The BIG picture: How a complete lake and watershed management plan guides the protection or restoration of your lake in both the short and long term

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Introduction - Chris L. Mikolajczyk, CLM

- ✓President – North American Lake Management Society
- ✓NALMS Certified Lake Manager
- ✓PH employee for 23+ years
- ✓Senior Aquatics Manager
- ✓30+ years experience
- ✓A.A.S. - Ecology & Environmental Technology **(PAUL SMITHS COLLEGE)**
- ✓B.S. - Geography (Water Resources Emphasis)
- ✓M.S. - Geography (Watershed Management)

"Anyone who can solve the problems of water will be worthy of two Nobel Prizes – one for peace and one for science." - John F. Kennedy

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A Golden Rule of Lake Management:

Don’t Just Treat The Symptom….Correct the Cause!

US EPA 9-Steps for Watershed Plans

-Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. Sources that need to be controlled should be identified at the significant subcategory level along with estimates of the extent to which they are present in the watershed (Minimum Plan Component A).

-An estimate of the load reductions expected from management measures (Minimum Plan Component B).

-A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in Component B, and a description of the critical areas in which those measures will be needed to implement this plan (Minimum Plan Component C).

-Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied on to implement this plan (Minimum Plan Component D).

US EPA 9-Steps for Watershed Plans

-An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented (Minimum Plan Component E).

-Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious (Minimum Plan Component F).

-A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented (Minimum Plan Component G).

-A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards (Minimum Plan Component H).

-A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under Component H above (Minimum Plan Component I).

Why the Need For a Management Plan??

- Algae blooms
- Excessive SAV growth
- Taste and odor
- Degraded water quality
- Murky/muddy water
- Poor fishery
- Shoreline erosion
- Watershed loading
- FUNDING!!

Keys To Any Successful Plan

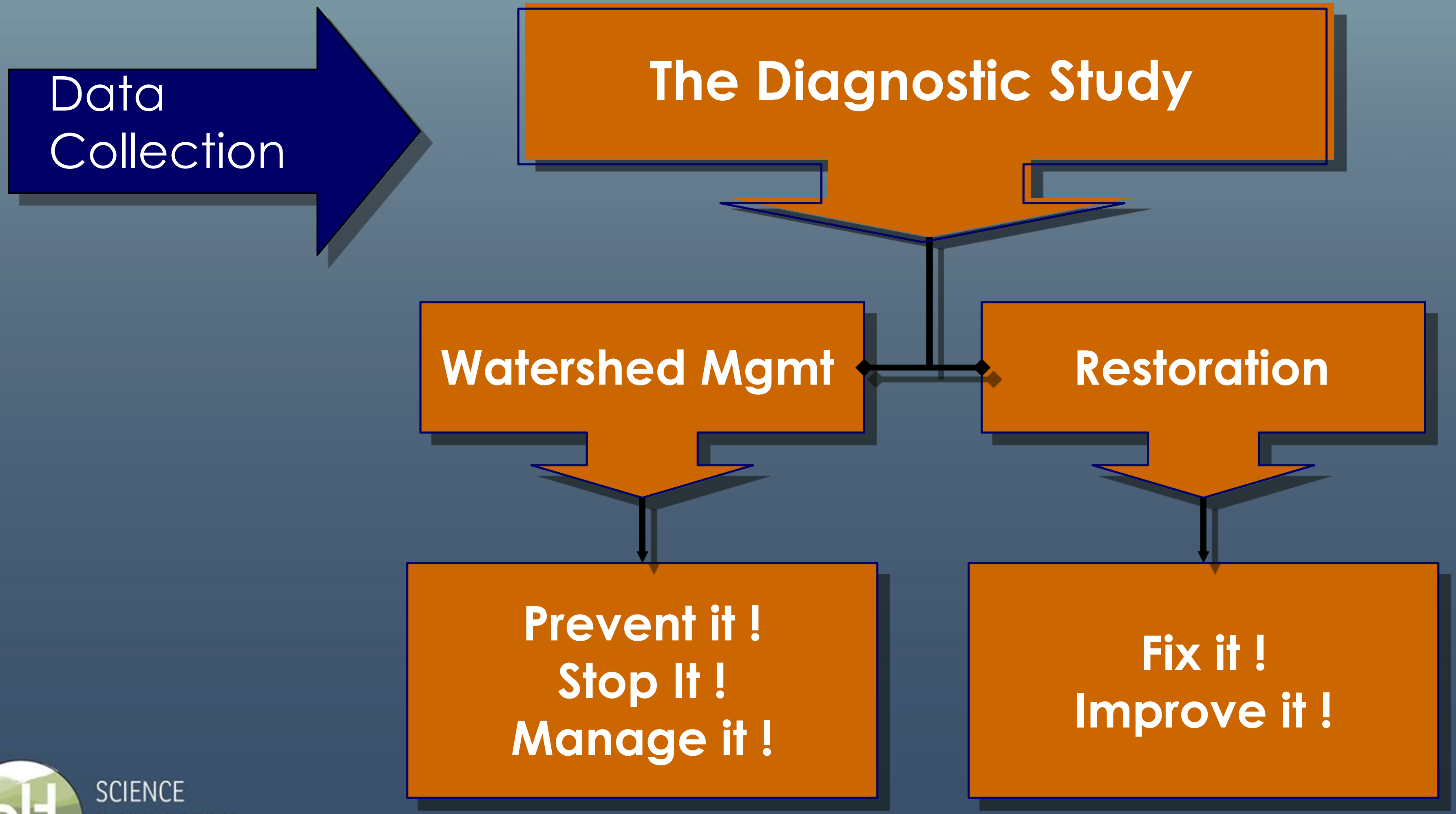
1. Have clearly defined, realistic goals and objectives.

2. Base management and restoration actions on a properly collected, technically sound dataset.

3. Put the plan into action using support and backing of the **community**, **membership or stakeholders**.

4. Review and revise goals and objectives as based on results of management and restoration efforts.

Flow Chart for Successful Lake and Pond Management

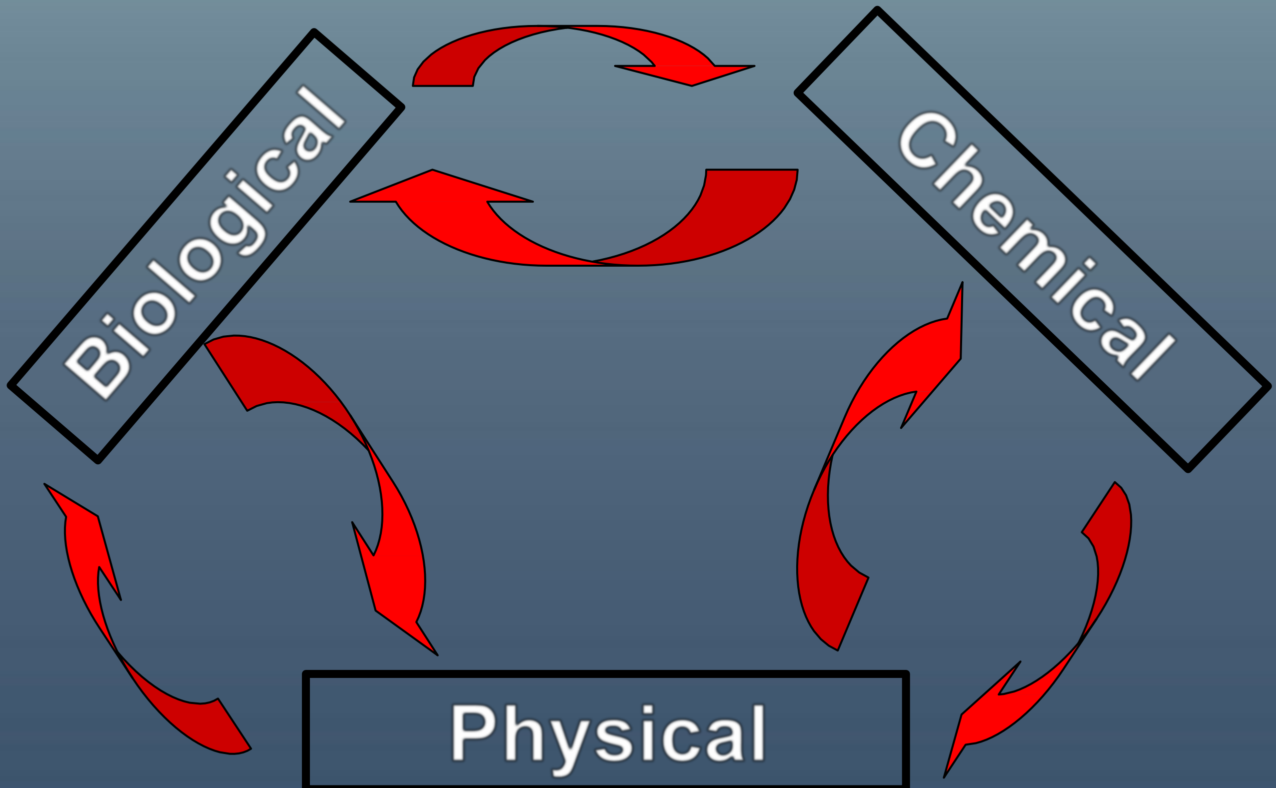


Use The Data To Understand …

- Role of internal nutrient sources
- Role of external (watershed) nutrient sources
- Stratification, DO depletion
- Storm impacts on lake productivity
- Sediment sources, areas of rapid infilling
- Biological interactions
- Use impairments

This typically provides the direction needed to objectively and properly manage a lake and its watershed over both the short-term and long term.

Lake Interactions



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Data Collection / Analysis

-Lake morphometry (shape)

-Watershed / Land use analysis

-Hydrologic budget

-Water quality monitoring

-Quantification of nutrient load

-Trophic state analysis

Hydrology Influences…

-Mixing, both horizontal and vertical

-Flushing and residence time

-Influx and retention of pollutants/nutrients

-Influx of aquatic invasive species

-Sediment infilling

-Development, longevity of algae blooms

-Success of restoration efforts

Hydrology Influences…

Aquatic nuisance species can be spread many ways including ships, boats, barges, aquatic recreation (fishing, hunting, boating, diving, etc.), water gardening, seaplanes, connected waterways and many other pathways. Through these and other means, thousands of terrestrial and aquatic invasive species have been introduced into our park waters.

-National Park Service

Hydrologic Budget

-Surface water in-flow

-Out-flow or discharge

-Groundwater in-flow

-Precipitation

-Evaporation

-Flushing (annual and/or seasonal)

Nutrient (Phosphorus) Loading

-The overall phosphorus load strongly determines the extent of in-lake productivity.

-The more phosphorus, the more algae and SAV growth.

-Loading can vary seasonally and originate from both internal and external sources.

-A detailed analysis & quantification of the P load is the "corner stone" of a successful diagnostic study and basis for the overall plan.

Computing Phosphorus Load

Quantify annual load:

-Effectively accomplished using a mixture of field sampling/desktop modeling techniques

-Field data provides a "snapshot" of existing conditions

Modeled data helps define the "big picture" and integration of lake's physical, biological and chemical attributes

Computing Phosphorus Load

-Account for all external sources (point source, septic, stormwater runoff, atmospheric, etc.)

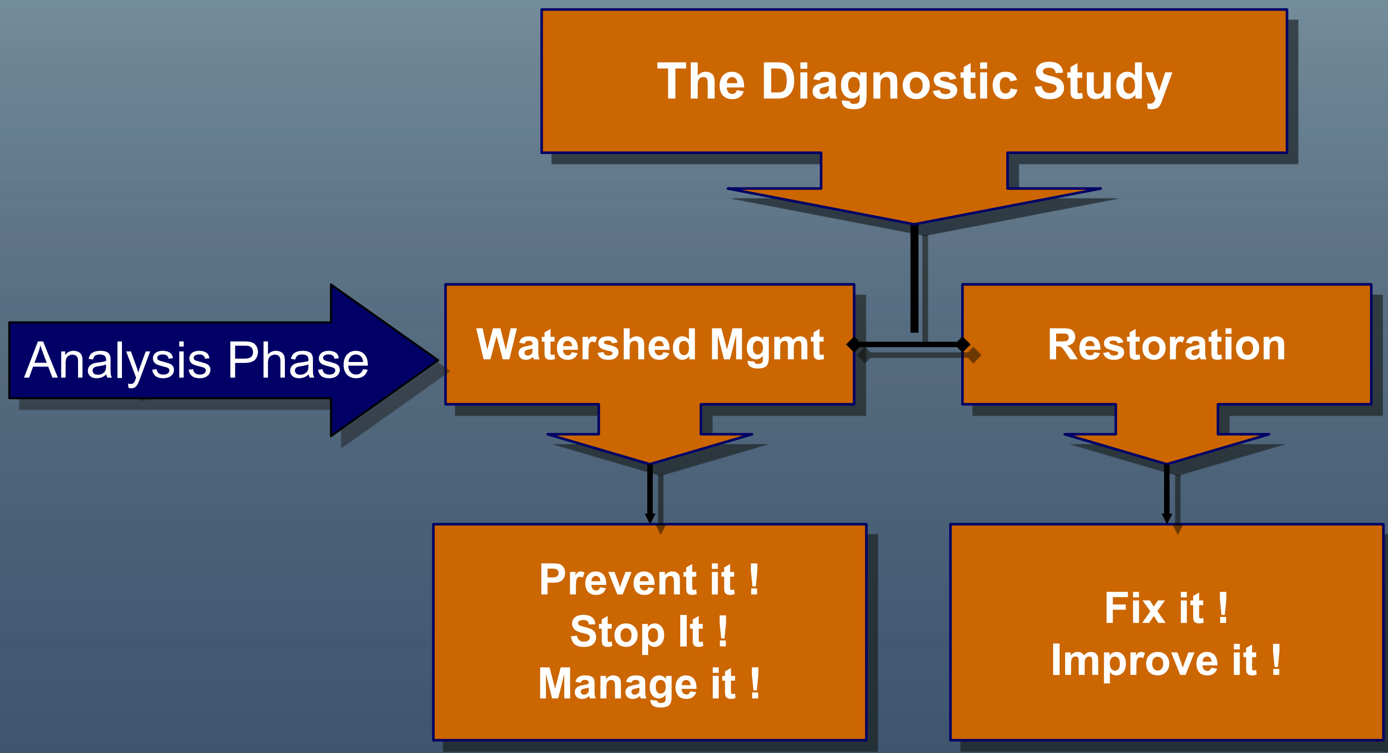
-Account for internal sources (internal recycling, SAV and algae die-off, etc.)

-Account for reduced nutrient load due to "sinks" (wetlands, upstream lakes or ponds)

-Recall Hydrology and seasonal nature of loading

-Input data into model – Unit Areal, AVGWLF, BASINSim, WikiWatershed, etc.

Plan Implementation Flow Chart



Put The Plan Together

-Base decisions on diagnostic data
-Address short and long term problems
*In-lake = short-term
*Watershed = long-term
-Prioritize projects accordingly
-Develop budget (and funding sources)
-Develop implementation schedule
-Make sure plan is cost-effective

Prioritize Your Efforts (and $$$!)

-Distinguish between the symptoms (SAV/algae) and causes (nutrients) of eutrophication

-Focus on correcting causes of degraded water quality and accelerated eutrophication

-Use diagnostic data and use impairment analysis to direct efforts and make decisions

-Identify required permits and approvals

-Review to insure that return on investment and cost-effectiveness have been maximized

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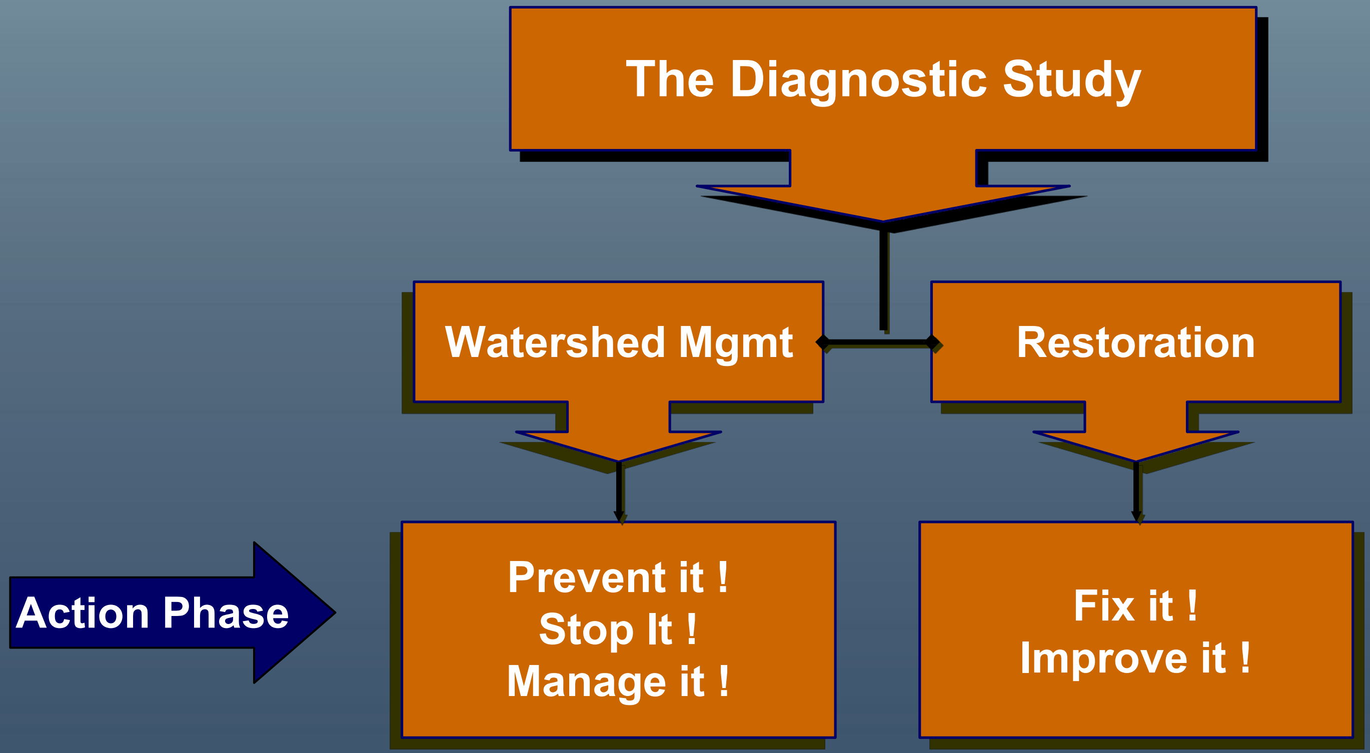

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Typical Elements of a Good Plan

Source Control - Reduce pollutant load at point of origin, by decreasing inputs you decrease rate of eutrophication

Delivery Control - Intercept and decrease pollutants before they enter lake

In-lake Restoration – Use in-lake techniques to both correct the cause of eutrophication and lessen WQ impacts

Setting Management Goals

-Establish goals using easy to understand threshold values.

-Based on measured water quality data, Phytoplankton growth, SAV growth, mat algae growth, and lake clarity.

-Example management thresholds…

– Clarity > 2.0 meters
– Chlorophyll *a* < 15 µg/L
– TP < 0.02 mg/L
– Maximum 20% SAV coverage

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Put Plan Into Motion

-Make full use of the data
-Listen to stakeholders
-Be sure the plan prioritizes the correction of the cause of problems
-Make sure plan addresses lake users
-Develop an implementation schedule
-Coordinate finances and create an operating budget
-Put plan into action

Out-reach and Education

-Make sure action plan is clear and well defined

-Set easily defined objectives and goals – *thresholds*

-Stress need for patience

Where to Go For Resources

North American Lake Management Society

www.NALMS.org

Adirondack Watershed Institute

www.adkwatershed.org

New York State Federation of Lake Associations

www.NYSFOLA.org

New York State Department of Environmental Conservation

www.dec.ny.gov/chemical/23848.html

Federal Government, USEPA, NRCS, FWS

www.EPA.gov/owow

http://www.wcc.nrcs.usda.gov

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An example…

Tibbetts Brook Park – Yonkers Westchester County, New York

- Approaching 100 years of use
- Approx. 161 acres
- Lakes ≈13 acres
- Activities include walking, hiking, fishing, birding
- Funded via NYSDEC 2019 Invasive Species Grant

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Restoration and Management Plan

- Bathymetric/Watershed Statistics

Table 1. Lake and Watershed Characteristics for Tibbetts Pond		
Parameter	Upper Basin	Lower Basin
Waterbody Surface Area	2.6 Acres	11.1 Acres
Watershed Area	852.2 Acres	1,027.8 Acres
Mean Depth	1.4 Feet	2.9 Feet
Maximum Depth	3.0 Feet	6.0 Feet
Waterbody Volume	1.2 Million Gallons	10.3 Million Gallons
Sediment Volume	18,700 Cubic Yards	50,000 Cubic Yards
Mean Sediment Thickness	4.5 feet	2.8 feet
Annual Hydraulic Residence Time	0.95 Days	6.9 Days
Annual Flushing Rate	384.2 times a year	53.1 times a year
Watershed Area/Waterbody Surface Area Ratio	327.8	92.6

Phosphorus Load – Watershed Land Use

Forest – 0.8%
Wetland – 0.1%
Low-Density Mixed – 6.1%
Medium-Density Mixed – 20.6%
High-Density Mixed – 4.4%
Low Density Open Space – 9.0%
Stream Bank (erosion) – 20.8%
Groundwater – 38.2%

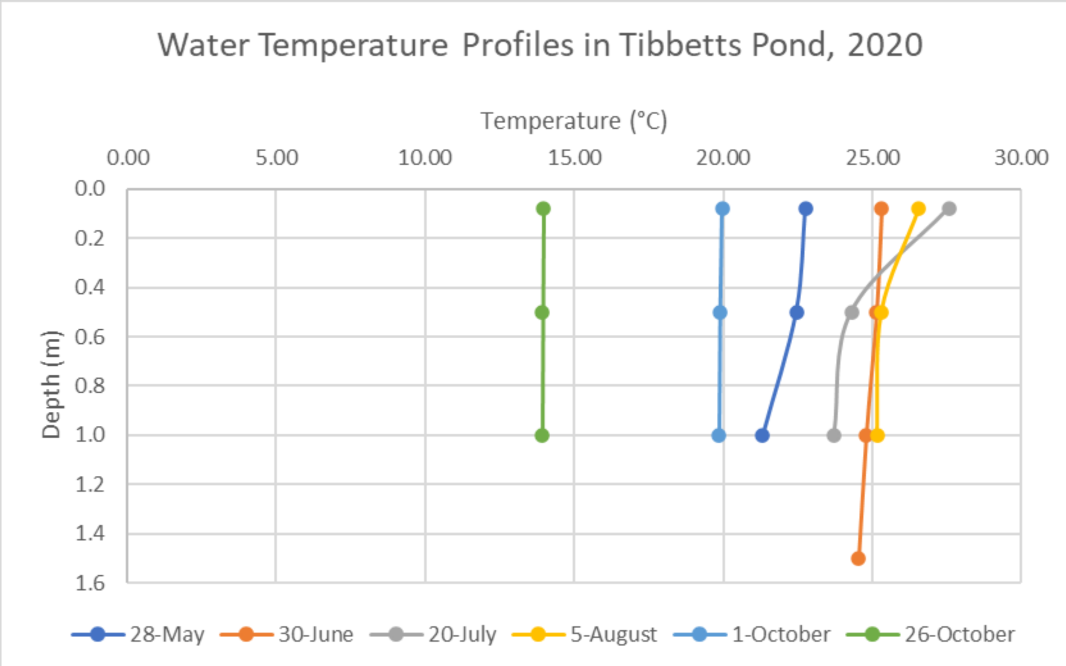
Phosphorus Load – Total Sources

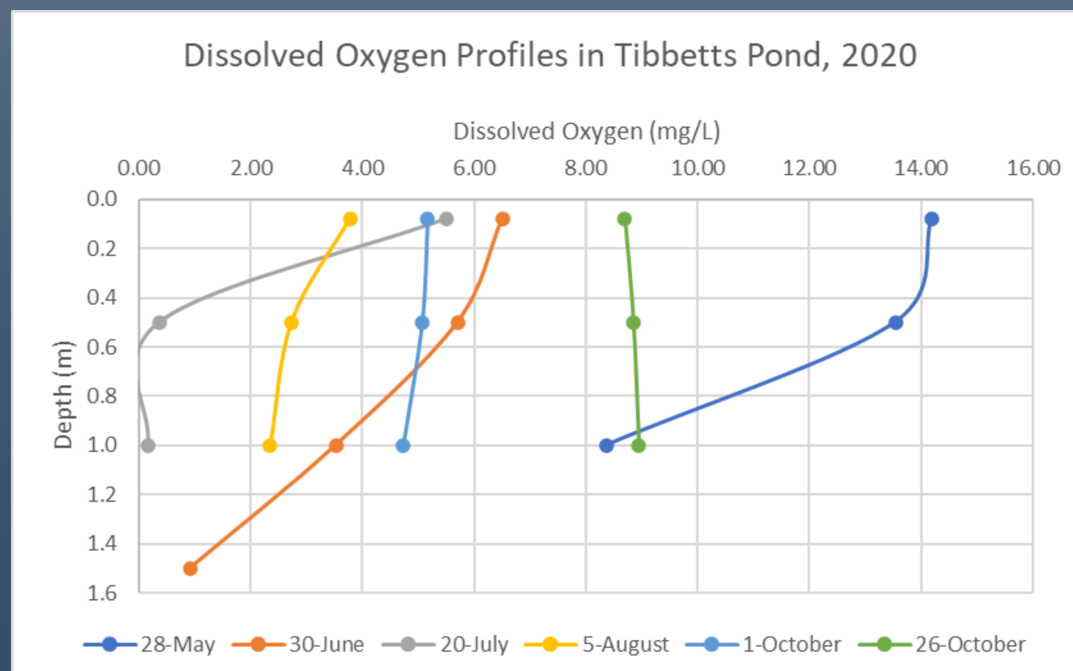
Watershed – 68.2%

Internal Load – 14.0%

Carp Bioturbation– 17.8%

In-Situ Data





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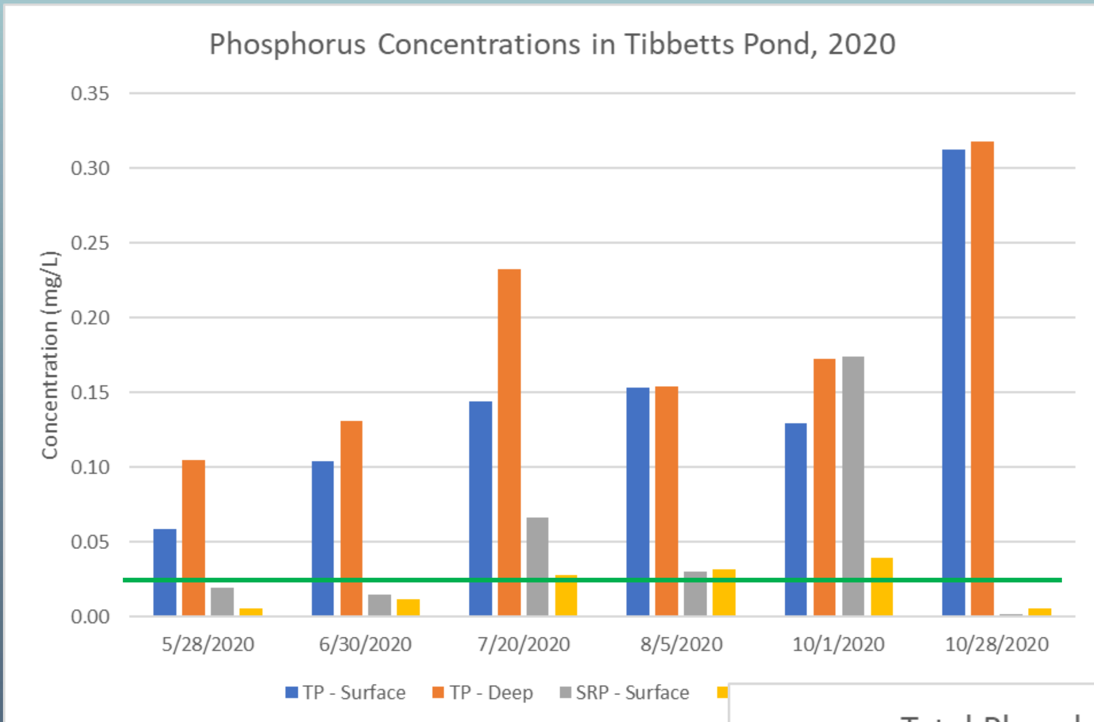
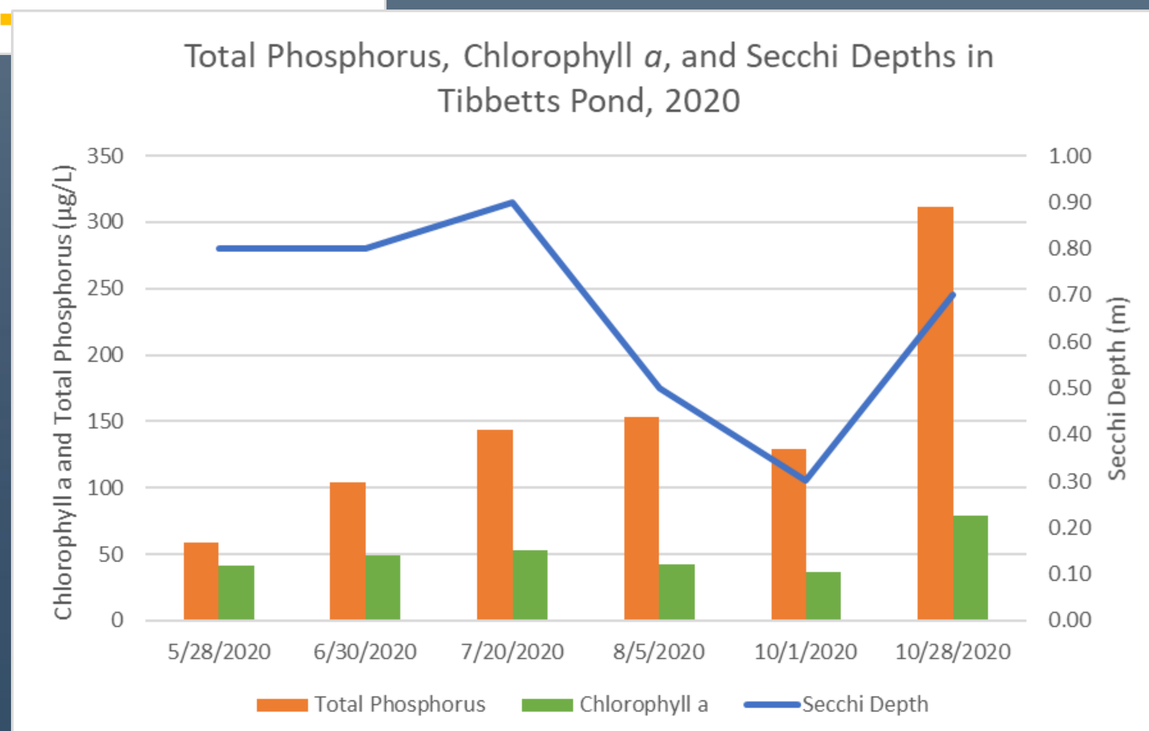
Discrete Data





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Biological Data

Put Plan Into Motion – Additional Recommendations

Internal Loading

- Water Chestnut Management
- Dredging (NEED plan first!)
- Formal Organized Carp Removal Activities
- Possible Aeration

External/Internal Loading

- Floating Wetland Islands
- Joint projects with City (storm based)
- Continued Monitoring

Put Plan Into Motion – Additional Recommendations

<u>Internal Loading</u>

- Water Chestnut Management

Other 2019 NYSDEC Grant Recipients

- Orange County Parks – Algonquin Park Lake Management Plan (LMP)
- Town of Ballston – Ballston Lake LMP
- Town of Chesterfield – Butternut Pond LMP
- Town of Fallsburg – Pleasure Lake LMP
- Town of Lake Luzerne – Lake Luzerne LMP
- Upper Saranac Foundation – Upper Saranac Lake LMP
- Columbia Land Conservancy – Oakdale Lake WMP

- **https://www.dec.ny.gov/pubs/grants.html**

- **https://nysfola.org/applying-for-grants/**

Lake and Watershed Management is not a leap, it's an ever changing and challenging climb! But, a slow and steady partnership will get you to the payoff!

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QUESTIONS?

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THANK YOU!

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