LAKE OSCAWANA

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Your local experts in limnology, lake management, and aquatic invasive species.

October 26th, 2019



Main Topics for Today

- Review of Lake Science & Management
- Water Quality Monitoring Program → clarity, oxygen, nutrients/chemistry, algae (& cyanobacteria), zooplankton, fish, aquatic plants...
- Long term Oscawana data led to new management strategies after detailed assessments in 2016-2018
- New Recommendations: Plants and Nutrients
- Watershed Improvement Projects

Lakes Are in Constant Change

• Geologic time spans (1000s of years) vs. human accelerated change

Oligotrophic: clear **Mesotrophic:** some algae, **Eutrophic:** cyanobacteria, reduced clarity, more plants excessive plants/algae



https://www.geocaching.com/geocache/GC273KR_lake-lansing







Managing Invasive Species

• Aquatic Invasive Plants...

- o Grow very quickly
- Aggressive reproduction
- Spread rapidly
- Grow over a wide range of conditions
- Replace dominant native plants maybe all natives
- o No natural predators
- Significantly degrade water quality
- o Economically devastating
- Very difficult to control

• Eurasian milfoil (Myriophyllum spicatum)



• Curly Leaf Pondweed (*Potamogeton crispus*)

Managing Cyanobacteria

- Still a threat at Oscawana
- aka Blue-green algae, or HABs (Harmful Algal Blooms)
- Technically not algae, but they function similarly to other types of phytoplankton
- 3.5 billion years ago!
 - o Deserve our respect (O2)
 - Will be here after us....
 - Photos from NOAA/EPA
- Blooms are problematic all of the world.
 - Worsened by increased development, population, and climate change





Water Quality Monitoring

- 1. Secchi water clarity
- 2. Temperature/Oxygen
- 3. Nutrients
- 4. Algae & cyanobacteria
- 5. Zooplankton
- 6. Aquatic plants
- 7. Fisheries
- 8. Stormwater / watershed

• <u>Secchi water clarity:</u> Easily noticed impacts of eutrophication (nutrient overenrichment)



4.5 meters

< 1 meter



Seasonal Oxygen Loss

Oscawana 2018 Percent Oxygen Saturation



Oxygen Loss Causes Internal Nutrient Release

• Regulates internal recycling of nutrients (internal loading) from lake bottom mud

Internal loading problems are often hidden below the thermocline....

Which is why sampling in Spring and Fall is so important (months with no thermocline)







Impaired Status of Oscawana

Impaired Waters NOT Included on the NYS Section 303(d) List

Not all impaired waters of the state are included on the Section 303(d) List. By definition, the List is limited to impaired waters that require development of a Total Maximum Daily Load (TMDL). A list of Other Impaired Waterbody Segments Not Listed (PDF, 83 KB) on the 303(d) List Because Development of a TMDL is Not Necessary is also available. The purpose of this supplemental list is to provide a more comprehensive inventory of waters that do not fully support designated uses and that are considered to be impaired. (NOTE: This list will be updated upon USEPA approval of the Proposed Final 2016 List.)

There are three (3) categories of justification for not including an impaired waterbody on the Section 303(d) List:

- · Category 4a Waters TMDL development is not necessary because a TMDL has already been established for the segment/pollutant.
- Category 4b Waters A TMDL is not necessary because other required control measures are expected to result in restoration in a reasonable period of time.
- Category 4c Waters A TMDL is not appropriate because the impairment is the result of pollution, rather than a pollutant that can be allocated through a TMDL.

 Oscawana TMDL and initial Lake Management Plan published in 2008

 EPA format watershed-based plans to updated TMDL Implementation Plan – to apply for NY DEC funding for lake improvement projects in watershed ⁽²⁾

Oscawana Lake Management Plan 2019

• In-depth water quality data analysis

- Used new information to answer lingering questions
- Much effort put into acquiring harvesting & watershed data
- New loading model estimates greater watershed importance vs. internal nutrient inputs

• Watershed:

- Mapped catch basins around Oscawana
- Reviewed Highway Dept maintenance files
- Reviewed MS4 reports
- Mesh MS4 requirements with Oscawana Management Plan
- Led LOMAC in following up with Town septic pump-out enforcement
- INVESTIGATED FOR PROBLEMS!

Phosphorus Trends

- Suppressed internal loading period
- Increase is not uniform over time, especially in the last decade...
 - Appears to be distinct decrease in internal loading from 2008-2012, high loading in 2013, and then somewhat of a decrease of TP after that
- Internal loading in lakes doesn't normally get better on it's own...
 - So what happened?
 - What IS happening?



Long Term TP Mass (kilograms)

- Same data, spread out by year to see annual variability
- Late summer TP spikes = internal loading
- NOT same pattern every year
- Amount of internal loading is being heavily affected by something...



Evaluating Impacts of Weed Harvesting



- Harvesting is messy!
 - Rips plant roots and heavy sediment disturbance in shallow waters
- Visible sediment plumes behind harvester
- Many plant fragments

Is Harvesting Connected to Internal Loading?

- Limited data, but statistically strong correlation
- Could test this theory by reducing weed harvesting (recommended)
- Alternative plant control methods are available



Pros/Cons of Grass Carp for Milfoil Control

- Very little control
- Cannot target specific areas
- Mixed results in NY case studies
- Favor native species over invasives
- Potentially very cost effective for plant reduction
- Not native & science not well established – proceed with <u>caution</u>

2019: Data suggests carp have reduced plant density in northern coves. Milfoil also appeared lower in the water column than usual in Wildwood (confounding harvester efforts make this a difficult assessment).



Lower stocking densities & partial plant control appears to have minimal impact on phytoplankton Pipalova (2002) Bonar et al. (2002) Cassani et al. (1995) High stocking density more problematic Macenia et al. (1992) & Kogan (1974)

Alternative Plant Control Methods Exist

• Benthic barriers

- Only appropriate for beaches or private dock areas (small areas)
- Should be taken out for winter & cleaned annually
- Diver hand harvesting or suction harvesting (swimming areas)
 - Some residents say they already take it upon themselves to hand-remove milfoil in their swim areas a couple times per season
 - Diver suction harvesting will disturb sediments, but only once per season because hand removal gets roots, while mechanical weed-harvesting does not



Or combination of the two.... cheaper than weed-harvesting over and over again!

Alternative Plant Control Methods

Aquatic herbicides

- Spot treatments in recreationally important areas
- Start with potential test cases to prove efficacy
- Needs more public education –EPA & NY registered herbicides are the most well-studied and successful forms of plant control. More science behind herbicides than any other method.
- Recommend: SONAR or ProcellaCor (require NY permits)
 - both highly effective at targeting Eurasian milfoil
 - Less impact to native pondweeds when treated with low dose
 - 2+ years of control in one treatment
 - No sediment disturbance
 - Will not harm anything that isn't a plant
 - NEAR does NOT sell treatments that would be a conflict of interest we would help you hire the right **licensed applicator**

Future of Plant Management at Oscawana

Oscawana Pond July 24, 2019 Survey: Invasive Eurasian milfoil Northeast Aquatic Research, LLC



Updated Nutrient Loading Model

- TMDL (2008) did not estimate internal load
- PH (2008) over-estimated internal load
- NEAR (2019) LLRM model and in-lake TP calculations
 - Internal P-Flux Rate: PH used 6mg/m²/day, but we calculated using in-lake data the real rate to be an average of 3mg/m²/day (MUCH LESS!)

Performed by:	Total Estimated Annual P Load	Modeled Watershed P Load	Internal P Load	Surface Runoff P Load	Septic Systems P Load
Cadmus Group,	663 lbs	663 lbs (300.7	Not	228 lbs	313 lbs
2008	(300.7 kg)*	kg)	Calculated*	(103.4 kg)	(142 kg)
Princeton Hydro,	2,170.8 lbs	835.2 lbs	1,247.4 lbs	428 lbs	407.3 lbs
2008	(984.5 kg)	(378.8 kg)	(565.7 kg)	(194.1 kg)	(184.7 kg)
Northeast Aquatic,	1,490 lbs	960 lbs (436	467 lbs	560 lbs	400 lbs
2019	(678 kg)	kg)	(212 kg)	(254 kg)	(182 kg)

LMP Steps Away from In-Lake Options

- Aeration and oxygenation are proven methods to reduce internal loading BUT not easy for Oscawana, full of practical issues
- Similarly, Alum treatments are not regularly permitted in NY
 Not feasible option right now.
- Focus on lessening potential impact from weed-harvester and on reducing nutrients from watershed
- Watershed improvements = Long term management



Main Watershed Sources of Nutrients

- **1.** Septic systems
- 2. Stormwater runoff
- 3. Erosion & sediment disturbances near water
- 4. Natural stream & groundwater inputs

Areas Vulnerable to Improper Sewage Treatment

- Systems >15+yrs likely not functioning adequately
- <2ft above typical water level line.....
- Natural fluctuation in ground water may prevent proper leach field nutrient treatment

NY Technical Standards: "Highest groundwater level shall be at least two feet below the proposed trench bottom," meaning that a minimum of 24 inches of usable soil is required for conventional septic system leaching fields.



Watershed Best Management Practices (BMPs)

Use Low Impact Development! (LID)

• Dry Detention Basins or Swales

- Up to 30% N & P reduction
- Nearly 80% Total Suspended Solids reduction

Wet Detention Basins

- For areas with no ability to infiltrate runoff
- Inflow and overflow must be on opposite sites to allow particle settling
- Not good at P reduction (if it's too deep, P can even be increased!)
- Designed for temporarily holding and directing runoff away from culvert system (needs overflow)





Photos from MA Clean Water ToolKit

More LID Stormwater Retrofits

Porous pavement

- Sidewalks/driveways / parking lots
- No sanding or salting during winter!
- Wetland Restoration
 - Dechannelization / spread out water flow

Constructed wetlands (Oscawana's 'biofilter')

- Good initial P removal, long-term best for N removal
- Only for areas where soils cannot infiltrate runoff







Filtration part!

Wet settling pool / somewhat slows water velocity (usually full of groundwater...)

Help Your Lake! LID for Homeowners

Bioretention (aka rain gardens)

- For home use
- Direct water from your roof, driveways, & lawn
- <u>Need to be designed</u> <u>correctly (drainage</u> size/soil type)
- Good N & P removal!

Interlocking infiltration pavers/pea gravel

- Personal parking spaces or walkways
- Rain barrels
 - Don't let your roof runoff go onto the street or directly into the lake!
 - Customize it for your needs



Rain gardens should fully infiltrate stormwater in 24hrs!



Suggest a Townwide rain barrel program





Image courtesy of Berkeley, CA, Office of Energy and Sustainable Development

Public and Private Partnerships Needed

- LOMAC needs to hear from you if you are willing to volunteer your property for small stormwater infiltration projects **or** to allow Town easements on roadsides for stormwater retention
- Lake Management Plan lists priority sites for watershed projects:
 - 1. Lee Ave Inlet 4
 - 2. Winnebego / Chippewa Road
 - 3. Community Place & Hilltop Park
 - 4. Inlet 7 at Lakefront Road
 - 5. Investigate Illicit Discharges Found
 - 6. West Shore Drive Catch Basin Retrofit / Infiltration Easement
 - 7. West Shore Drive Primary Erosion Project
 - 8. West Shore Drive Small Erosion and Infiltration Projects
 - 9. Cayuga Road
 - 10. Sunken Mine Road
 - 11. Unadilla and Seneca Drive
 - 12. Lee Ave Lake Access Path



• We provide on-site reviews and "lake-smart" recommendations for individual properties – group rates can be organized through LOMAC in future for willing participants.

Watershed Management Requires Everyone

- **State:** New York Department of Environmental Conservation
 - Funding source
- **County:** Putnam Health Department
 - Cyanobacteria guidance / testing / septic system inspection and grants
- Putnam County Soil & Water Conservation District
- Town: MS4 Coordinator



- Make sure MS4 requirements in line with lake management objectives & communicate with other Town departments
- Building Department any permits in watershed must comply with LID
- Highway Department maintain catch basins & filters, key to LID projects
- Town Engineer & Wetlands Inspector help design LID retrofits & proper wetlands KEY
- Lake Oscawana Management Advisory Council (LOMAC)

 Organize, Engage, Educate Lake Oscawana Civic Association Hillton Community District 	What you do on your property affects the lake.		
 Abele Park District Wildwood Knolls District 	Normalize conversation about septic and		
• Smaller Homeowner Associations	stormwater management.		

