

You have your lake data, now what?? Creating a Lake and Watershed Plan.

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Why the Need For Overall Lake Management??

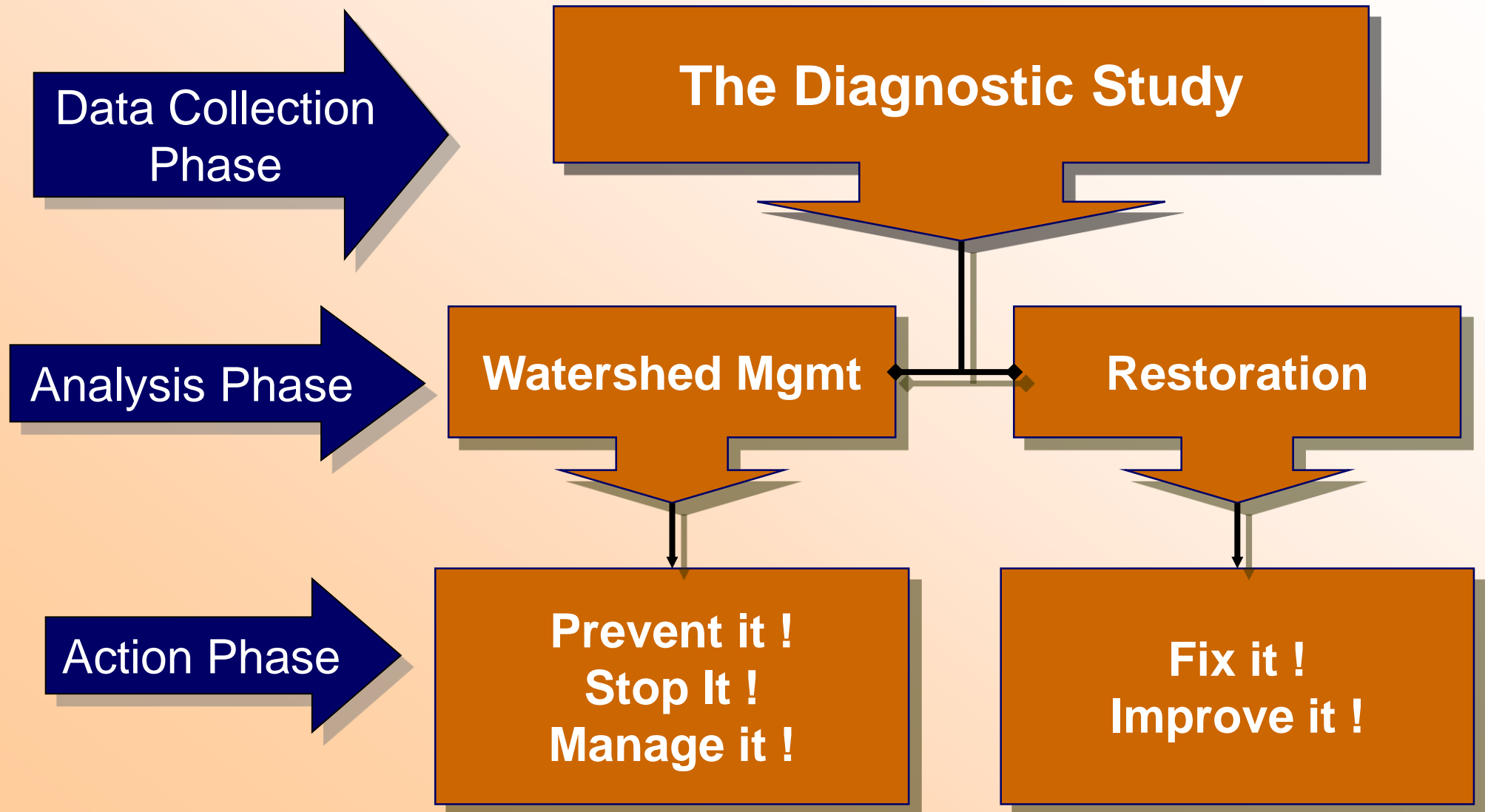


- **Algae blooms**
- **Excessive SAV growth**
- **Taste and odor**
- **Degraded water quality**
- **Murky/muddy water**
- **Poor fishery**
- **Shoreline erosion**
- **Poor aesthetics**

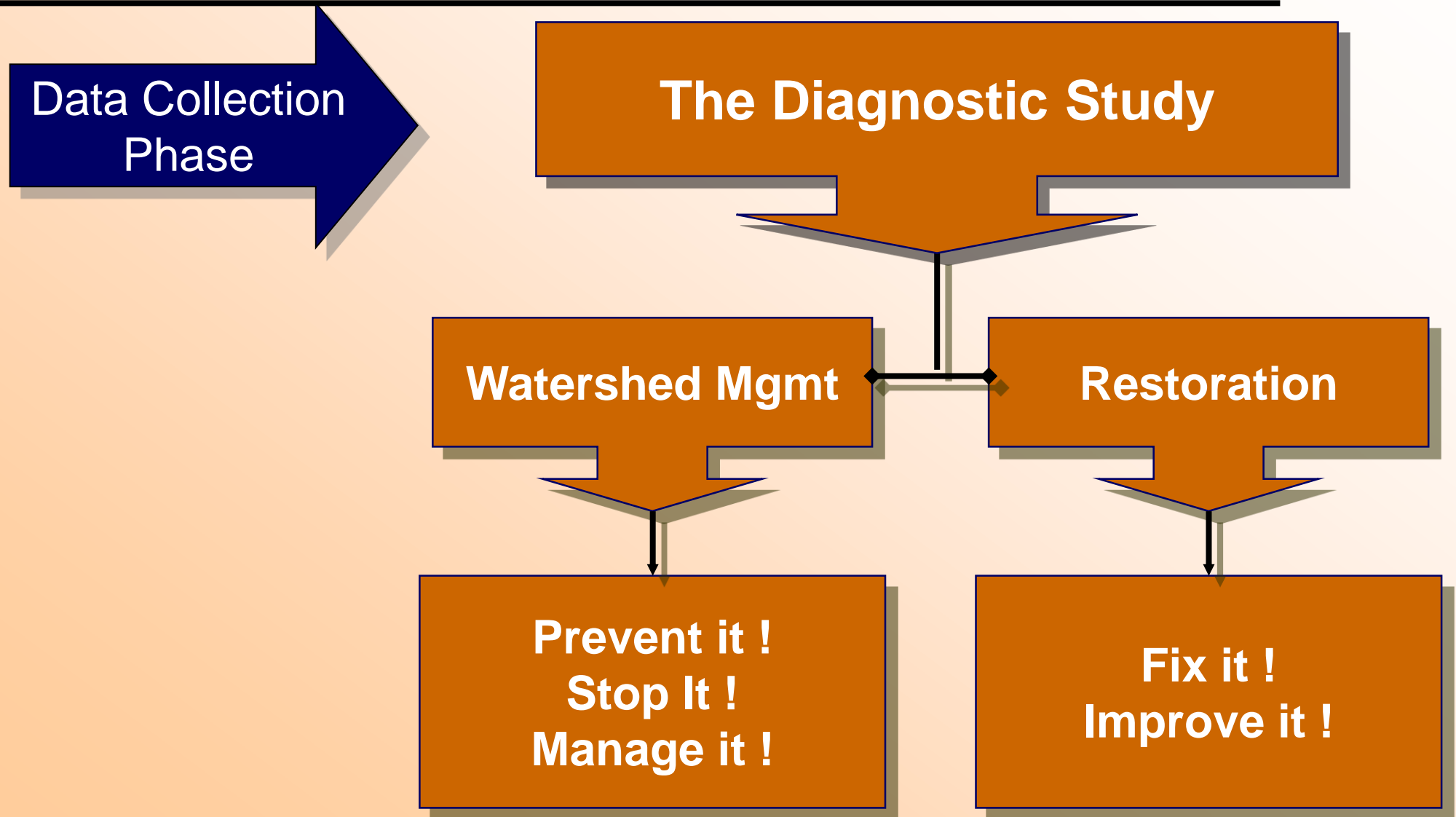
Keys To Any Successful Plan

- 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.**

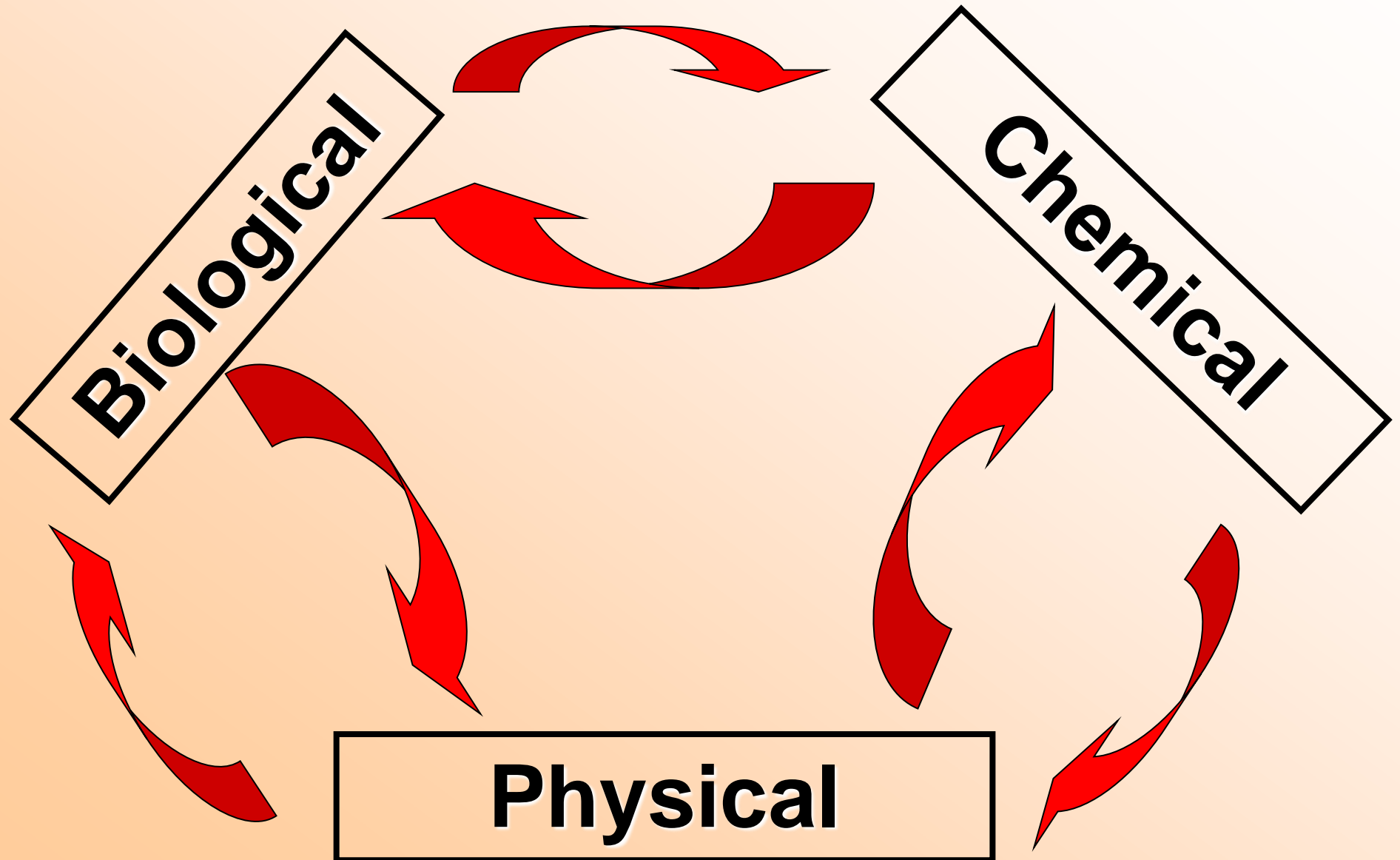
Flow Chart for Successful Lake and Pond Management



Plan Implementation Flow Chart



Lake Interactions



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 will provide you with the direction needed to objectively and properly manage a lake over both the short-term and long term

Data Collection / Analysis

- Lake morphometry (shape)
- Watershed / Land use analysis
 - Hydrologic budget
 - Water quality monitoring
- Quantification of nutrient load
 - Trophic state analysis

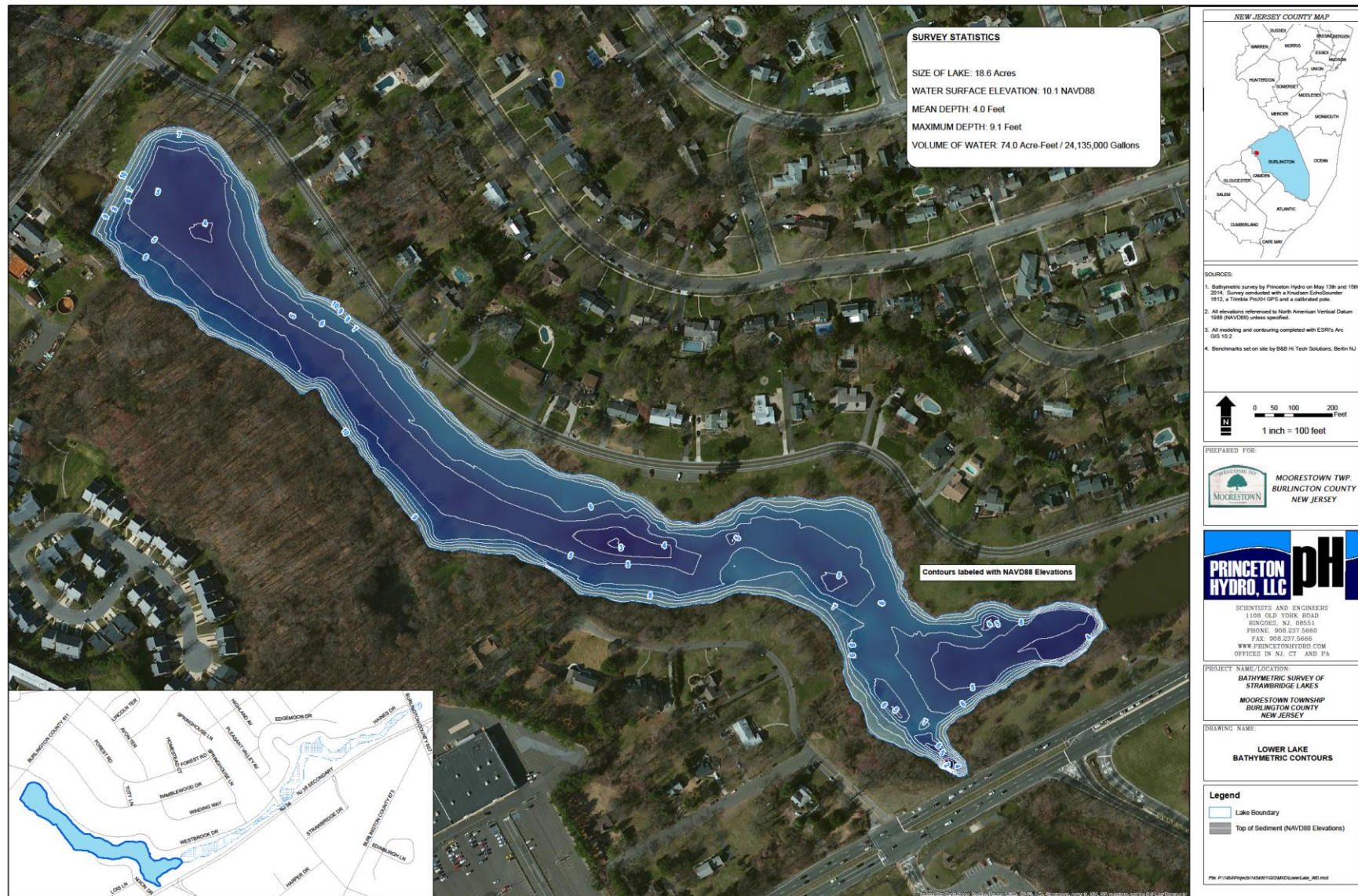
Hydrology Influences...

- Mixing, both horizontal and vertical
 - Flushing and residence time
- Influx and retention of pollutants/nutrients
 - Sediment infilling
- Development, longevity of algae blooms
 - Success of restoration efforts

Hydrologic Budget

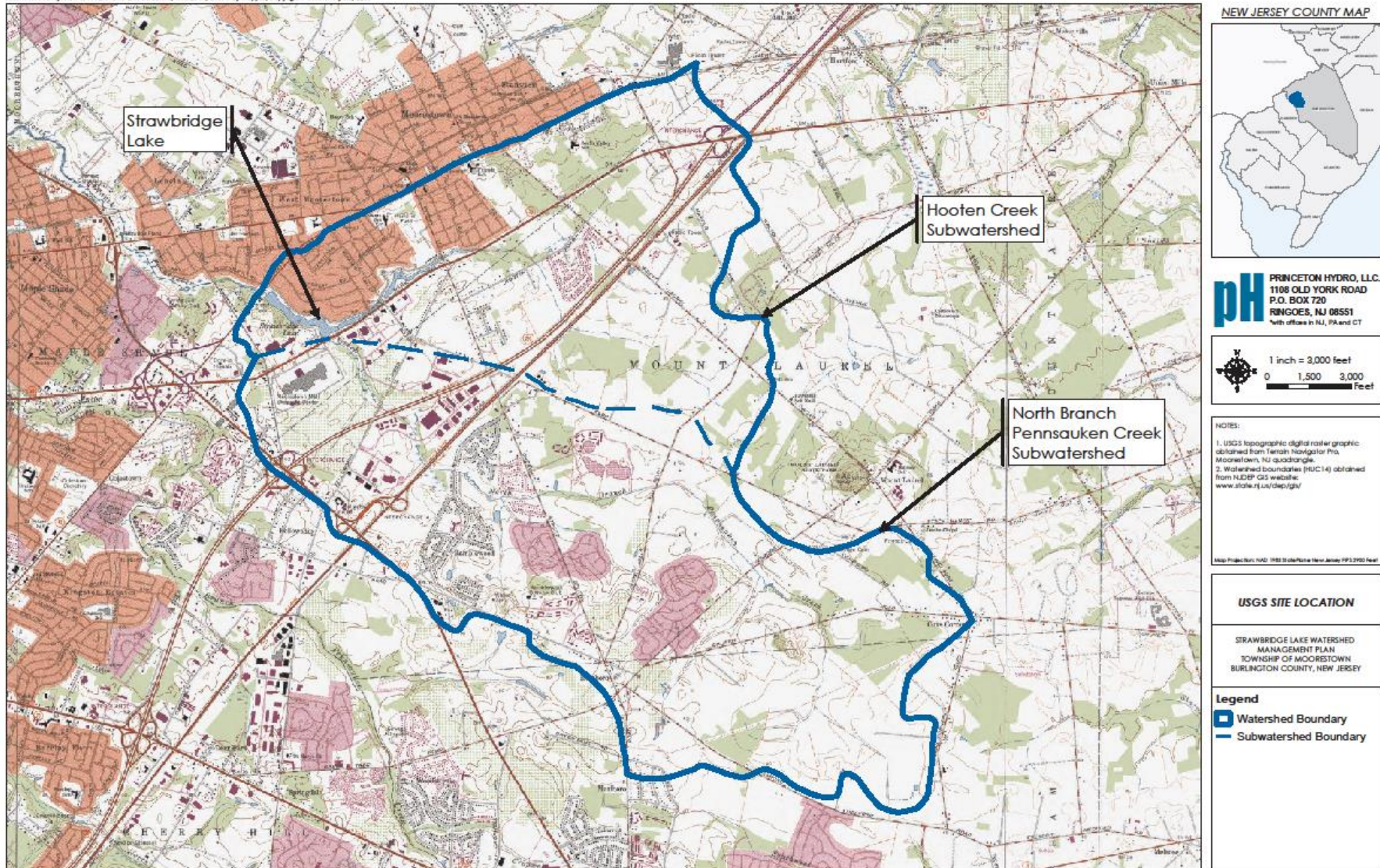
- Surface water in-flow
- Out-flow or discharge
- Groundwater in-flow
 - Precipitation
 - Evaporation
- Flushing (annual and/or seasonal)

Hydrologic Budget – Flushing Rates



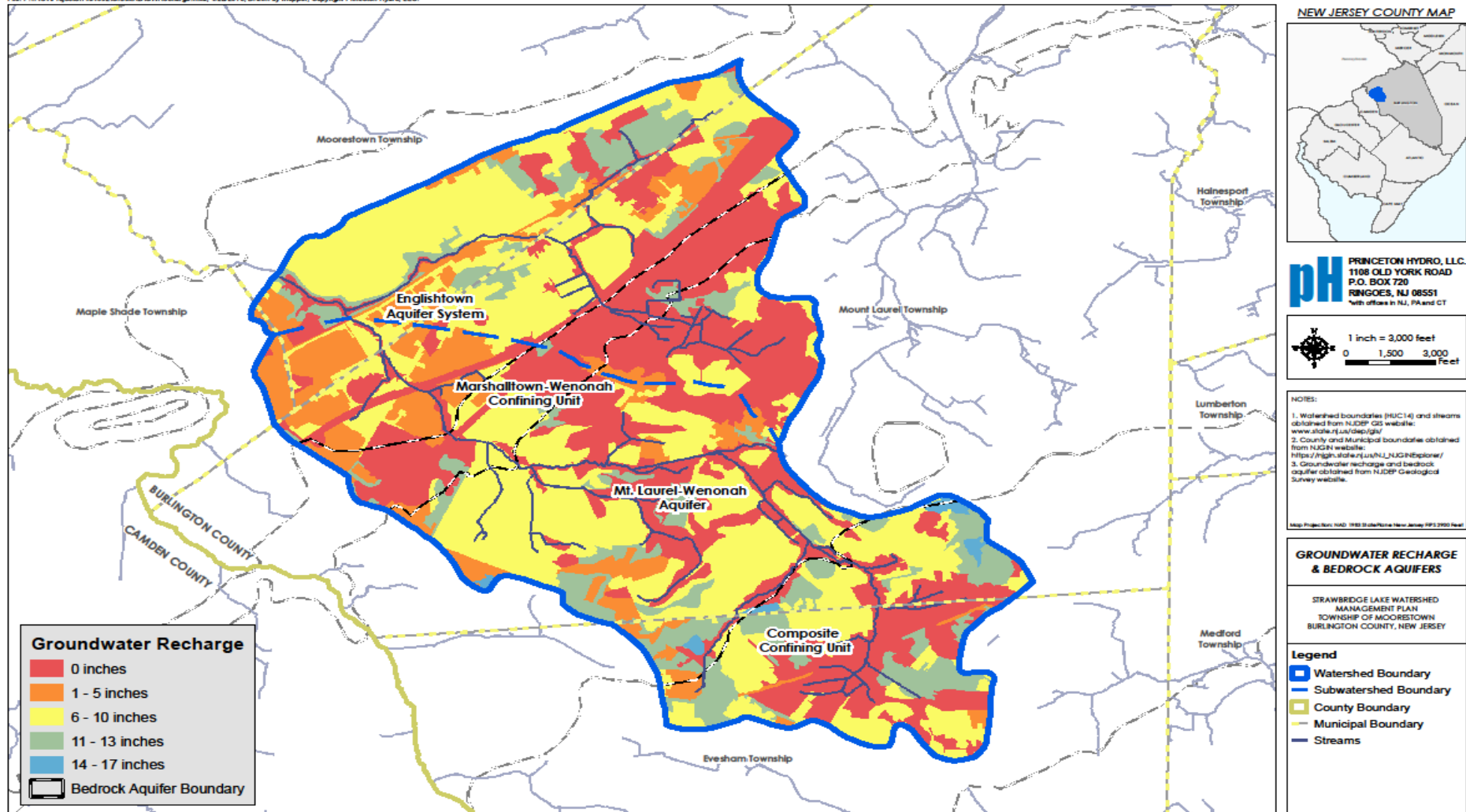
Hydrologic Budget – Surface Water

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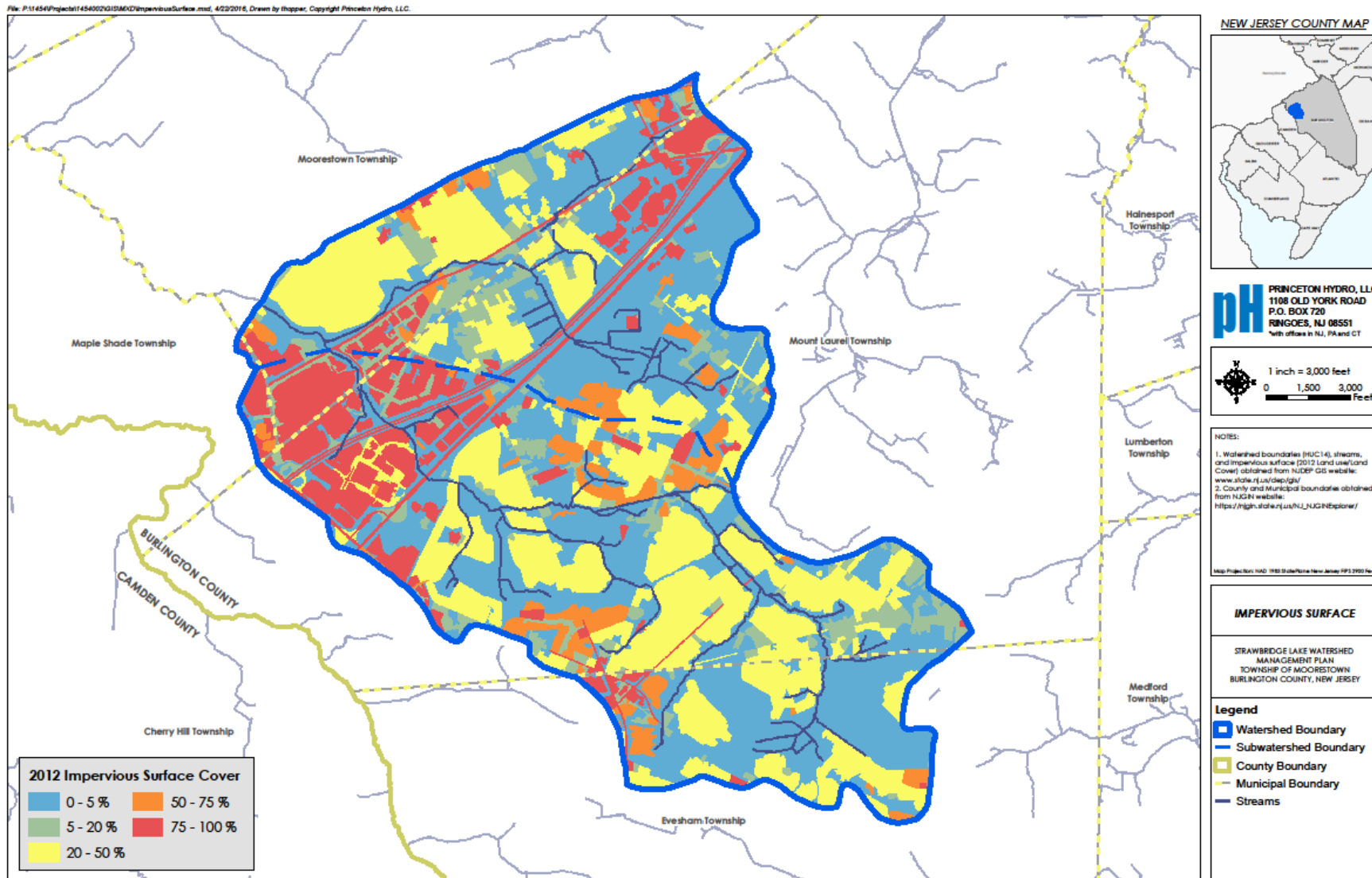


Hydrologic Budget – GW Recharge

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Hydrologic Budget – Impervious Surfaces



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.

Computing Phosphorus Load

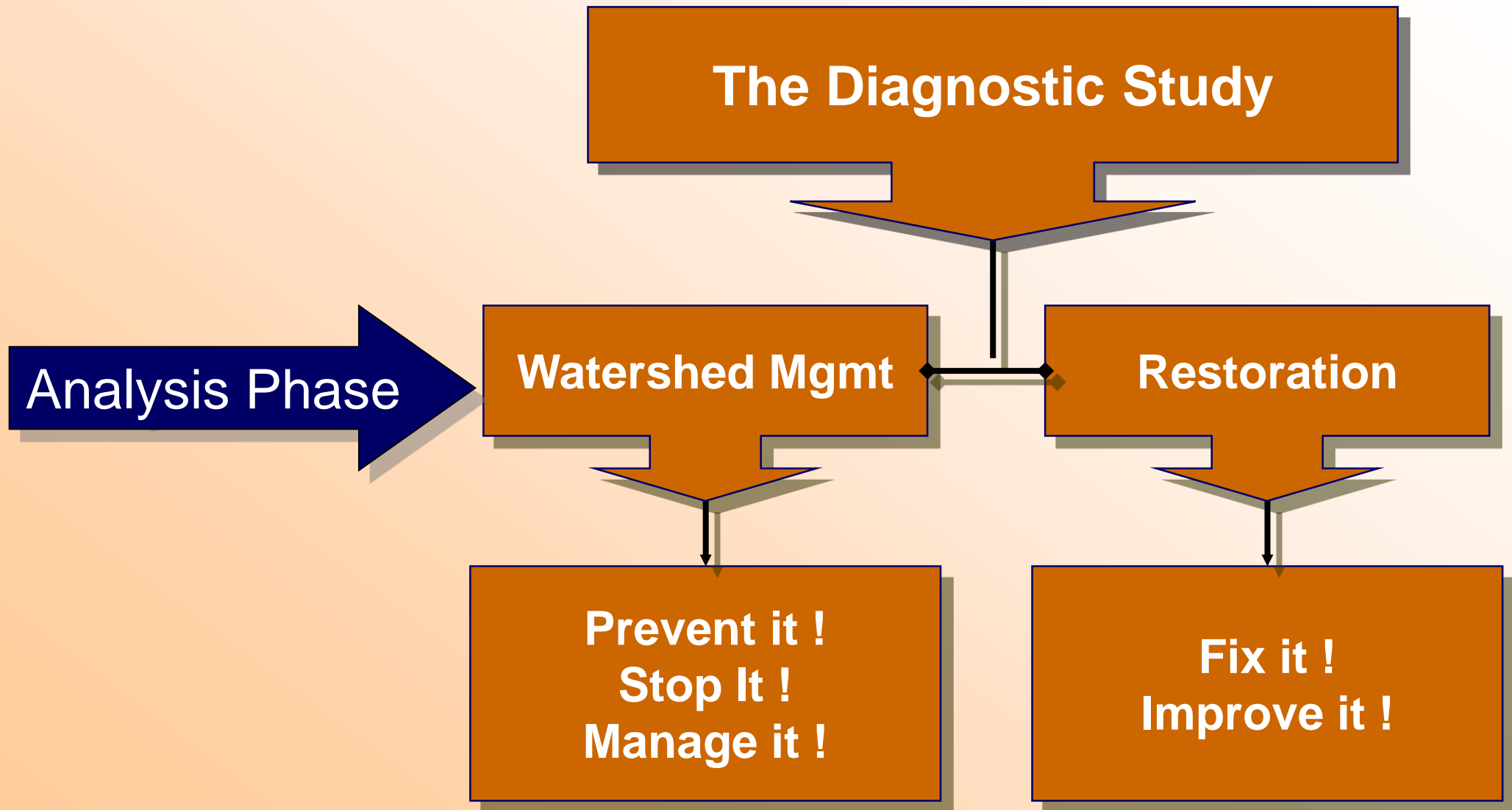
Quantify annual load using:

- **Most effectively accomplished using a combination of field sampling and desktop modeling techniques**
- **Field data provides a “snap shot” of existing conditions**
- **Modeled data help define the “big picture” and integration of lake’s physical, biological and chemical attributes**

Computing Phosphorus Load

- Account for all external sources (point sources, septic source, stormwater runoff, atmospheric, etc.)
- Account for internal sources (internal recycling, weed and algae die-off, etc.)
- Account for reduction of nutrient load due to “sinks” (wetlands, upstream lakes or ponds)
- Don't forget role of hydrology and seasonality of loading
 - Input data into model – Unit Areal, AVGWLF, BASINSim, 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
- Develop implementation schedule
 - Make sure plan is cost-effective

US EPA 9-Steps for Watershed Plans

1. 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).
2. An estimate of the load reductions expected from management measures (Minimum Plan Component B).
3. 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).

US EPA 9-Steps for Watershed Plans

4. 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).
5. 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).
6. Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious (Minimum Plan Component F).

US EPA 9-Steps for Watershed Plans

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

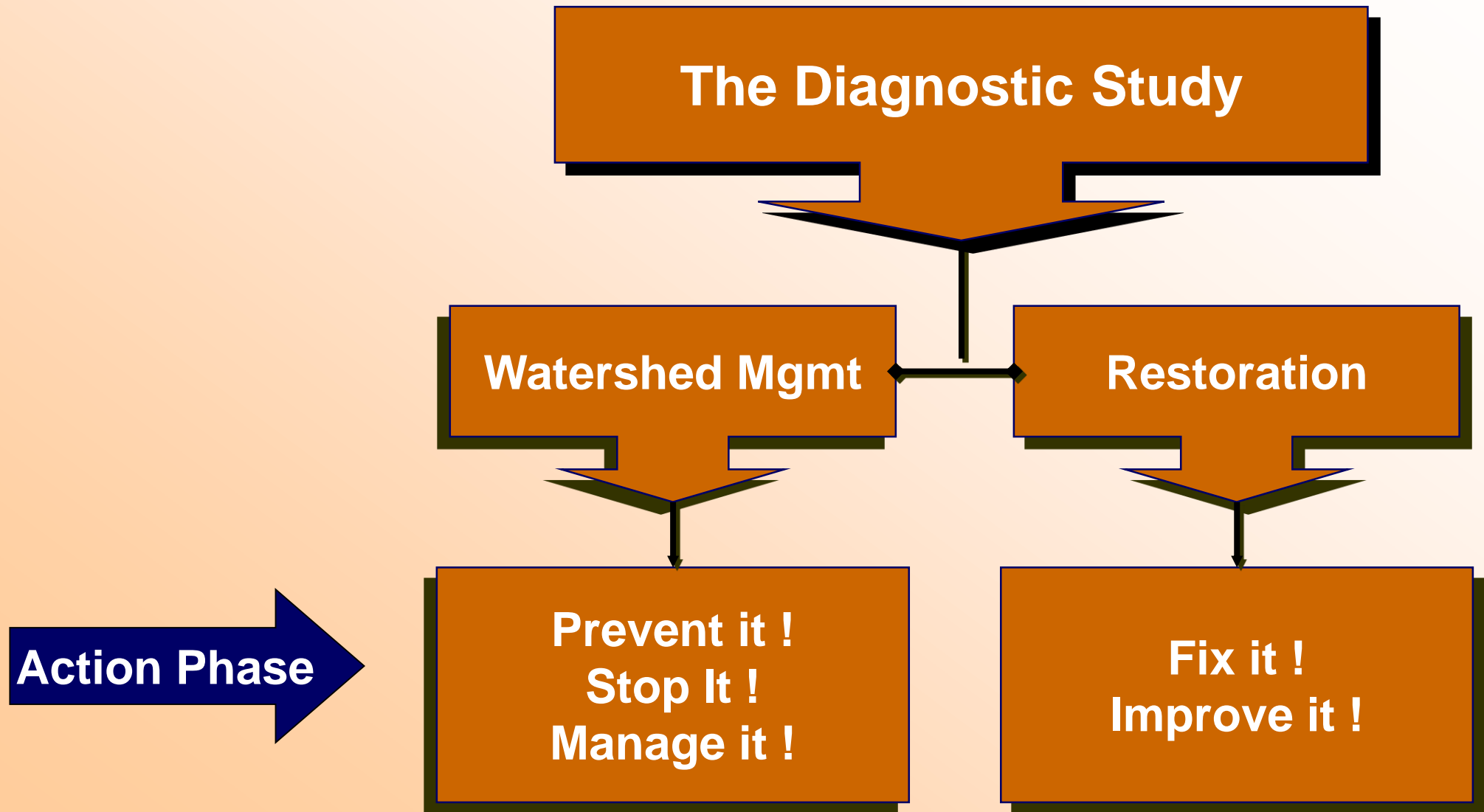
8. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards (Minimum Plan Component H).

9. 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).

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

Plan Implementation Flow Chart



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, observations of phytoplankton, weed and mat algae growth, and lake clarity.
 - Example management thresholds...
 - Clarity > 1.0 meter
 - Chlorophyll *a* < 15 µg/L
 - TP < 0.05 mg/L
 - Maximum 20% weed coverage

Put Plan Into Motion

- Make full use of the data
 - Listen to stakeholders
- Make sure plan prioritizes the correction of 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

New York State Federation of Lake Associations

www.NYSFOLA.org

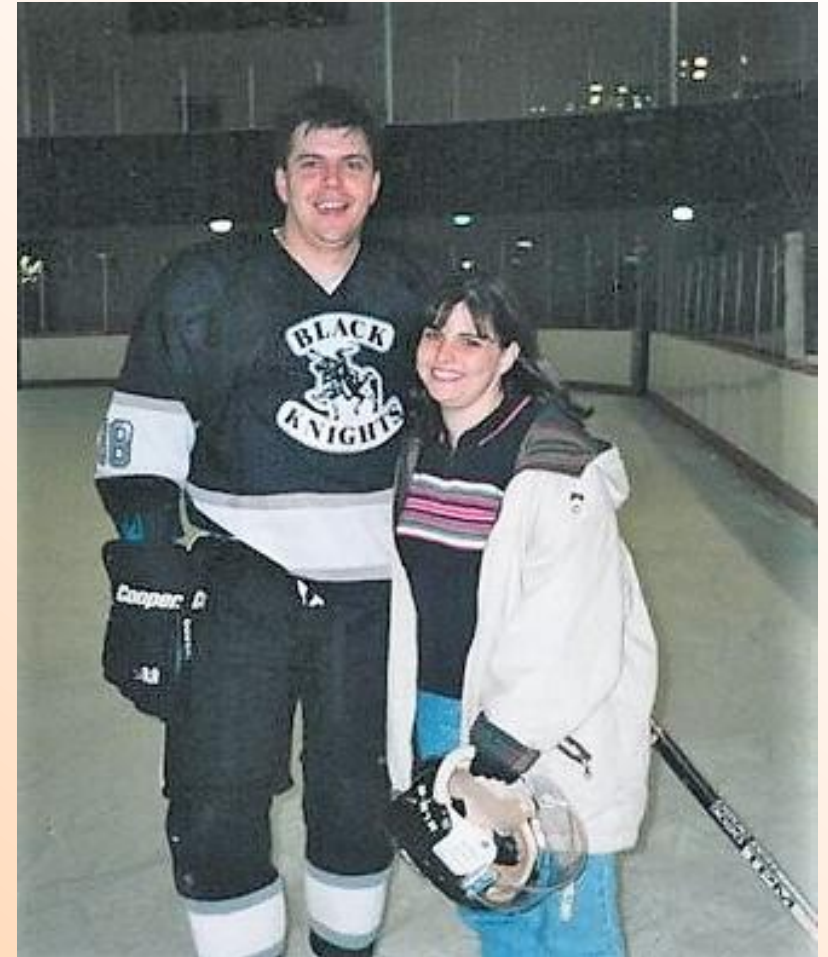
Federal Government, USEPA, NRCS, FWS

EPA.gov/owow

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

Lake Management's Golden Rule

***Don't Just Treat
The
Symptom....
Correct the
Cause!***



For More Information ...

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