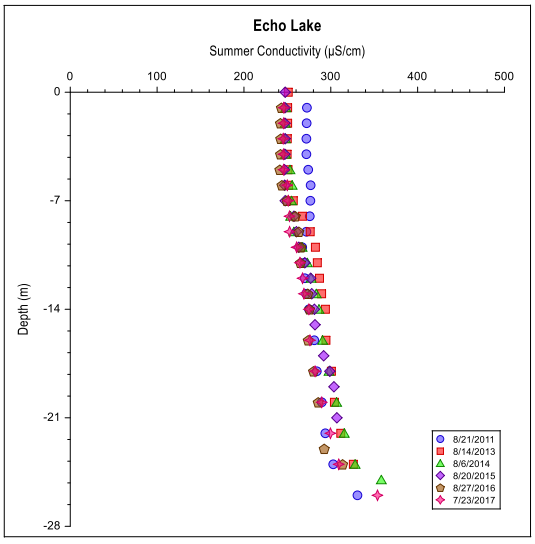


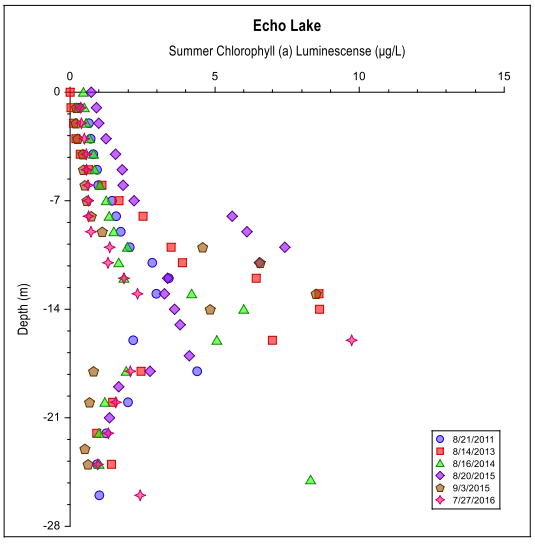


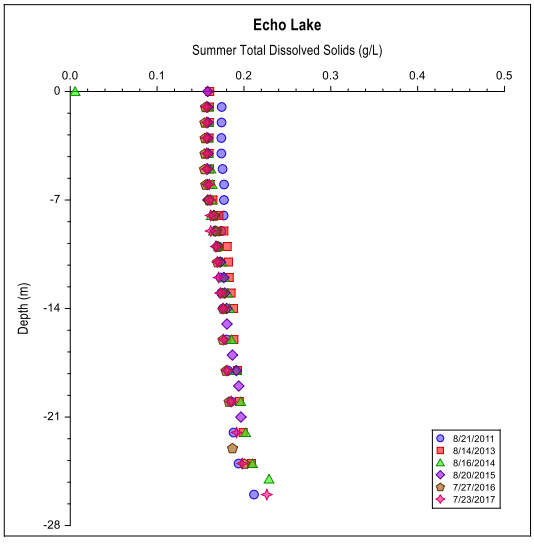


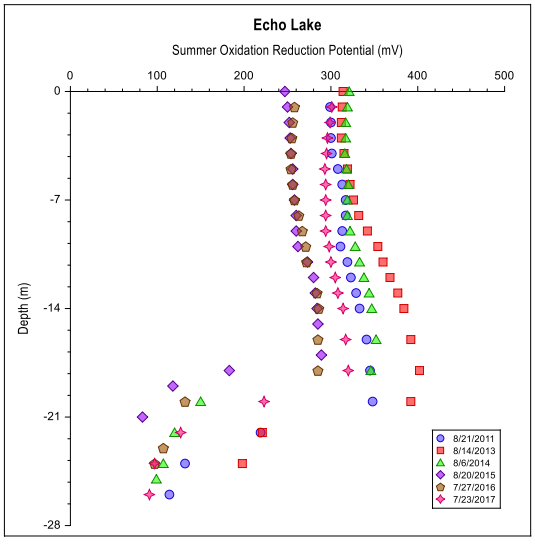
Echo Lake Summer Hydrolab Profiles



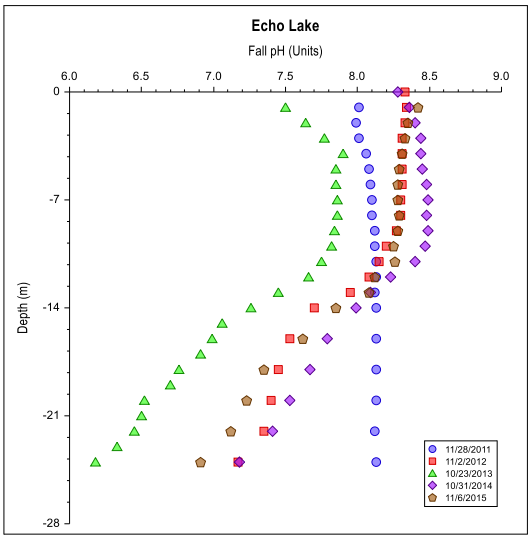


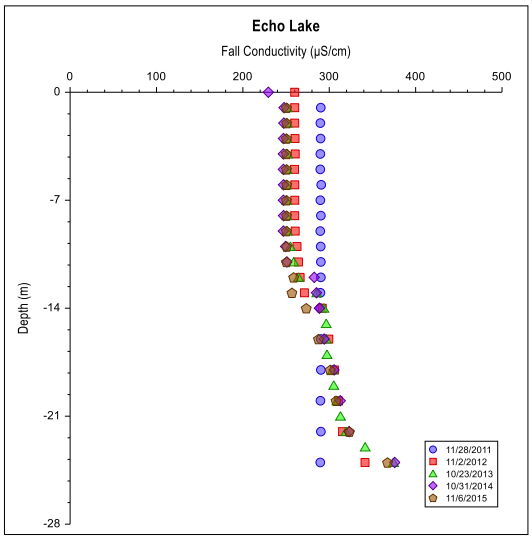


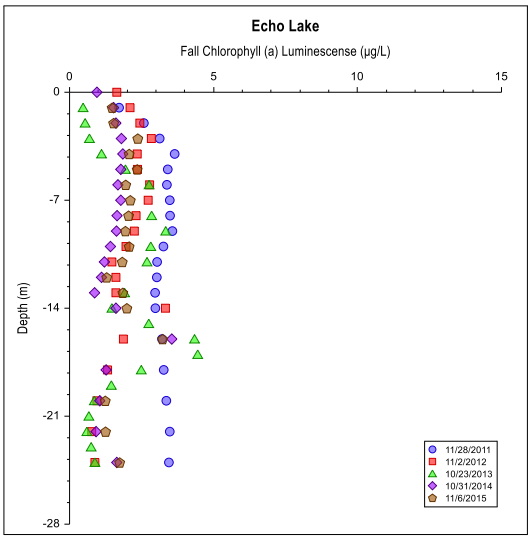


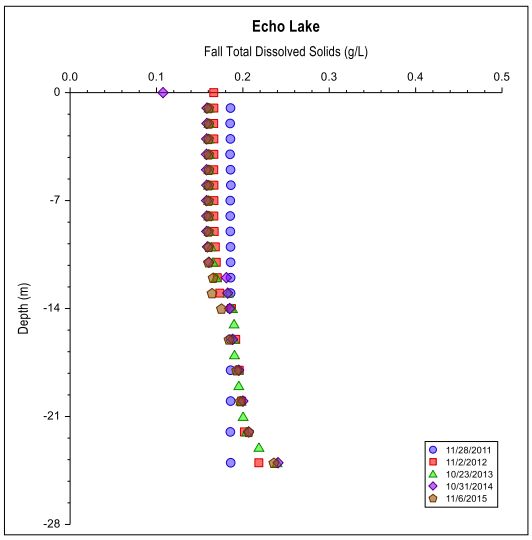


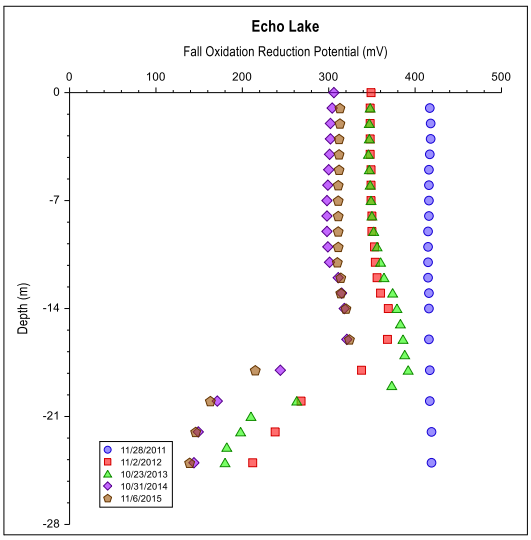
Echo Lake Fall Hydrolab Profiles



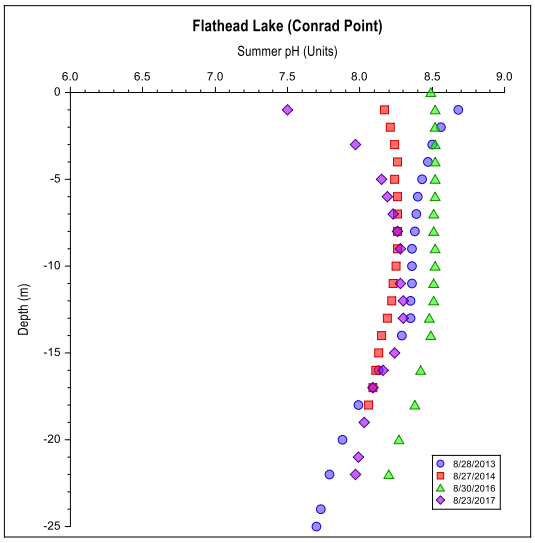


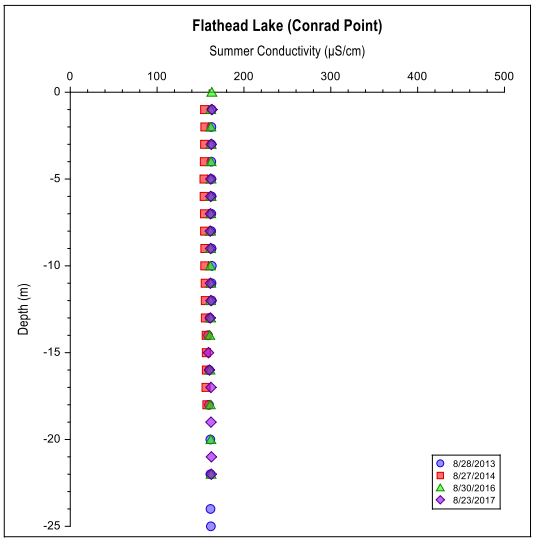


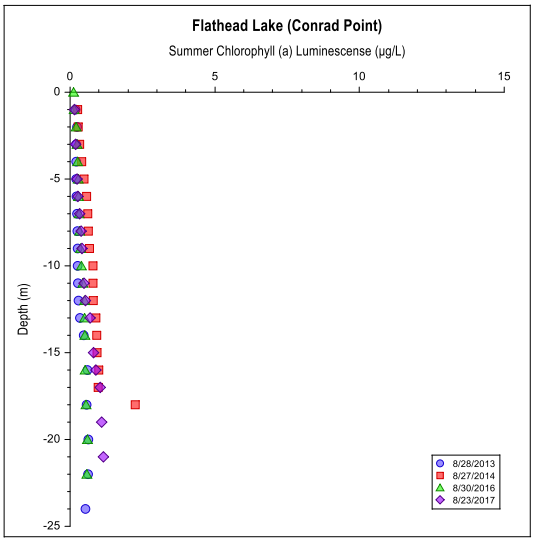


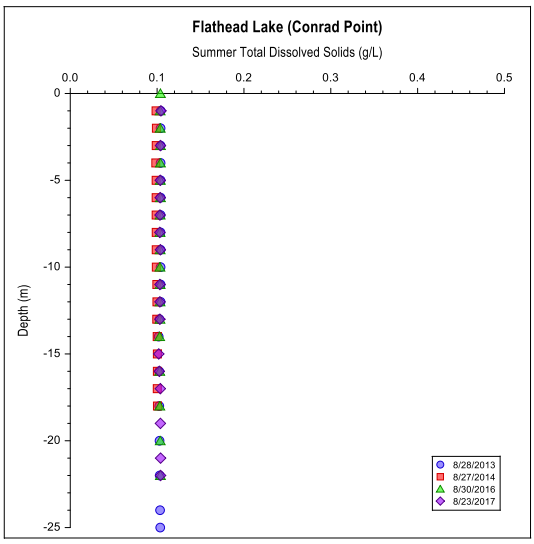


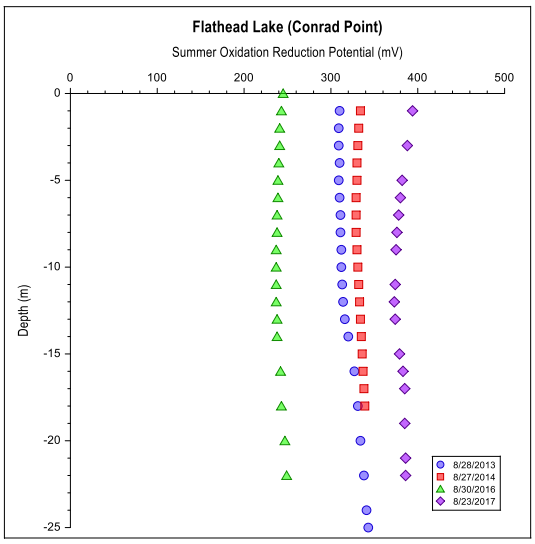
Flathead Lake (Conrad Point) Summer Hydrolab Profiles



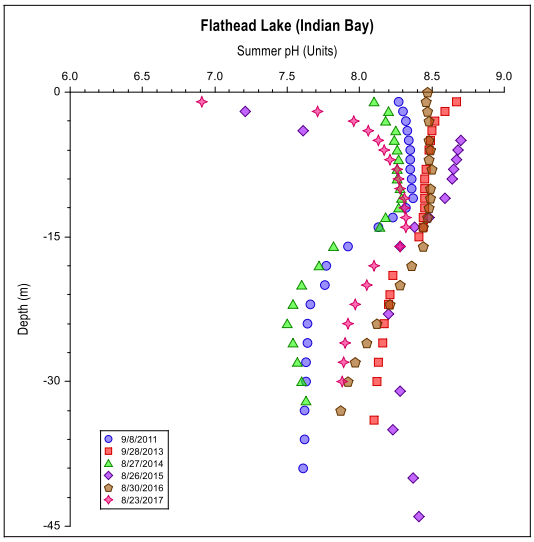


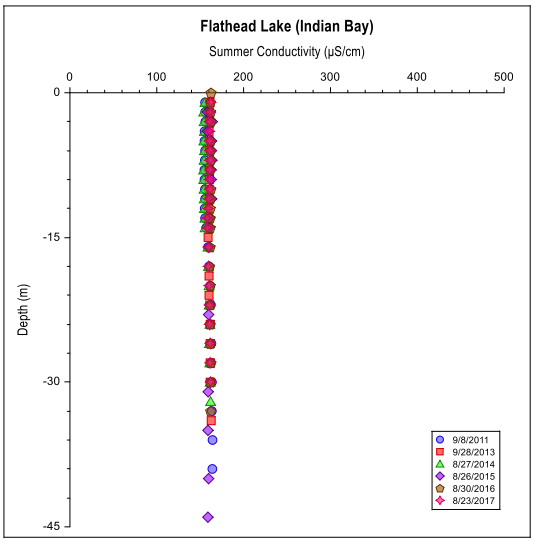


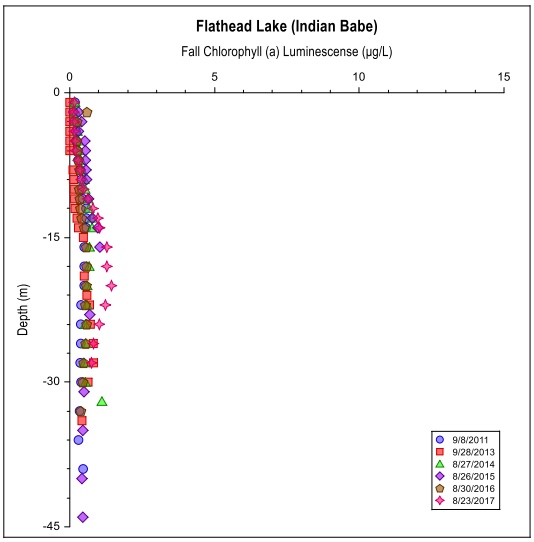


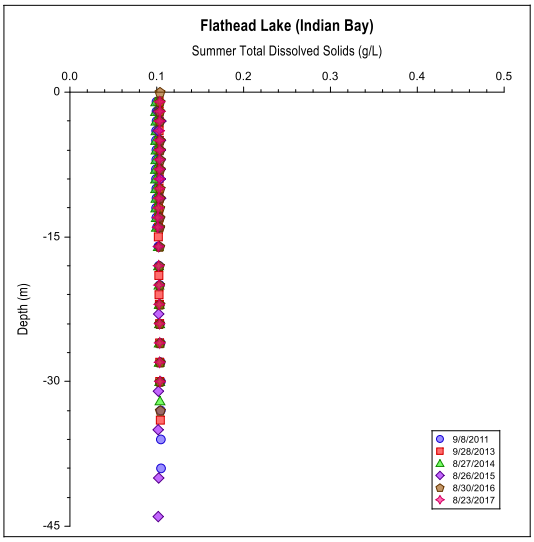


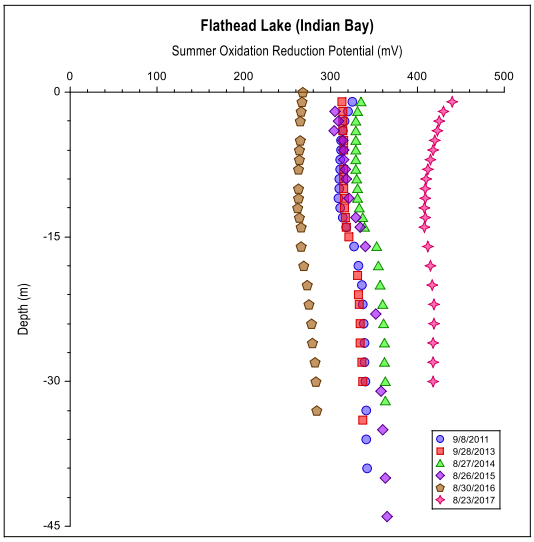
Flathead Lake (Indian Bay) Summer Hydrolab Profiles



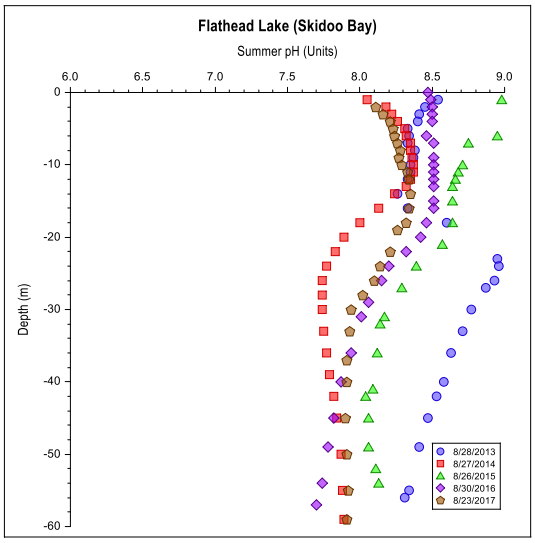


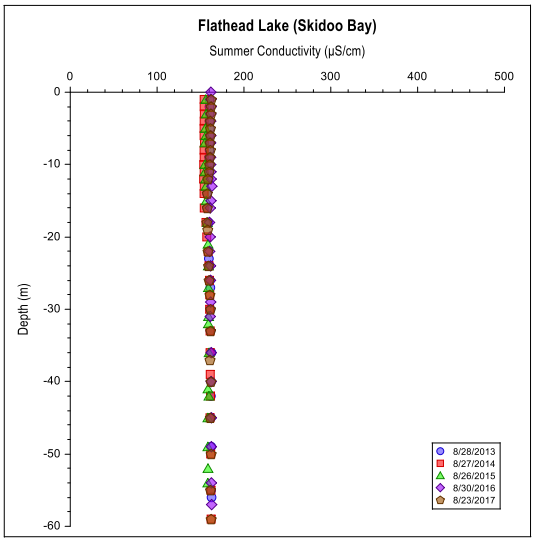


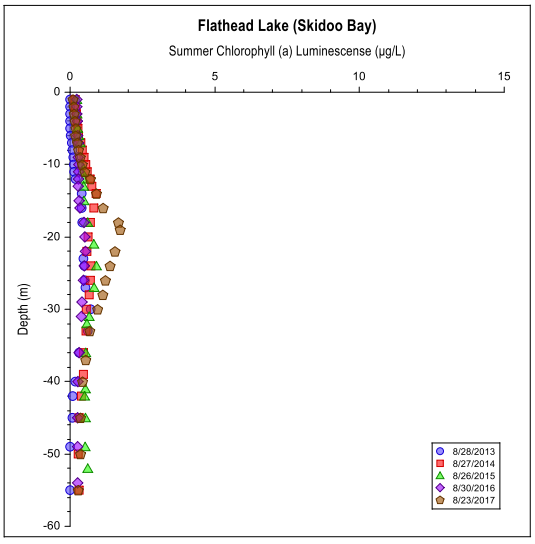


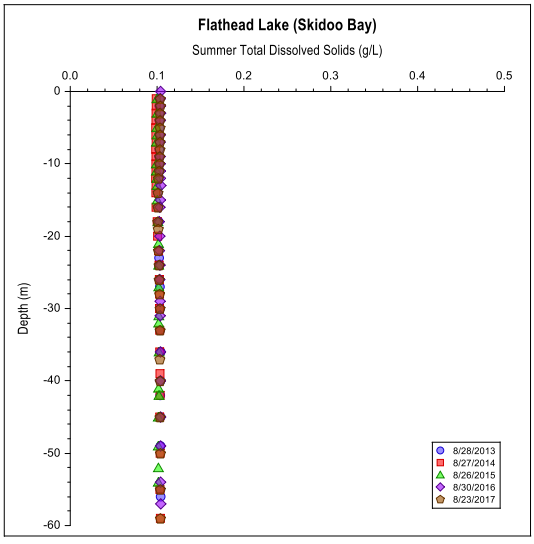


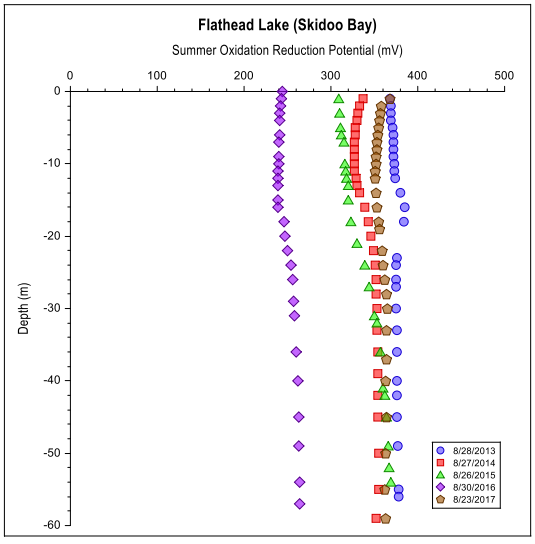
Flathead Lake (Skidoo Bay) Summer Hydrolab Profiles



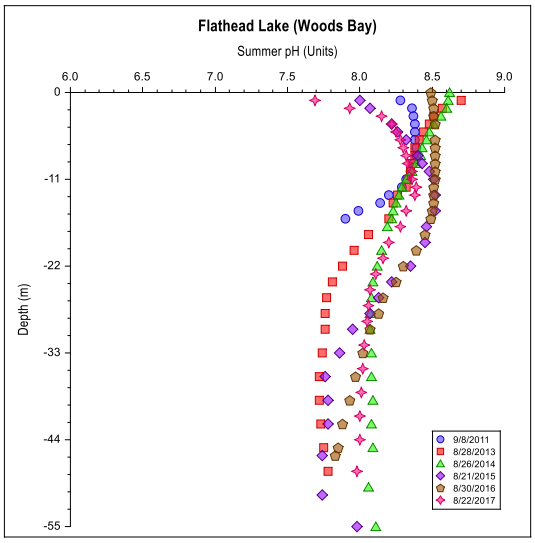


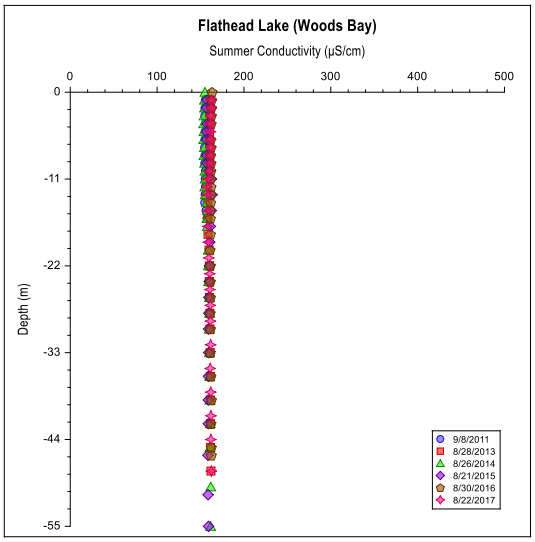


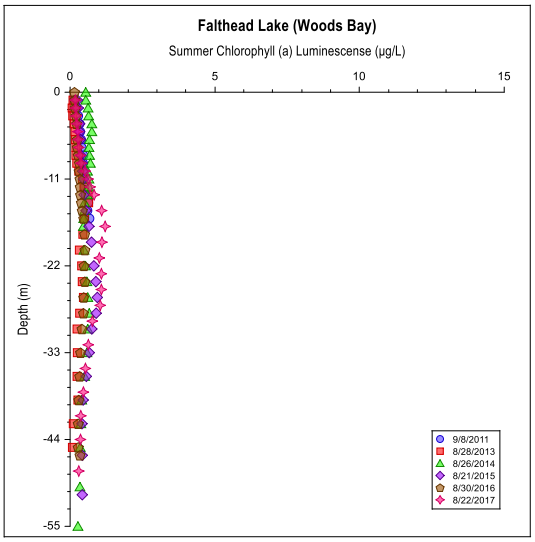


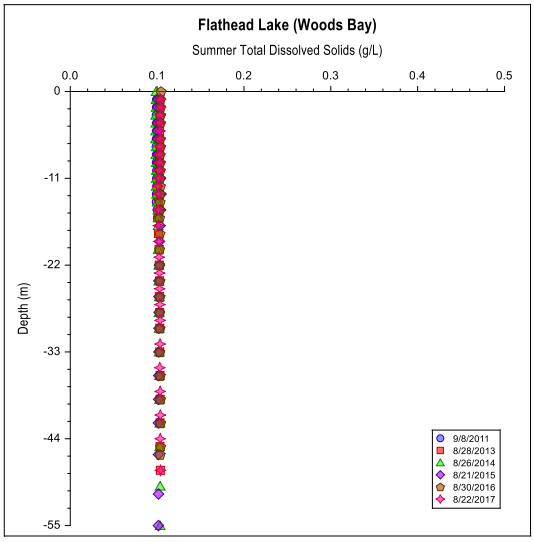


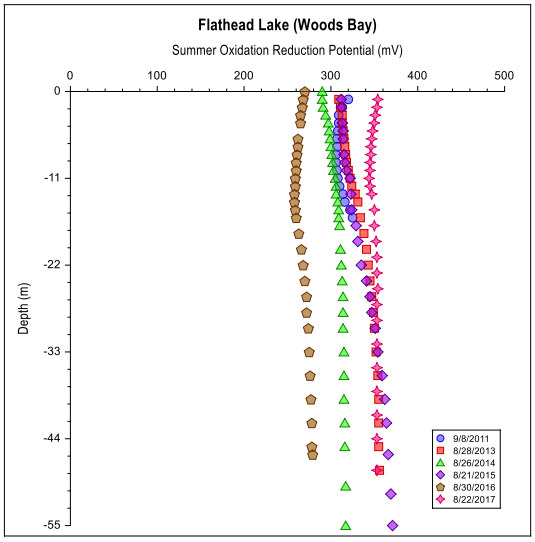
Flathead Lake (Woods Bay) Summer Hydrolab Profiles



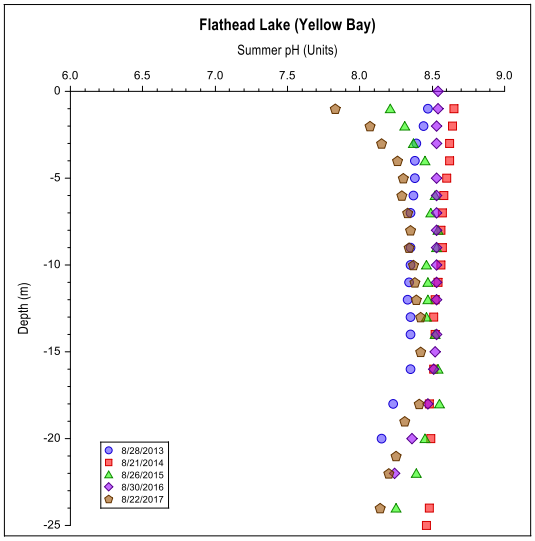


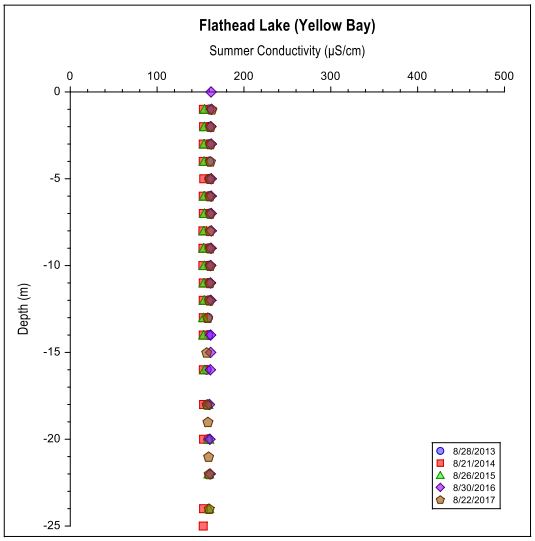


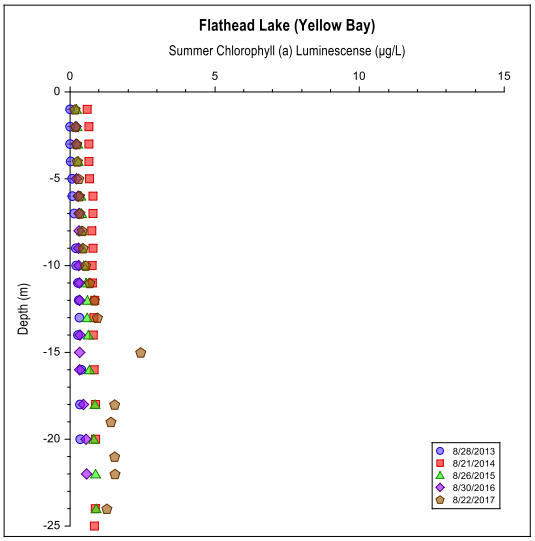


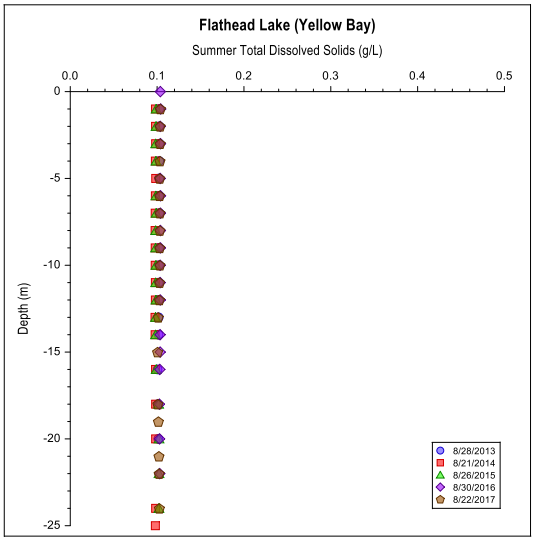


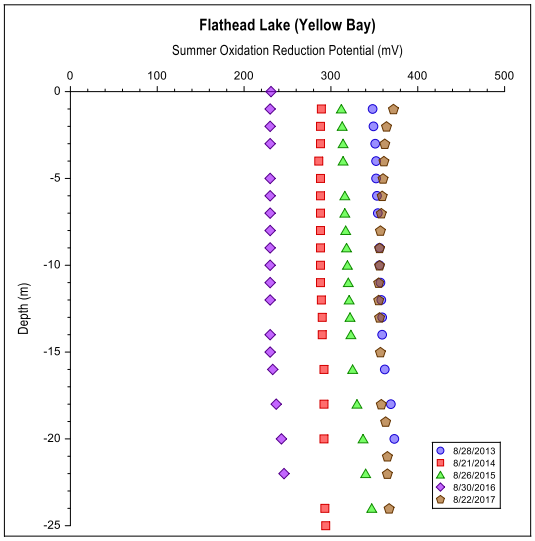
Flathead Lake (Yellow Bay) Summer Hydrolab Profiles



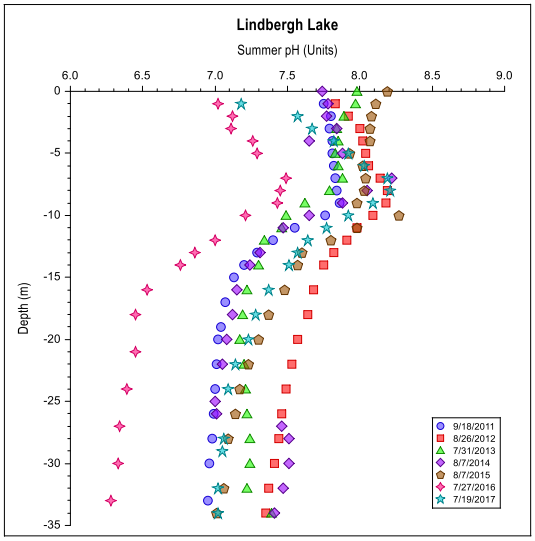


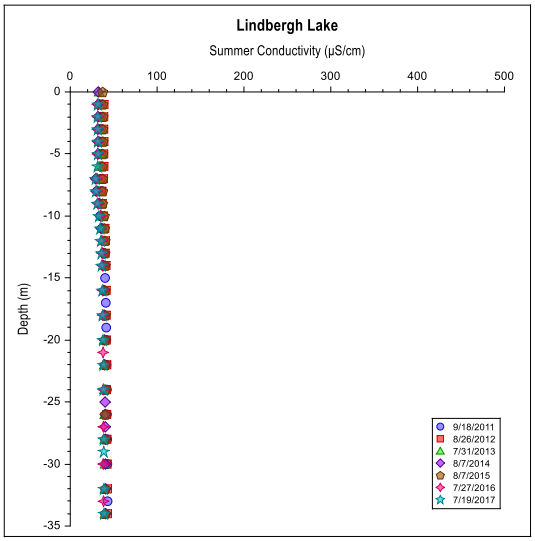


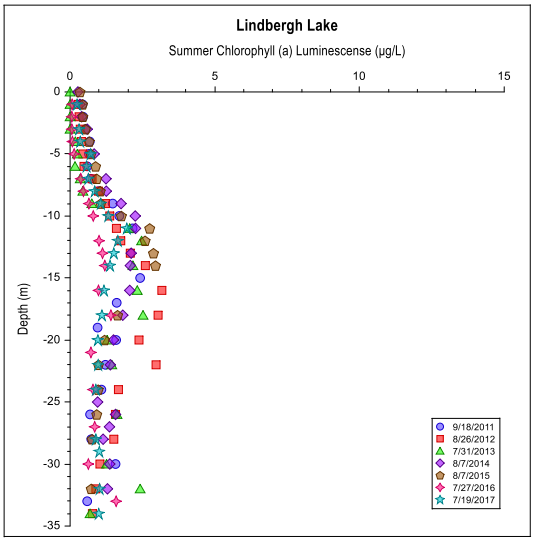


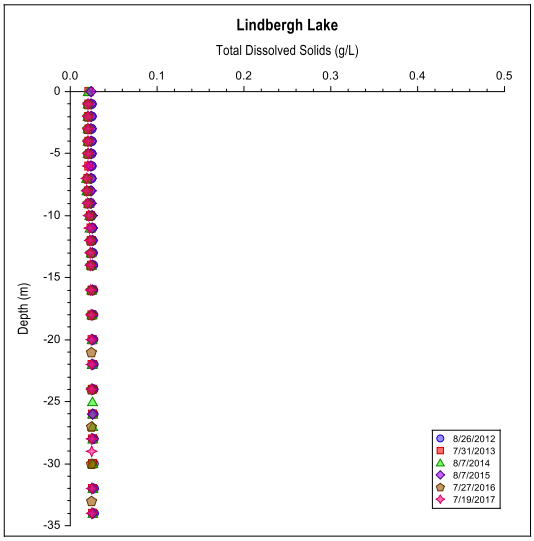


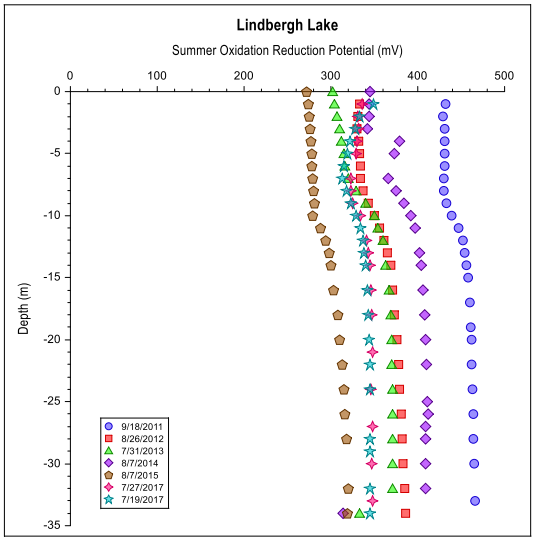
Lindbergh Lake Summer Hydrolab Profiles



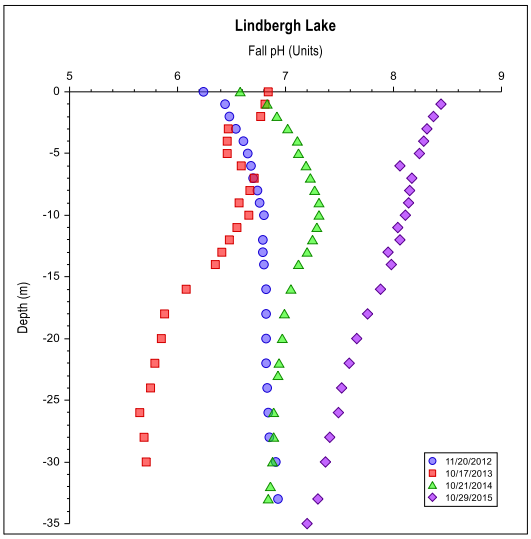


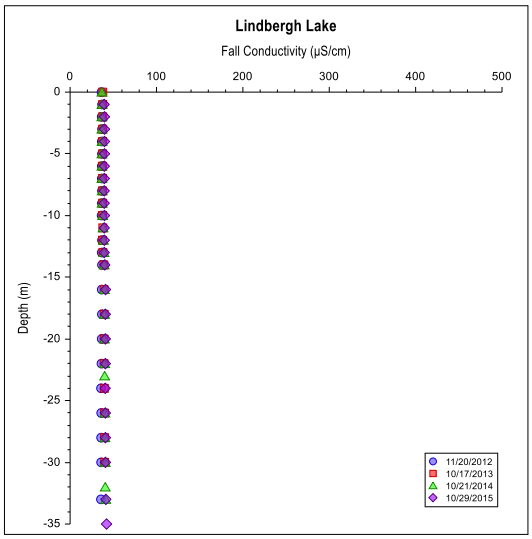


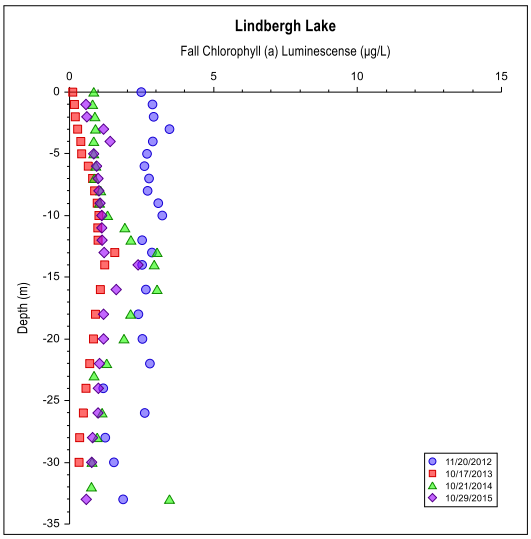


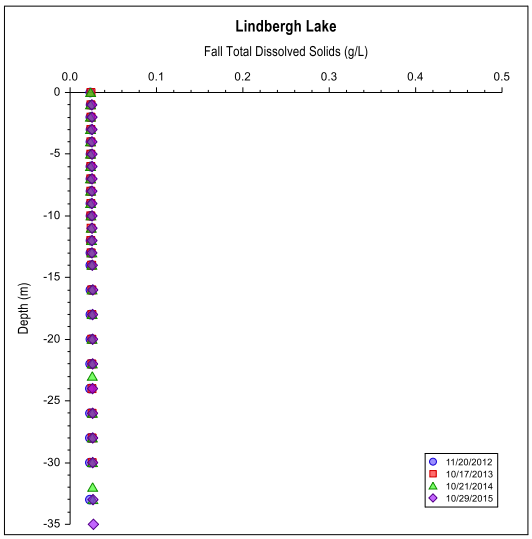


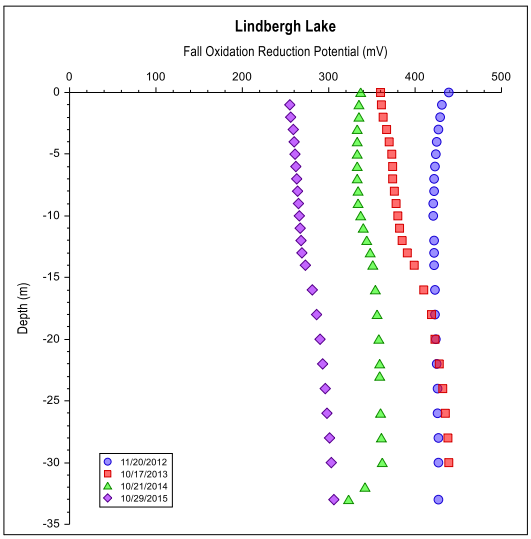
Lindbergh Lake Fall Hydrolab Profiles



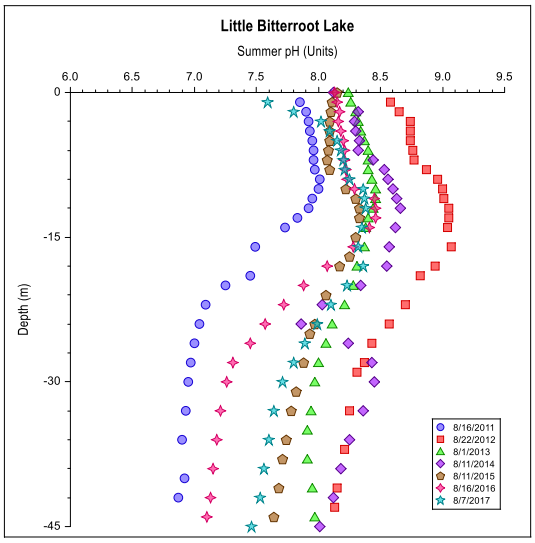


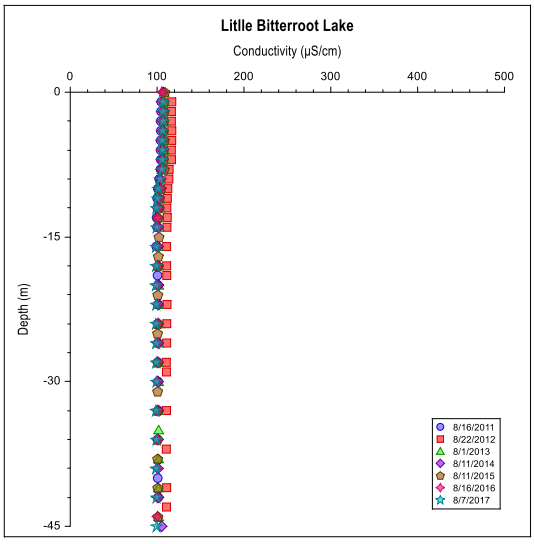


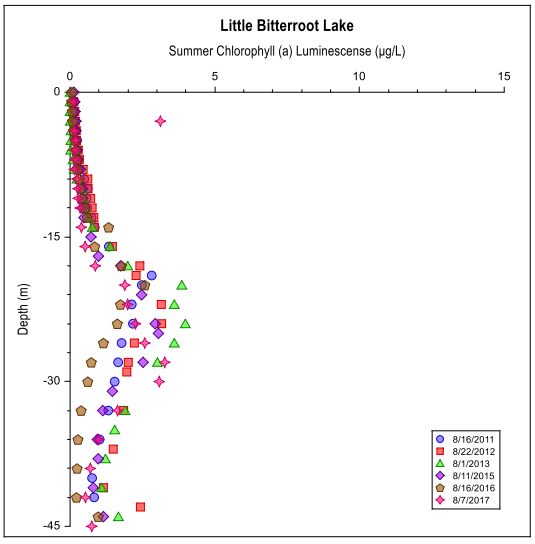


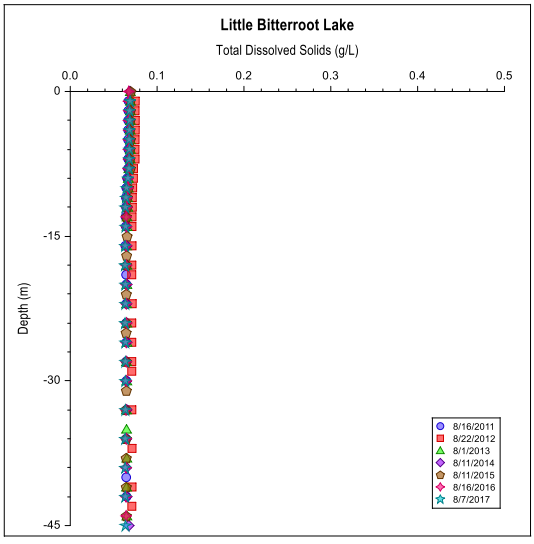


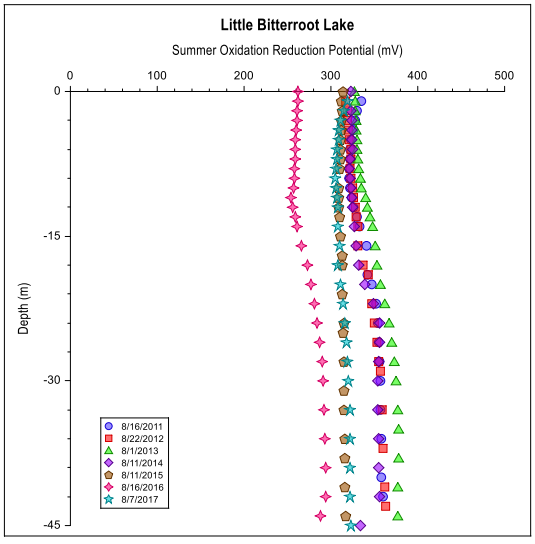
Little Bitterroot Lake Summer Hydrolab Profiles



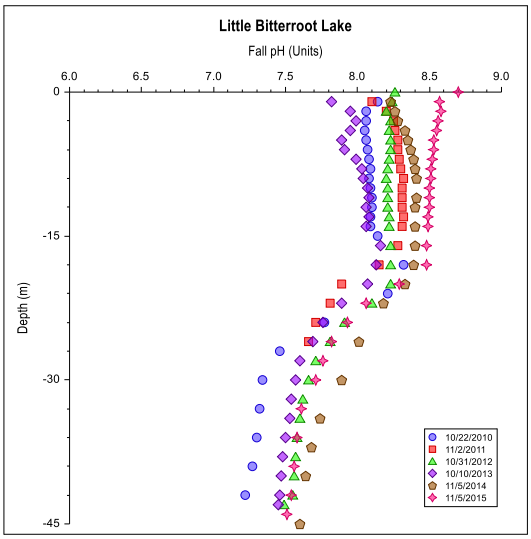


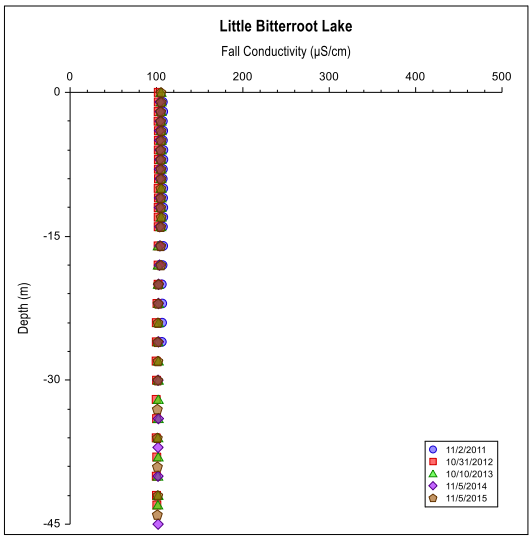


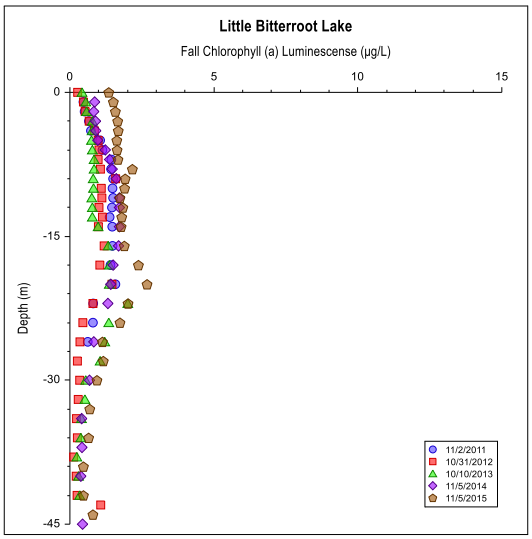


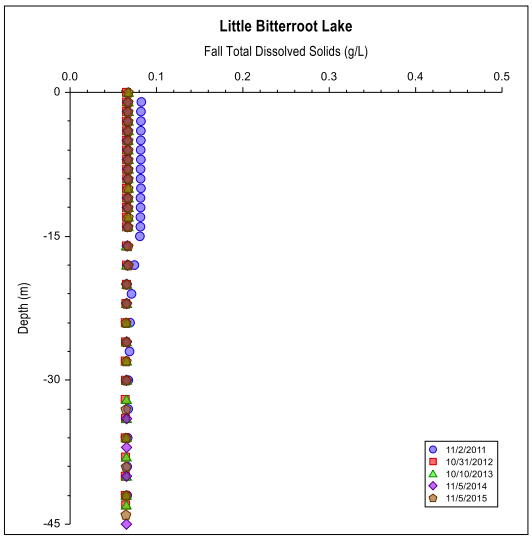


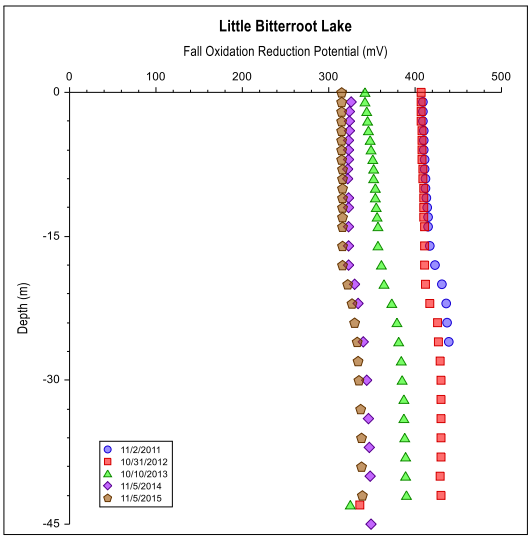
Little Bitterroot Lake Fall Hydrolab Profiles



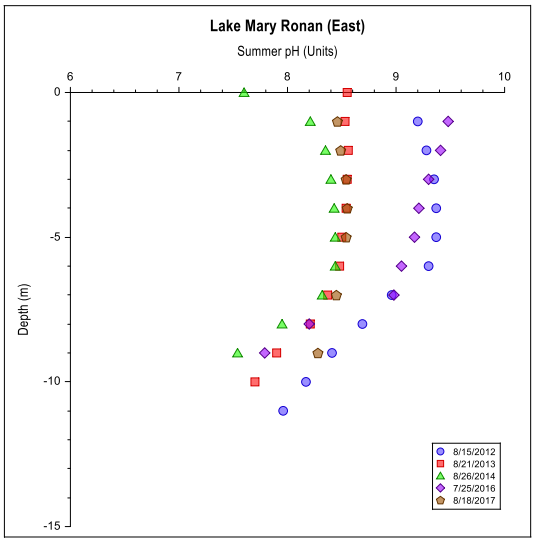


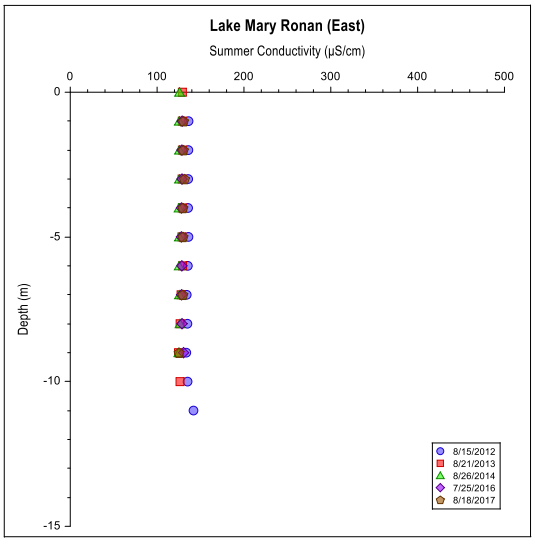


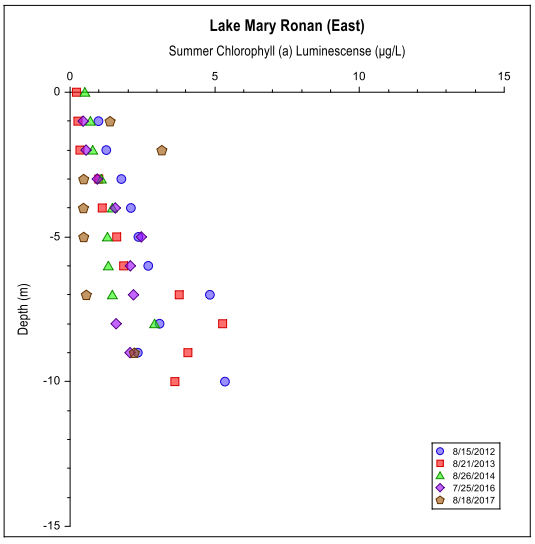


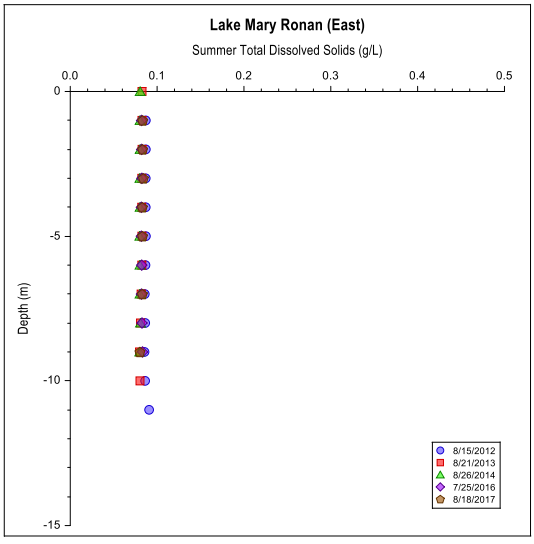


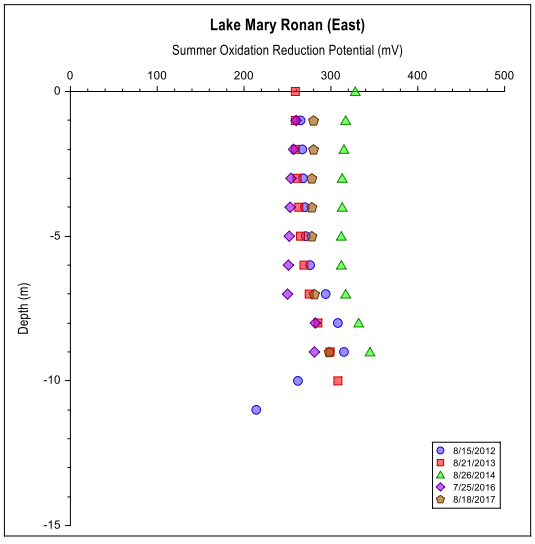
Lake Mary Ronan (East) Summer Hydrolab Profiles



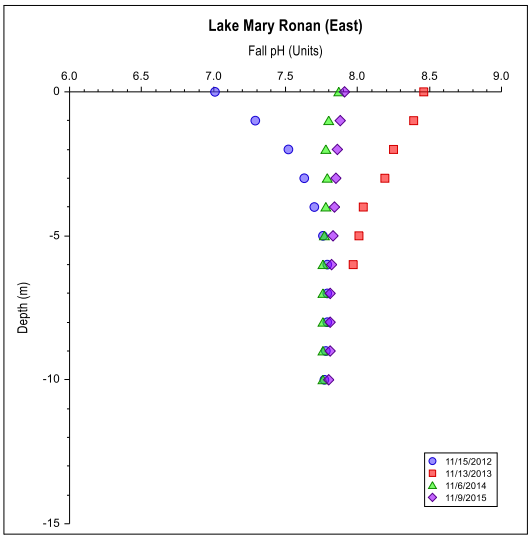


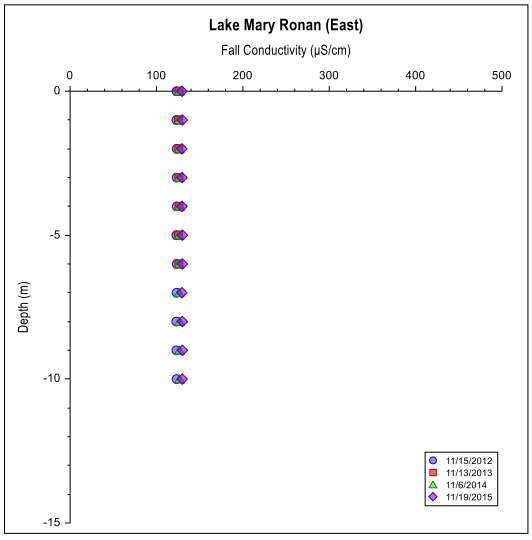


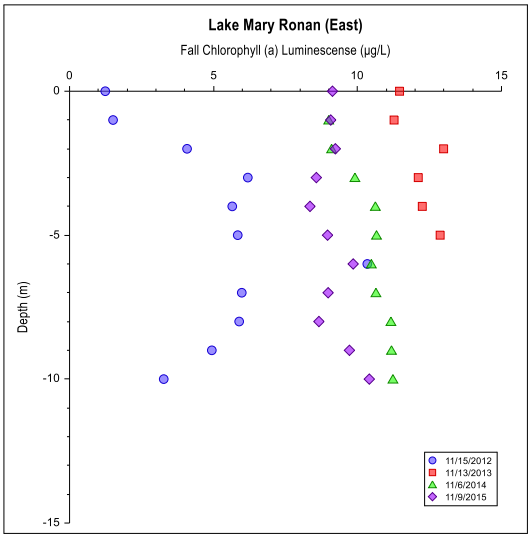


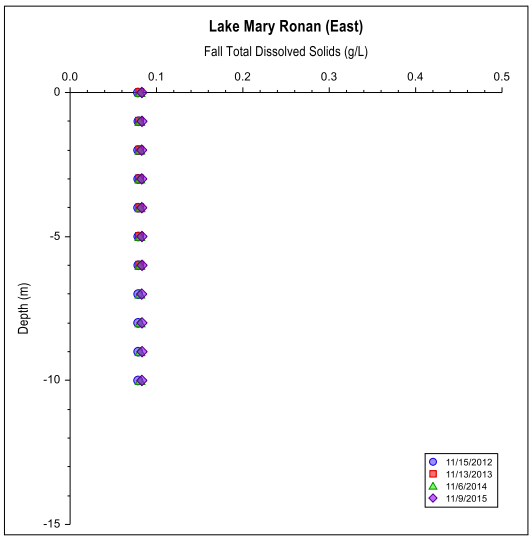


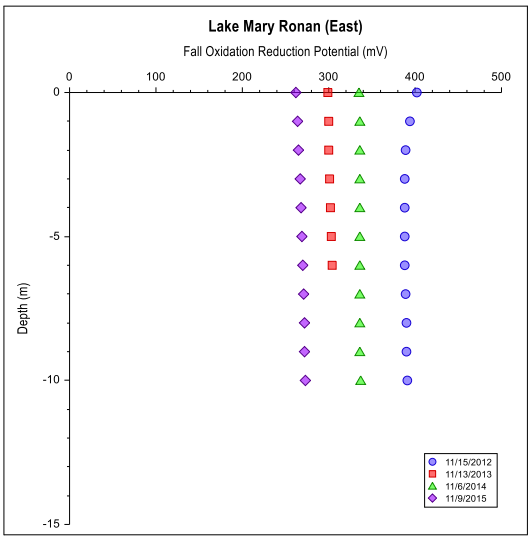
Lake Mary Ronan (East) Fall Hydrolab Profiles











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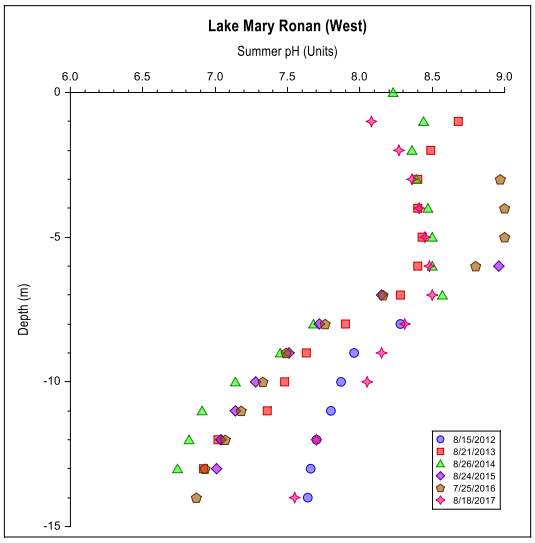
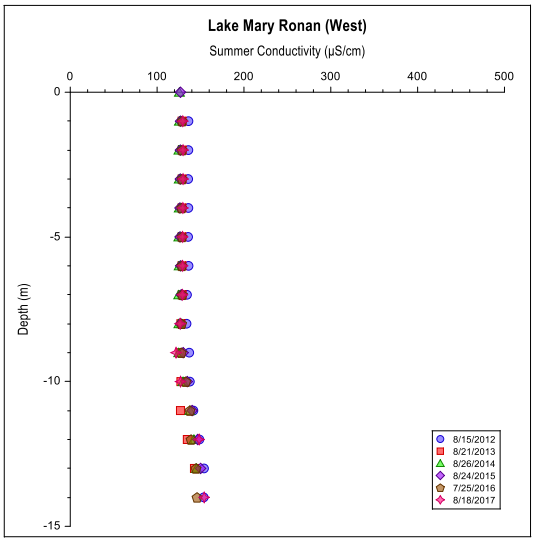
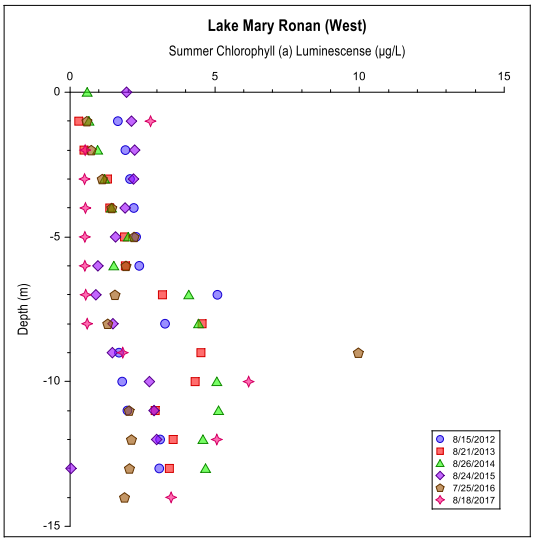
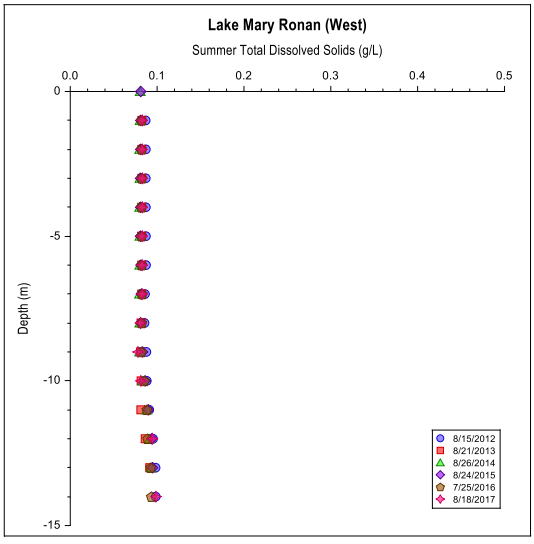
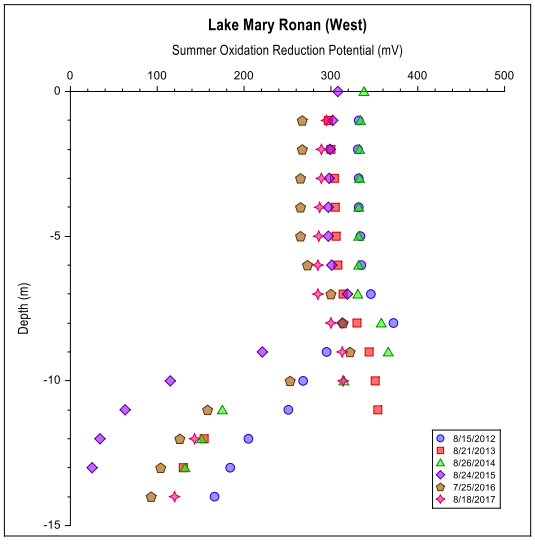


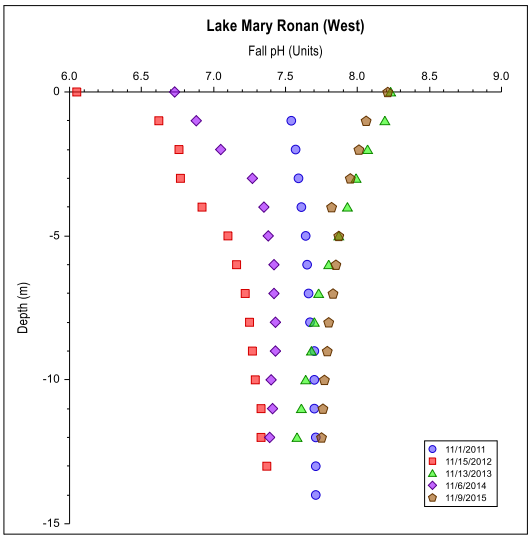


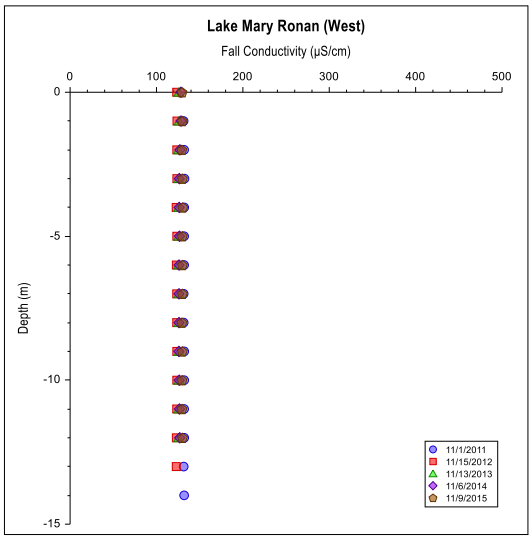


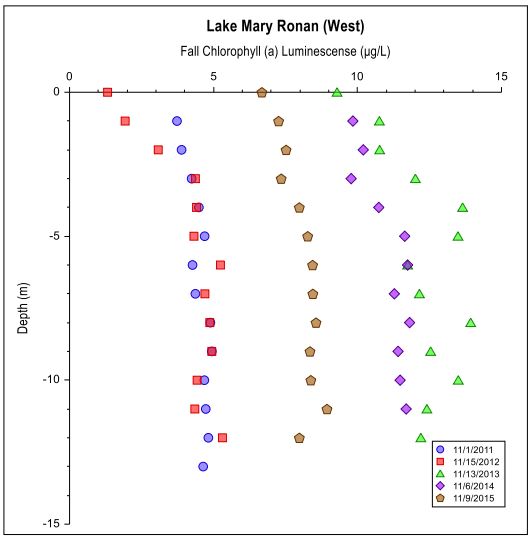


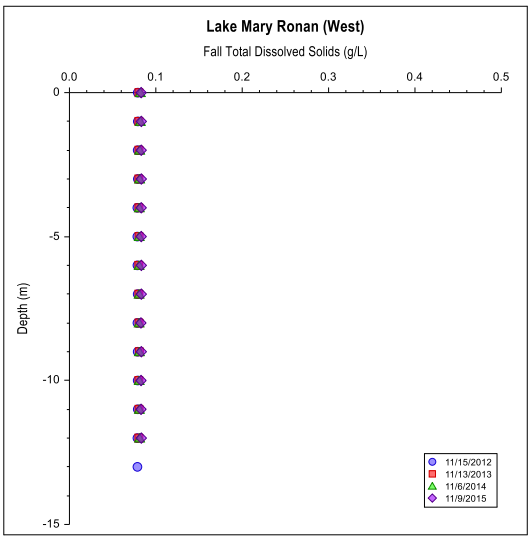


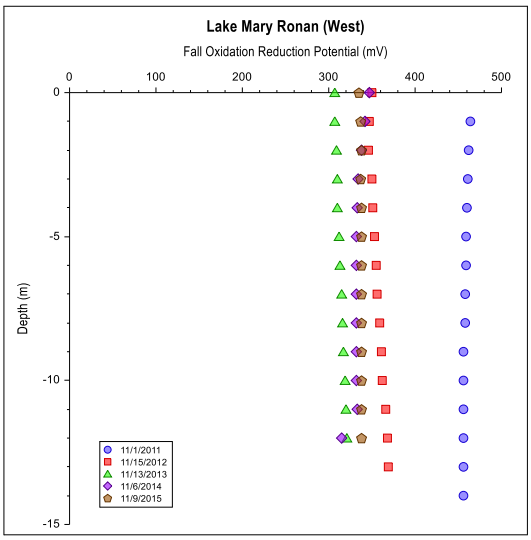
Lake Mary Ronan (West) Fall Hydrolab Profiles











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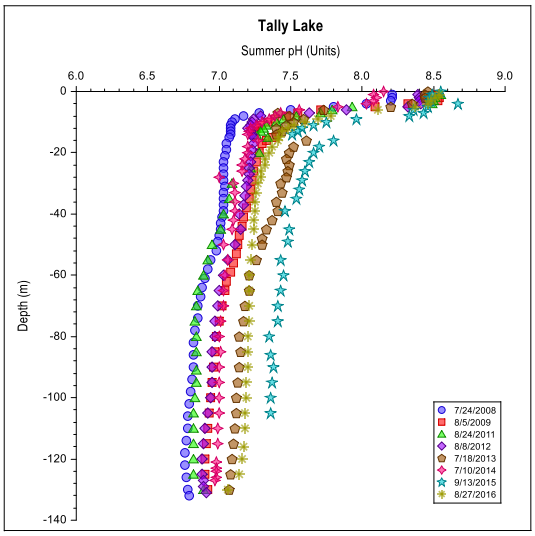

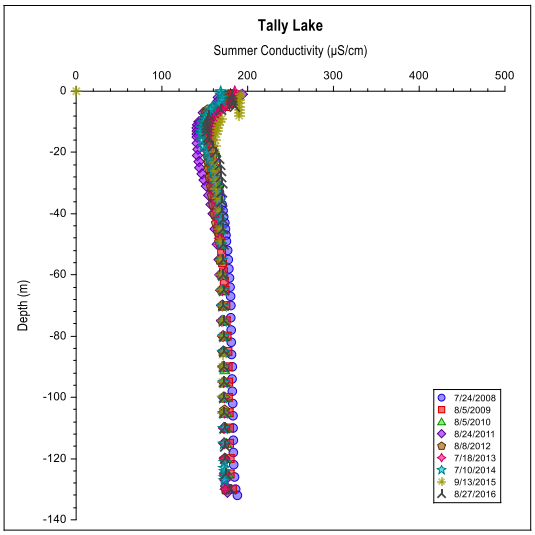

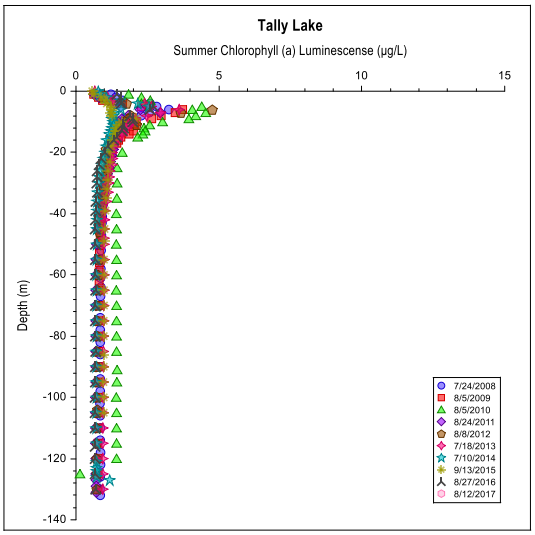

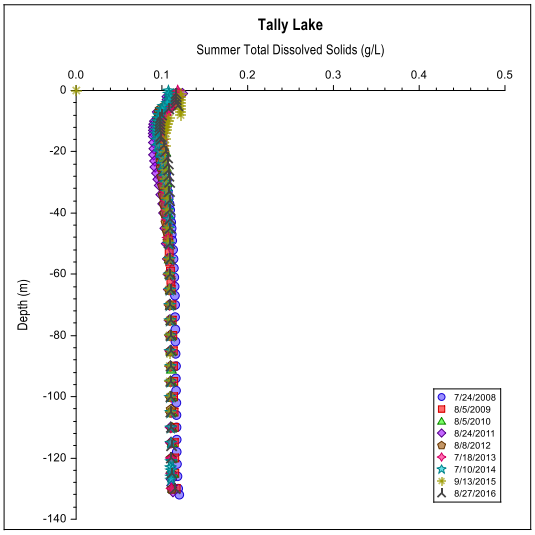

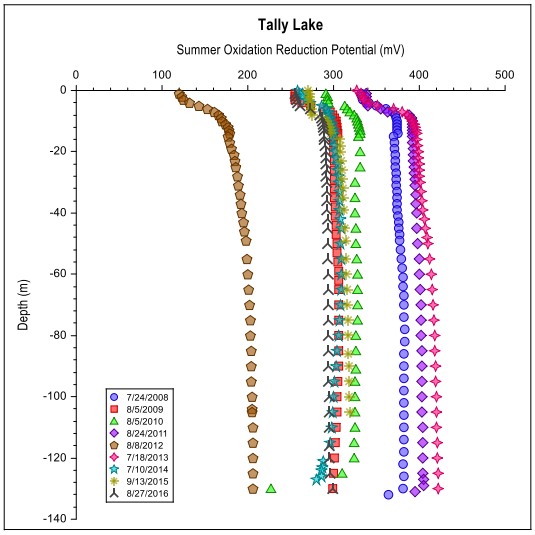

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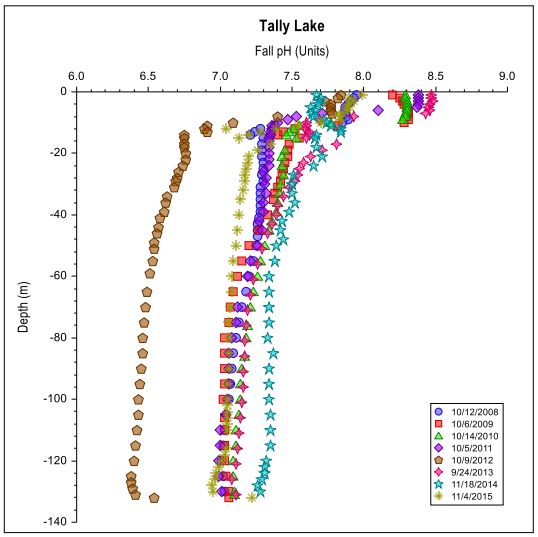

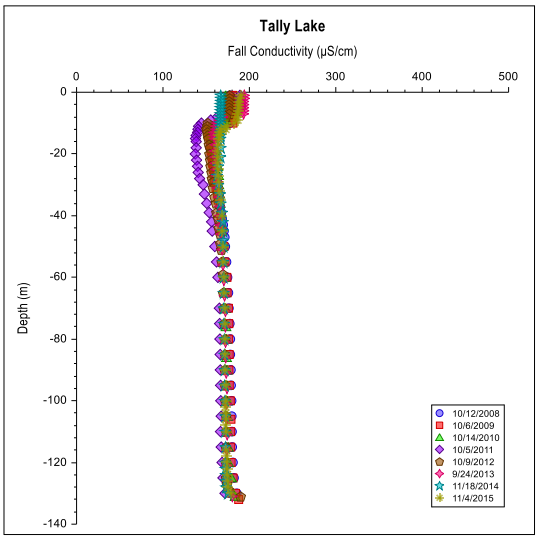

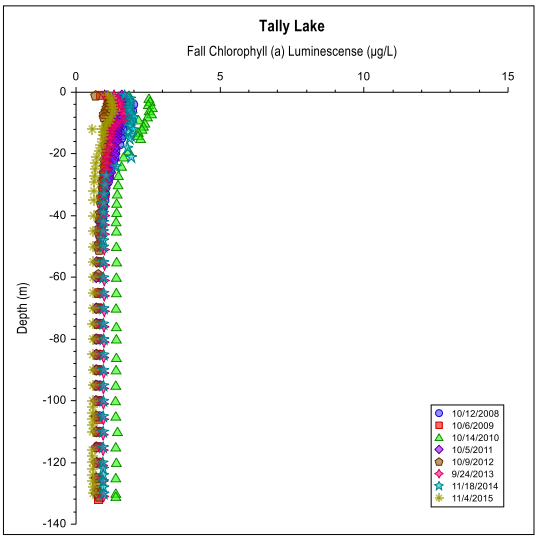

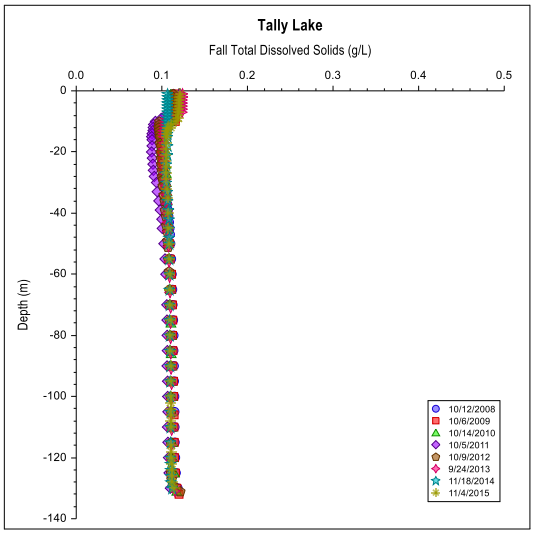

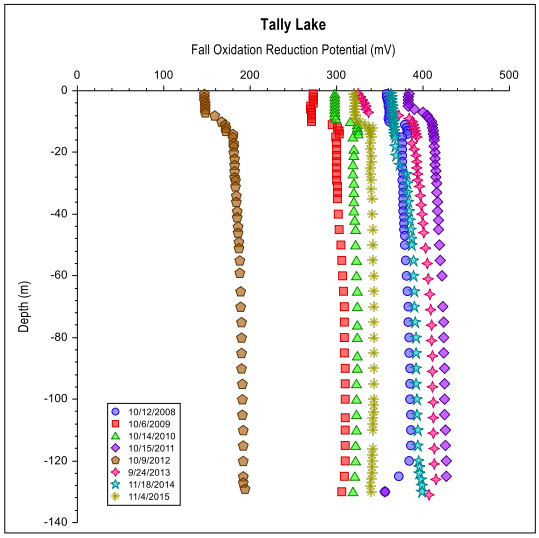

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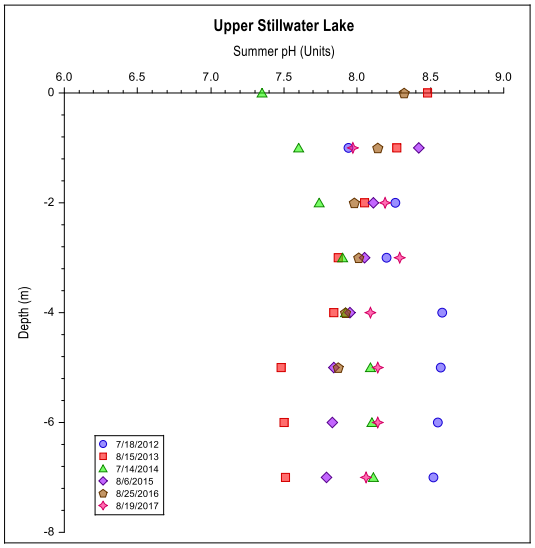
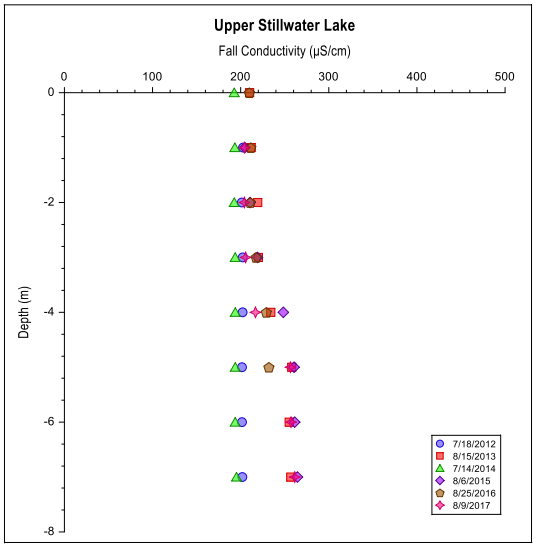
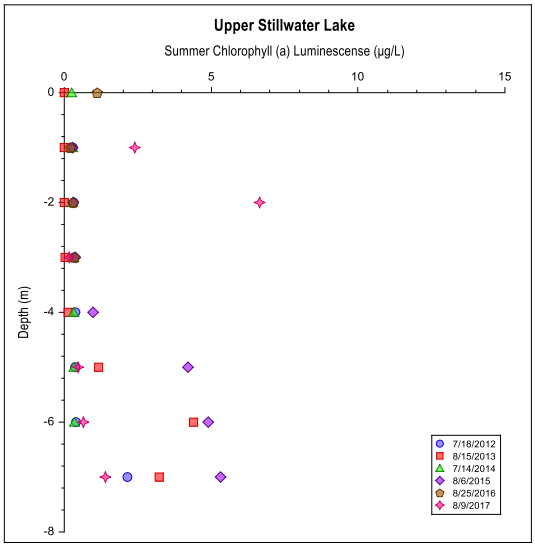
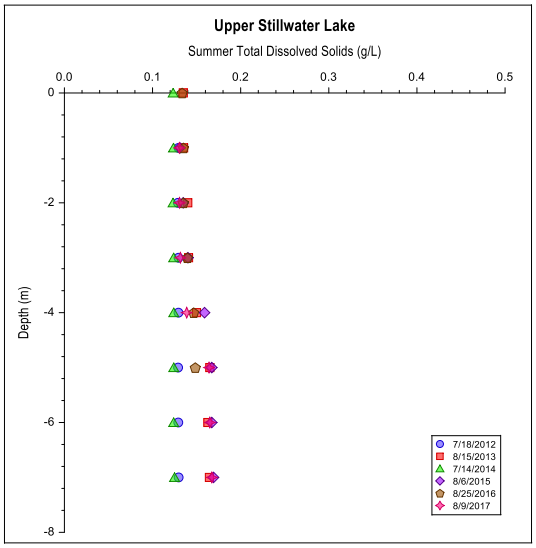
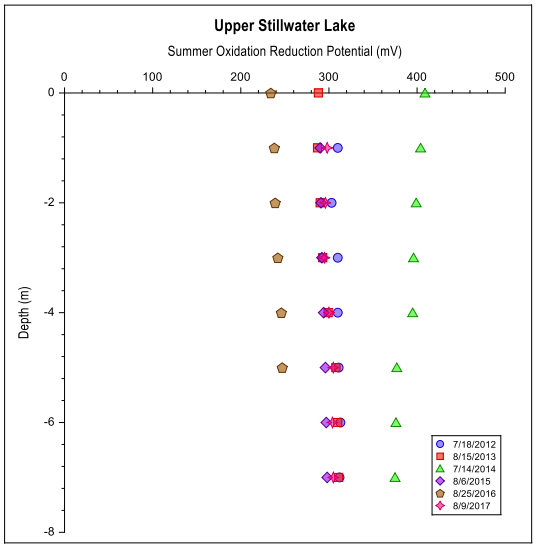


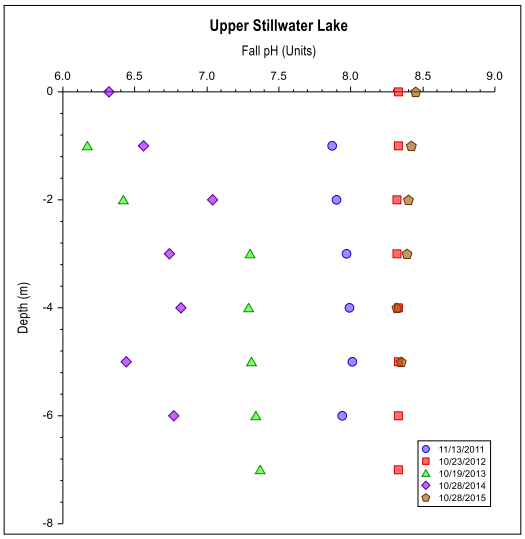


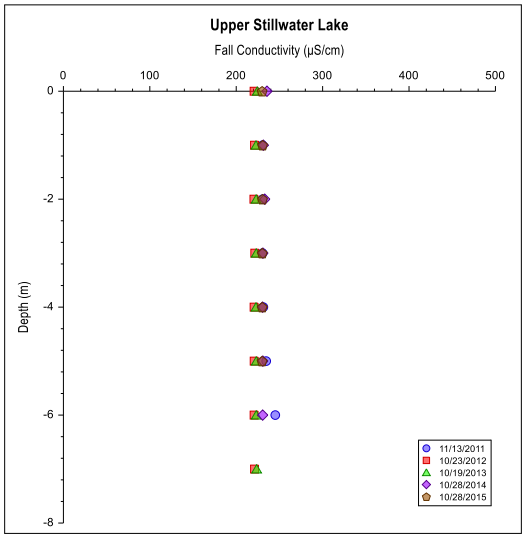


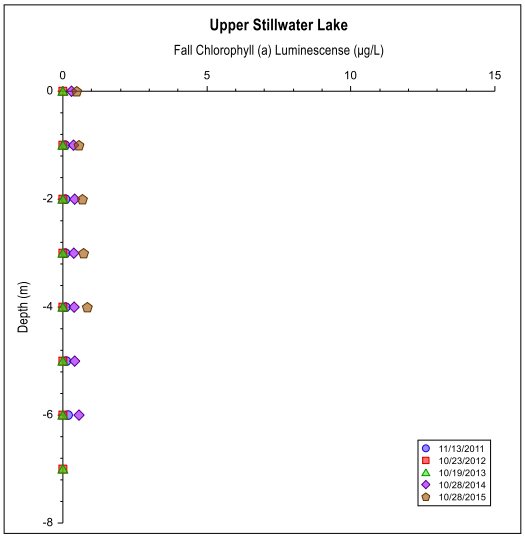


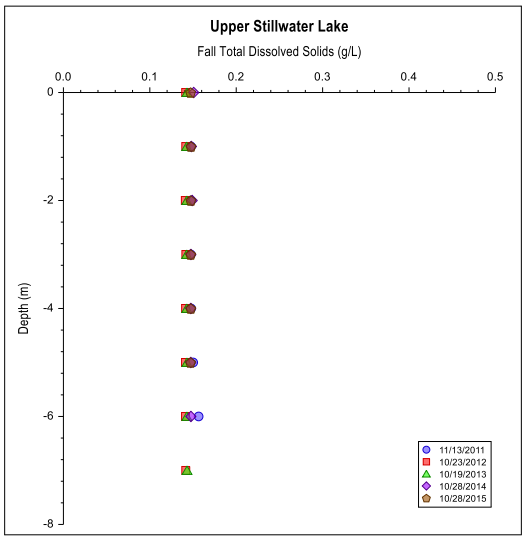


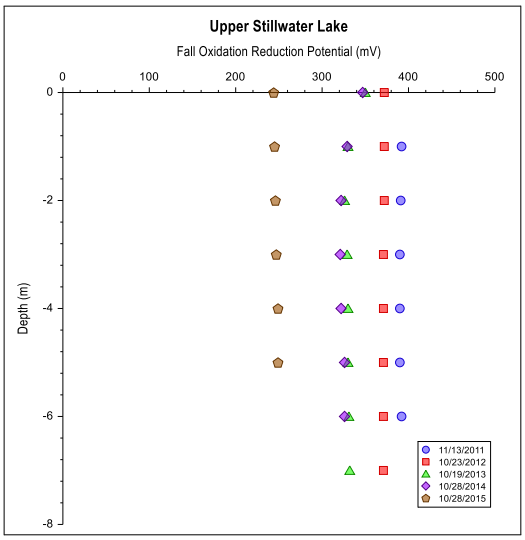
Upper Stillwater Lake Fall Hydrolab Profiles



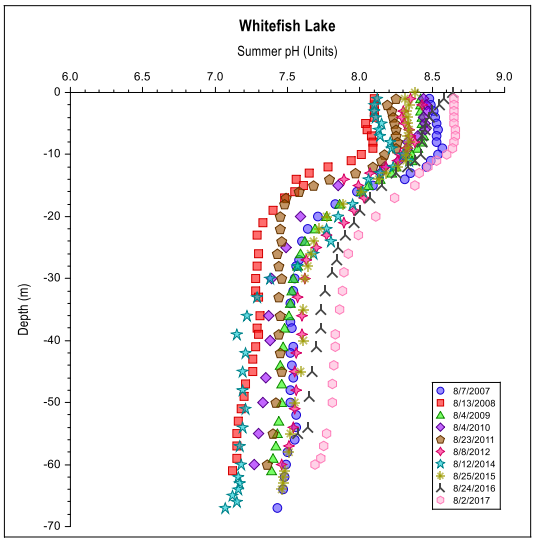


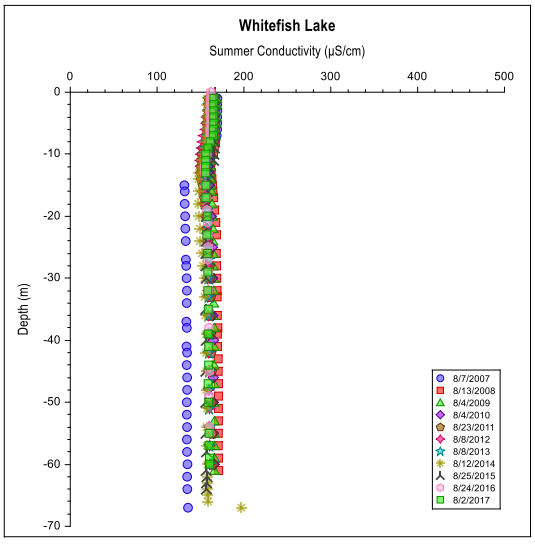


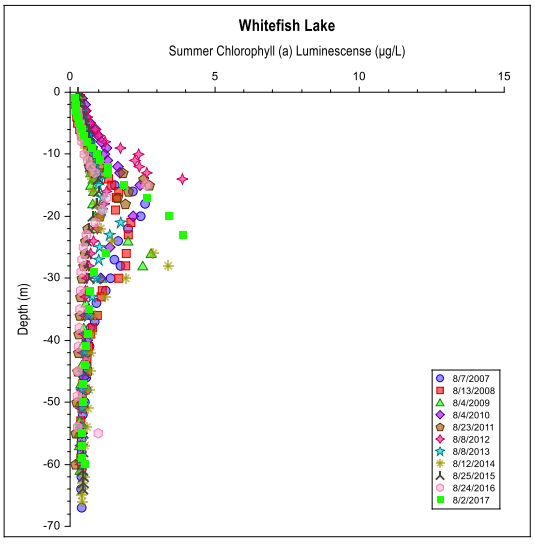


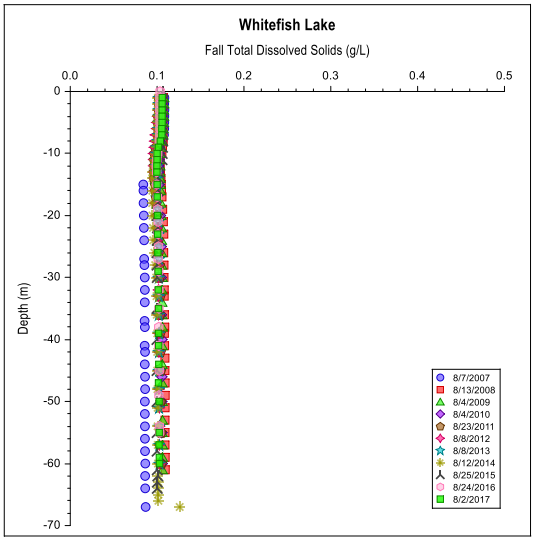


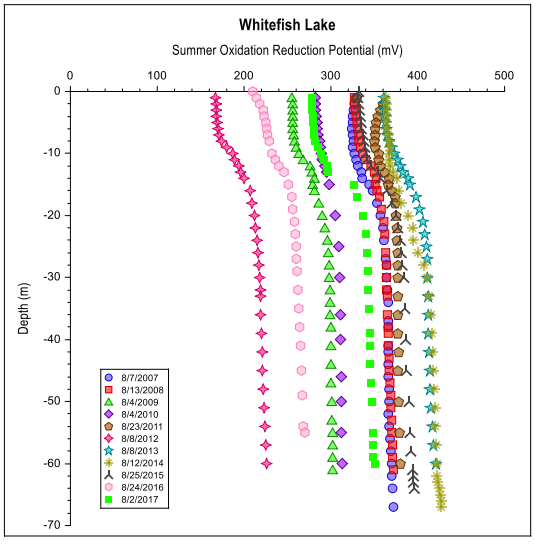
Whitefish Lake Summer Hydrolab Profiles



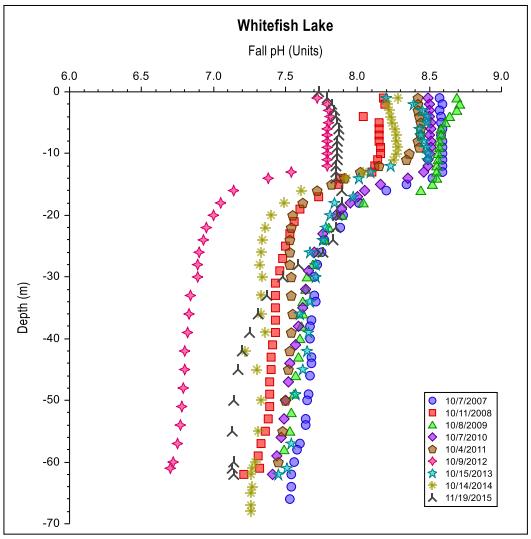


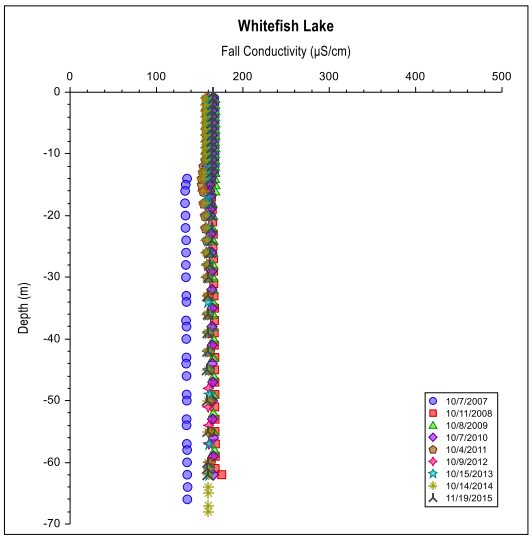


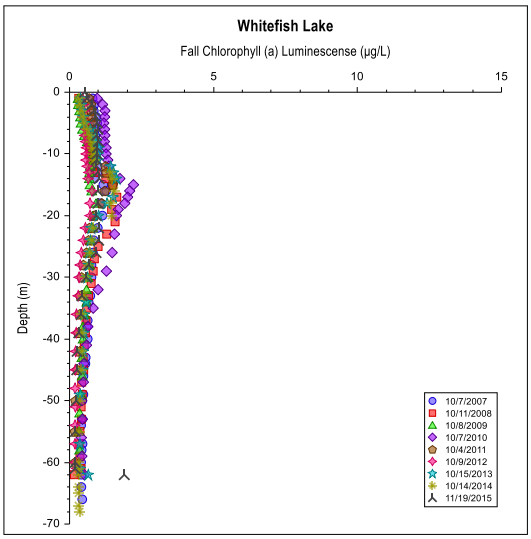


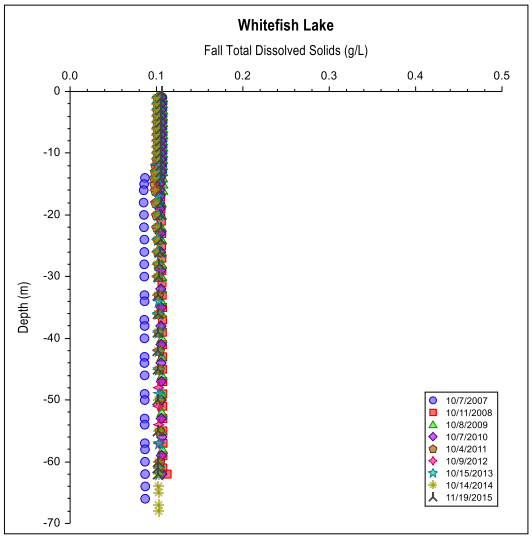


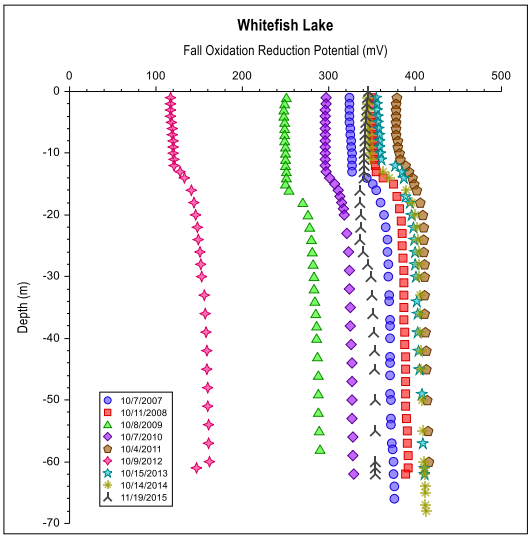
Whitefish Lake Fall Hydrolab Profiles











Appendix C

eDNA Lab Reports 2019

2019 Water Sample Testing for Eurasian Watermilfoil: Environmental DNA for the Detection of Aquatic Invasive Species

ZOE DAHLQUIST, STEPHEN J. AMISH, CAROLINE MAUGHAN, AND GORDON LUIKART, Montana Conservation Genomics Laboratory, Flathead Lake Biological Station, Division of Biological Sciences, University of Montana, Missoula, MT

Introduction & Methods

We tested environmental DNA (eDNA) collected from July-September 2019 from four lakes for non-native Eurasian watermilfoil (*Myriophyllum spicatum)* and native northern watermilfoil (*Myriophyllum sibiricum*). In addition to testing for non-native milfoil, we test for closely related native milfoil because its detection indicates that effective sampling, preservation, and PCR amplification occurred.

We used a TaqMan real-time PCR (rt-PCR) species discrimination assay (Applied Biosystems) to test a total of 34 eDNA samples. These samples were collected using a plankton tow net. The threshold used for positive detection of milfoil is 100 copies of DNA per PCR reaction successfully amplified in at least two replicate reactions. This 100 copies are roughly equivalent to or less than the amount of DNA found in less than one eukaryotic cell. All sample handling, storage, and DNA extractions were conducted in a separate facility designated only for handling eDNA samples in order to prevent contamination by PCR amplification products.

A Custom Internal Positive Control (IPC) assay was used to differentiate true real-time PCR negatives, where no target DNA is present (e.g. Eurasian Milfoil DNA), from false negatives due to PCR inhibitors preventing amplification when target DNA is present. PCR inhibitors (e.g. naturally occurring compounds such as humic acid) can persist through the extraction process and prevent amplification of target DNA. Field samples that test negative for the target species' DNA due to PCR inhibition are identified by adding a known amount of IPC DNA to each sample before testing. The amount of PCR inhibitors in each field sample is then measured based on delayed amplification of IPC DNA relative to a control sample with no PCR inhibitors. If an amplification delay greater than 5 PCR cycles was observed in the field sample, it was diluted and re-tested.

Results & Discussion

Note that the statements below pertain only to the absence of Eurasian watermilfoil DNA in these SAMPLES. It is important to understand that negative results for SAMPLES do not definitively establish that Eurasian watermilfoil is absent from a given waterbody. 'No detection' results only increase our confidence that a waterbody is indeed free of Eurasian watermilfoil at the time of sampling. More sampling, with multiple methods including eDNA, can further increase our confidence. Nevertheless, these data make us cautiously optimistic that Whitefish, Tally, and Blanchard Lakes did not contain Eurasian watermilfoil at the time of sampling.

Preliminary results were provided October 5th 2019. The official results are as follows: We did NOT detect Eurasian watermilfoil in any samples collected from Whitefish, Tally, or Blanchard Lakes. However, we DID detect Eurasian watermilfoil in one sample collected from Beaver Lake in 2019 (Table 2). To further verify this presence of Eurasian milfoil DNA, we ran 6 more reps of the samples, 3 of which were diluted at a 1:3 ratios. This yielded only 2 of 9 reps amplifying, indicating a low concentration of the target DNA. This sampling site is near a known infestation of Eurasian milfoil where there has

recently been plant removal efforts, so our results are not unexpected. We successfully detected northern watermilfoil in Whitefish and Tally Lakes (Table 1, Table 2). Positive detection of northern watermilfoil in these samples demonstrates effective sampling, preservation, and amplification of eDNA.

Detection rates of northern watermilfoil vary by lake, with some lakes showing milfoil amplification in 0% of samples and others in 27% (Table 3). This is likely due to differences in the quantity of northern watermilfoil in each lake and the proximity of the sampling sites to milfoil beds. Sampling month may also strongly influence milfoil detection rate. In other datasets, we have observed the highest detection rates of northern watermilfoil occur in late fall. Seasonal differences in detection rate may be due to the biological characteristics of target organism and likely vary by species. Testing for native species like northern watermilfoil helps us learn more about effective eDNA sampling and can help inform future eDNA methods.

Several quality control steps were taken to insure there were no false positive or false negative test results. To make sure that decontamination of field equipment was successful, field negative controls were collected. In the event of a positive detection, these field negative controls would be analyzed to test gear for potential DNA contamination. We included lab negative controls with each eDNA extraction and rt-PCR. No evidence of contamination was observed in any negative controls. We checked samples for PCR inhibitors which can create false negative results. No substantial PCR inhibition was observed in any samples.

Environmental DNA testing is a useful tool to monitor the spread of aquatic invasive species. Plankton tow nets capture large amounts of eDNA by filtering thousands of liters of lake water across long transects. Real-time PCR assays, used to analyze eDNA samples, are highly sensitive making them able to detect new infestations of invasive species. With future research, we will further improve sampling and testing strategies and continue to screen for new infestations of Eurasian watermilfoil.

Table 1. Location, sampling date, and rt-PCR results for 2019 eDNA samples from Whitefish Lake. An 'X' in the Eurasian watermilfoil (*Myriophyllum spicatum*) or Northern watermilfoil (*Myriophyllum sibiricum*) column indicates the eDNA amplification of that species was observed using the TaqMan Eurasian/northern watermilfoil real-time PCR assay. An 'X' in the 'No Amplification' column indicates that no eDNA amplification from either species was observed. An 'N' in the High Level PCR Inhibitors column denotes positive detection of the internal positive control DNA. The IPC C_t delay column denotes the difference in the number of cycles the sample reached the amplification threshold compared to the IPC control, with a negative number reflecting earlier amplification and a positive number reflecting a delay in amplification. The threshold for a high level of PCR inhibitors is a 5 cycle C_t delay.

Sample Identification					DNA detected					
Waterbody	Site Name	Sample Date	Latitude	Longitude	Invasive Milfoil Amplification	Native Milfoil Amplification	No Amplification	IPC C_t delay	Dilution Factor	High Level PCR Inhibitors
Whitefish Lake	City Beach	7/8/2019					X	0.28	0	N
Whitefish Lake	City Beach	Aug-19					X	-0.01	0	N
Whitefish Lake	City Beach	Sep-19					X	0.63	0	N
Whitefish Lake	Lazy Bay	7/8/2019					X	0.49	0	N
Whitefish Lake	Lazy Bay	Aug-19					X	0.21	0	N
Whitefish Lake	Lazy Bay	Sep-19				X		0.56	0	N
Whitefish Lake	Beaver Bay	7/8/2019					X	0.58	0	N
Whitefish Lake	Beaver Bay, Lion MT	Aug-19				X		-0.08	0	N
Whitefish Lake	Beaver Bay	Sep-19				X		0.87	0	N
Whitefish Lake	State Park	7/8/2019					X	0.65	0	N
Whitefish Lake	State Park beach	Aug-19				X		0.28	0	N
Whitefish Lake	State Park	Sep-19					X	0.59	0	N
Whitefish Lake	Monks Bay	7/8/2019					X	0.05	0	N
Whitefish Lake	Monks Bay	Aug-19					X	0.20	0	N
Whitefish Lake	Monks Bay	Sep-19					X	0.75	0	N
Whitefish Lake	Bay Point Marina	7/8/2019					X	0.57	0	N
Whitefish Lake	Bay Pnt Marina	Aug-19					X	0.15	0	N
Whitefish Lake	Bay Point Marina	Sep-19				X		0.38	0	Y

Table 2. Location, sampling date, and rt-PCR results for 2019 eDNA samples from Tally, Beaver, and Blanchard Lakes. An 'X' in the Eurasian watermilfoil (*Myriophyllum spicatum*) or Northern watermilfoil (*Myriophyllum sibiricum*) column indicates the eDNA amplification of that species was observed using the TaqMan Eurasian/northern watermilfoil real-time PCR assay. An 'X' in the 'No Amplification' column indicates that no eDNA amplification from either species was observed. An 'N' in the High Level PCR Inhibitors column denotes positive detection of the internal positive control DNA. The IPC C_t delay column denotes the difference in the number of cycles the sample reached the amplification threshold compared to the IPC control, with a negative number reflecting earlier amplification and a positive number reflecting a delay in amplification. The threshold for a high level of PCR inhibitors is a 5 cycle C_t delay.

Sample Identification					DNA detected					
Waterbody	Site Name	Sample Date	Latitude	Longitude	Invasive Milfoil Amplification	Native Milfoil Amplification	No Amplification	IPC C_t delay	Dilution Factor	High Level PCR Inhibitors
Tally	Boat Ramp	7/11/2019					X	0.51	0	N
Tally	Boat Ramp	Sep-19					X	0.81	0	N
Tally	Logan Creek	7/11/2019				X		0.96	0	N
Tally	Logan Creek	Sep-19					X	0.63	0	N
Beaver	Near public Access	Jul-19					X	0.01	0	N
Beaver	Near public Access	Sep-19			X			0.30	0	Y
Beaver	Near houses/ docks	Jul-19					X	0.20	0	N
Beaver	Near houses/ docks	Sep-19					X	0.15	0	Y
Beaver	Near Outlet	Jul-19					X	0.29	0	N
Beaver	Near Outlet	Sep-19					X	0.19	0	Y
Beaver Impoundment	Culvert out of imp.	Aug-19					X	0.16	0	N
Beaver	Culvert out of impoundme	Sep-19					X	0.54	0	N
Blanchard	Near public Access	Aug-19					X	0.57	0	N
Blanchard	Near public Access	Sep-19					X	3.03	0	Y
Blanchard	Midlake	Aug-19					X	0.33	0	N
Blanchard	Midlake	Sep-19					X	2.67	0	Y

Table 3. The percent of samples collected at each lake that amplified northern watermilfoil.

Waterbody	Number of samples that amplified northern watermilfoil	Total number of samples	Percent of samples that amplified northern watermilfoil
Whitefish	5	18	27.8
Tally	1	4	25
Beaver	0	8	0
Blanchard	0	4	0

2019 Water Sample Testing for Dreissenid Mussels: Environmental DNA for the Detection of Aquatic Invasive Species

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Introduction & Methods

We tested for aquatic invasive zebra and quagga mussels (*Dreissena polymorpha* and *Dreissena rostriformis*) using a TaqMan quantitative PCR (qPCR) DNA assay on environmental DNA (eDNA) extracted from plankton tow net samples from four lakes. A total of 34 plankton tow net eDNA samples were tested. The threshold used for positive detection of mollusks is roughly equivalent to the signal generated from the amount of DNA found in 1/10 to 1/100 of a *Dreissenid* veliger (10 copies of the target gene sequence) per qPCR reaction. All sample handling, storage, and DNA extraction were conducted in a separate facility (locked laboratory) designated only for handling eDNA samples in order to prevent possible false positives or contamination of the extractions by PCR amplification products.

A Custom Internal Positive Control (IPC) assay was used to differentiate true real-time PCR negatives, where no target DNA is present (e.g. *Dreissenid* mussel DNA), from false negatives due to PCR inhibitors preventing amplification when target DNA is present. PCR inhibitors (e.g. naturally occurring compounds such as humic acid) can persist through the extraction process and prevent amplification of target DNA. Field samples that test negative for the target species' DNA due to PCR inhibition are identified by adding a known amount of IPC DNA to each sample before testing. The amount of PCR inhibitors in each field sample is then measured based on delayed amplification of IPC DNA relative to a control sample with no PCR inhibitors. If an amplification delay greater than 5 PCR cycles was observed in the field sample, it was diluted and re-tested.

Results & Discussion

Note that the statements below pertain only to the absence of *Dreissenid* mussel DNA in the SAMPLES. It is important to understand that these negative results for SAMPLES do not definitively establish that zebra and quagga mussels are absent from a given water body. Instead, lack-of-detection results increase our confidence that a water body is indeed free of *Dreissenid* mussels at the time of sampling. More sampling, with multiple methods including eDNA, would further increase our confidence in that conclusion. Nevertheless, these data make us cautiously optimistic that these lakes did not contain invasive *Dreissenid* mussels in 2019.

Preliminary results were provided October 9, 2019. The official results are as follows: we did NOT detect zebra or quagga mussels in any samples collected from Whitefish, Beaver, Tally, or Blanchard Lakes (Table 1). Several quality control steps were taken to insure there were no false positive or false negative test results. Field negative controls were taken to test sampling gear for potential DNA contamination in the event of a positive result. We included lab negative controls with each eDNA extraction and qPCR. No mollusk DNA was detected in any of the negative laboratory controls analyzed with field samples.

Six samples were diluted and re run due to higher than average Ct delay (but below our lowest threshold of 5 cycles). These samples were Beaver outlet, Beaver near houses/ docks, beaver near public access, Bay Point, Blanchard Midlake, and Blanchard near public access, all collected in September of

2019. These samples were diluted at a 1:3 ratios and returned the same results as before, further verifying NO presence of the species in the waterbodies.

Applying species discrimination PCR assays to eDNA samples provides a sensitive new tool for monitoring aquatic invasive species. Using plankton tows for eDNA collection is novel and promises to be an excellent method to detect mussels because tow nets can sample large volumes of water across long transects. Our future research and applications will improve testing and sampling strategies and build a baseline of data to detect and pinpoint the geographic locations of newly established zebra and quagga mussel populations.

Table 1. Sampling dates, locations, and results of the *Dreissenid* assay for the 2019 eDNA samples. Positive amplification is denoted with an 'X' in the Invasive *Dreissenid* Amplification column. An 'X' in the No Amplification result means that there was not a positive detection for mollusk DNA from either species. An 'N' in the High Level PCR Inhibitors column denotes positive detection of the internal positive control DNA. The IPC C_t delay column denotes the difference in the number of cycles the sample reached the amplification threshold compared to the IPC control, with a negative number reflecting earlier amplification and a positive number reflecting a delay in amplification. The threshold for a high level of PCR inhibitors is a 5 cycle C_t delay.

Sample Identification			DNA detected				
Waterbody	Site Name	Sample Date	Invasive Dresseina Amplification	No Amplification	IPC C_t delay	Dilution Factor	High Level PCR Inhibitors
Whitefish Lake	City Beach	7/8/2019		X	0.28	0	N
Whitefish Lake	City Beach	Aug-19		X	-0.01	0	N
Whitefish Lake	City Beach	Sep-19		X	0.63	0	N
Whitefish Lake	Lazy Bay	7/8/2019		X	0.49	0	N
Whitefish Lake	Lazy Bay	Aug-19		X	0.21	0	N
Whitefish Lake	Lazy Bay	Sep-19		X	0.56	0	N
Whitefish Lake	Beaver Bay	7/8/2019		X	0.58	0	N
Whitefish Lake	Beaver Bay, Lion MT	Aug-19		X	-0.08	0	N
Whitefish Lake	Beaver Bay	Sep-19		X	0.87	0	N
Whitefish Lake	State Park	7/8/2019		X	0.65	0	N
Whitefish Lake	State Park beach	Aug-19		X	0.28	0	N
Whitefish Lake	State Park	Sep-19		X	0.59	0	N
Whitefish Lake	Monks Bay	7/8/2019		X	0.05	0	N
Whitefish Lake	Monks Bay	Aug-19		X	0.20	0	N
Whitefish Lake	Monks Bay	Sep-19		X	0.75	0	N
Whitefish Lake	Bay Point Marina	7/8/2019		X	0.57	0	N
Whitefish Lake	Bay Point Marina	Aug-19		X	0.15	0	N
Whitefish Lake	Bay Point Marina	Sep-19		X	0.38	1 : 3	N
Tally	Boat Ramp	7/11/2019		X	0.51	0	N
Tally	Boat Ramp	Sep-19		X	0.81	0	N
Tally	Logan Creek	7/11/2019		X	0.96	0	N
Tally	Logan Creek	Sep-19		X	0.63	0	N
Beaver	Near public Access	Jul-19		X	0.01	0	N
Beaver	Near public Access	Sep-19		X	0.30	1 : 3	N
Beaver	Near houses/ docks	Jul-19		X	0.20	0	N
Beaver	Near houses/ docks	Sep-19		X	0.15	1 : 3	N
Beaver	Near Outlet	Jul-19		X	0.29	0	N
Beaver	Near Outlet	Sep-19		X	0.19	1 : 3	N
Beaver Impoundment	Culvert out of imp.	Aug-19		X	0.16	0	N
Beaver	Culvert out of impou	Sep-19		X	0.54	0	N
Blanchard	Near public Access	Aug-19		X	0.57	0	N
Blanchard	Near public Access	Sep-19		X	3.03	1 : 3	N
Blanchard	Midlake	Aug-19		X	0.33	0	N
Blanchard	Midlake	Sep-19		X	2.67	1 : 3	N

Appendix D

Volunteer Reporting Forms

635 Denver Street Whitefish, MT 59937 Phone: 406.862.4327 www.nwmtlvmn.org

WATER QUALITY DATA COLLECTION FORM FOR VOLUNTEER MONITORS

First name		Last name	
Lake name		Site	
Date: (mm/dd/yy)	____/____/____	Time: (hh:mm)	____:____ ○ am ○ pm
Lake depth *(if known)*	_____ ○ feet ○ meters	Water temperature	_____ ○ F ○ C

Water conditions				Weather conditions			
1. Water color appears:				1. Secchi disc measured in:			
○ Clear		○ Green		○ Strong sunlight		○ Bright clouds	
○ Brown		○ Yellow		○ Hazy sunlight		○ Overcast	
○ Gray		○ Blue-Green					
2. The amount of suspended sediment is:				2. The air temperature is:			
○ None		○ Moderate		○ Cold (<40F)		○ Hot (81-90F)	
○ Minimal		○ Substantial		○ Cool ((41-60F)		○ Very hot (>90F)	
				○ Warm (61-80F)			
3. The amount of suspended algae is:				3. The wind conditions are:			
○ None		○ Moderate		○ Calm		○ Strong	
○ Minimal		○ Substantial		○ Breezy			
4. The amount of waterfowl activity is:				4. The wind is generally from:			
○ None		○ Moderate		○ North		○ South	
○ Minimal		○ Substantial		○ East		○ West	
5. The odor of the water is:				5. The water surface is/has:			
○ None		○ Musty		○ Calm		○ Moderate waves	
○ Fishy		○ Rotten egg-like		○ Ripple waves		○ White caps	
○ Septic-like				○ Small waves			
6. Other observed substances:				6. The lake level is:			
○ None		○ Algae mats		○ Below normal		○ Above normal	
○ Dead fish		○ Algae clumps		○ Normal		○ Measured	
○ Pollen		○ Sediment clumps				○ Feet ○ Meters	
○ Oily-film		○ Leaves/debris					

Secchi Disc:	Disappear	_____ ○ Feet ○ Meters	Average	_____ ○ Feet ○ Meters
	Reappear	_____ ○ Feet ○ Meters		

Did you find evidence of aquatic invasive species? If YES or NOT SURE, please go online and submit AIS Form. Thank you!	○ Yes ○ No ○ Not sure
Please list the number of hours it took for field sampling and administrative tasks for this trip *(to be used as a cost share for future grants).*	Time: (hh:mm) _____:_____

Comments:
(please limit your comments to 500 characters or less)

PLEASE MAIL YOUR COMPLETED FORM TO THE ADDRESS LISTED AT TOP OF PAGE.

635 Denver Street Whitefish, MT 59937 Phone: 406.862.4327 www.nwmtlvmn.org

AQUATIC INVASIVE SPECIES DATA COLLECTION FORM

First name		**Last name**			
Date: (mm/dd/yy)	_____/_____/_____	**Time:** (hh:mm)	____:____	○ am ○ pm	
Mailing address	*Street*		*City*		
	State		*ZIP*		
Phone #		**Email address**			
Lake name					
Nearest City		State			

If you have a GPS, please take a new reading even if you've sampled from this location before.
Please set your GPS at NAD83 (ex., N48.37827, W114.36475)

		Decimal		Deg	Min	Sec
Location	**Latitude**		**Latitude**			
	Longitude		**Longitude**			

Description of location and substrates examined

Substrate type	○ Boulder ○ Cobble ○ Gravel ○ Sand ○ Silt ○ Muck ○ Artificial
Method of survey	○ Scuba ○ Snorkel ○ Swim/Wade ○ Dock search ○ Shoreline walk

How much time did you spend searching this location?
(to be used as a cost share for future grants)
Time: (hh:mm) _____:_____

Which of the following were found?

○ **Zebra mussel** *(Dressiena polymorpha)*	○ **Quagga mussel** *(Dreissena rostriformis bugensis)*	○ Eurasian Watermilfoil *(Myriophyllum spicatum L.)*
		○ **Other species?** *Please describe below:*
○ **Flowering Rush** *(Butomus umbellatus L.)*	○ **New Zealand Mudsnail** *(Potamopyrgus antipodarum)*	

Comments: *(please limit your comments to 500 characters or less)*	

PLEASE MAIL YOUR COMPLETED FORM TO THE ADDRESS LISTED AT TOP OF PAGE.