

Seneca Lake Water Quality

Cayuga-Seneca WQ Initiatives
January 18, 2017

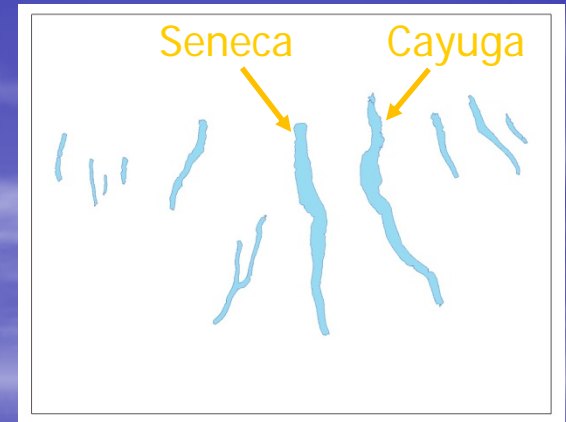
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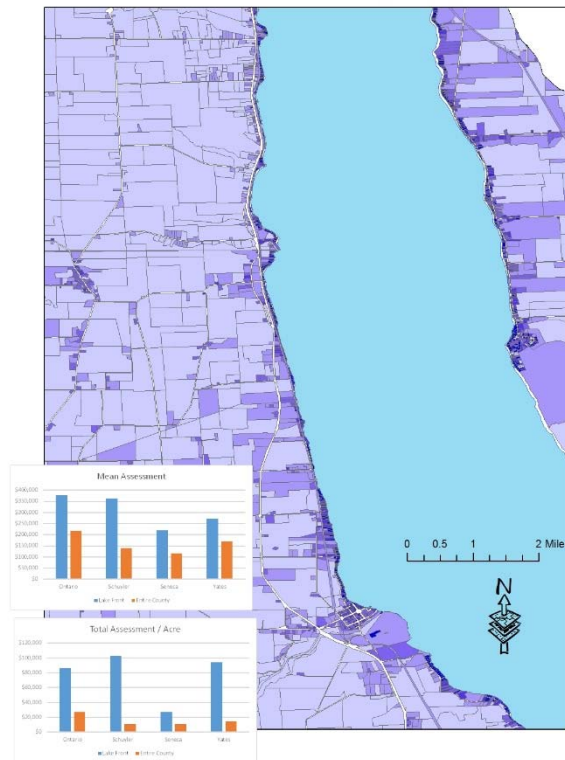
Issues – Many Issues... Speak Succinctly on Two



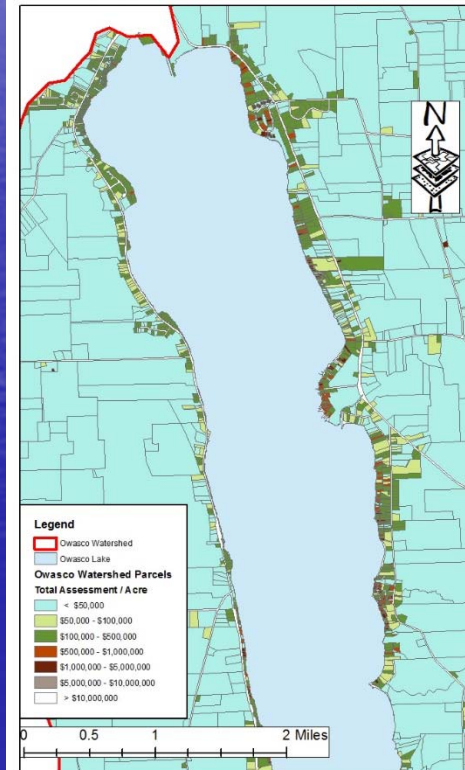
- Chloride / Salinity Seneca Lake
 - Issues
 - Unanswered Questions
- Nutrient Loading & Blue Green Algae
 - Issues
 - Solutions
- Many Other Issues Exist...but I lack time (20 min) and/or expertise
 - Invasive Species, Heavy Metals, WWTF Upgrades, Landfills, Leachate ...
- Seneca Lake
 - Over 50% of the water in the Finger Lakes
- Cayuga Lake
 - Over 30% of the water in the Finger Lakes
- Must be Protected for future GENERATIONS
 - Drinking Water Supplies
 - Regional Rural Tourism/Winery Economy
 - Tax Base

Economics – Local Taxes

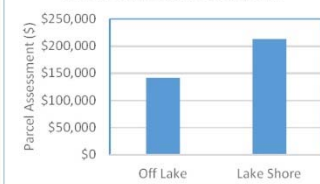
Seneca Watershed Assessment / Acre



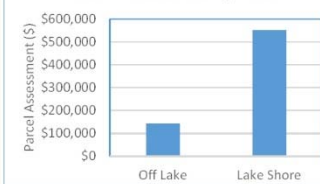
Owasco Lake Property Assessments



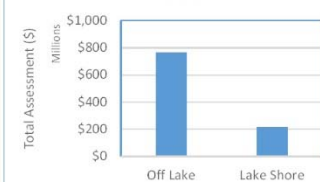
Mean Parcel Assessment



Mean Assessment/Acre



Total Assessment



Seneca Lake Salinity

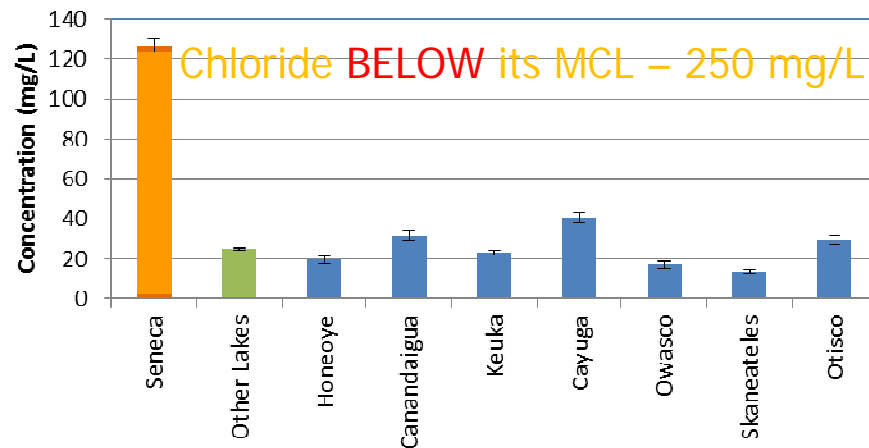
Seneca Saltiest Finger Lake

Wing et al., 1995

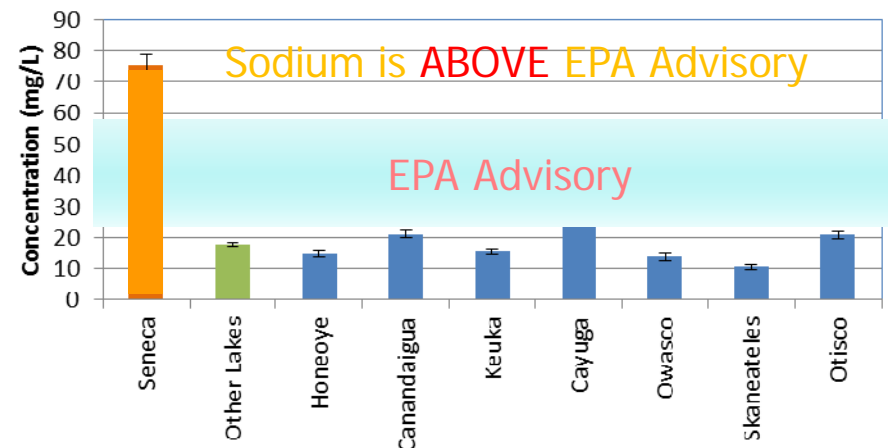
Halfman et al., 2006



Chloride



Sodium



Average data from past 20+ years

Halfman, 2014

Will LPG Storage Induce More Salt into the Lake?

My Data was Used, Incompletely, by Both Sides Of LPG Storage Issue!

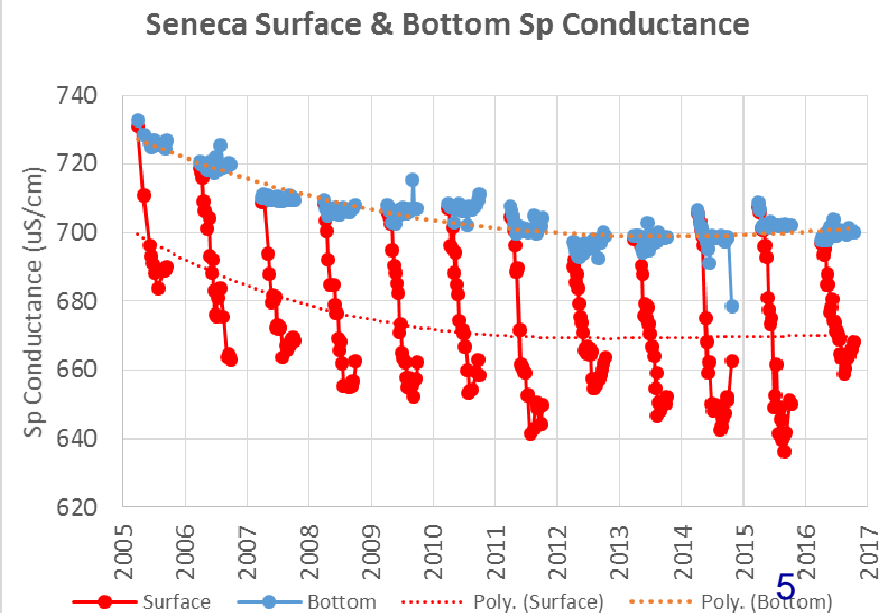
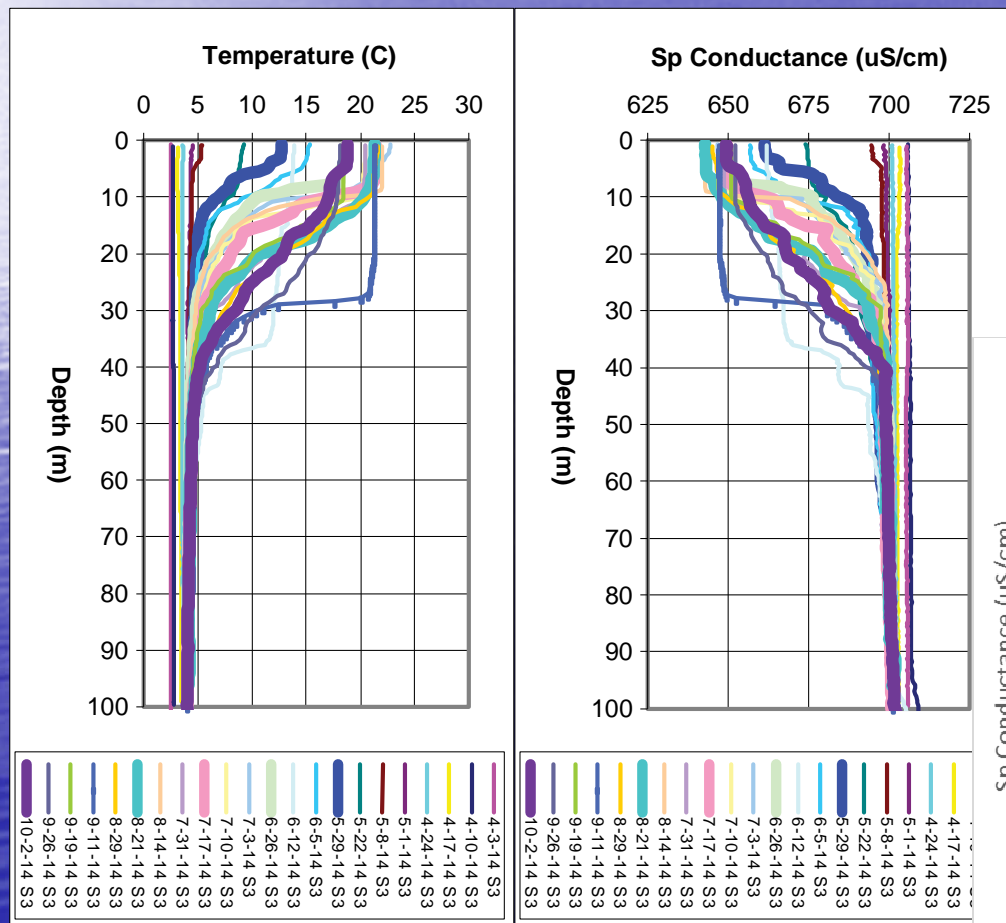
Groundwater Source?

If salt enters from below...

Where is the Lake Floor Salt?

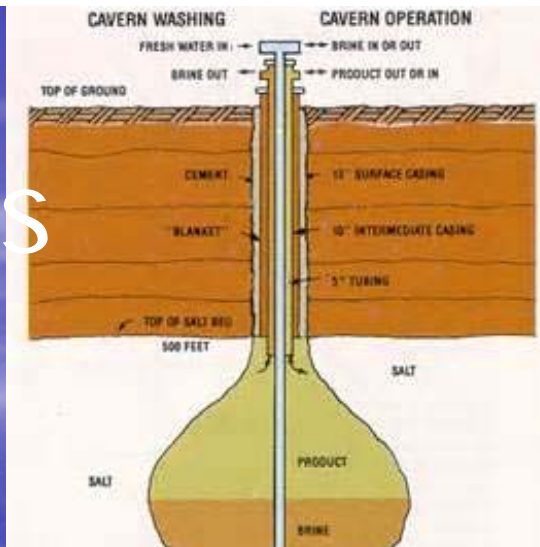


Halfman, 2014



Modeling Chloride Inputs

Unresolved Issues

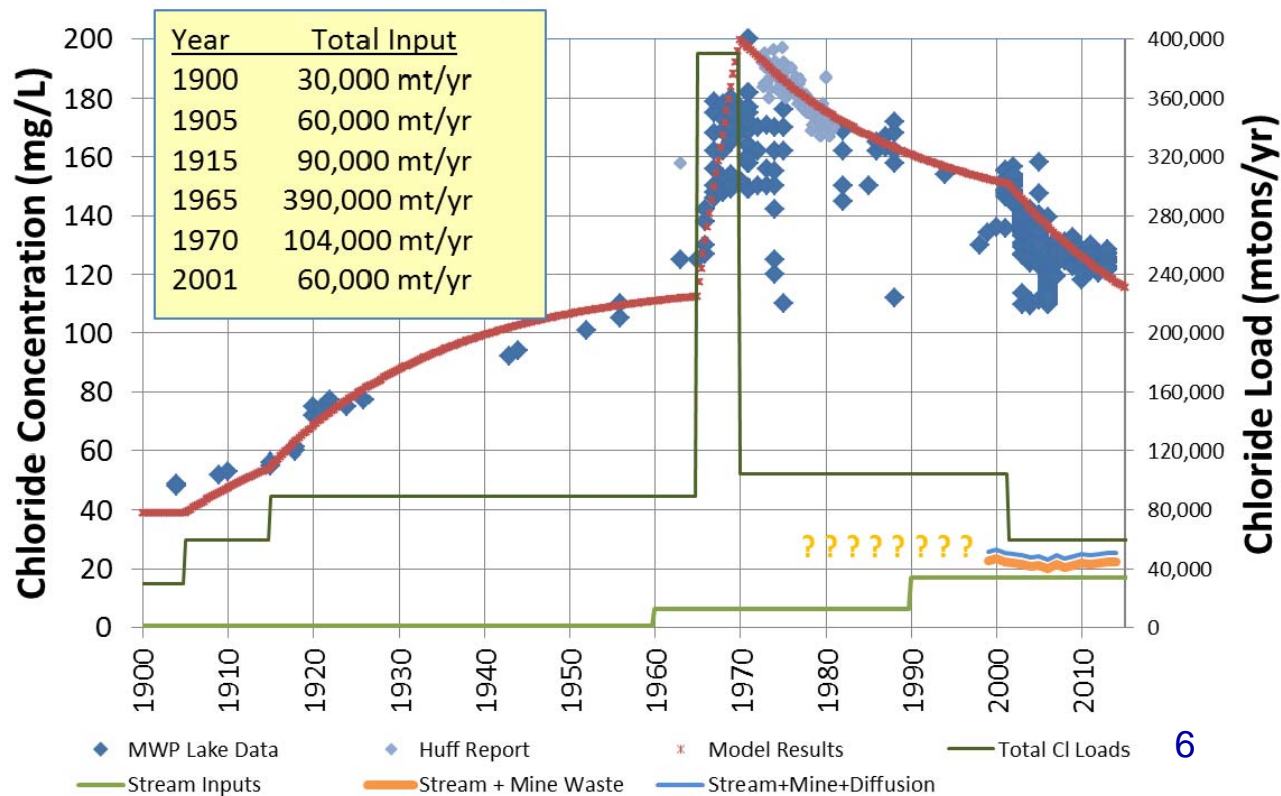


Potential Sources

- Increase in early 1900s
 - Salt Mining Starts 1880s
 - Increased Mining to 1960s
- Huge Increase 1965
 - Himrod Mine "Issues"?
 - Gas Storage by TEMPCO?
 - Short Lived
- Decline/Natural Flushing Since 1970
- **ANY Groundwater Inputs?**
Gas was stored!

Halfman, 2014

Modeling Seneca's Chloride

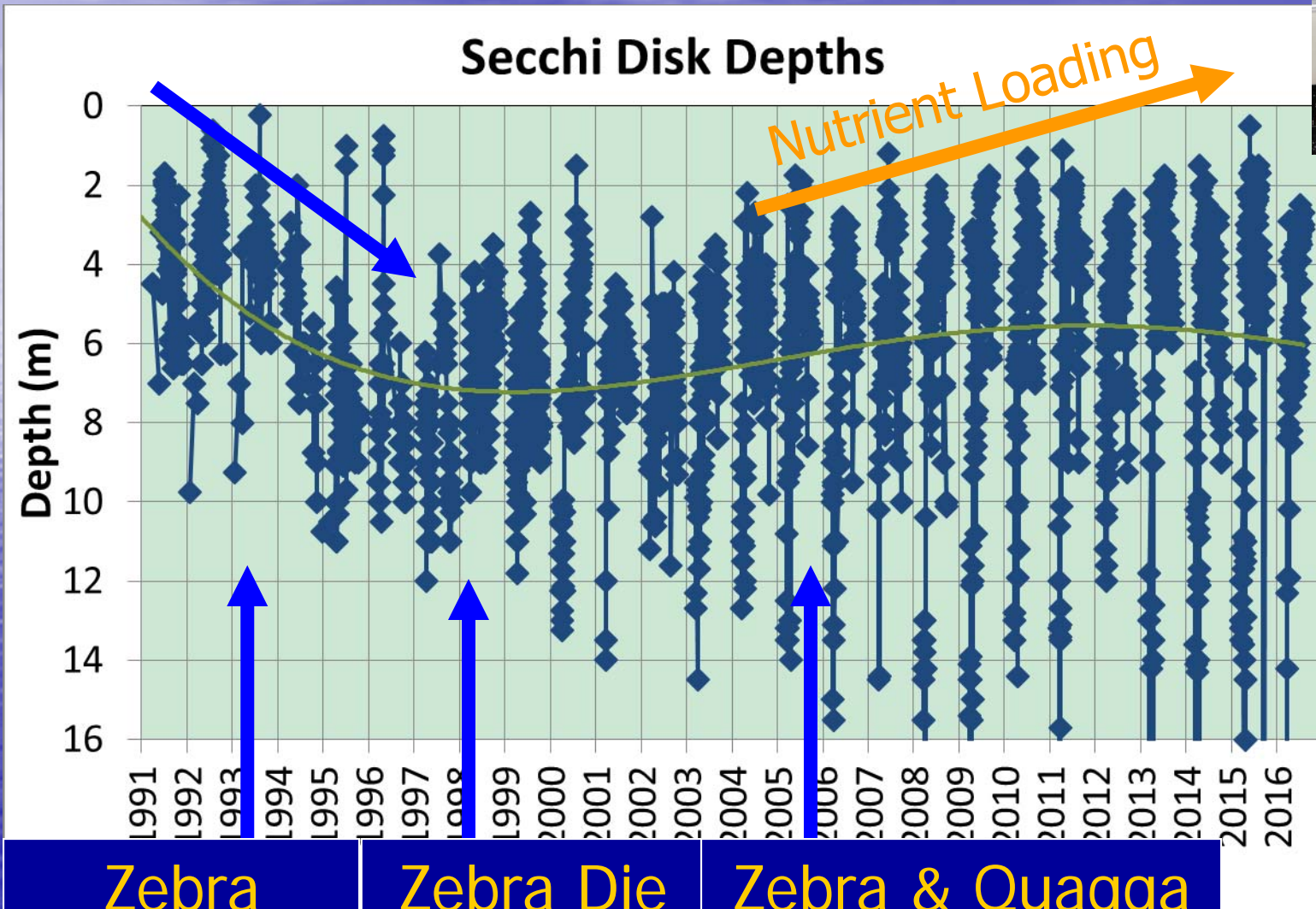


Issue 2: Nutrient Loading!



Slime Covered Rocks – Geneva – *Cladophora*
Toxic Blue Green Algae in Lake Erie
Harvesting Macrophytes in Seneca Lake

Seneca Lake Secchi Disk Data



Four Sites

Weekly
Surveys

April
through
October

Zebra
Introduced

Zebra Die
Off

Zebra & Quagga
Rebound

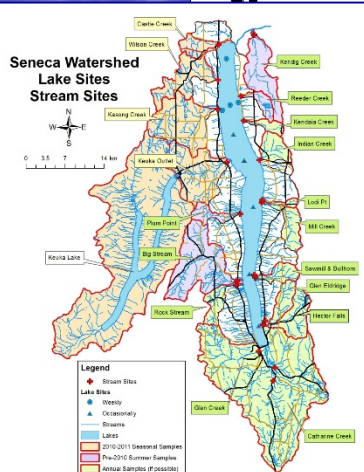
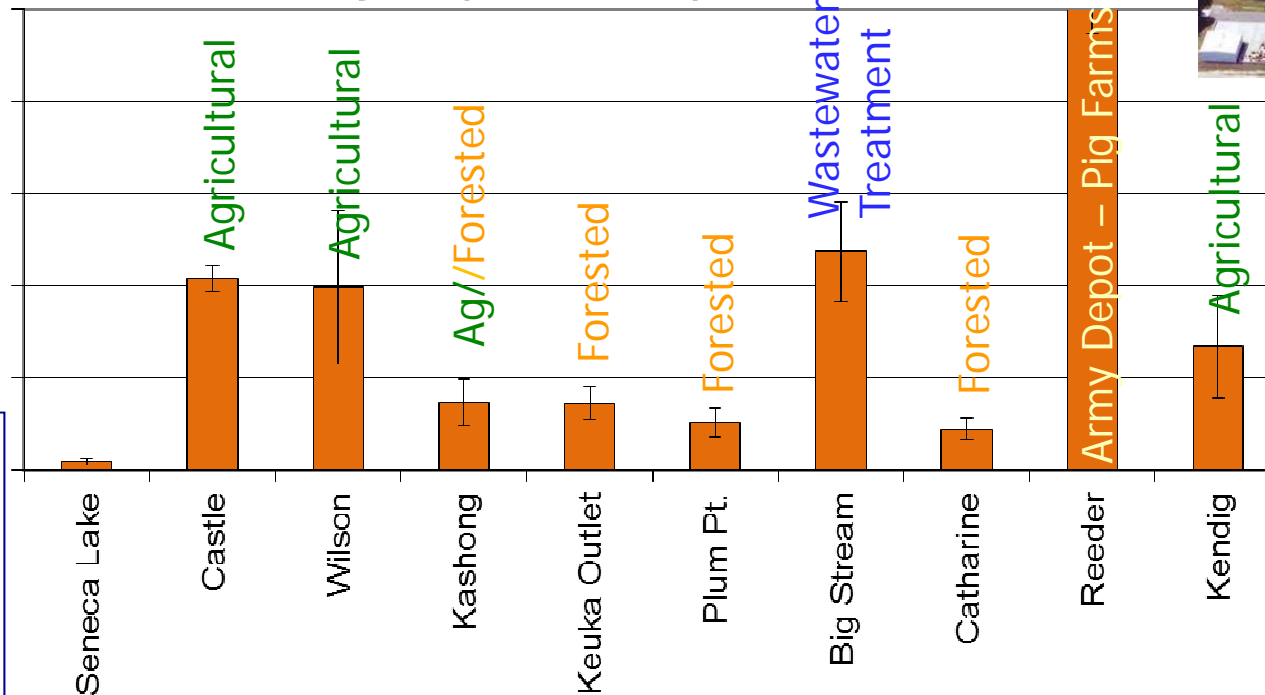
Seneca Lake: Nutrient Loading



Dissolved Phosphate (SRP) Average ('99-'14) Conc.

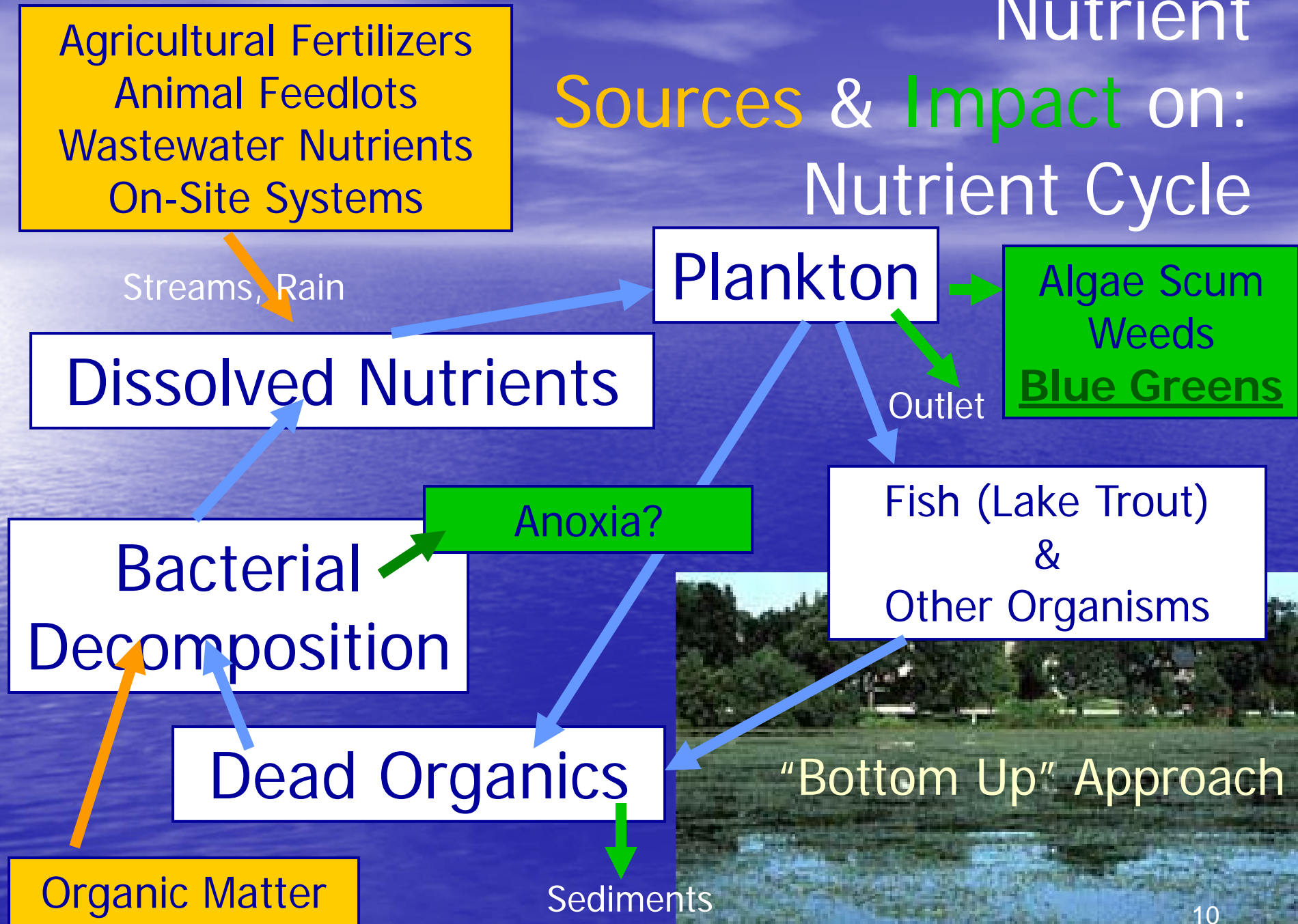
SRP (ug/L, P)

80
60
40
20



Phosphate is Limiting. P:N Algae 1:7, In Lake 1:200

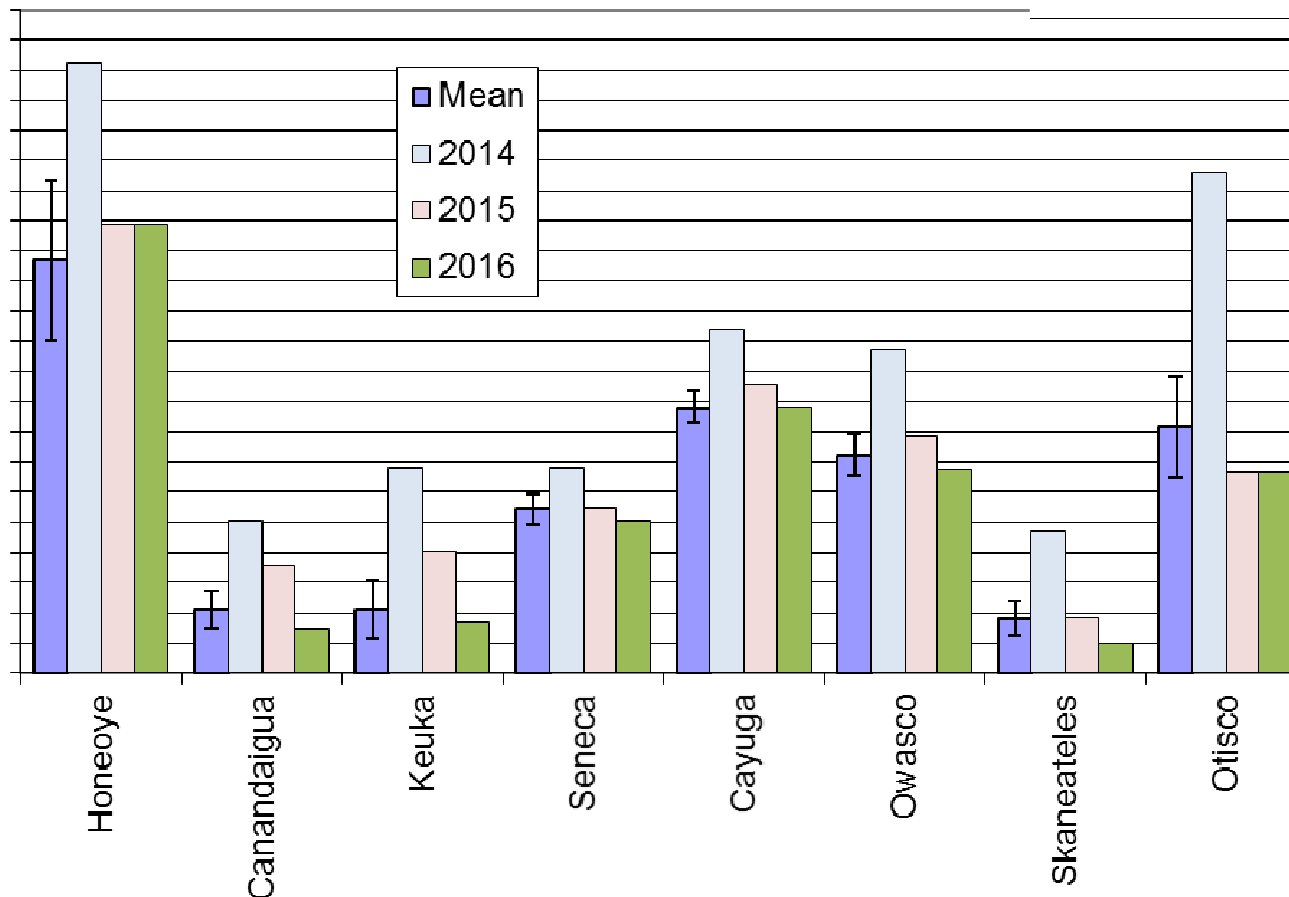
Nutrient Sources & Impact on: Nutrient Cycle



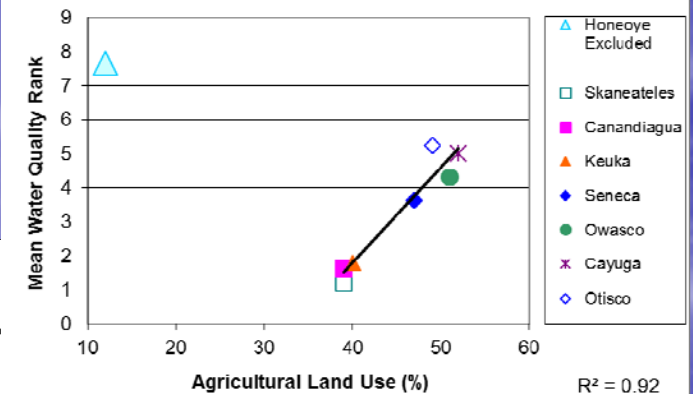
Finger Lakes WQ Ranks

Mean 2005-2013, 2014, 2015 & 2016 Rank

Excellent Quality => => Worst Quality

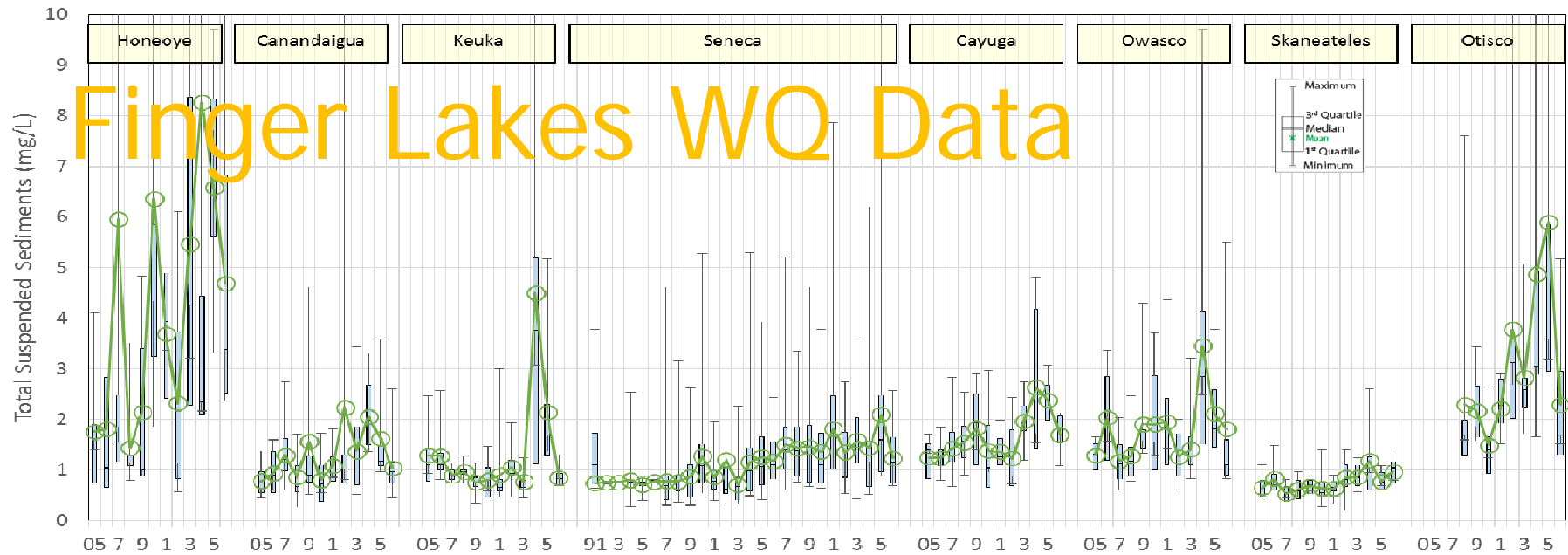


Mean Rank vs. Agricultural Land Use

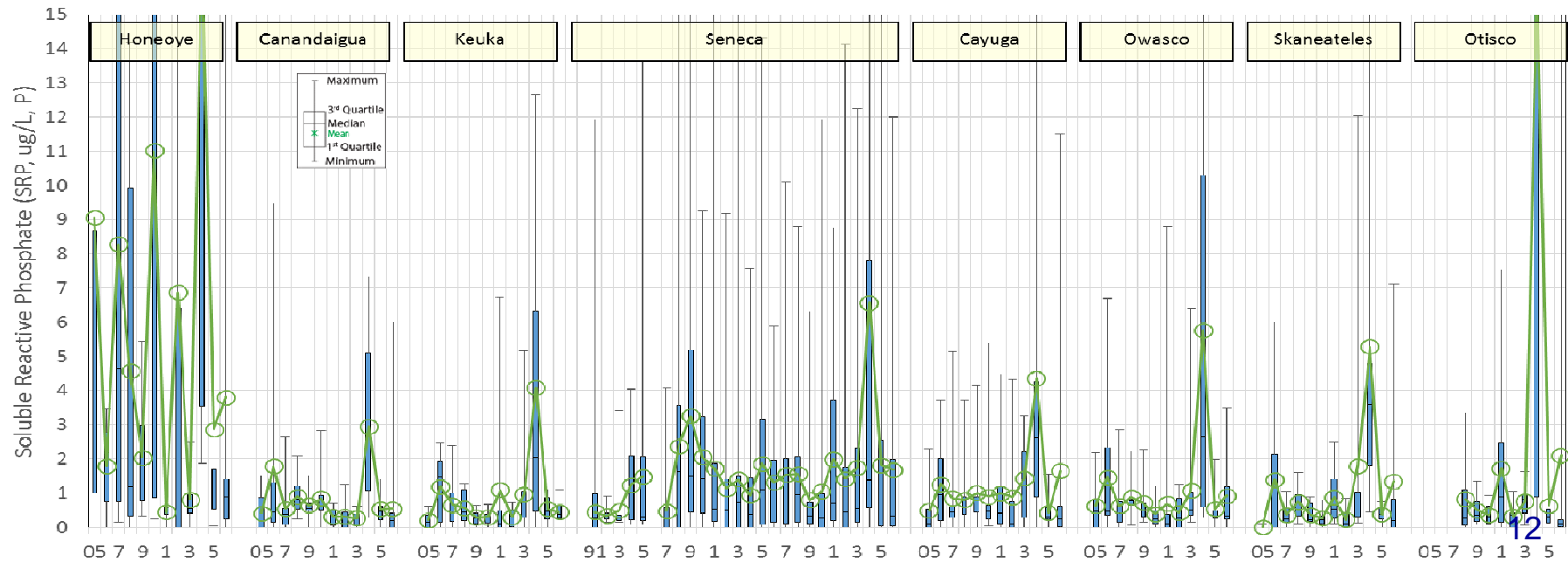


Proportional
Ranks Based on
Annual Average
Surface
Concentrations...
Total S Sediments
Total Phosphorus
Phosphate (SRP)
Nitrate
Chlorophyll
Secchi Depths

Surface Total Suspended Solids

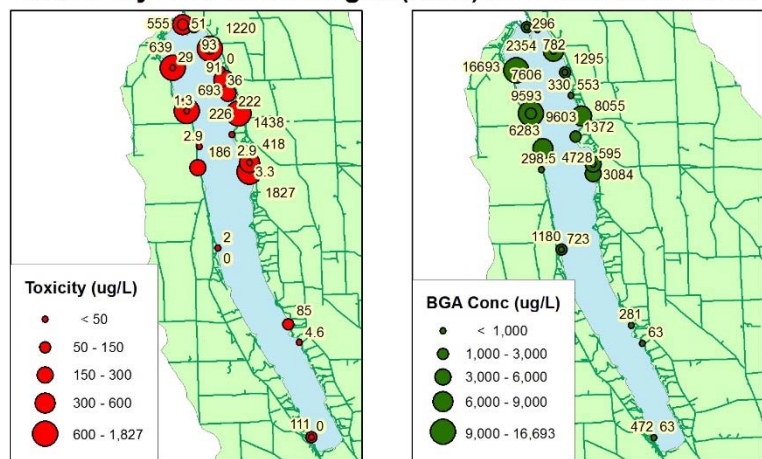


Surface Soluble Reactive Phosphate



Owasco Lake

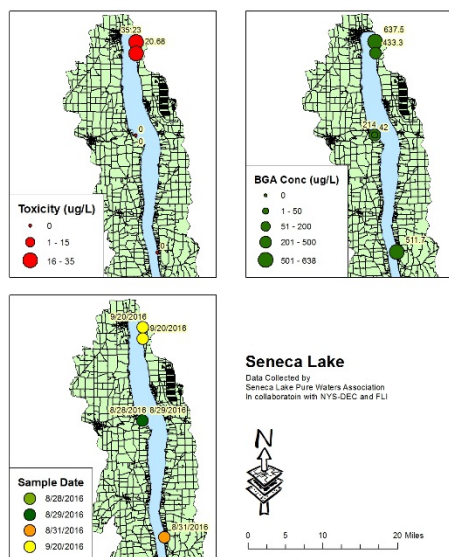
Summary Blue Green Algae (BGA) Measurements 2016



Impact BGA Blooms

Images & Data on this page from the NYS DEC

Summary 2016 Blue-Green Algae Data



Lake	2012	2013	2014	2015	2016
Conesus			C (7 wks)	C (3 wks)	C (4 wks)
Hemlock	-	-	-	-	-
Canadice	-	-	-	-	-
Honeoye	S (12 wks)	HT (18 wks)	C (8 wks)	HT (7 wks)	C (9 wks)
Canandaigua				HT (4 wks)	C (3 wks)
Keuka	-	-	-	-	-
Seneca				C (6 wks)	HT (2 wks)
Cayuga			S (3 wks)		C (7 wks)
Owasco	HT (1 wk)	C (7 wks)	HT (12 wks)	HT (9 wks)	HT (9 wks)
Skaneateles	-	-	-	-	-
Otisco				S (? Wks)	

Solutions

Curtail Sources!

- Stream Bank & Roadside Ditch Erosion

- Armor Stream Banks
- Seed Roadside Ditches

- Septic (on-site) Systems

- Pump Outs
- Expand Sewer Systems (Carefully)

- Wastewater Treatment Facilities

- Tertiary Treatments (\$\$) decrease P

- Agricultural Runoff

- ∇ Runoff Events, esp. in Spring
 - Buffer Strips around Fields
- ∇ Manure Spreading, esp. in Winter
 - Send Manure to WWTF or Digesters



Owasco Inlet Turbidity Plume

Spreading of Manure on Snow

March 11, 2014



Invasive Species

Humans



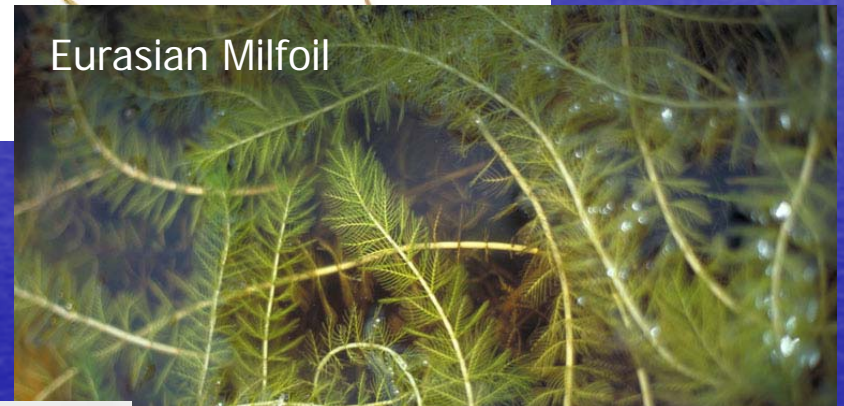
Zebra & Quagga Mussels



Cercopagis



Eurasian Milfoil



Hemimysis

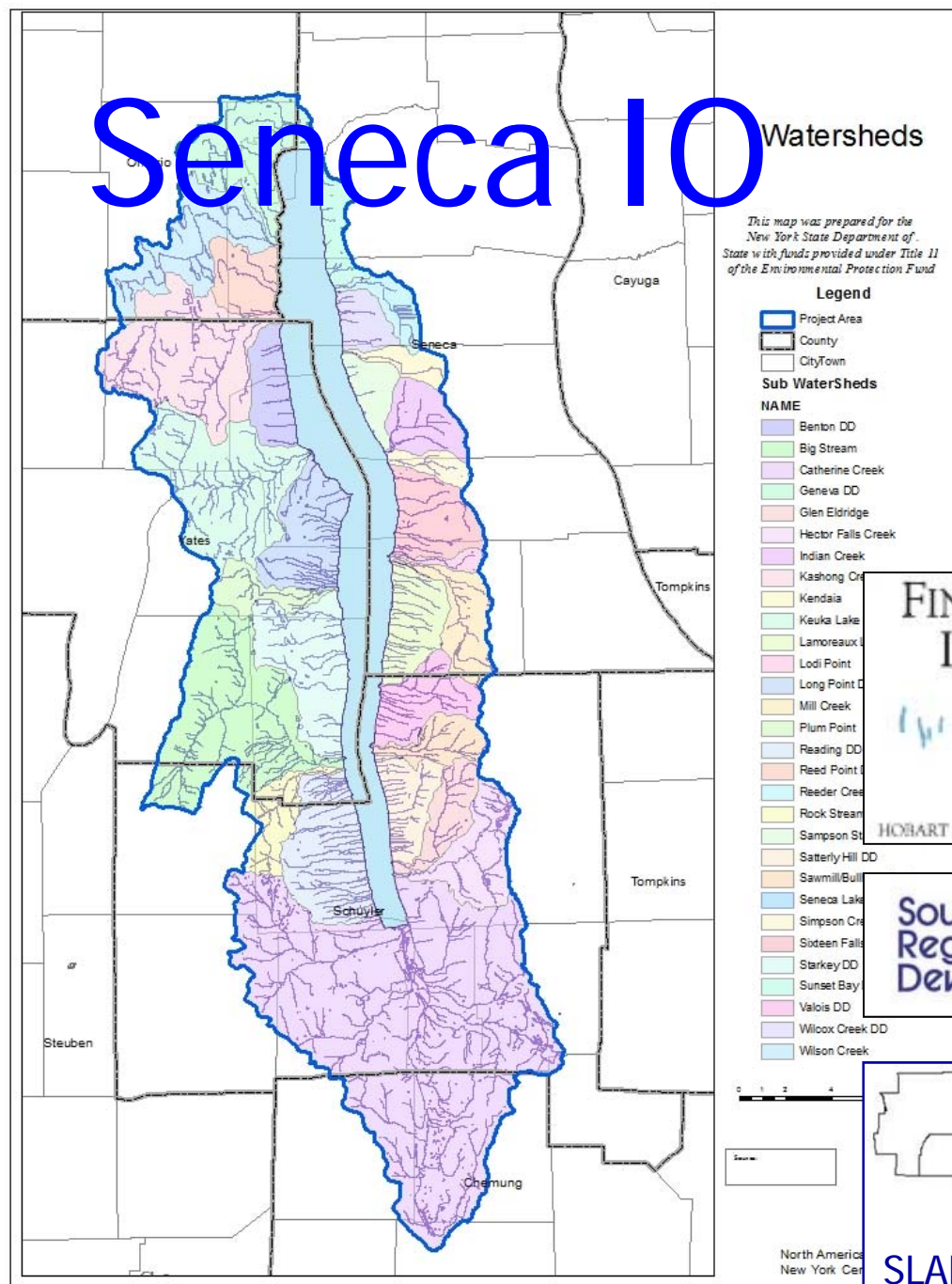


Round Goby

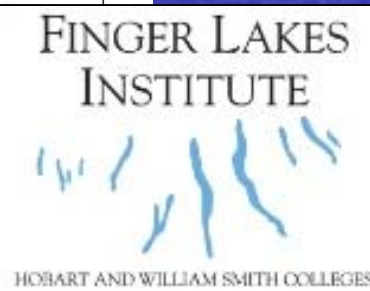


Hydrilla

Seneca 10



Seneca Lake Watershed Management Plan



Watershed
Intermunicipal Org

SLAP-5