

Severn Sound Environmental Association



PWQMN Results Update
SSEA Board Meeting, July 26, 2022
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SSEA Tributary Monitoring Programs



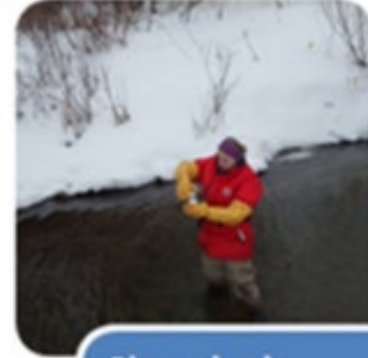
Physical Characteristics

- Land Use/ Mapping
- Temperature
- Flow



Biological Characteristics

- Benthic Invertebrates

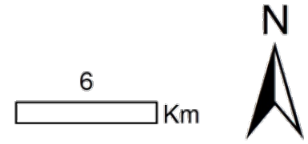


Chemical Characteristics

- PWQMN Sampling

- Provincial Water Quality Monitoring Network (PWQMN) allows for monitoring of ambient water quality conditions in major Severn Sound tributaries
- SSEA samples 12 PWQMN stations + 2 stations not covered under the program ~8 times throughout the year, capturing baseflow and event flow conditions

Tributary Monitoring Stations



HYDAT stations

- Active
- Inactive



Legend

- PWQMN Station
- Supplementary Station
- ~ Drainage
- ⬭ Severn Sound Watershed
- ⬭ Subwatersheds
- ⬭ Severn River Watershed

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Comparison of Results to Provincial Water Quality Objectives

Percentage of samples meeting PWQO from 2010 to 2020

River System	Station (wtshd position)	Chloride (Cl)	Total Phosphorus (TP)	Nitrate (NO3)	Suspended Sediment (SS)	Iron (Fe)	Zinc (Zn)	Aluminum (Al)	Cadmium (Cd)	Copper (Cu)
Copeland Ck	201 (DS)	100	86	100	91	86	97	72	57	97
Coldwater R	45 (US)	100	80	100	88	84	97	73	62	100
Coldwater R	206 (DS)	100	79	100	88	80	99	68	59	100
Hogg Ck	43 (US)	100	79	100	91	80	99	62	59	100
Hogg Ck	204 (DS)	100	75	100	85	74	99	53	61	100
Lafontaine Ck	LAC1 (DS)	100	76	100	n.d.	100	100	88	100	100
North R	N3 (US)	99	93	100	95	86	96	82	51	100
North R	207 (DS)	100	79	100	100	77	100	42	57	100
Severn R	PS2 (DS)	100	99	100	100	100	100	100	67	100
Sturgeon R	205 (DS)	100	81	100	90	85	100	77	53	100
Wye R	41 (US)	100	83	100	95	84	97	43	55	99
Wye R	203 (MID)	100	37	83	91	53	100	8	54	100
Wye R	W23 (MID)	100	66	92	n.d.	81	100	19	100	100
Wye R	208 (DS)	100	85	99	100	86	100	79	52	100
	Objective	210 mg/L	0.03 mg/L	2.9 mg/L	30 mg/L	300 µg/L	20 µg/L	100 µg/L	0.5 µg/L	5 µg/L

Watershed position is indicated as upstream (US), midstream (MID) or downstream (DS).

Note that the median value for phosphorus from 2010-2020 was greater than the objective at station 203. Median values for aluminum from 2010-2020 were greater than the objective at stations 207, 41, 203 and W23.

n.d. indicates no data available.



Trend Analysis

Trend directions are indicated as increasing (**inc**), decreasing (**dec**) or unchanging (=).

River System	Station	Cl (1994- 2020)	TP (1994- 2020)	NO3 (1994- 2020)	SS (1994- 2020)	Fe (2002- 2020)	Zn (2002- 2020)	Al (2002- 2020)	Cd (2002- 2020)	Cu (2002- 2020)
Copeland Ck	201 (DS)	inc	dec	inc	=	=	inc	=	inc*	inc
Coldwater R	45 (US)	inc	dec	inc	dec	=	inc	=	inc	inc
Coldwater R	206 (DS)	inc	dec	inc	dec	=	inc	=	inc*	inc
Hogg Ck	43 (US)	inc	dec	inc	dec	dec	inc	=	inc	inc
Hogg Ck	204 (DS)	inc	dec	inc	dec	=	inc	=	inc	inc
Lafontaine Ck	LAC1 (DS)	i.d.	i.d.	i.d.	n.d.	i.d.	i.d.	i.d.	i.d.	i.d.
North R	N3 (US)	inc	dec	=	dec	=	inc	=	inc	=
North R	207 (DS)	inc	dec	inc	dec	=	inc	=	=	inc
Severn R	PS2 (DS)	inc	dec	inc	dec	inc	inc	=	=	inc
Sturgeon R	205 (DS)	inc	dec	inc	dec	=	inc	=	inc*	inc
Wye R	41 (US)	inc	dec	inc	=	=	inc	=	inc*	inc
Wye R	203 (MID)	inc	dec	inc	dec	=	inc	=	inc	inc
Wye R	W23 (MID)	=	dec	=	dec	i.d.	i.d.	i.d.	i.d.	i.d.
Wye R	208 (DS)	inc	dec	inc	dec	=	inc	=	=	inc

n.d. indicates no data available.

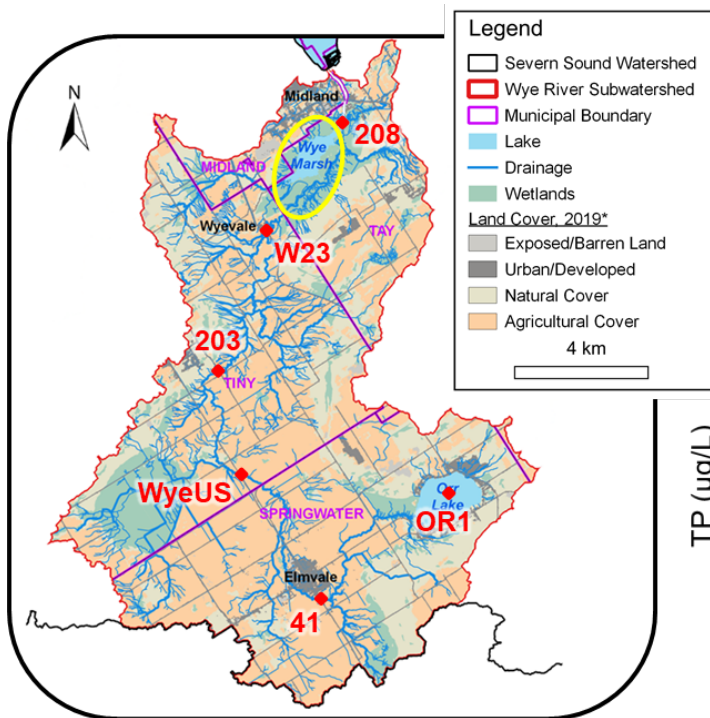
i.d. indicates insufficient data to conduct trend analyses (min 8 years needed).

Results of Mann Kendall tests were deemed significant at $p < 0.05$, except where otherwise noted.

*For cadmium, trend analysis indicated an increasing trend at $p < 0.1$ for stations 201, 206, 205 and 41. Although the trends were of slightly weaker strength than other results that were significant at $p < 0.05$, they are worth noting.

Spatial & Seasonal Analyses

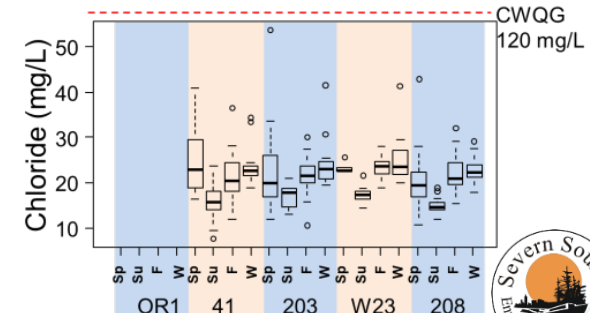
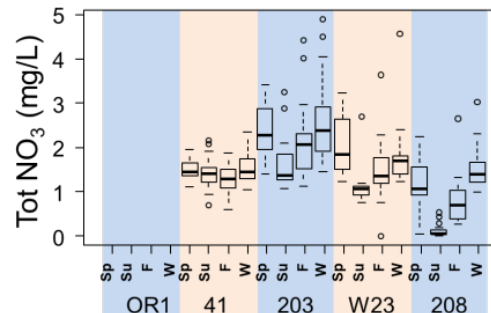
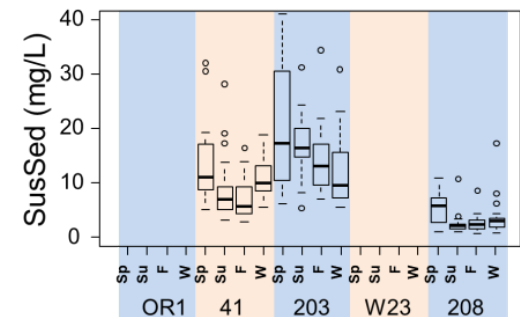
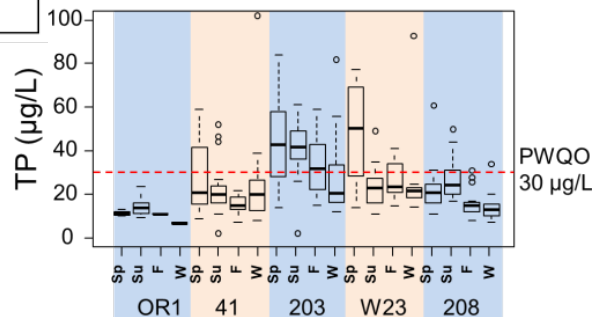
- In progress: looking at seasonal and spatial patterns where multiple stations exist on one river system



Wye River example:

- Water quality degrades towards middle of subwatershed (203), improves after passing through Wye Marsh

Wye River 2010-2019 Spatial & Seasonal Patterns



What's Next?

- Calculate flow-weighted concentrations
 - Concentrations need to be put in the context of river flow
 - Higher concentrations of water quality indicators like TP and SS expected in high flow conditions
 - Allows for more meaningful year to year and seasonal comparisons
 - Work has been in the past done to calculate flow-weighted concentrations, needs updating
 - Valuable in quantifying impact of storm events
 - Many Environment Canada HYDAT flow stations now discontinued (5 out of 10 that used to exist in SS) - need methods to estimate and extrapolate data to fill in gaps
- Install continuous conductivity sensor
 - Opportunity to join continuous monitoring network
 - Plan to install sensor in Coldwater River at monitoring station in Coldwater
 - Expect to be able to better detect influence of storm events on water quality, can pair with rainfall and flow data



Summary

- SSEA remains a committed partner in the PWQMN with 12 stations sampled, +2 supplemental stations
- Comparison to Provincial Water Quality Objectives shows:
 - Nearly all stations currently meeting guidelines for Chloride, Zinc and Copper almost all the time
 - Most stations meeting guidelines for Suspended Sediment and Iron most of the time
 - Some stations not meeting guidelines for Total Phosphorus some of the time
 - Mid watershed station on Wye River doesn't meet TP guideline most of the time
 - Many stations often not meeting guidelines for Aluminum (related to geological sources) and Cadmium
- Trend analysis shows:
 - Increase in Chloride, Nitrate, Zinc, Cadmium and Copper at nearly all stations
 - Decrease in Total Phosphorus, Suspended Sediment at nearly all stations
- Further work needed to look at spatial and seasonal patterns, and relate concentrations to flow
- Results of water quality of SS tributaries indicate while there have been improvements in some aspects, there are deteriorations in other aspects
- Could be mitigated through stewardship actions in rural and urban landscapes such as:
 - Increased stream buffers, proper septic system maintenance, agricultural best management practices, better management of de-icing salt, and improved municipal stormwater management and wastewater treatment



Program Support

- Water quality monitoring of Severn Sound tribs wouldn't be possible without support from Province for PWQMN (lab analysis, equipment)
- Strong need to maintain/increase lab load
- Importance of maintaining/re-establishing HYDAT flow stations
- SSEA thanks our municipal members:



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