Kickoff Meeting: Development of a Watershed Restoration Plan for Moultonborough Bay Inlet

October 27, 2014

LAKE INNIPESAUKEE WATERSHED ASSOCIATION

FB environmental

DK Water Resource Consulting LLC

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

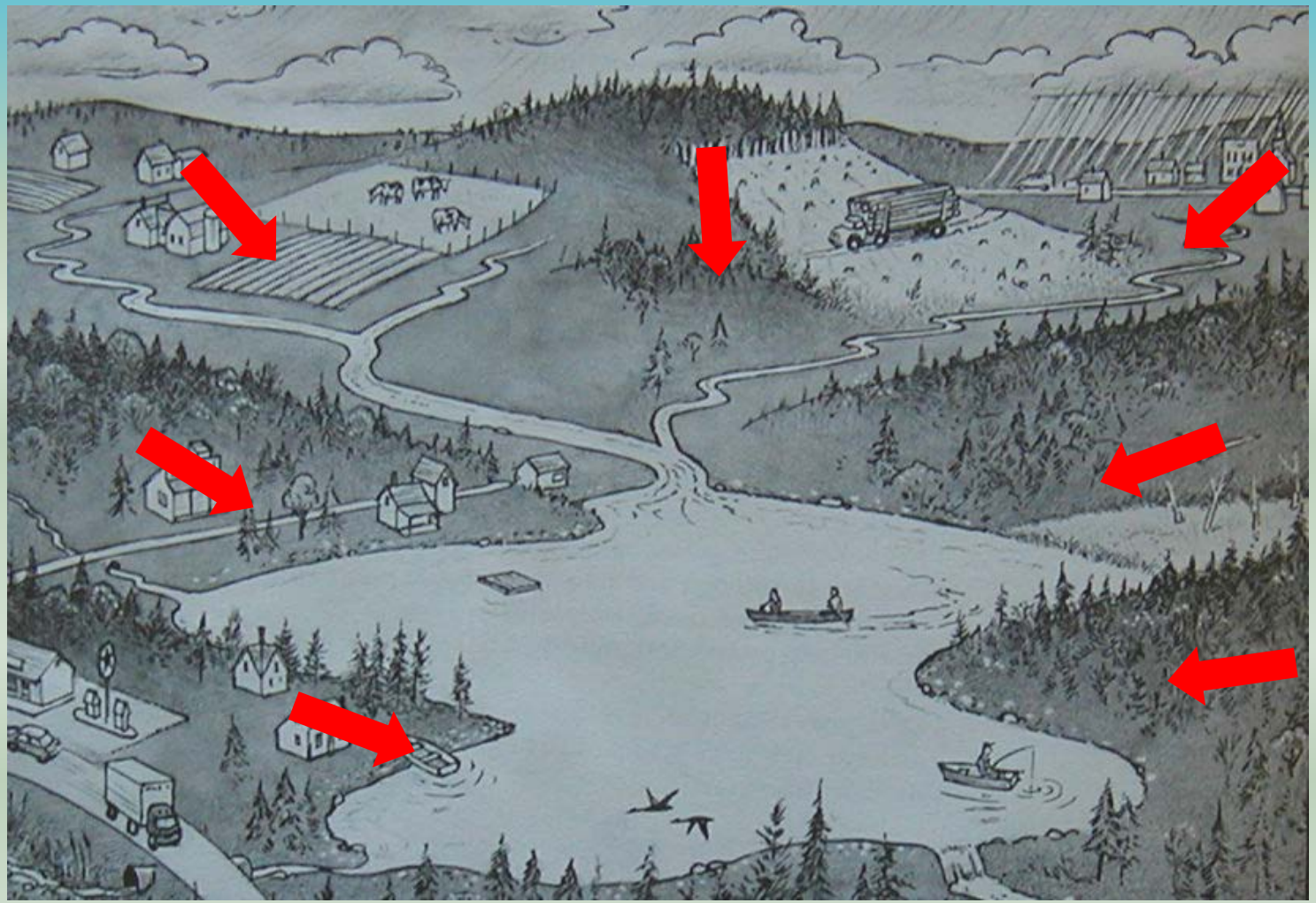
UNIVERSITY OF NEW HAMPSHIRE STORMWATER CENTER

FB environmental

DK Water Resource Consulting LLC

- Small businesses founded on leading lake assessment and restoration projects.
- Work on public sector projects "Where science meets civics"
- Work throughout New England – much of our work is in New Hampshire

What is a Watershed?



A watershed is an area of land that drains into a lake or river.

What is Phosphorus?

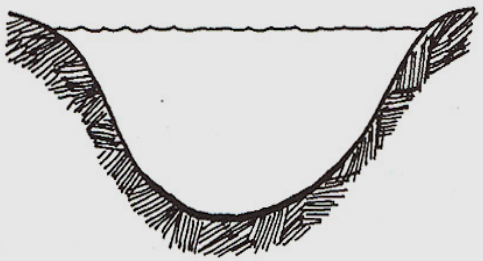
- Phosphorus is one of the major nutrients needed for plant growth.
- Naturally present in small amounts.
- Generally, as phosphorus increases, the amount of algae also increases.

Experimental Lake Area Study Canada

- Top-to-bottom curtain divides lake in two

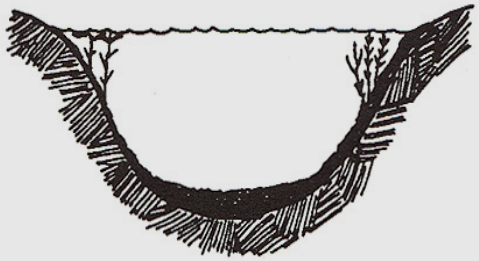
- Carbon and nitrogen added to one side; Carbon, nitrogen and phosphorus added to other side

Speeding aging of lakes



OLIGOTROPHIC

- Clear water, low productivity
- Very desirable fishery of large game fish



MESOTROPHIC

- Increased production
- Accumulated organic matter
- Occasional algal bloom
- Good fishery

EUTROPHIC

- Very productive
- May experience oxygen depletion
- Rough fish common

10,000's YEARS IN NATURAL CONDITIONS

10's to 100's YEARS UNDER HUMAN INFLUENCE

Water Quality & Property Values

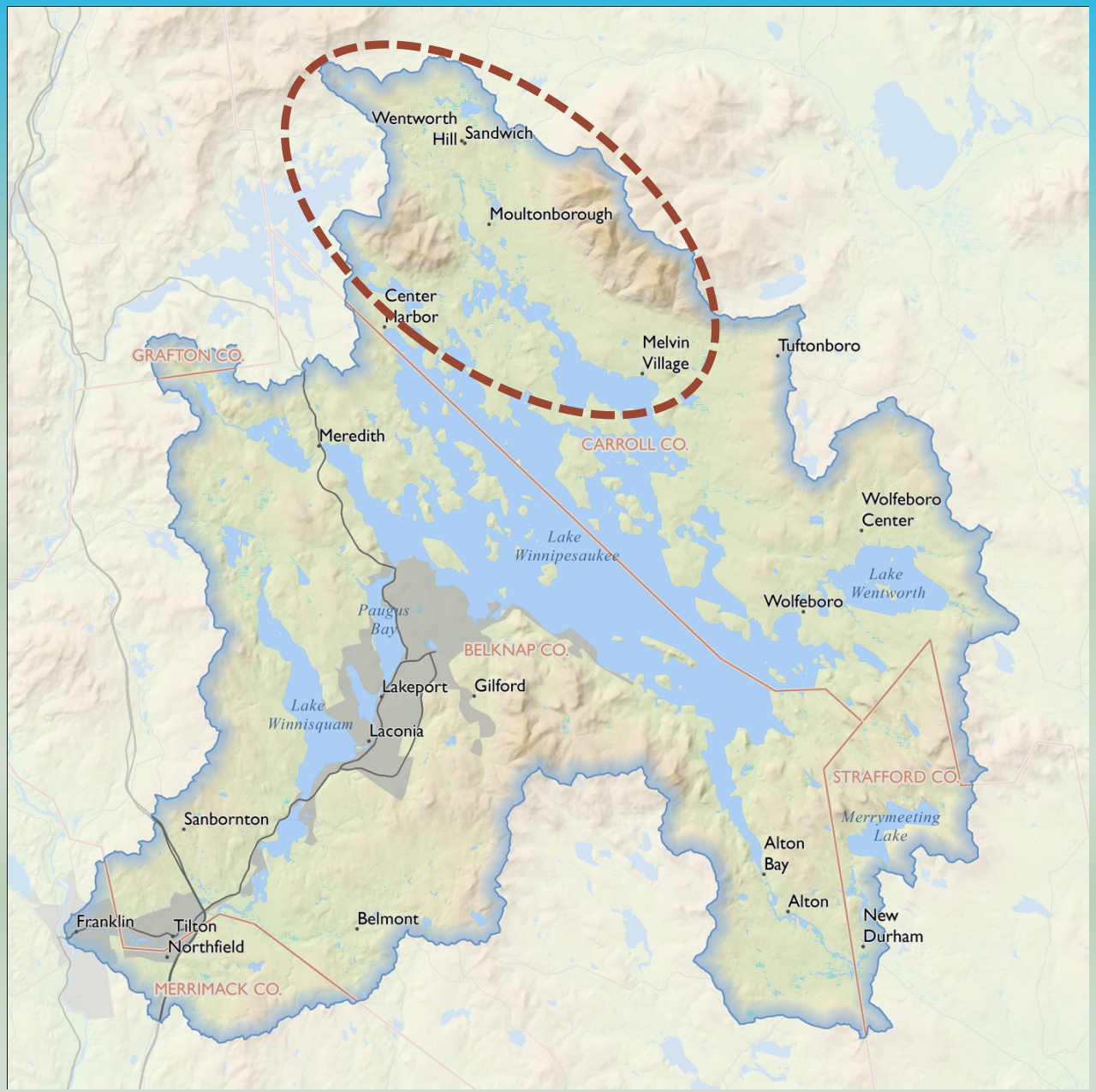
- For every 3 ft. decline in water clarity, shorefront property values can decline as much as 10%.
- Declining property values affect individual landowners and the economies of entire communities.
- With property rights comes property responsibility

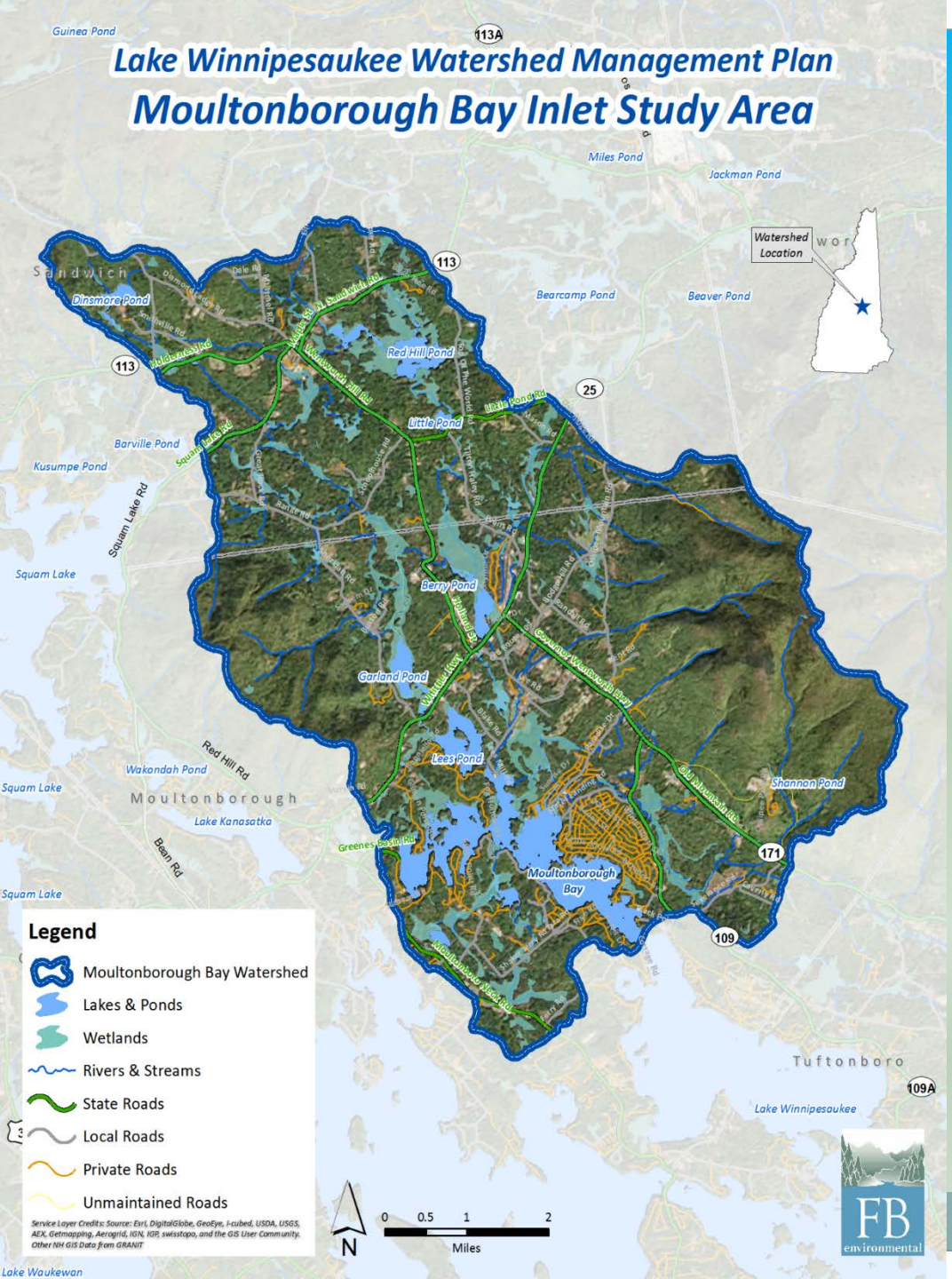
Forested Watershed

Developed Watershed

5 to 10 times the amount of **phosphorus** in the runoff from the developed area.

Lake Winnipesaukee Watershed





Moultonborough Bay Inlet Study Area

49 Square Mile Watershed Area

Towns of Moultonborough and Sandwich

Headwaters to Lake Winnipesaukee

Total Phosphorus, Dissolved Oxygen, and Chlorophyll-a impairments

Highly Sensitive to Nutrient Loading

Pollution Sources

Past

Point source pollution discharged from pipe

Present

Now **polluted runoff** or *nonpoint source pollution* from many smaller, diffuse sources

Where does phosphorus come from?

- Land disturbance and development (erosion)

Where does phosphorus come from?

- Fertilizer

Where does phosphorus come from?

- Septic systems

Where does phosphorus come from?

- Waterfowl and pets

Where does phosphorus come from?

- Camp roads

Where does phosphorus come from?

- Point Sources (storm drains)

Why Develop a Plan?

Because we care about the health of our lakes and want to keep them clean for future generations to enjoy.

If a lake doesn't meet State standards it is required.

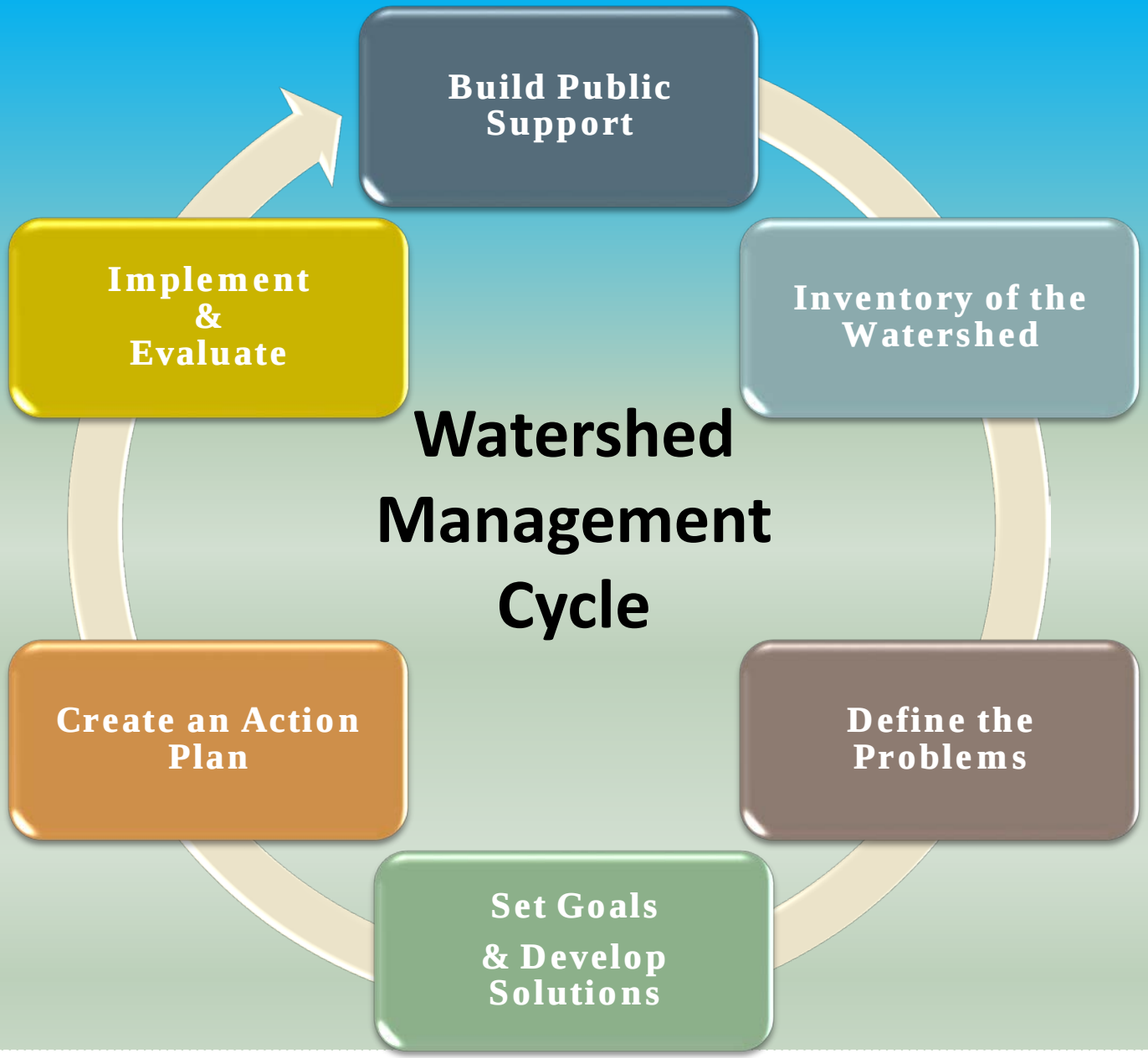
Why Develop the MBI Watershed Plan?

Problems:

- Total Phosphorus, Dissolved Oxygen, and Chlorophyll-a impairments
- Highly Sensitive to Nutrient Loading

Solution:

- Analyze the Water Quality Situation & Develop a Systematic Approach for Addressing the Problems



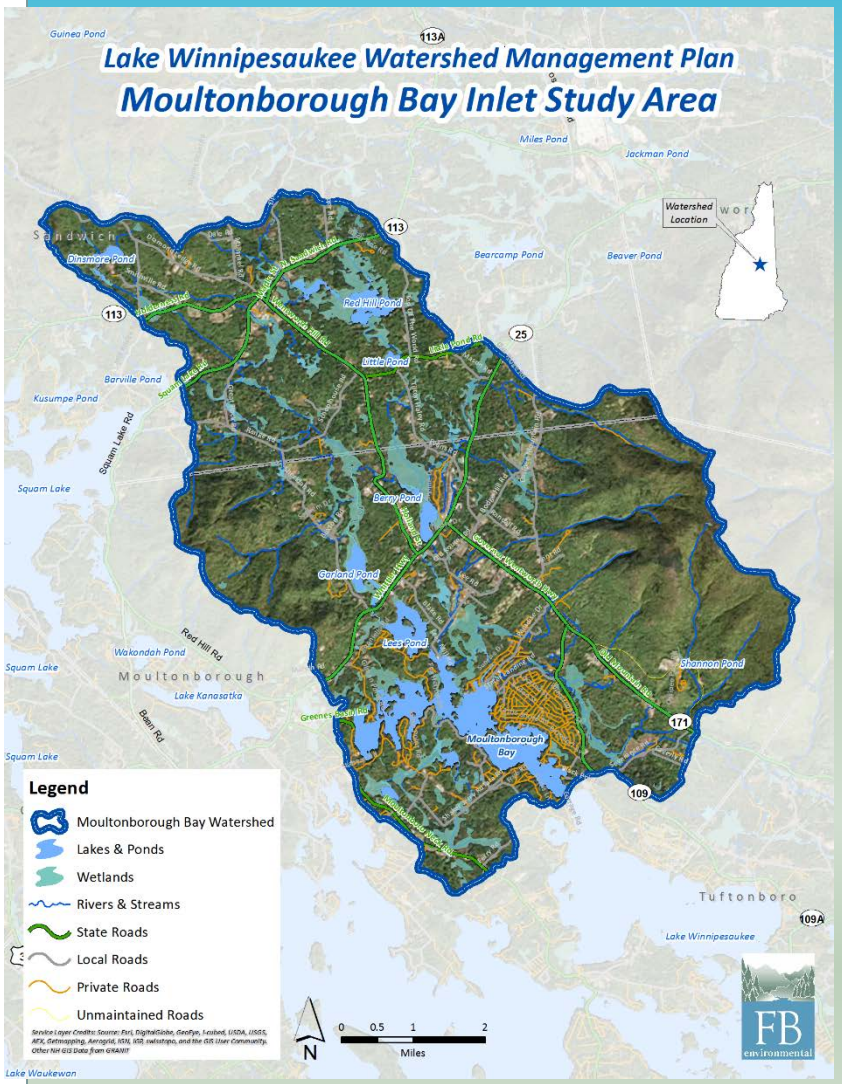
WATERSHED MANAGEMENT PLANNING

Develop An Action Plan

- ✓ What are the priorities?
- ✓ How much will it cost?
- ✓ Who will pay for the costs?
- ✓ When will tasks be implemented?
- ✓ Who will do the work?
- ✓ How will it be tracked/monitored?

Education & Outreach	BMPs	Municipal Ordinances	Monitoring & Assessment

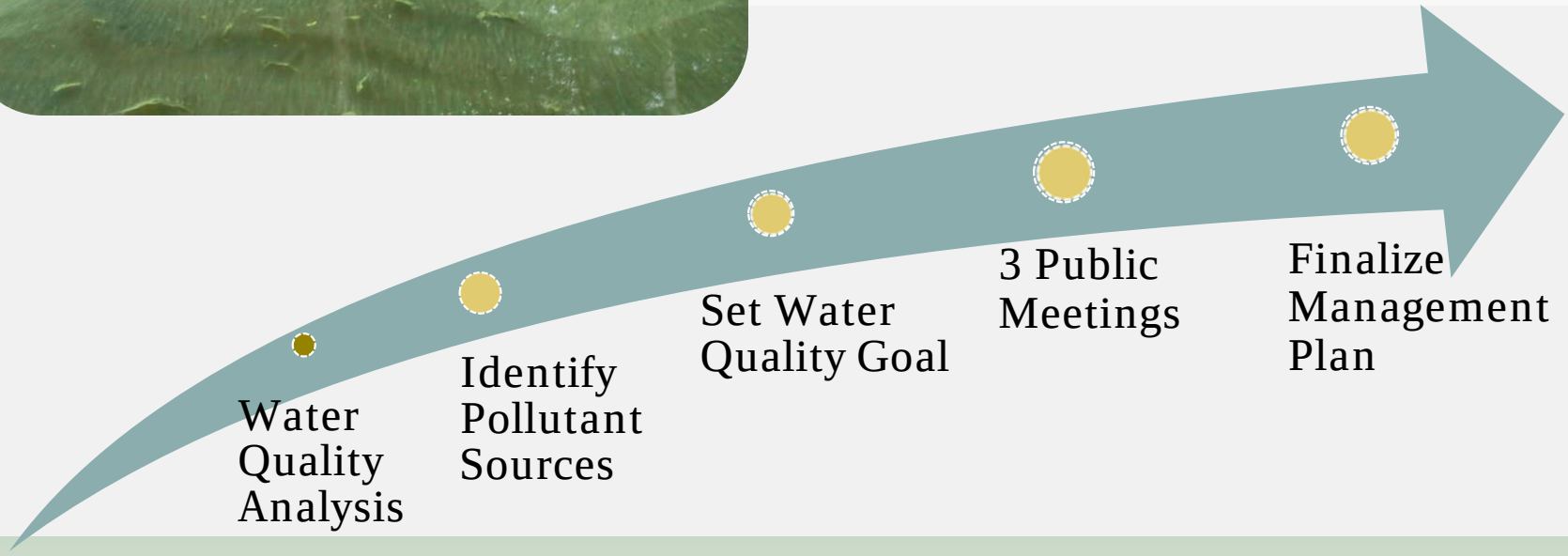
Moultonborough Bay Inlet Watershed Restoration Plan Approach

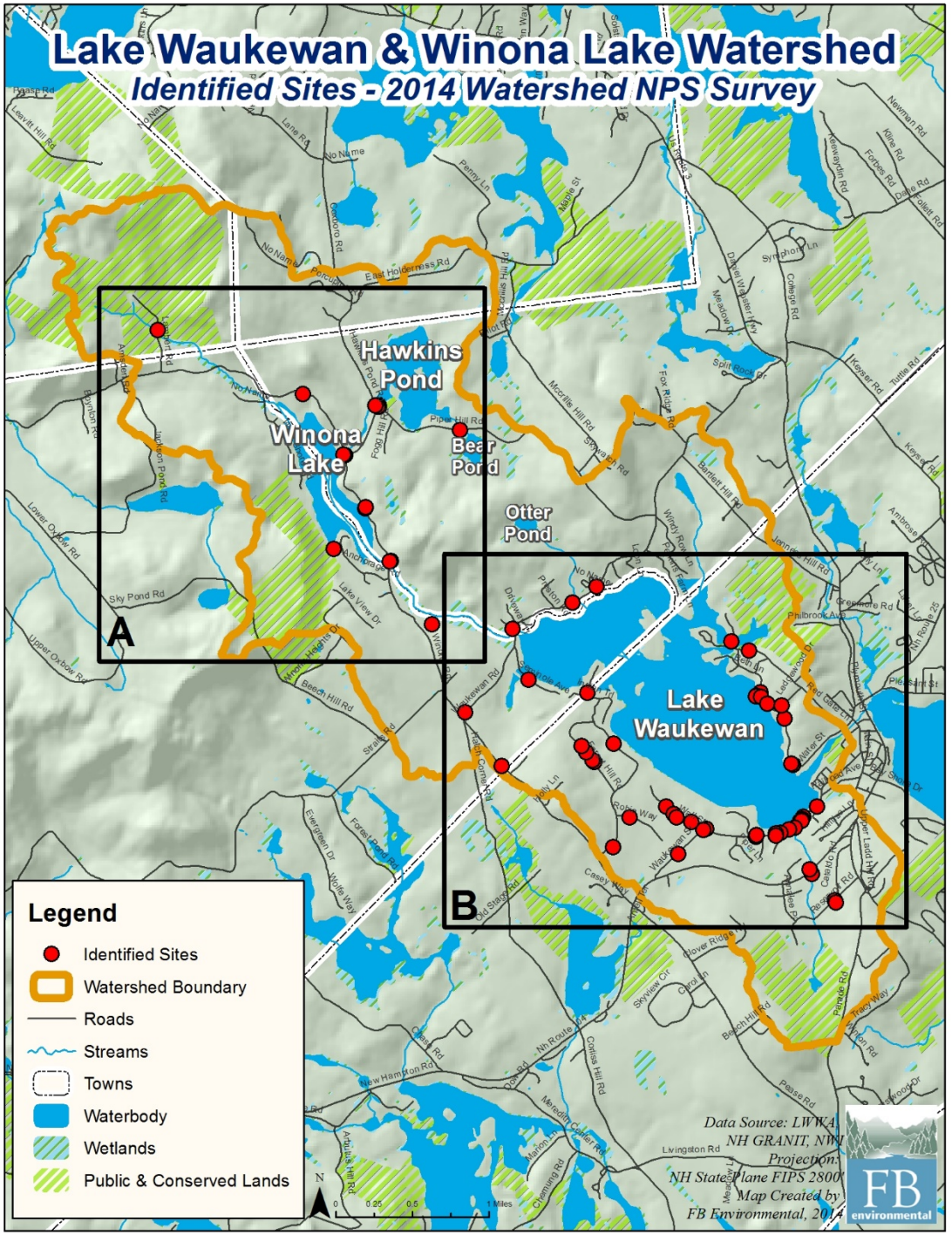


1. Public Meetings & Presentations
2. SSPP/Assess Water Quality (Determine Goal & Assimilative Capacity)
3. Inventory the Watershed
    1. Stormwater Survey (from land)
    2. Shoreline Survey (from boat)
4. Develop a Nutrient Loading Model - LLRM
5. Determine Load Reductions Needed
6. Conduct a Build-Out Analysis/Ordinance Review
7. Develop an Action Plan (not in current scope)
8. Assist with Writing the Plan (a-i elements)
9. Four BMP Designs

MBI Project Timeline

- WQ Analysis & Modeling – this winter;field analysis spring/summer of 2015
- Complete by July 2016




Lake Waukewan & Winona Lake Watershed
Identified Sites - 2014 Watershed NPS Survey
Hawkins Pond
Winona Lake
Bear Pond
Otter Pond
Lake Waukewan
A
B
Legend
Identified Sites
Watershed Boundary
Roads
Streams
Towns
Waterbody
Wetlands
Public & Conserved Lands
N
0
0.25
0.5
1 Miles
Data Source: LWWA, NH GRANIT, NWI
Projection: NH State Plane FIPS 2800
Map Created by FB Environmental, 2014
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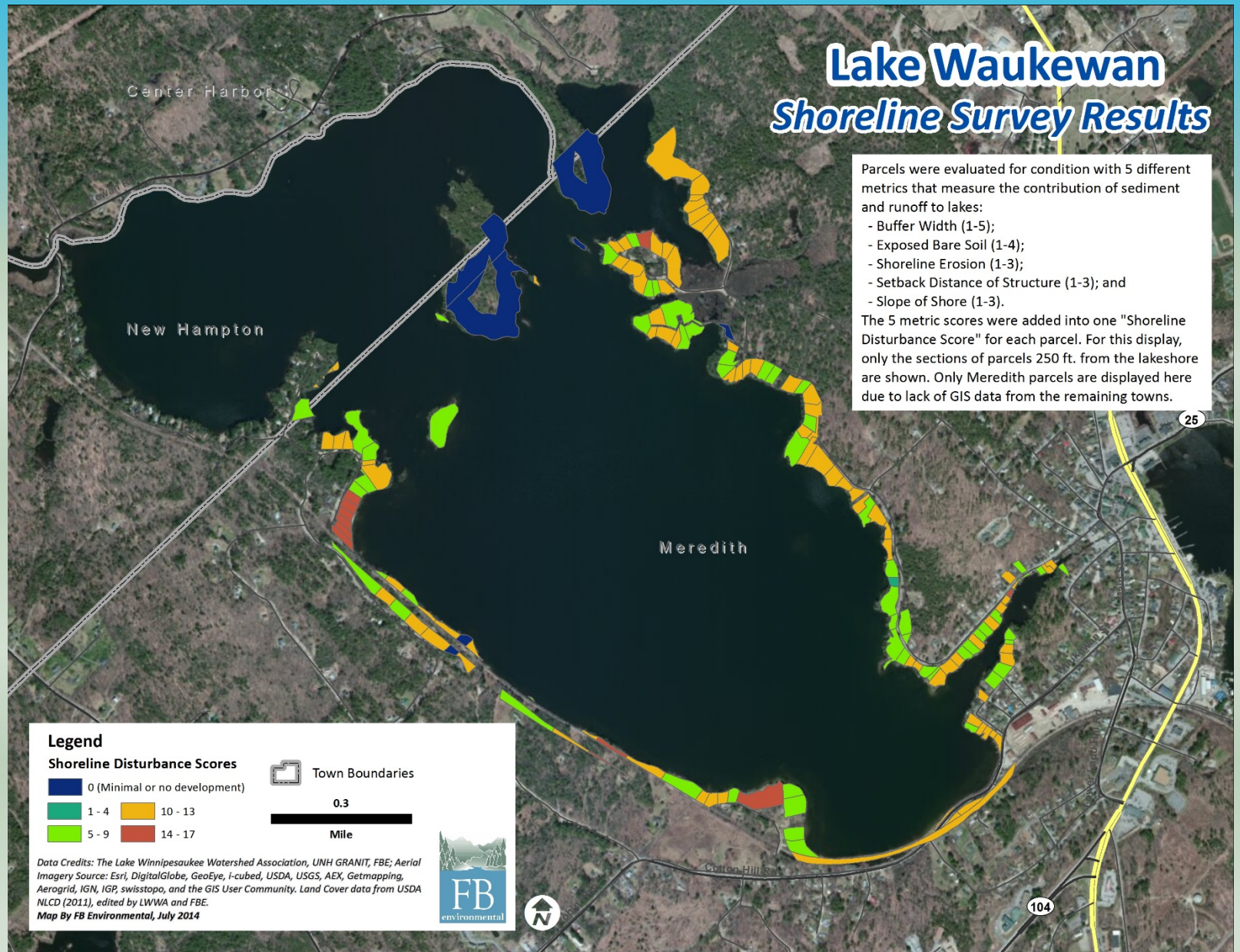
Shoreline Survey Assessment (Example)



Model Output: Buildout Analysis

How Much?

- How Much Land is Currently Available for Development?

Where & When?

- Where & When Will Development Occur?

Effects?

- What are the Impacts from Future Development?

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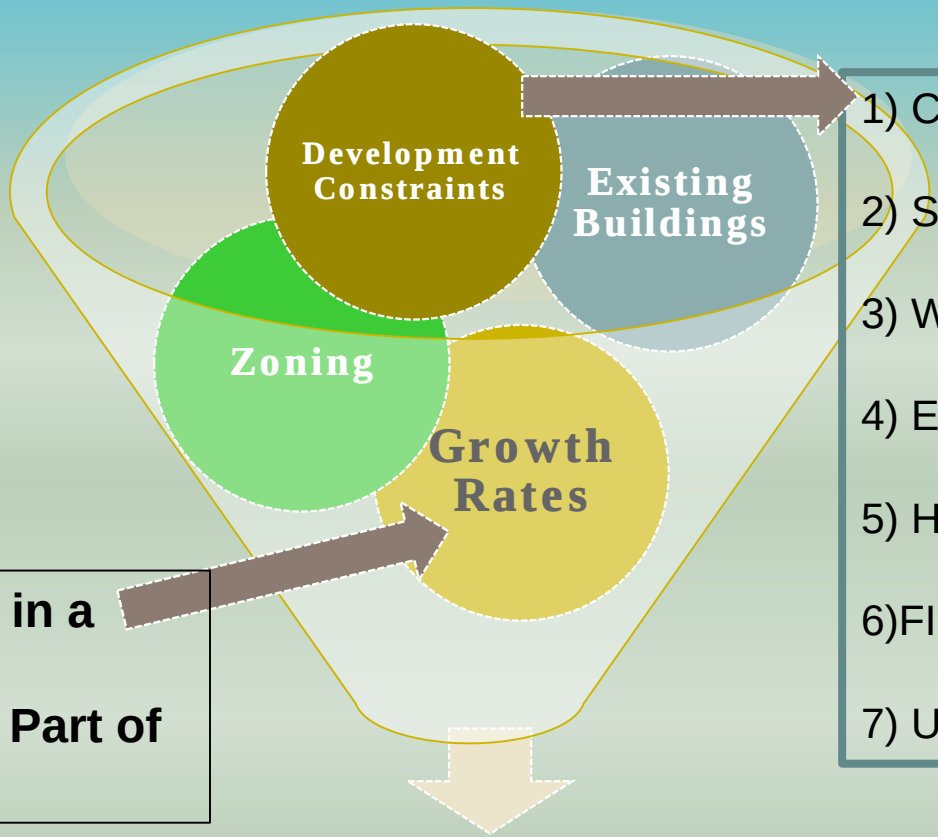
Buildout Analysis Inputs



Assumptions

You Live in a Steadily Growing Part of NH

1) Conservation Land
2) Steep Slopes (>25%)
3) Wetlands
4) Existing Buildings
5) Hydric Soils
6)FIRM Floodplains
7) Unbuildable Parcels

Buildout Results

Build Out Analysis

Estimating Future Development in Your Area

Population Growth Rates

Increase since 1960:

Carroll Co. - **Moultonborough** – 381% increase since 1960

Carroll Co. – **Sandwich** – 114% increase since 1960

Lakes Are Your Economic Driver

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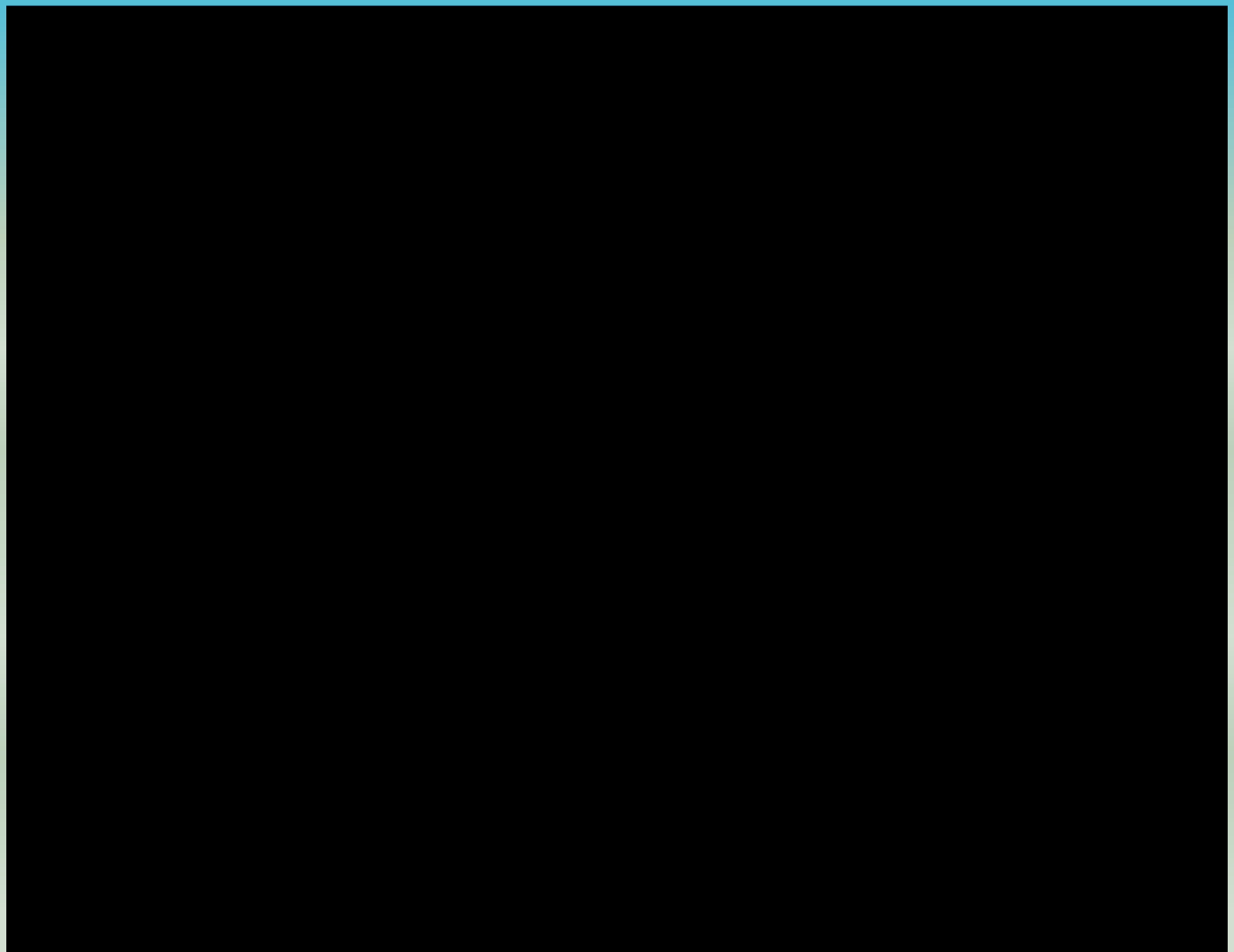
Sample Buildout Results

TimeScope

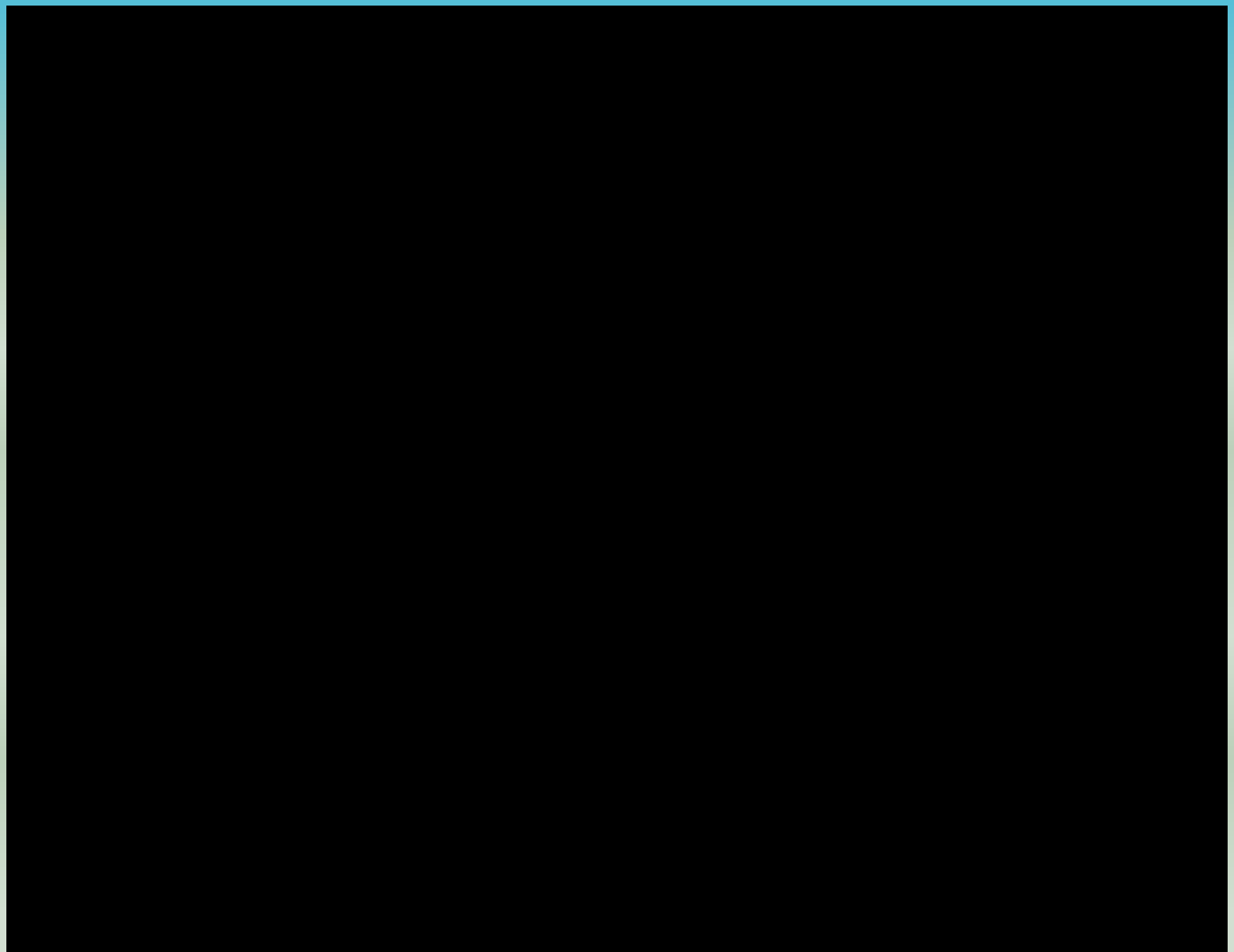
Buildout Results

Existing Buildings



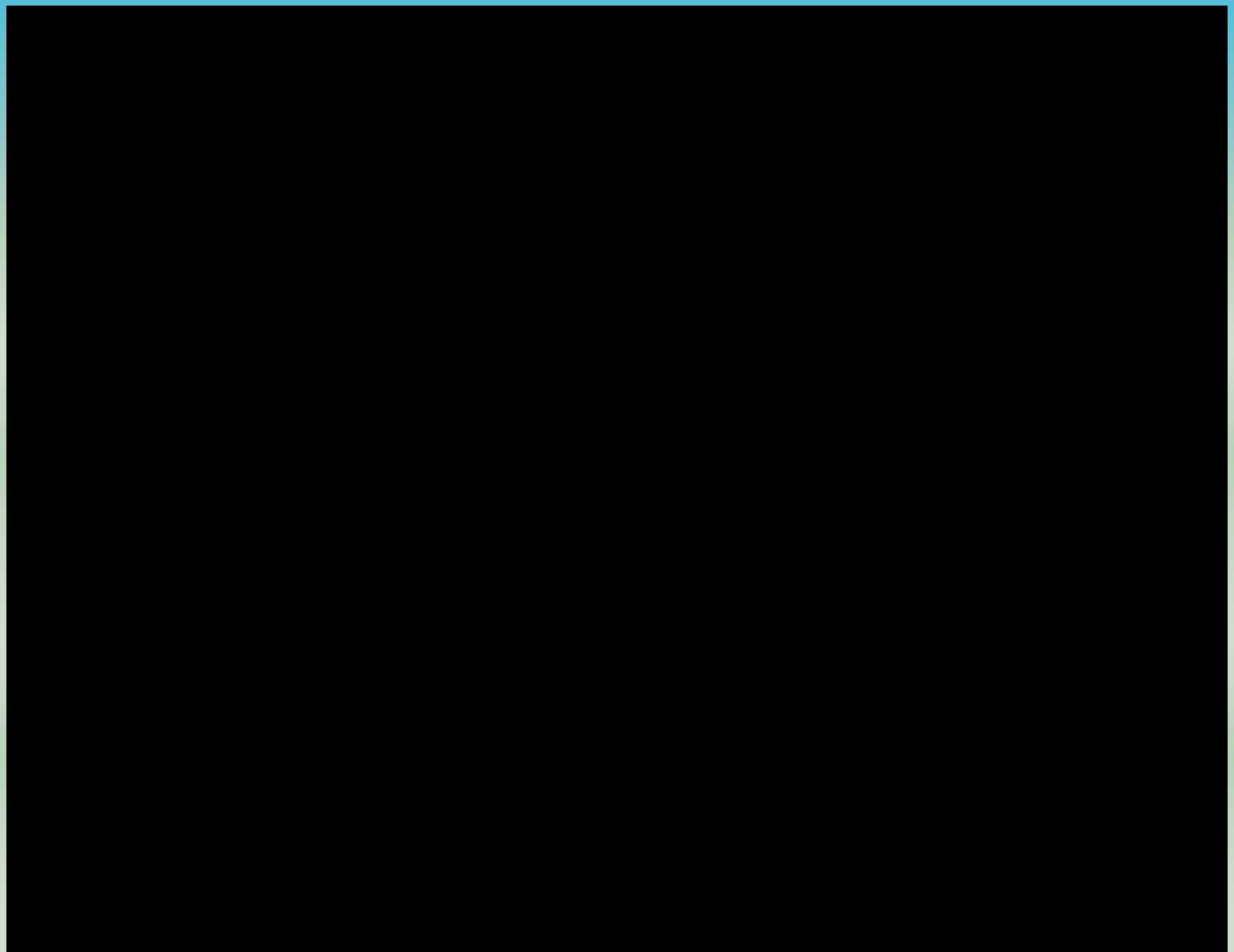
Buildout Results

Projected Buildings - 2036



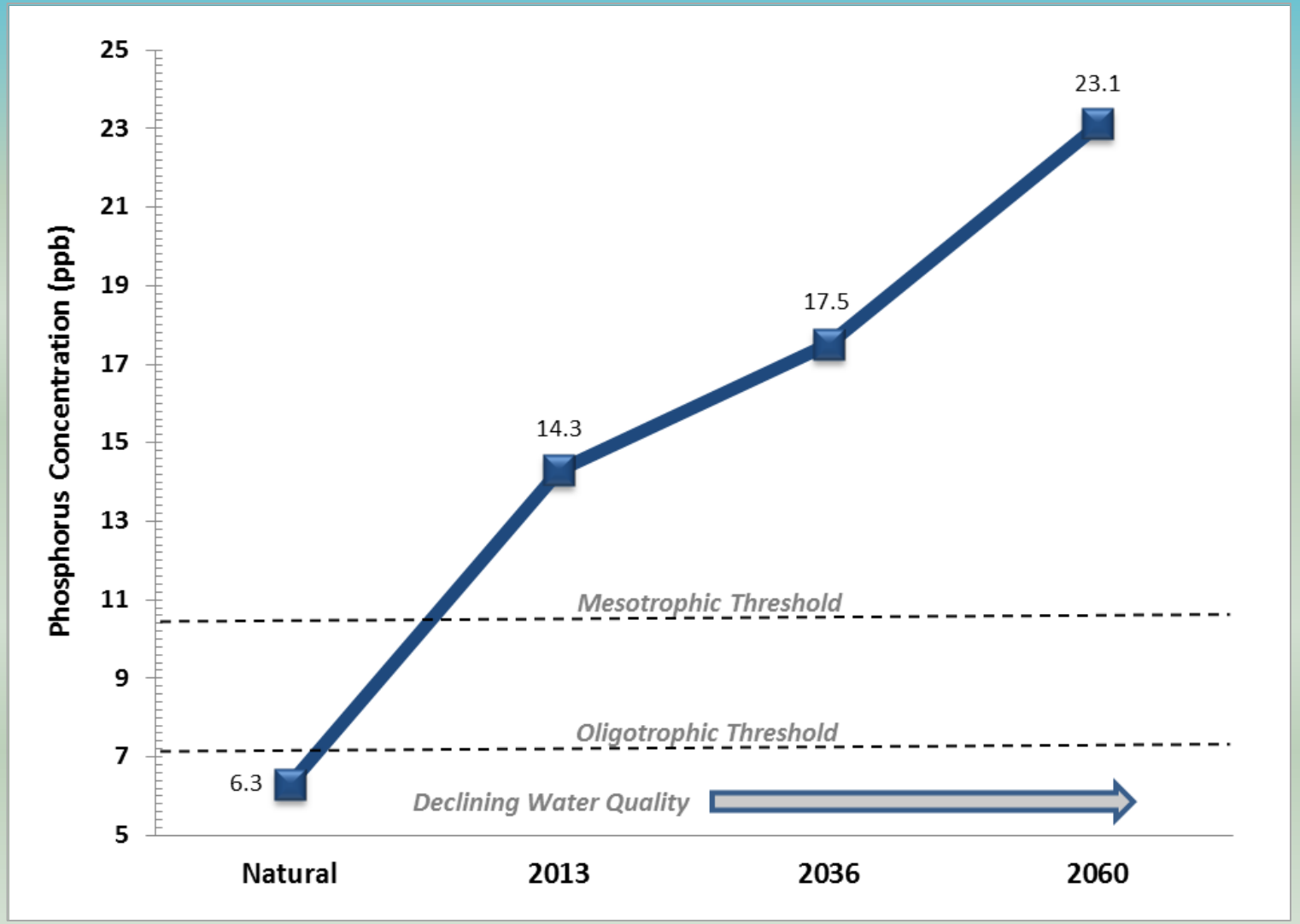
Buildout Results

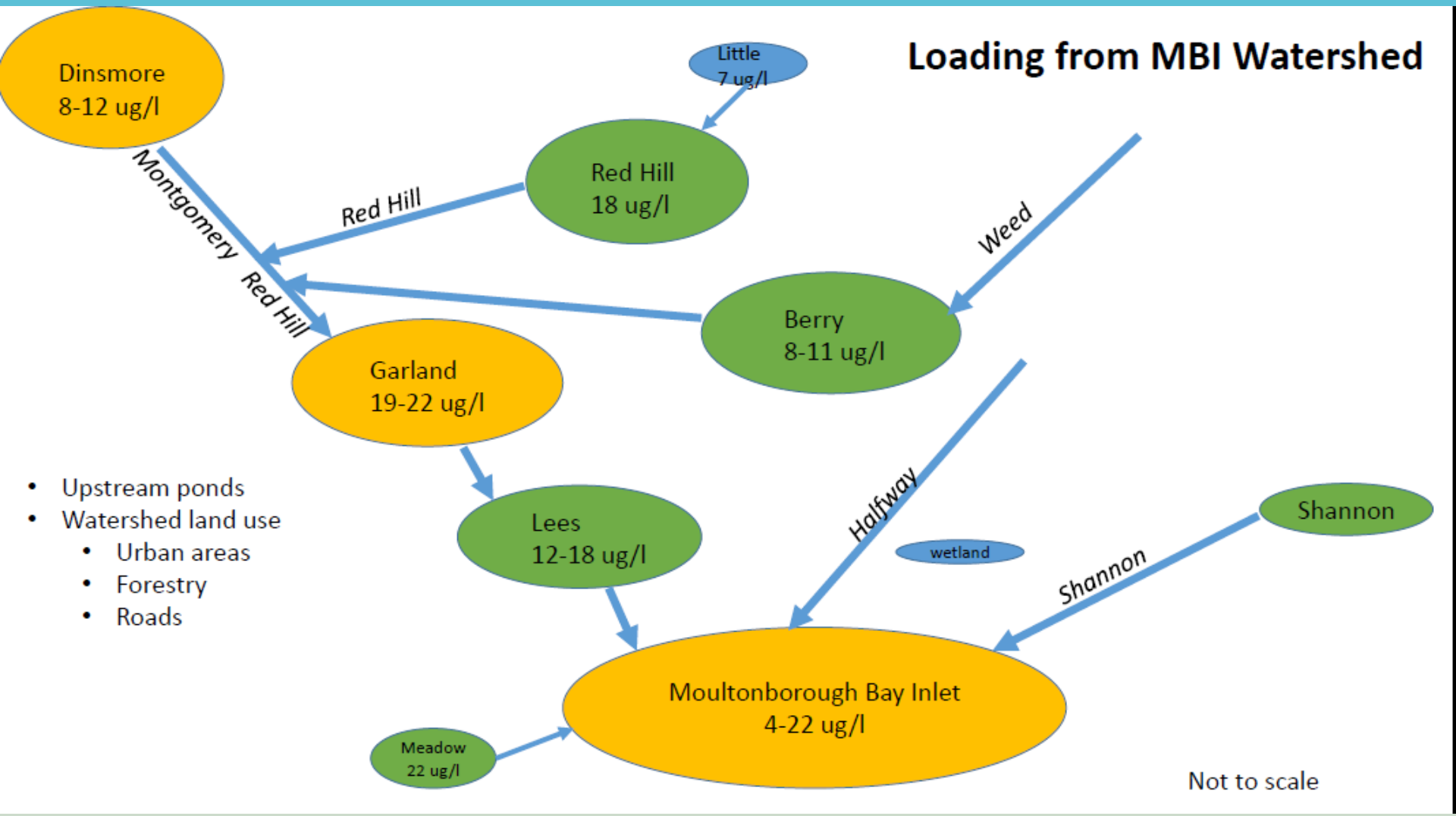
Full Buildout (2060)



Province Lake Buildout

Predicted *In-Lake Phosphorus Concentrations*





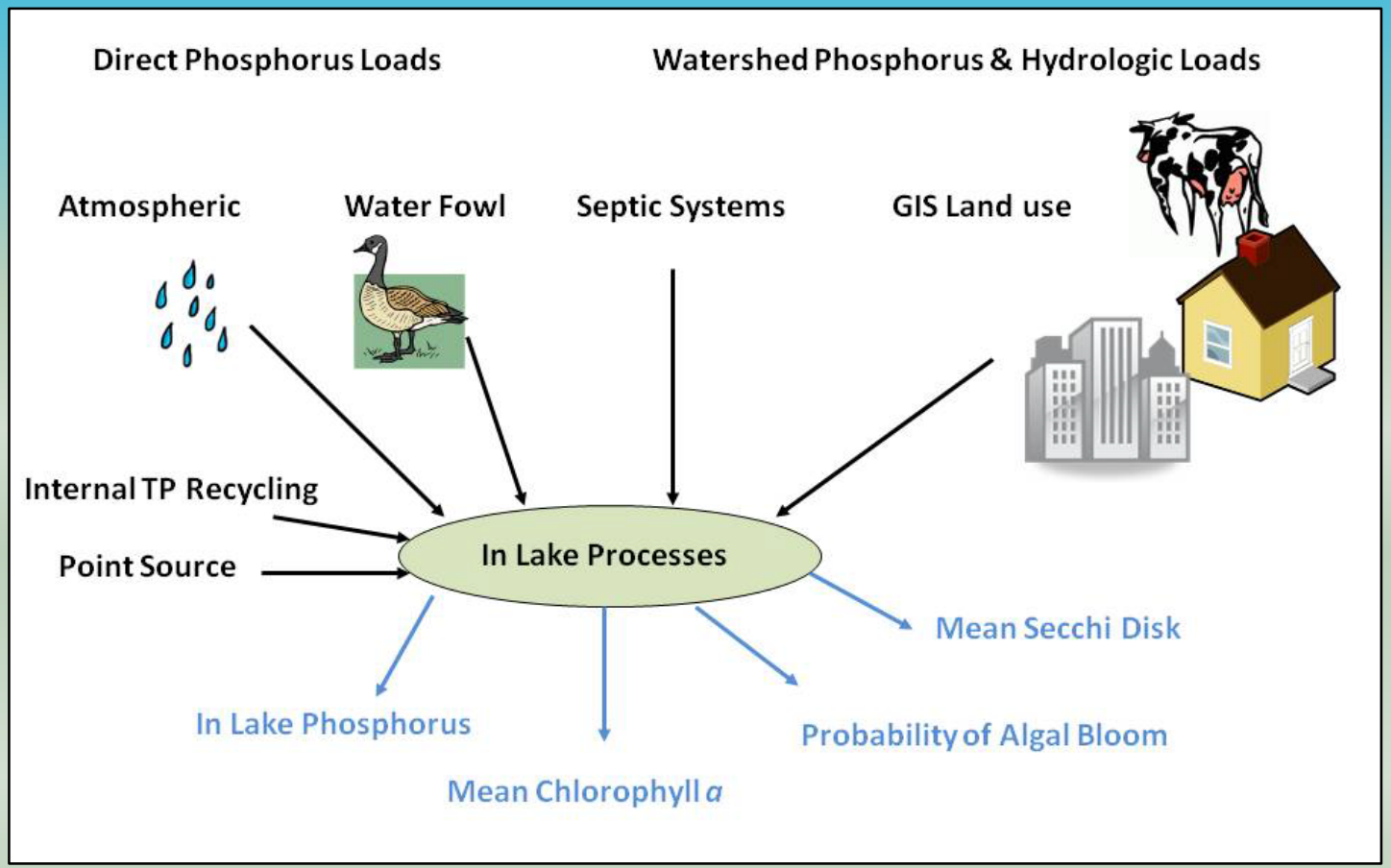
- Upstream ponds
- Watershed land use
  - Urban areas
  - Forestry
  - Roads

Direct and Nearshore Loading

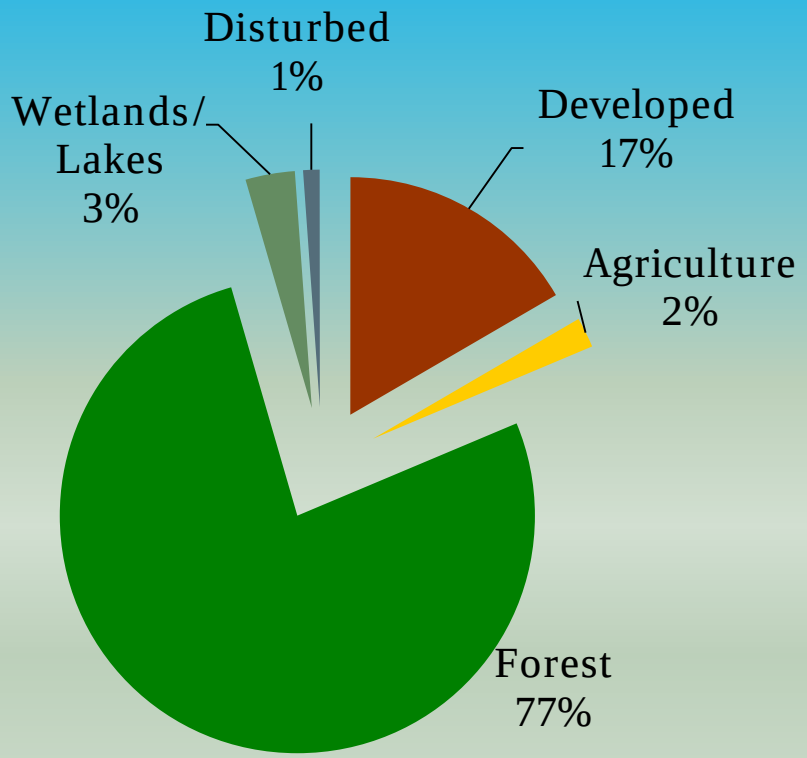
- Dense Land Use
- On-site septic
- Internal Loading
- Waterfowl
- Atmospheric

Potential sources of nutrients

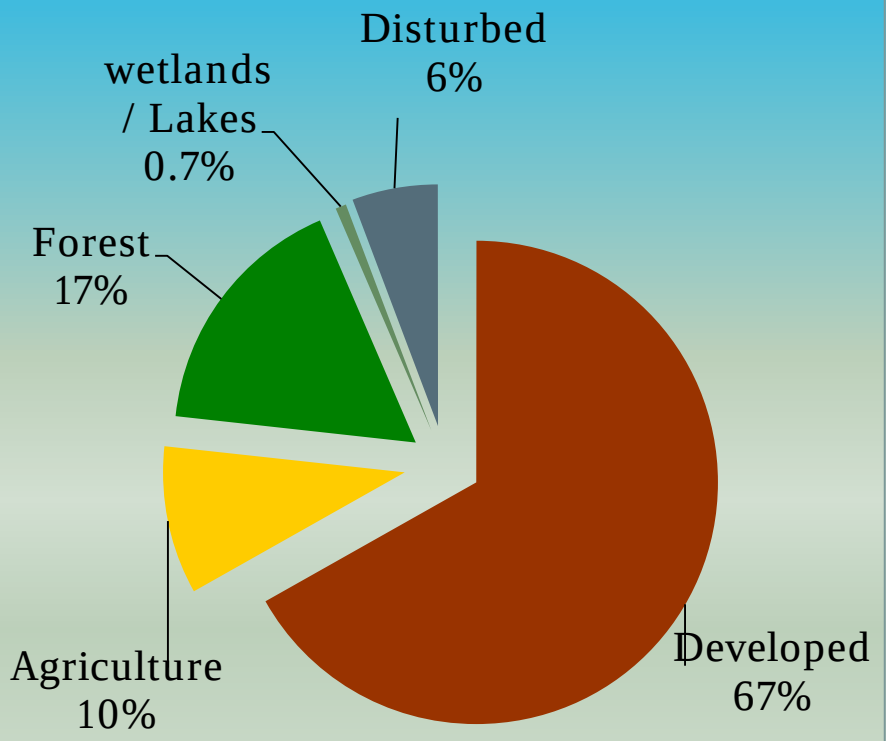
Modeling helps us understand how much phosphorus the lakes can take and where the phosphorus is coming from



It also gives us a way to prioritize BMPs and lets us predict future loadings



Lake Waukewan Watershed Land Use %



Lake Waukewan Phosph. Load by Land Use %

Very preliminary modeling results suggest:

- 1/2 to 2/3 of P load could be from development within 1 mile of shore
- Load from upstream watershed and ponds likely important at times (high flows)
- Septic influence likely, particularly during periods with little flushing from watershed
- MBI has a possibility of experiencing algal blooms

Public Education is a big part of the solution

We will be answering these questions:

1) How much phosphorus can the lakes take?
2) Where is phosphorus coming from?
3) What do we fix first?
4) What solutions work?
5) Which areas should be protected?

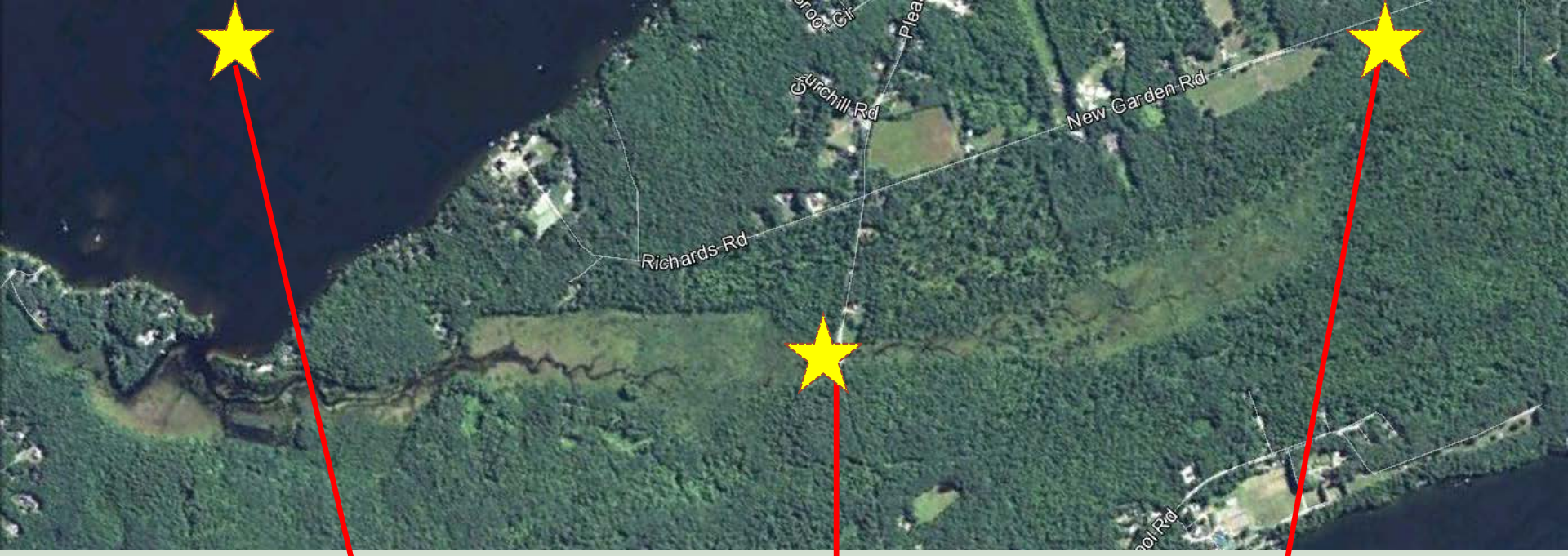
Infiltration

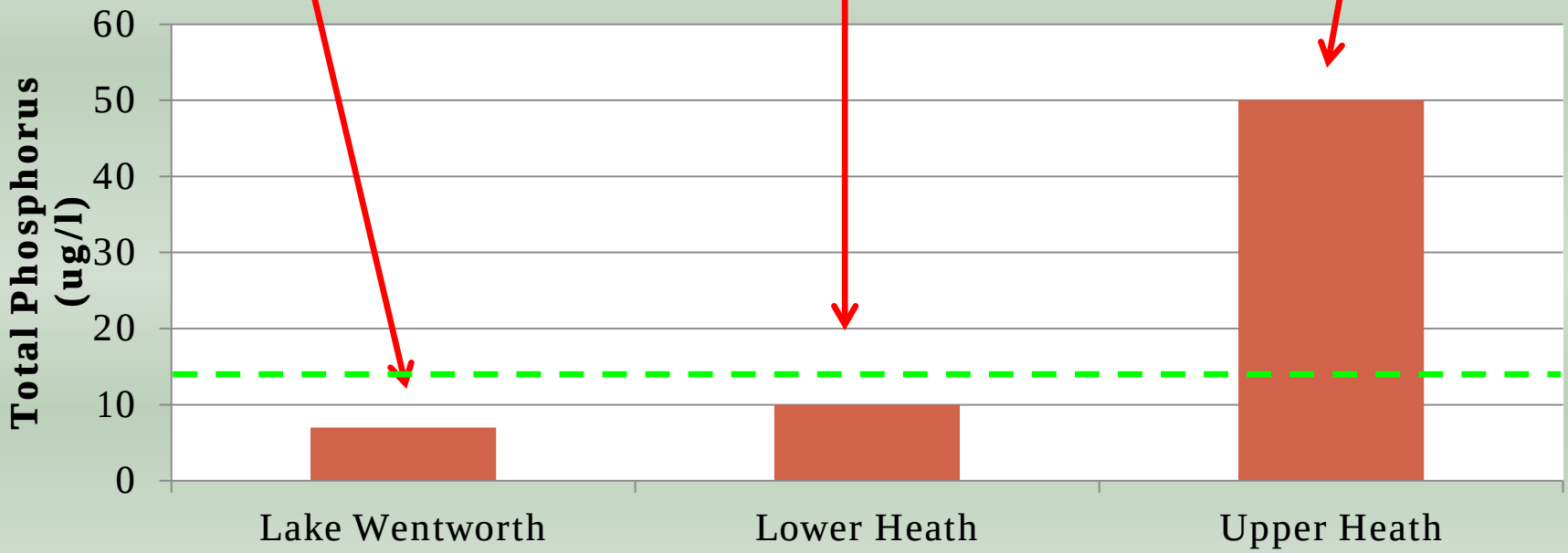
- Infiltrate, don't run off
- Filtering water through soil = the best watershed solution we have

Open Space/Alternative Land Use Changes

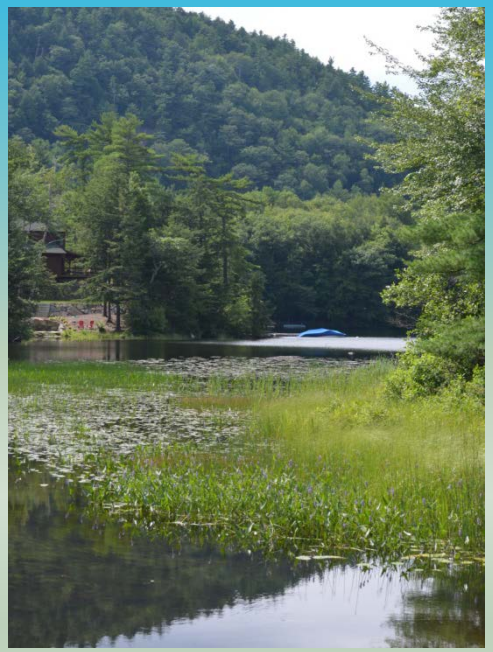
We might consider permanent protection of critical watershed lands by:

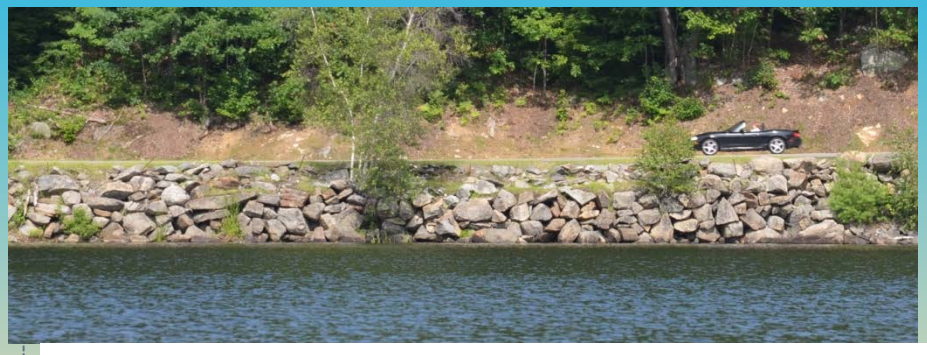
-Purchase and Protection or
-Conservation Easements


Richards Rd
New Garden Rd


Total Phosphorus (ug/l)
60
50
40
30
20
10
0
Lake Wentworth
Lower Heath
Upper Heath

You don't know what you've got……





FOR IMMEDIATE RELEASE:
DATE: August 24, 2009
CONTACT: Jody Connor (603) 271-3414 or 419-9229
Sonya Carlson (603) 271-0698

State Issues Cyanobacteria Warning for Lake Waukewan,
Meredith & New Hampton

Concord, NH – An elevated cyanobacteria cell concentration has been measured in Lake Waukewan in Meredith and New Hampton. Samples revealed that the state standard of 50 percent or greater

……..until it's gone


Final thought
TIME TO GET MOVING
THE LAKE YOU SAVE COULD BE YOUR OWN.

Questions and Discussion