

SSEA Update for Farlain Lake



Canada-Ontario Agreement
Respecting the Great Lakes Basin Ecosystem



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Severn Sound Environmental Association
July 30 2017

SSEA Activities in 2016

1. Private drinking water well survey
2. Stream water level measurements
3. Biweekly lake and stream sampling, early May until mid October
4. Sampling of spring discharge and Kettle's Lake
5. Sweetener analysis: influence from septage site on spring discharge
6. Citizen Science: Ice Spotters program



1. Farlain Lake Well Survey

- SSEA collected information on private wells and provided information to residents on water testing, care and maintenance of wells
- Goal: establish a baseline of information on wells in the area
- SSEA documented 116 wells on 243 properties that had dwellings
- Report detailing well types and conditions available on our website
- **Reminder: Health Unit recommends testing for bacteria 3x per yr (free test), and nitrate once per yr**

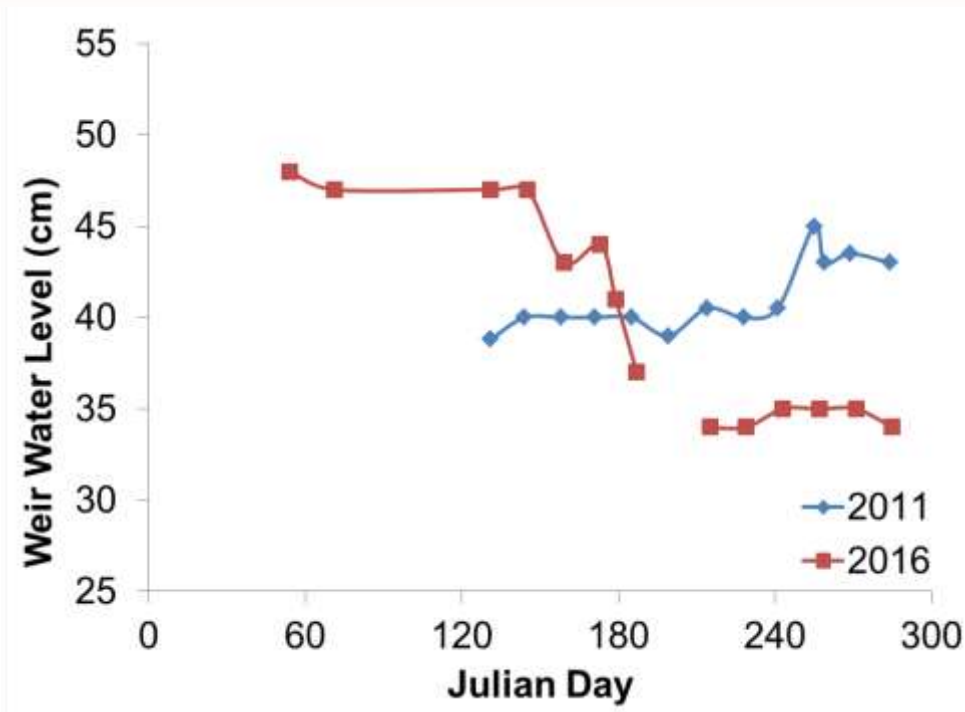


Recording well information



Well casing surrounded by day lilies and showing damage to the cap

2. Flow from Inflowing Stream



- Lower water level measurement indicate higher flows (measure from top of weir wall down to surface)
- Flow rate in 2011 began dropping mid Aug
- Flow rate in 2016 steadily increased from mid May to early Aug, stayed high
- Refinements to calculations ongoing

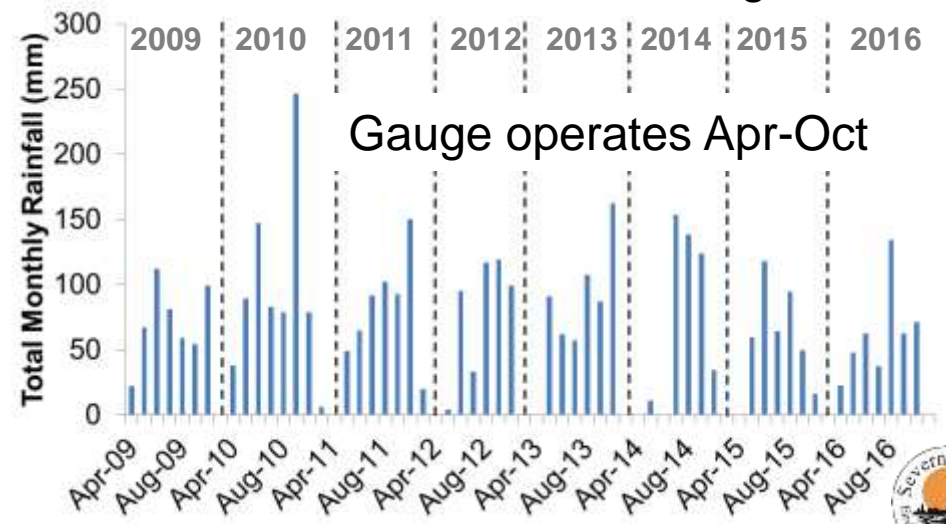


High Water Levels on Farlain Lake



- Spring 2017 was higher than 2016 for Farlain L.
- Levels continue to be high
- High precipitation amounts and high groundwater levels likely contributed to flooding

Weather Station, Penetanguishene



High Water Levels on Farlain Lake



October 2011

Point off Farlain Lake Rd E



May 2015



May 2016



August 2015

Township Parkette Information Kiosk

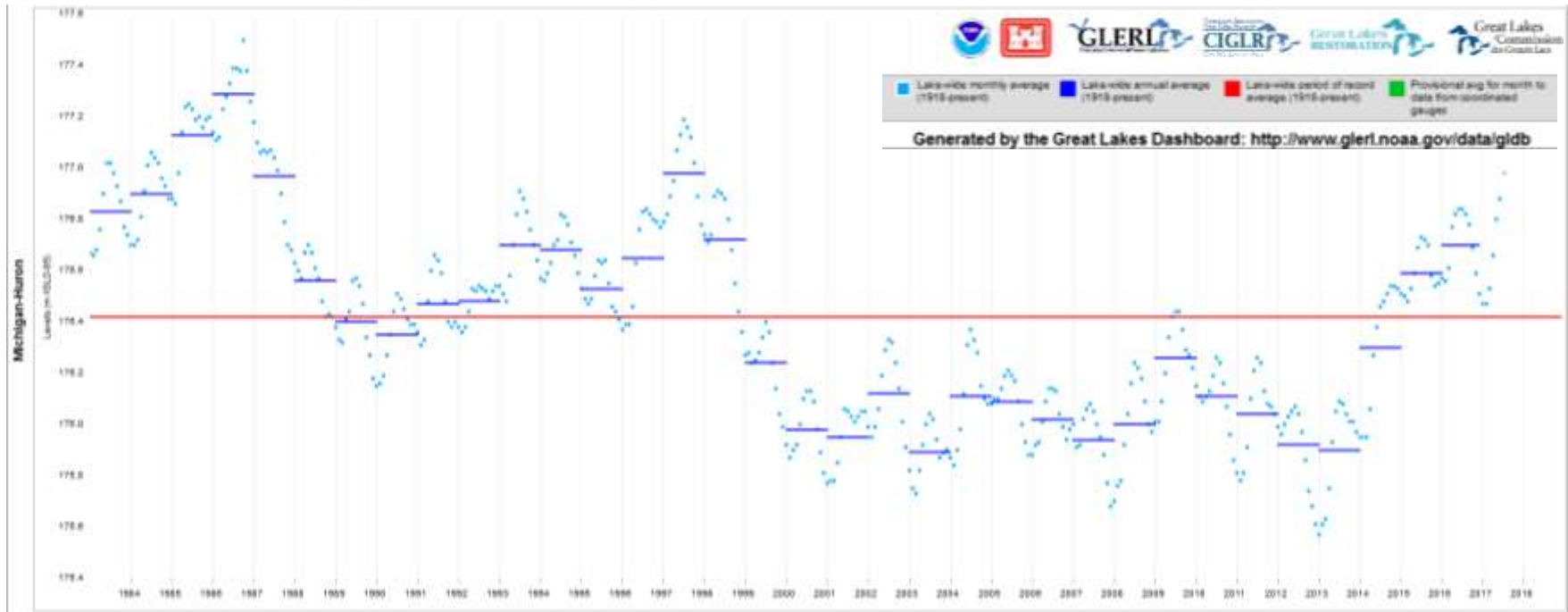


April 2016



May 2017

Water Levels in Severn Sound



Oct 2013



Jul 2017



Jul 2017



Jul 2017



3. Sampling Methods 2011, 2016

- Sampling done every 2 weeks during ice-free season
- Water collected for nutrient, metal (2011) and algal analysis

water
sampling



water
sampling



zooplankton
sampling



- Zooplankton collected for community analysis
- Secchi depth taken (water clarity)
- Temperature, conductivity, dissolved oxygen and pH recorded at 1m depth intervals



profile data
collection



recording
profile data



Secchi
disk

Characteristics

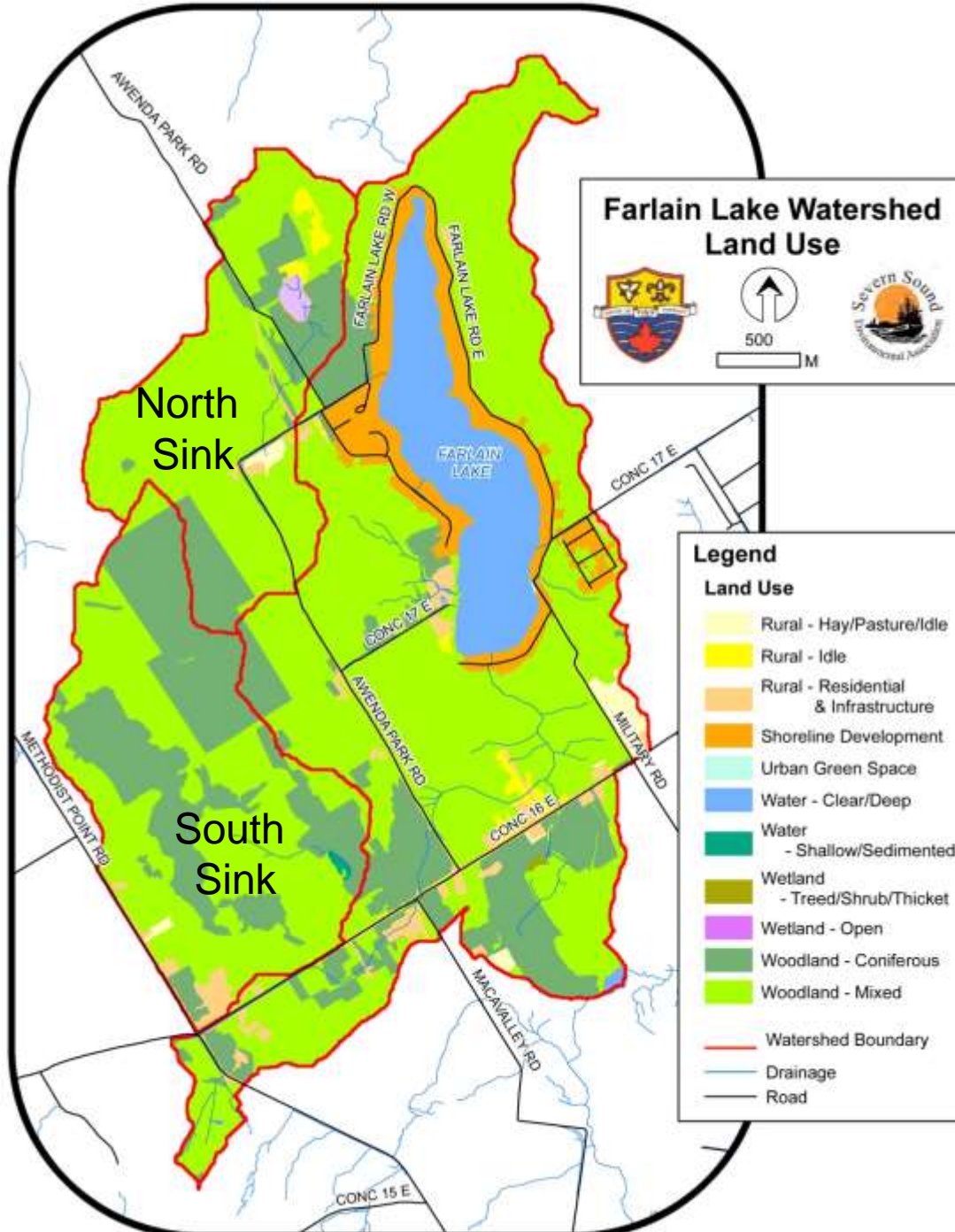
- Small, shallow kettle lake
- No outlet, fed by groundwater and precipitation (seepage)
- Lies within Simcoe uplands formation
- Watershed bedrock geology is 100% limestone
- Shoreline development is a mix of permanent and season residents
- Cooks Lake Municipal Water System located on west side of lake - municipal groundwater drawn from the west



Watershed Land Use Summary

Residential: 10%
Rural lands: 2%
Wetlands: 0.6%
Woodlands: 88%

- The north and south sink areas are not connected to the Farlain lake watershed by direct overland flow, but may be connected via groundwater flows
- The land bridges that separate the sinks are ~ 5 m high



Legend

- Water Quality Sampling Station
- Drainage

Farlain Lake Study 2016



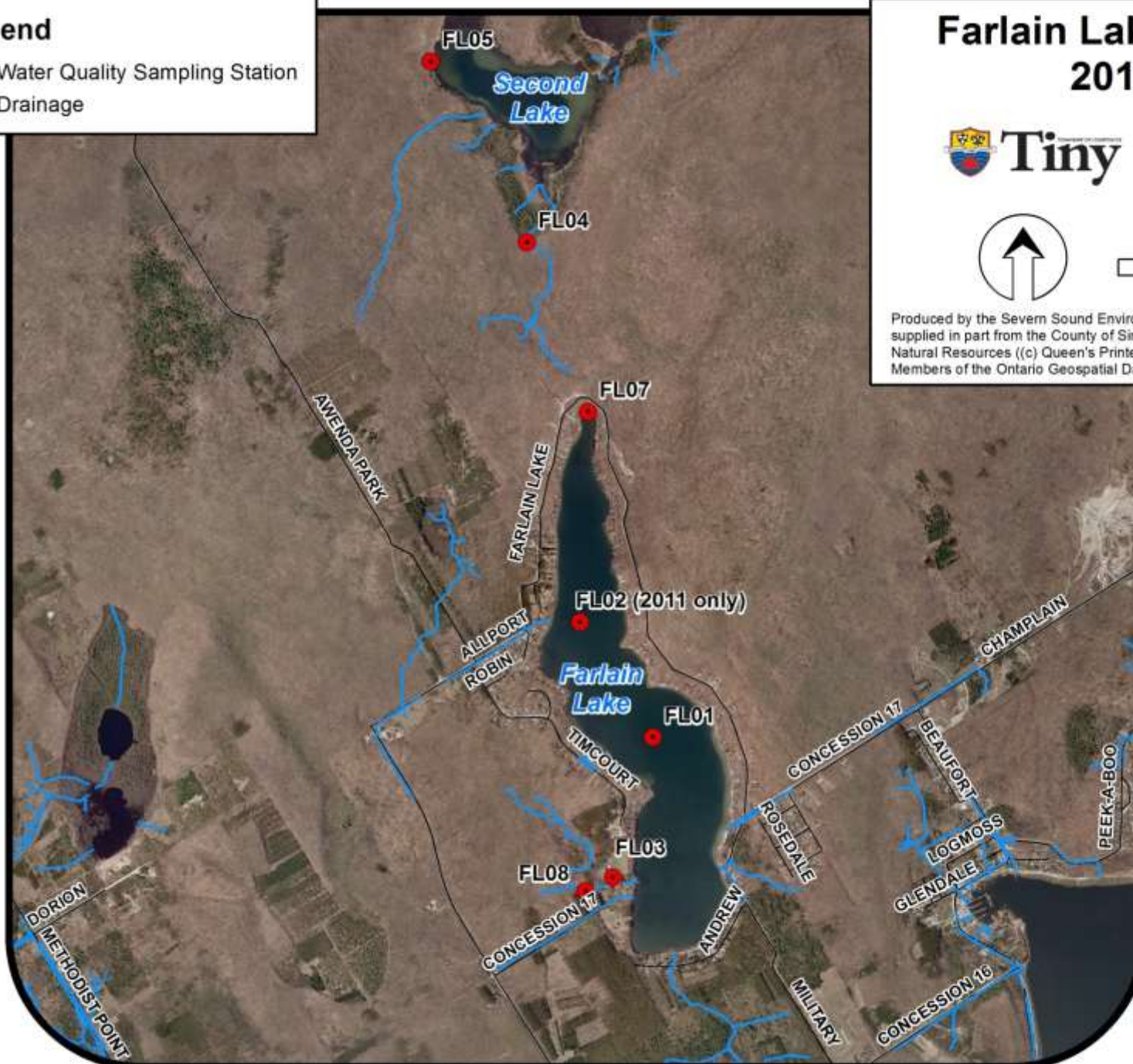
Tiny



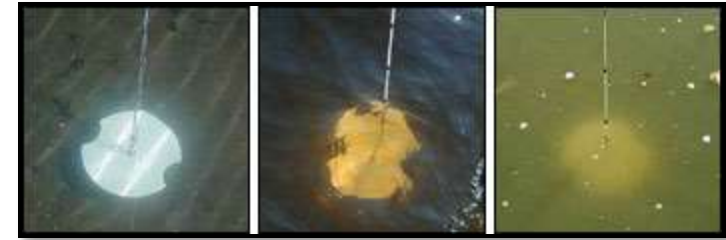
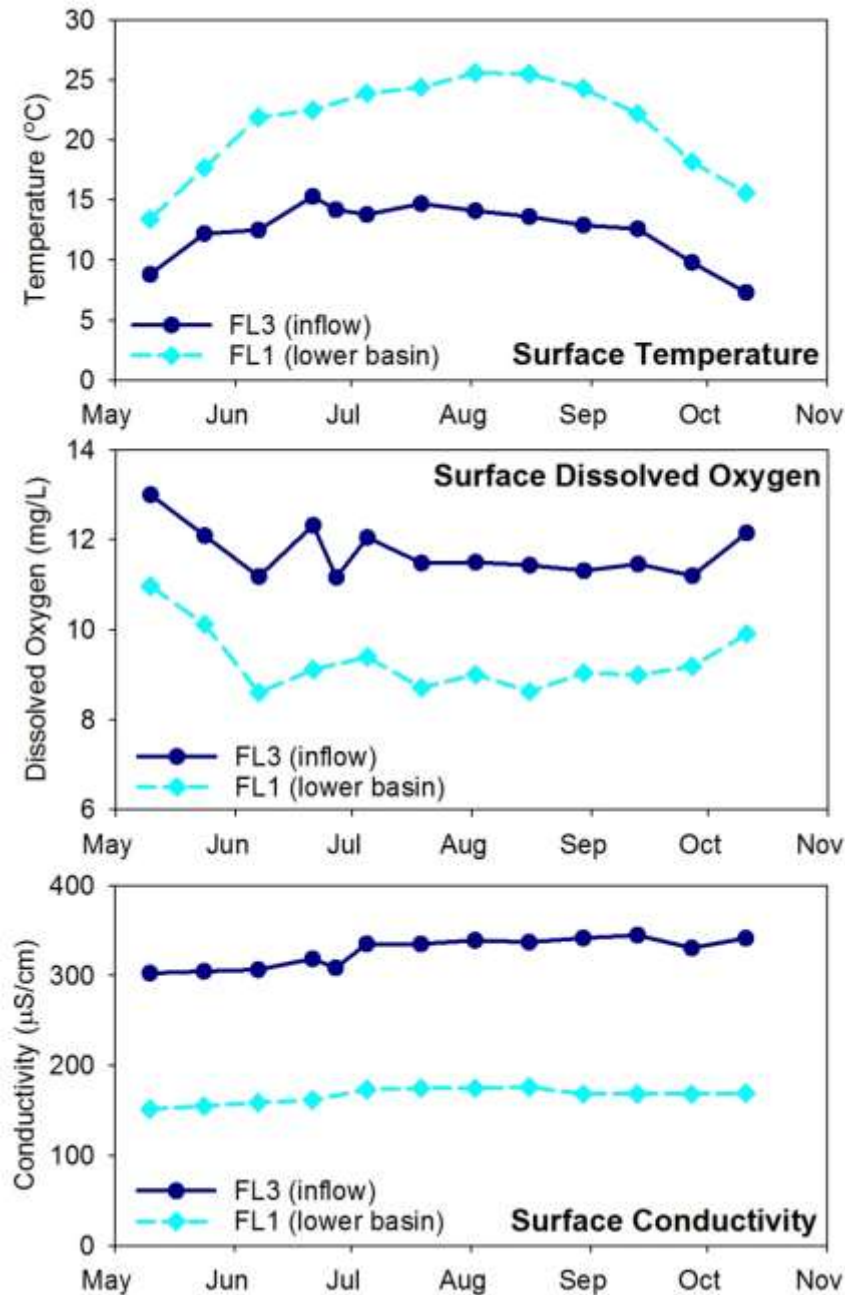
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Produced by the Severn Sound Environmental Association with Data supplied in part from the County of Simcoe, the Ontario Ministry of Natural Resources ((c) Queen's Printer 2017) and under License with Members of the Ontario Geospatial Data Exchange, 2017



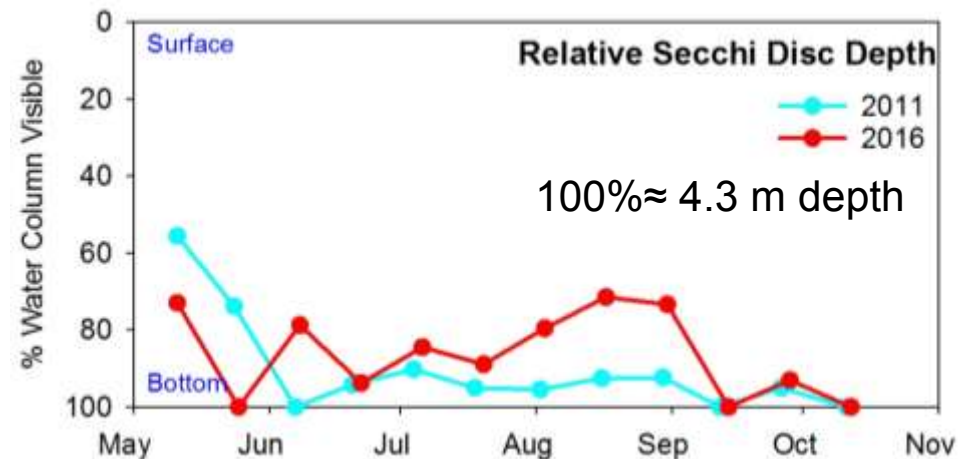
2016 Physical Variables: Temperature, Oxygen, Conductivity and Water Clarity



clear

high
DOC

high
turbidity



- Water clarity lowest in spring due to runoff events and late summer
- Disc was on the lake bottom 3 of 12 sample dates in 2016

Trends in Trophic Status of Farlain Lake

Indicator	Trend Dir. [‡]	1996 Avg.	2011 Avg.	2016 Avg.
Total phosphorus	↔	11.6 µg/L	8.8 µg/L	8.7 µg/L
Total Kjeldahl nitrogen	↔	593 µg/L	388 µg/L	413 µg/L
Water clarity	↓	2.7 m	3.7 m	3.9 m
Chlorophyll <i>a</i> *	↓	3.7 µg/L	-	-
Total algae biovolume	↔	1362 mm ³ /m ³	1064 mm ³ /m ³	1005 mm ³ /m ³
Calcium	n.a.	-	26.2 mg/L	24.2 mg/L

↔ No change ↑ Increase ↓ Decrease

- Trend analyses included all available data for each indicator
- Values for these indicators place Farlain Lake in the **mesotrophic, or moderately** enriched category

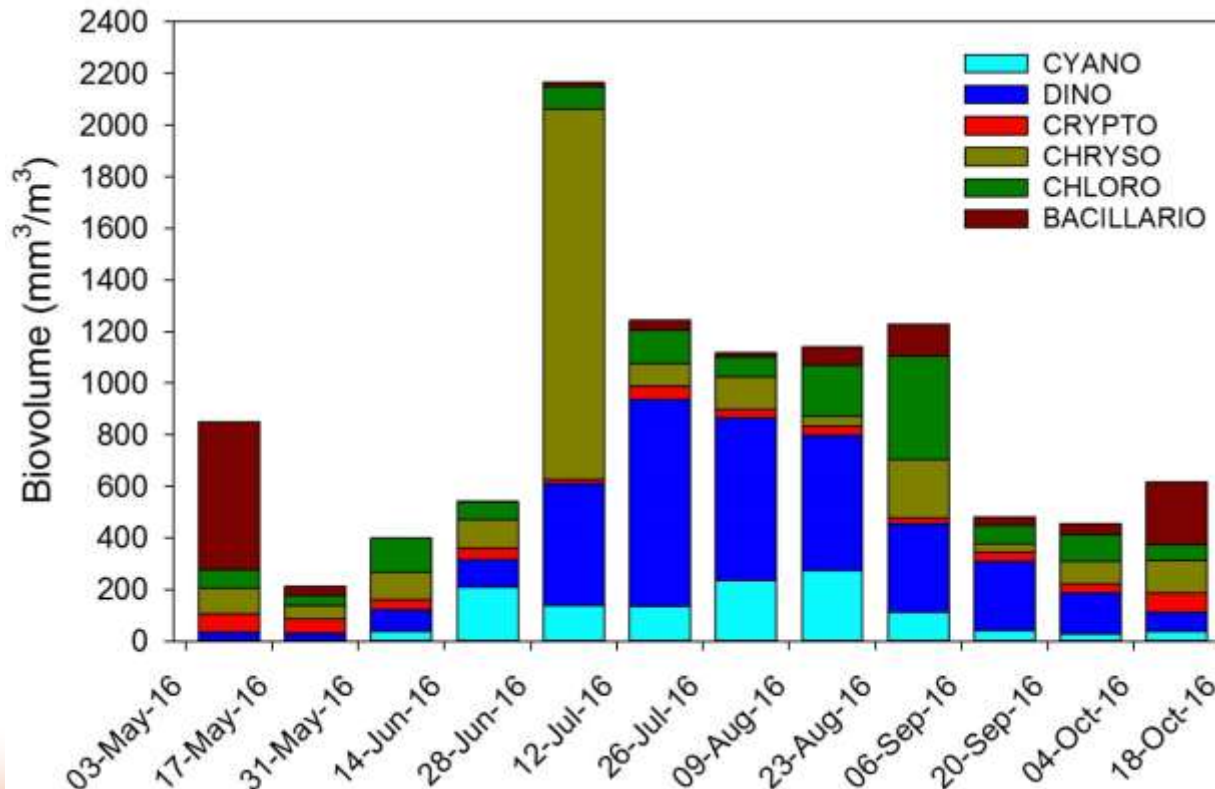
[‡]Includes all available data, some back to 1973

*Last year of data was 1996



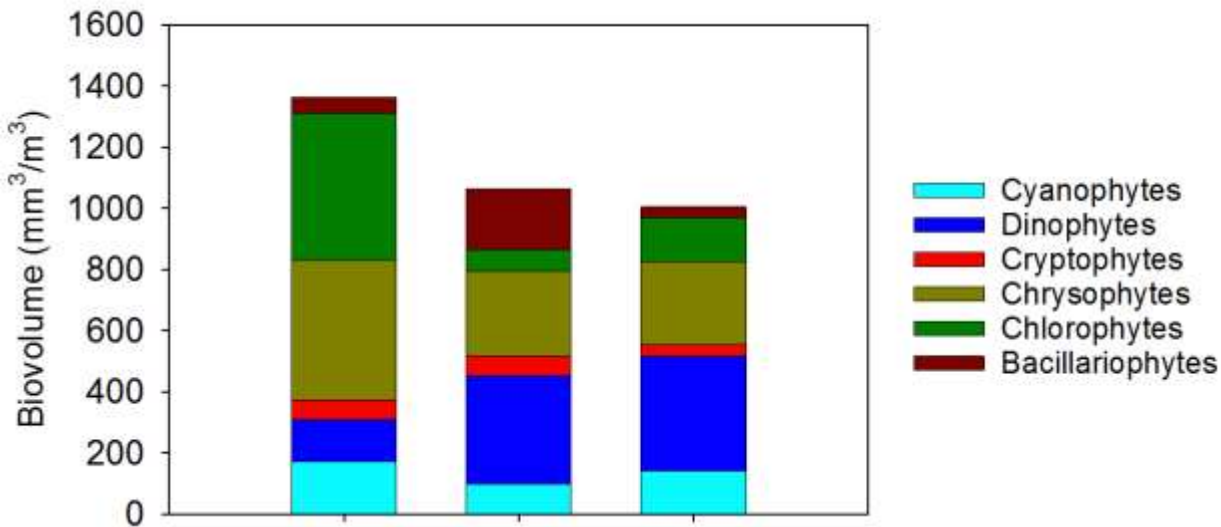
Phytoplankton (Algae) - 2016

- Biovolume (mm^3 of algae per m^3 of water)
estimate of the algae cell volume in the sunlit portion of the water column
- May-Oct mean total biovolume was $870 \text{ mm}^3/\text{m}^3$
- Total biovolume highest in mid to late summer

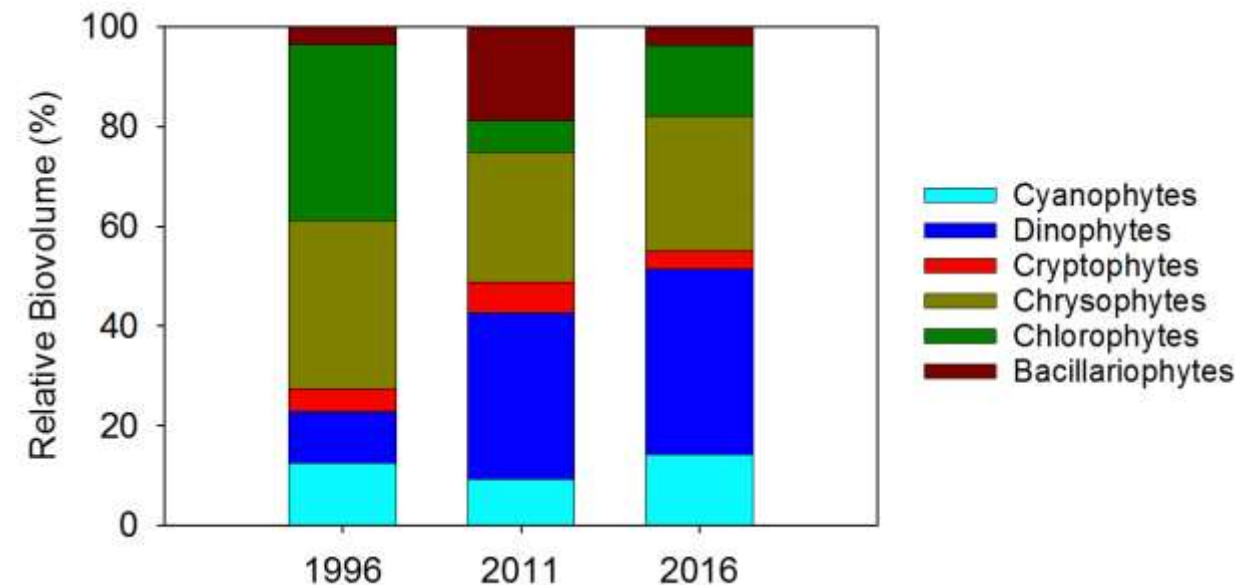


- Dinoflagellates (dinophytes) dominated for much of the summer
- *Uroglena* (type of chrysophyte) bloomed on July 5 – can cause fishy taste in water
- Diatoms (bacillariophytes) highest in spring and fall, prefer cool temperatures
- Blue-green algae (cyanophytes) peaked in early and late summer

Phytoplankton – Long Term Trends



- Total algae amounts have decreased since 1996; no change since 2011
- Slight changes in community:
 - Relative amount of blue-green algae and cryptophytes fairly constant; diatoms fluctuated
 - Chrysophytes and green algae highest in 1996; dinoflagellates lowest in 1996



Note: Biweekly data were collected from May 29-Aug 21 in 1996; the same period was used to calculate mean annual biovolume for 2011 and 2016.



4. Flow Path Investigation

Station	Description	Date	Alkalinity	Calcium	Chloride	Colour	Conductivity
FL3	DS Sweeney's weir	21/06/2016	172.0	52.2	3.05	8.65	338
FL1	lake, lower basin	21/06/2016	78.8	25.2	2.39	11.40	172
FL7	top end of Farlain Lake	04/11/2014	70.3	22.0		12.20	
FL4	start of Kettle's spring	21/06/2016	118.0	39.4	2.25	5.58	248
FL5	Kettle's lake	21/06/2016	127.0	38.0	1.57	12.80	259

Station	Description	Date	Potassium	Magnesium	Sodium	pH	Sulphate
FL3	DS Sweeney's weir	21/06/2016	1.15	10.40	2.01	8.33	6.2
FL1	lake, lower basin	21/06/2016	0.74	4.96	1.56	7.90	3.4
FL7	top end of Farlain Lake	04/11/2014	0.64	4.72		7.95	4.2
FL4	start of Kettle's spring	21/06/2016	0.79	6.33	1.20	7.74	6.1
FL5	Kettle's lake	21/06/2016	0.96	7.93	1.45	8.08	5.7

- Basic chemistry done to determine character of water along continuum from inflow → Farlain → Kettle's Lake
- Snapshots assumed to represent avg. conditions
- Kettle's Lake has stronger **GW influence**
- Sweetener analysis done at headwater of stream into Farlain (FL8) → results were below detection

Elevation Profile of Farlain Lake



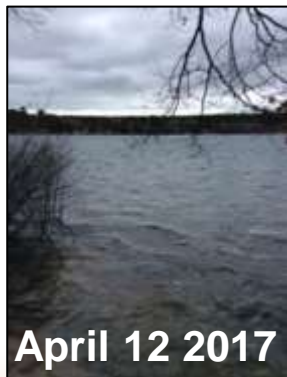
Discharge into
Kettle's Lake

Sampling point
along stream (FL4)

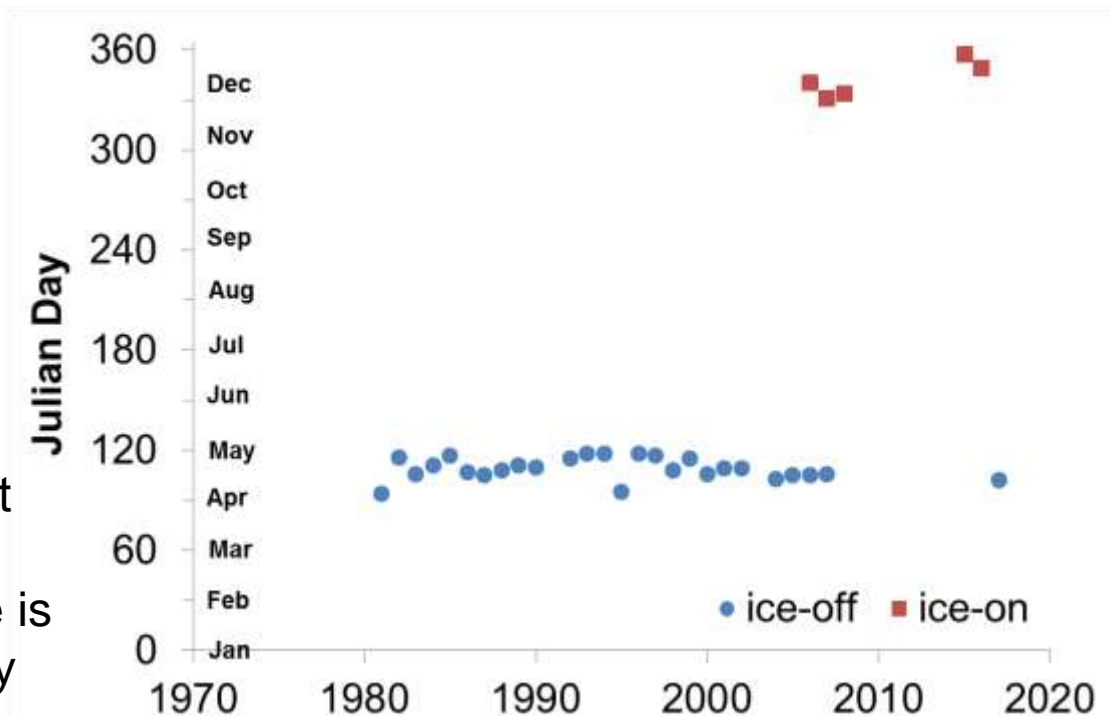
Beginning
of spring

5. Ice Spotters

- Collected existing records from 2 volunteer sources
 - Ice-off back to 1981
- THANK YOU to the four new volunteers who contributed observations for 2016/2017 ice season



- Changes aren't statistically significant but ice is coming off slightly earlier and forming slightly later



Conclusions

- Farlain Lake is moderately enriched, based on nutrient concentrations, algal biovolume and clarity
- Strong groundwater influence on the lake via single spring-fed inflow
- Little influence from road salt up to 2016 based on sodium and chloride concentrations; slight increase since 1996
- Water quality has generally improved since 1996 (phosphorus, clarity, algae)
- Algal communities in 2016 typical of shallow temperate waters; one incidence of *Uroglena* boom
- Observations indicate ice may be forming slightly later and melting slightly earlier – continued data collection is important



Recommendations

- Continue septic re-inspection program (6 year rotation, 5 year for those in drinking water protection zone)
- Next water quality survey should be conducted in 2021 to continue monitoring long-term trends in quality
- Continue Lake Partner Program to monitor total phosphorus and clarity between SSEA surveys
- Install a water level gauge
- Continue snow removal/sanding method using reduced salt/sand mix
- Maintain native aquatic plant communities to help keep algae densities low



Next steps

- Complete the drainage analysis of the lake using additional 2016 data
- Refine flow calculations from weir
- Calculate a nutrient/water budget estimate for the lake
- Complete Water Quality report summarizing change from 2011 to 2016
 - Draft report is in progress

Thank You

- Township of Tiny
- Ontario Ministry of the Environment and Climate Change
- Farlain Lake Community Association
- Bill Sweeney – use of boat, photos and data
- Peter Andrews – photos and data





Questions?

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