A Watershed-based Assessment of the Lakes of the Borough of Ringwood, Passaic County, New Jersey

Chris L. Mikolajczyk, CLM
Senior Aquatics Project Manager
cmiko@princetonhydro.com
908-237-5660 x114

PRINCETON HYDRO
SCIENCE ENGINEERING DESIGN

Introduction - Chris L. Mikolajczyk, CLM

- ✔ Senior Aquatics Project Manager
- ✔ NALMS Certified Lake Manager
- ✔ PH employee for 20+ years
- ✔ 30+ years experience
- ✔ A.A.S. - Ecology & Environmental Technology
- ✔ B.S. - Geography (Water Resources Emphasis)
- ✔ M.S. - Geography (Watershed Management)

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

SCIENCE
ENGINEERING
DESIGN

Keys To Any Successful Plan

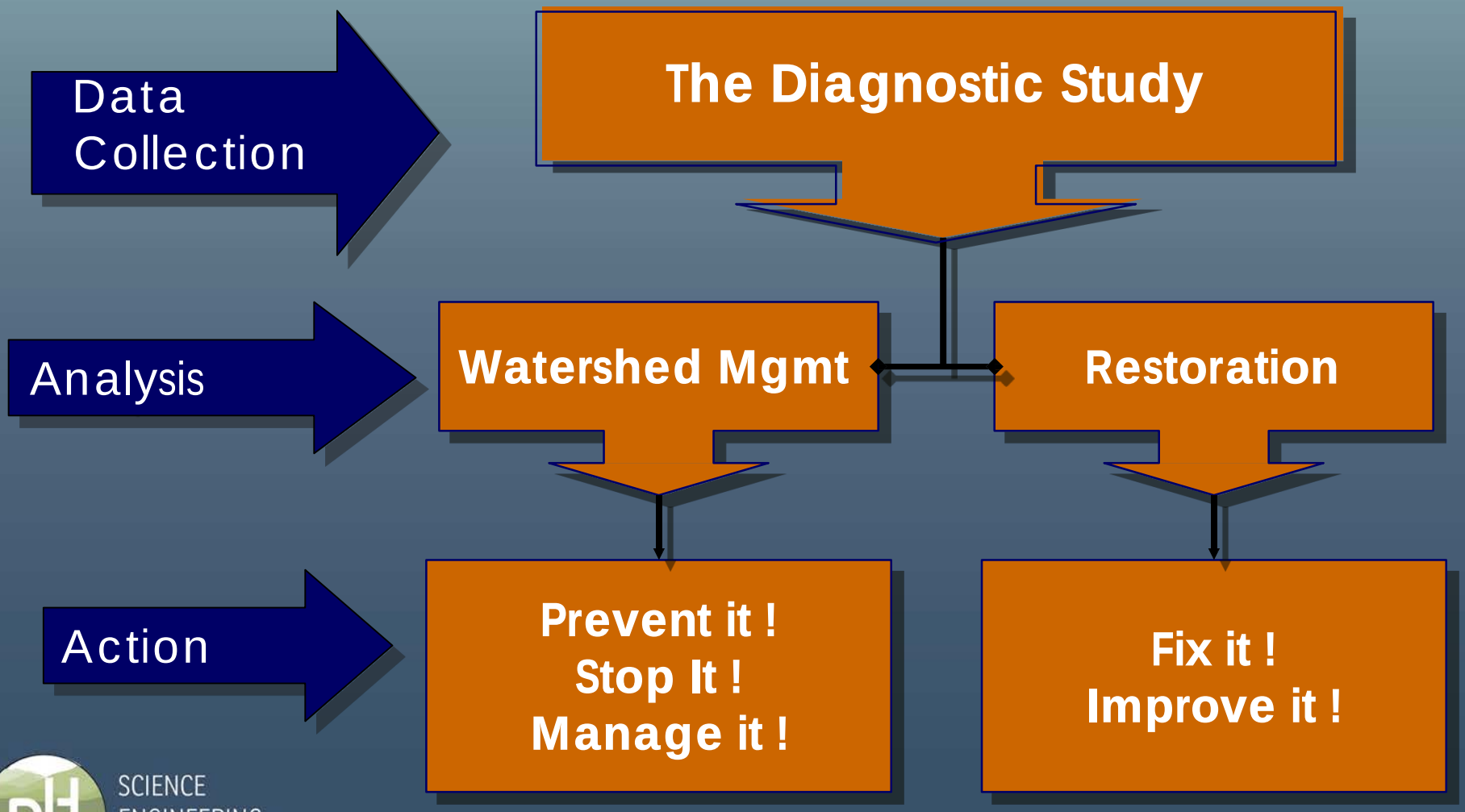
1. Have clearly defined, realistic goals and objectives.

1. 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



SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

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 & retention of pollutant/nutrients
- Sediment infilling
- Development, length of algae blooms
- Success of restoration efforts

Hydrologic Budget

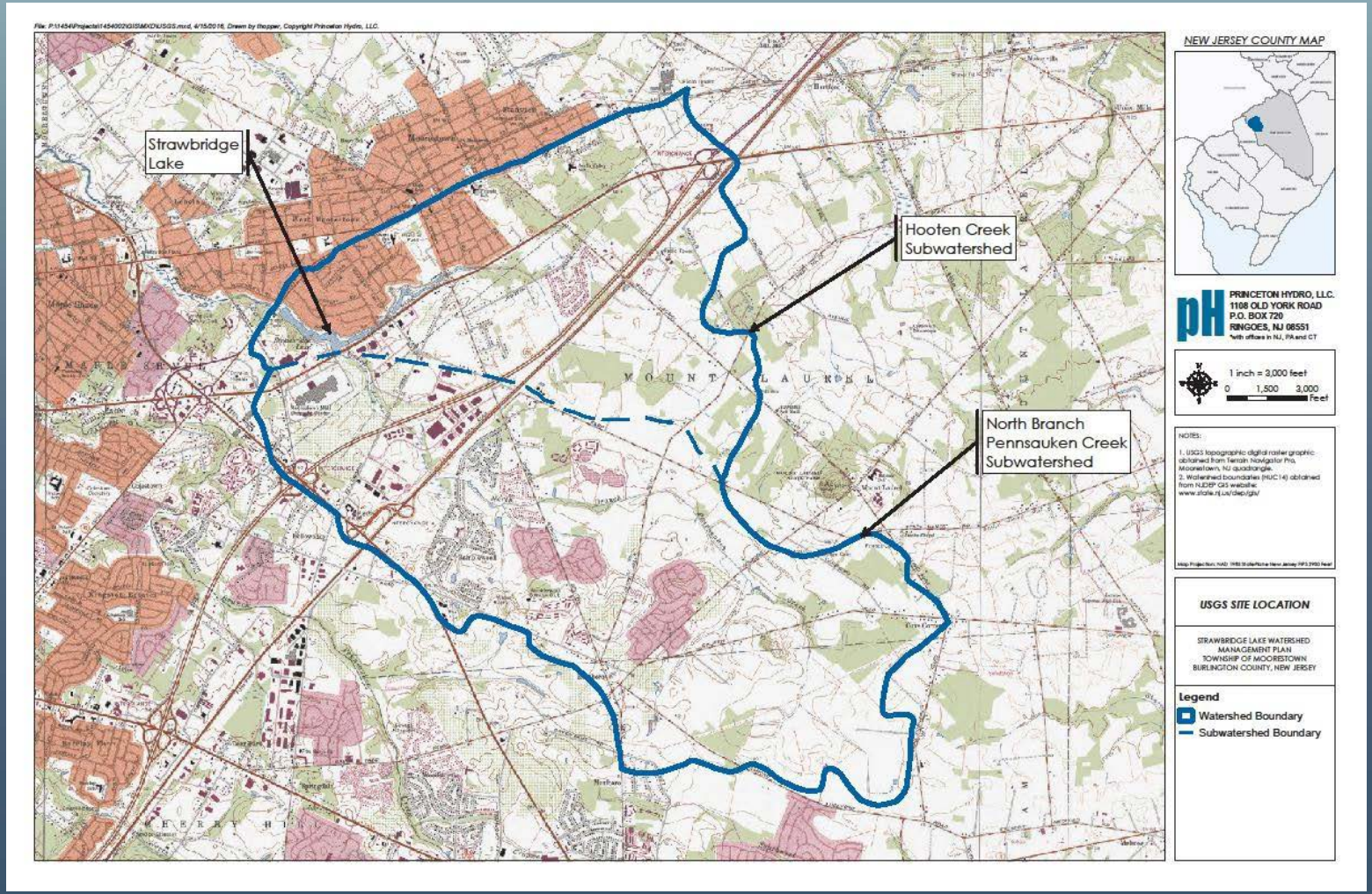
- Surface water in-flow
- Out-flow or discharge
- Groundwater in-flow
- Precipitation
- Evaporation
- Flushing (annual and/or seasonal)

Hydrologic Budget - Surface Water

SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

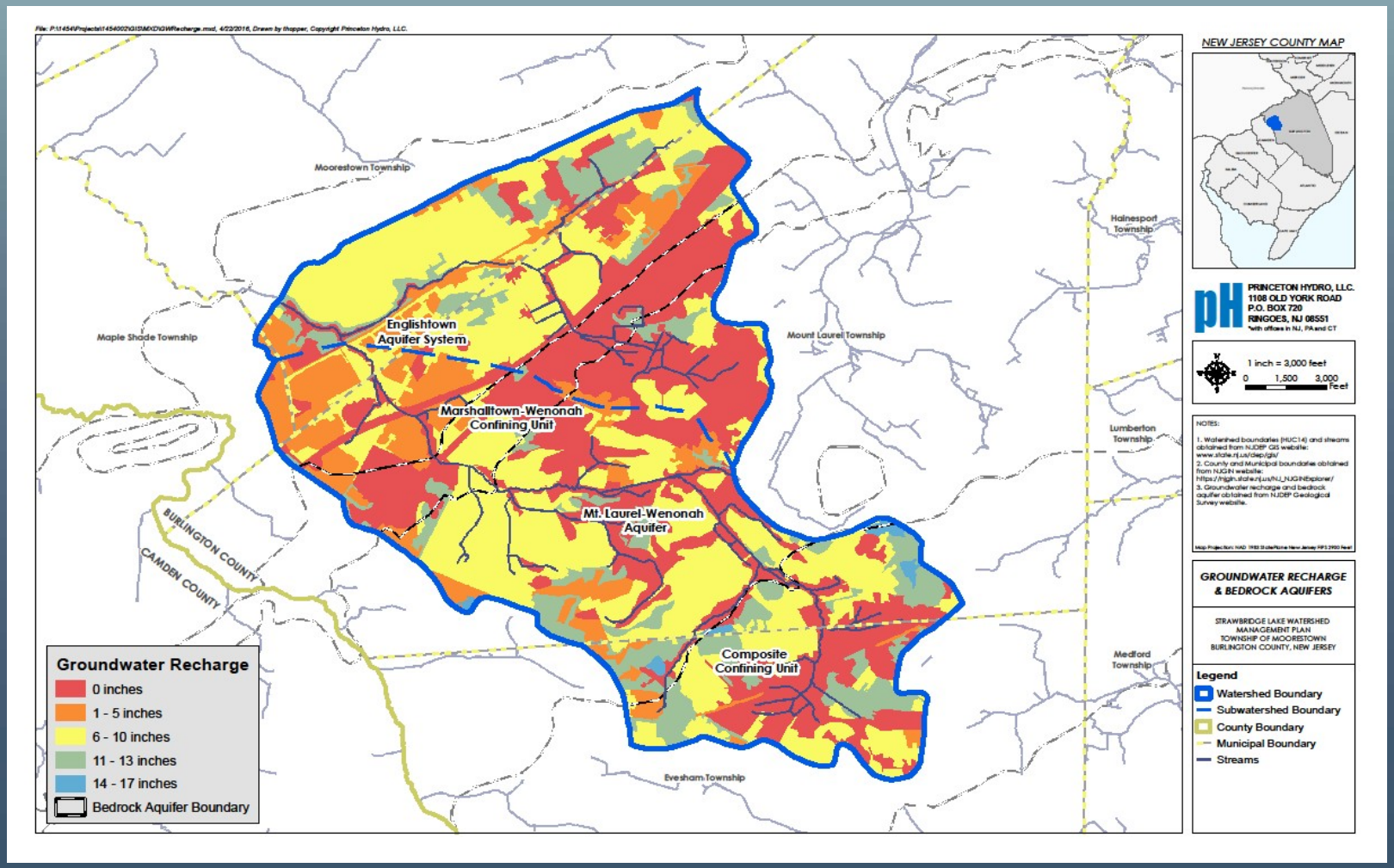
Hydrologic Budget - Surface Water



SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

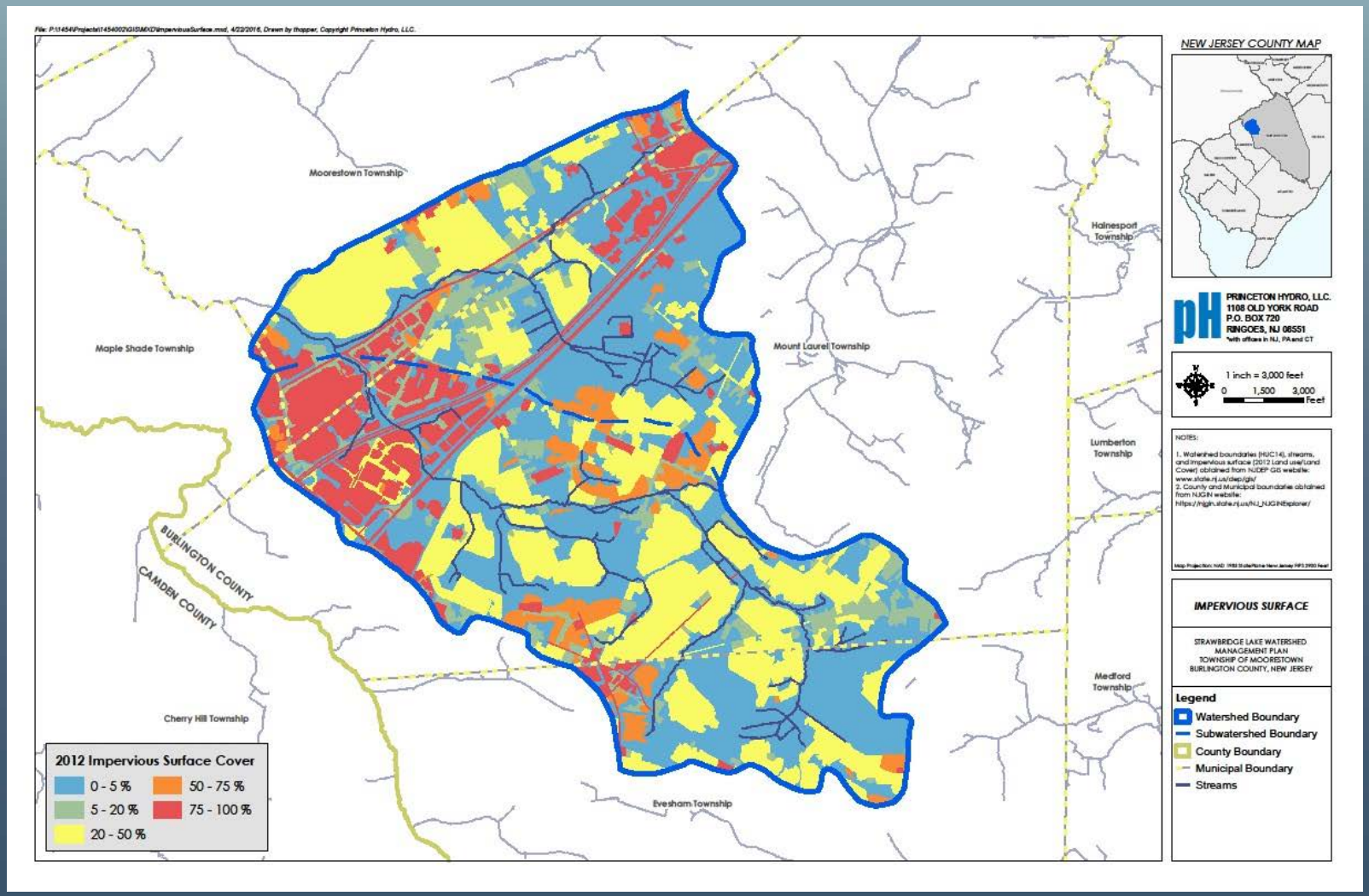
Hydrologic Budget - Groundwater Recharge



SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

Hydrologic Budget - Impervious Surfaces



SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

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 Phosphorus load is the "cornerstone" of a successful diagnostic study.

Computing Phosphorus Load

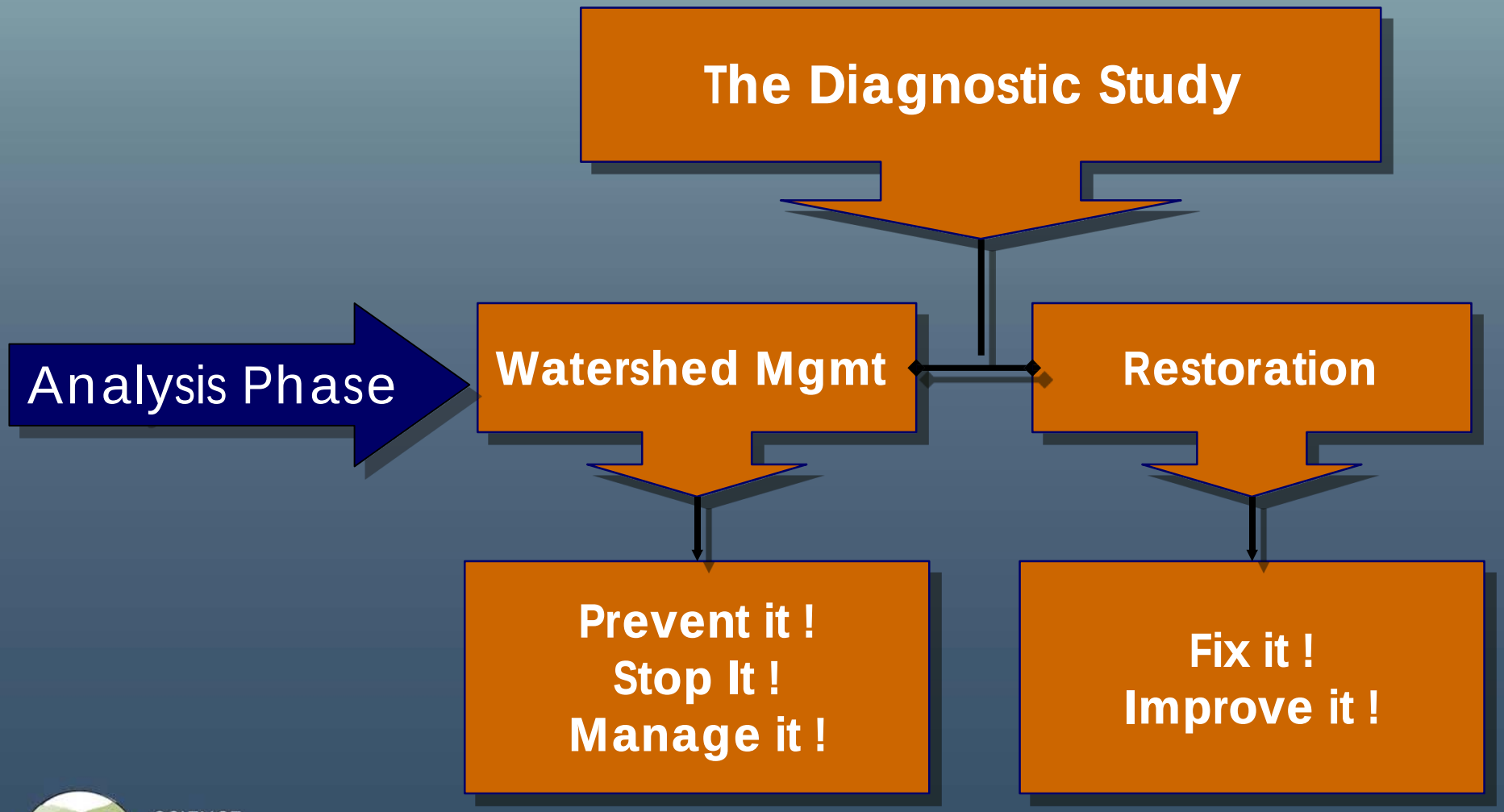
Quantify annual load using:

- Most effectively accomplished using a combination of field sampling and desktop modeling techniques
- Field data provides a "snapshot" of existing conditions
- Modeled data help define the "big picture" and integrate 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, SAV and algae die-off, etc.)
- Account for reduction of nutrient load due to “sinks” (wetlands, upstream lakes or ponds)
- Role of hydrology and seasonality of loading Input data into model – AVGWLF, BASINSim, Wikiwatershed, etc.

Plan Implementation Flow Chart



SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

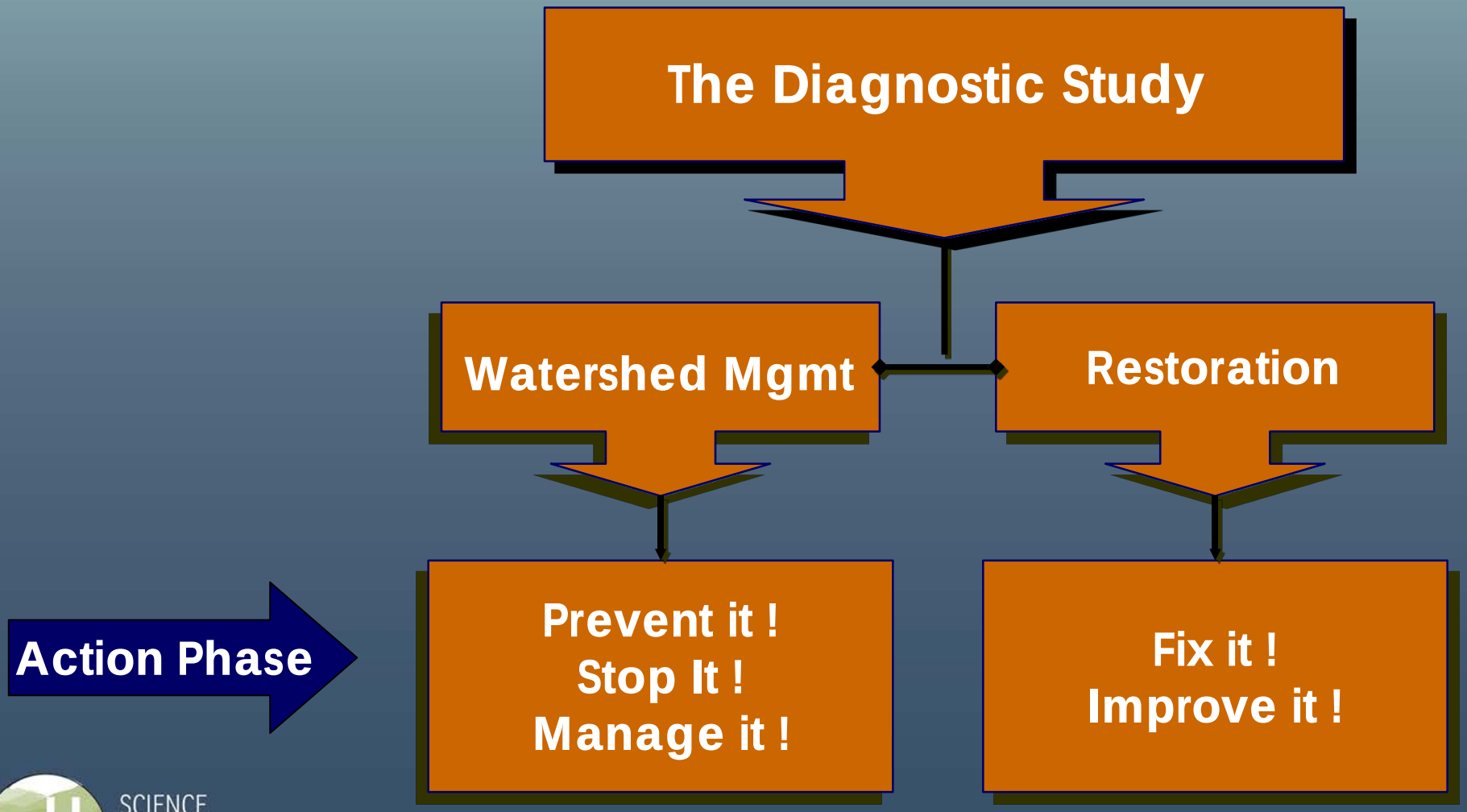
Put The Plan Together

- 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

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



SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

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, SAV 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% SAV 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 budget
- Put plan into action

Outreach and Education

- Make sure action plan is clear and well defined
- Set easily defined objectives and goals – *thresholds*
- Stress need for patience

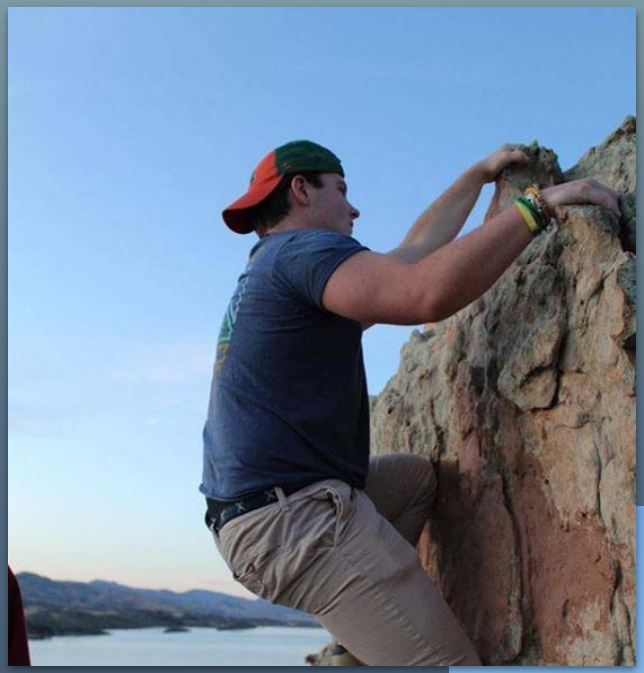
Borough of Ringwood Project

- Historical Data Review
- Watershed Modeling:
  - -Hydrologic Load
  - -Pollutant Load (sub-watershed)
  - -Pollutant Removal techniques
- Water Quality Assessment
  - -Baseline - watershed
  - -Storm - watershed
  - -Lake Based water quality data
    - Erskine Lakes (Upper and Lower)
    - Cupsaw Lake
    - Skyline Lakes (Upper and Lower)
    - Lake Riconda
- Assessment Report

SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

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



SCIENCE
ENGINEERING
DESIGN

PRINCETONHYDRO.COM

QUESTIONS?

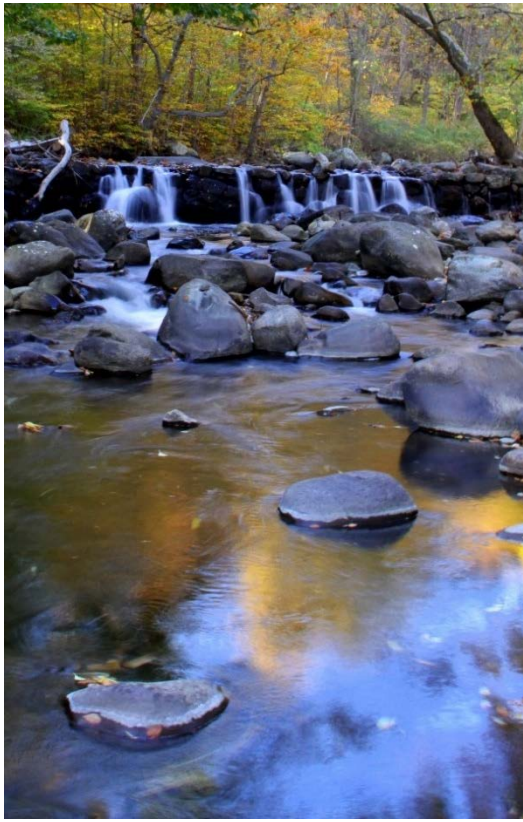
Chris L. Mikolajczyk, CLM
Senior Aquatics Project Manager
Princeton Hydro, LLC
cmiko@princetonhydro.com
908-237-5660 x114

THANK YOU!

PRINCETONHYDRO.COM

New Jersey Highlands Water Protection and Planning Council

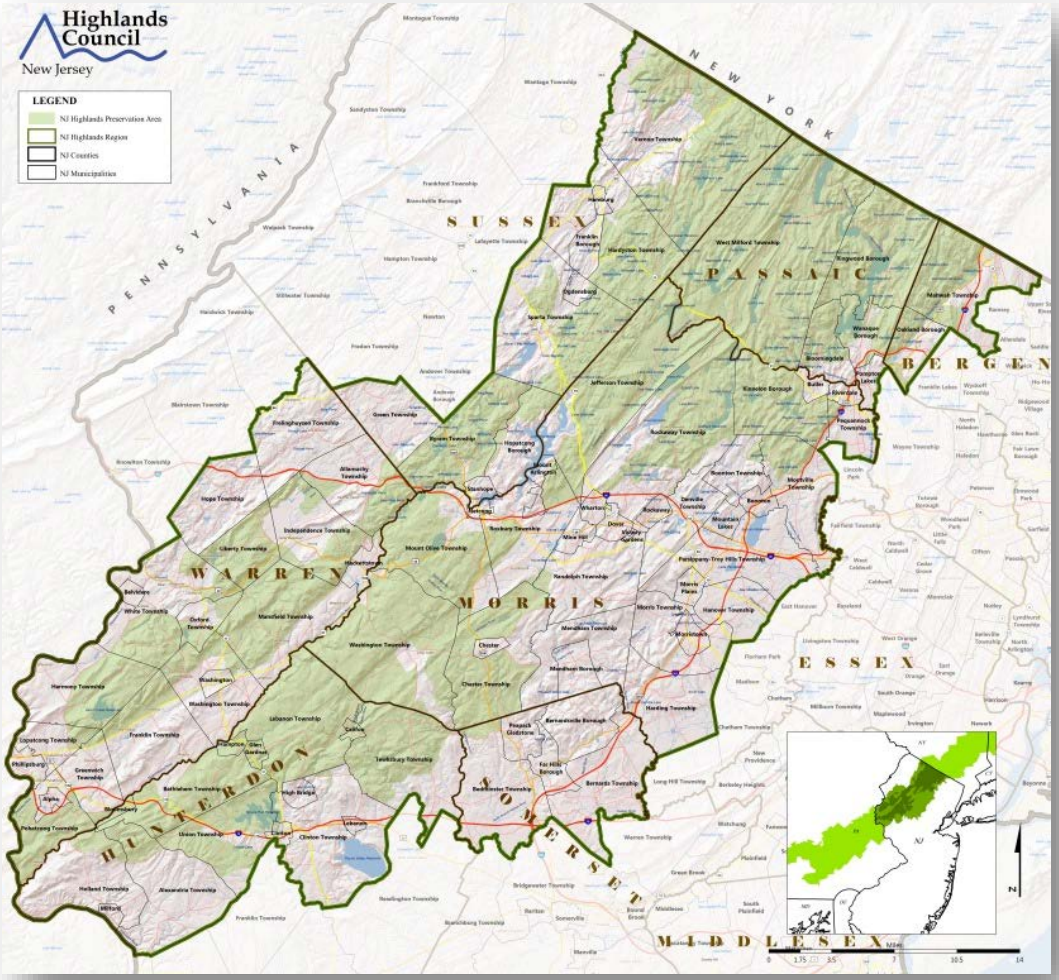
Grant Funding for Highlands Region Communities



NJ COLA - November 16, 2019

New Jersey Highlands Region

- The Highlands Region of New Jersey includes 88 municipalities and parts of 7 counties.
- The New Jersey Highlands Water Protection and Planning Act of 2004 was created to protect the region.



Highlands Council New Jersey

Because water and other natural resources do not follow municipal boundaries, a regional approach is required to protect and conserve the vital natural resources of the Highlands.

New Jersey Highlands Regional Master Plan (RMP)

- The New Jersey Highlands Council was established in the Act as the agency responsible for implementation of the Act through a Regional Planning approach.
- The Regional Master Plan (RMP) was developed and published in 2008.
- The Highlands Council works with municipalities and counties to implement the Act and the RMP through local land use regulations and resource management planning.

Highlands Council
New Jersey

RMP Structure & Content

- The RMP is structured around the following planning considerations:
  - Natural, Water, and Agricultural Resources
  - Historic, Cultural, Archaeological, and Scenic Resources
  - Transportation, Landowner Equity, Sustainable Economic Development, Air Quality
- **Resource Management Planning & Guidance**
  - Stream Restoration
  - Lakes
  - Stormwater
  - Wastewater
  - Critical Habitat

Highlands Council New Jersey

Grant Funding & Planning Expertise Available

Water Quality Monitoring

Historic Preservation Planning and Cultural Resource Inventory

Green Building and Environmental Sustainability Planning

Highlands Center Planning

Alternative Wastewater Planning

Lake Management Planning

Water Use and Conservation Management Planning

Land Preservation & Stewardship Plan

Trails and Recreation Planning

Habitat Conservation & Management Planning

Municipal Master Plan Reexamination and Updates

Stormwater Management Planning

Scenic Resource Management Planning

Forest Stewardship Planning

Sustainable Economic Development Planning

Stream Corridor Protection/Restoration Planning

Highlands Council New Jersey

Examples of funded projects

Wellhead Protection Planning & Ordinance
$17,000
Mahwah Township
Bergen County

Stream Corridor Restoration Plan
$38,000
Washington Township
Morris County

Alternative Energy Model Ordinance and Facilities Plan
$7,000
Bethlehem Township
Hunterdon County

Historic Preservation Plan
$37,850
High Bridge
Hunterdon County
$13,500
Phillipsburg
Warren County

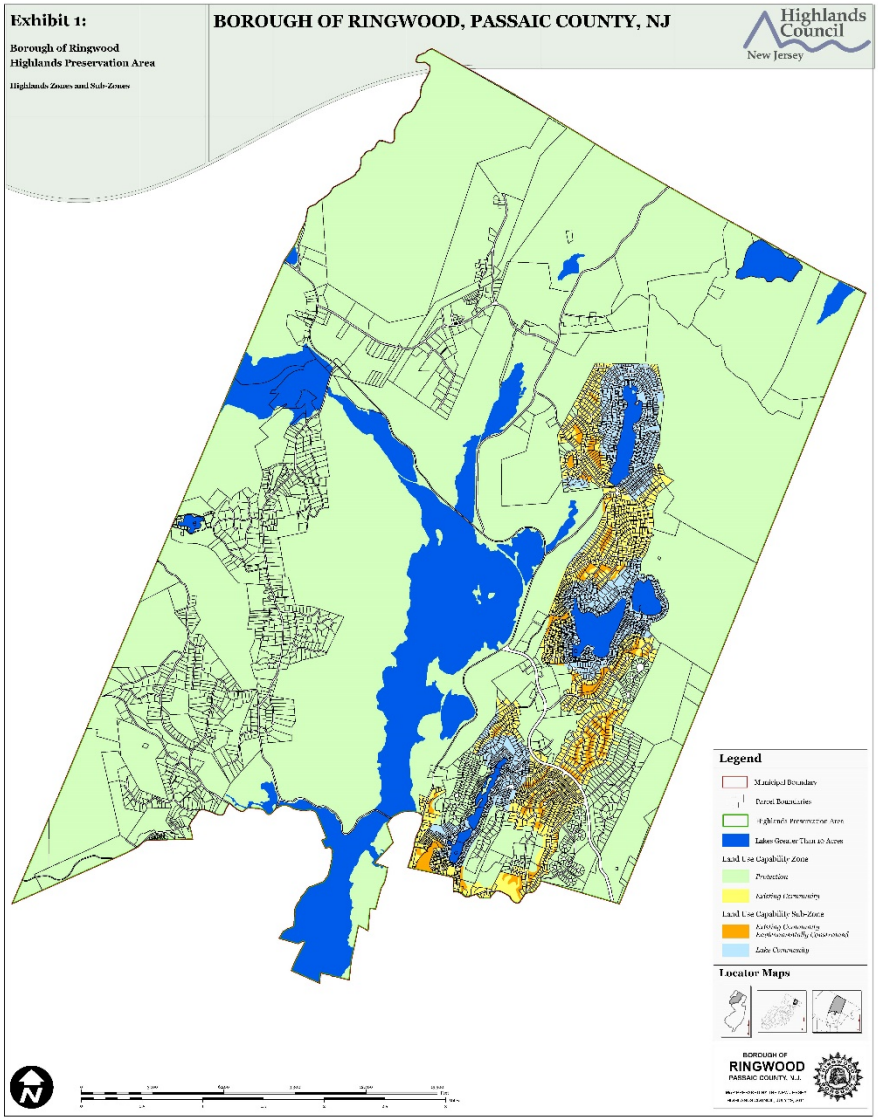
Watershed-Based Assessment of Lakes
$91,000
Ringwood Borough
Passaic County

Groundwater Recharge Enhancement Project
$85,000
Montville Township Morris County

Open Space and Recreation Plan
$21,000
Glen Gardner
Hunterdon County

Highlands Council
New Jersey

Ringwood Borough – Passaic County



Highlands Council
New Jersey

Ringwood Borough – Passaic County

- 100% Preservation Area.
- Petition for Plan Conformance approved October 2011.
- Approximately 2,100 lake acres in the Borough, including Wanaque Reservoir and numerous private lakes.
- Ringwood Borough Council requested assistance through the Highlands Plan Conformance Grant Program.
- Funding is reimbursement based, and can be utilized for planning initiatives only. Grant: $91,000

Highlands Council
New Jersey

Other Highlands Grants – can they help?

Stormwater Management Planning:

- Highlands Stormwater Management program:
  - comprehensive guidance materials and technical assistance
  - model ordinances
- Assists municipalities in compliance with the NJDEP MS4 permit requirements.
- Grants provided for this work, to address stormwater issues, and improve watershed water quality, especially for lake communities.

Highlands Council
New Jersey

Other Highlands Grants – can they help?

Wastewater Management Plans (WMPs):

- Highlands Council assists in development of municipal WMPs, to be submitted for adoption by NJDEP.
  - Technical expertise
  - GIS mapping
  - Build-out analysis
  - Document production
- Planning allows towns to:
  - Identify areas for sewers
  - Consider septic management
  - Address areas of failure
- Highland Grants provided for WMPs

  Grants also available for Innovative wastewater feasibility studies

Highlands Council New Jersey

Other Highlands Grants – can they help?

Stream Corridor and Other Planning:

Washington Township (Musconetcong River)

- Stream corridor assessment, water quality evaluation, restoration

Montville Township

- Stream corridor planning, recharge investigation project

Wharton Borough

- Lake plan & drainage study
- Implementation

Byram Township

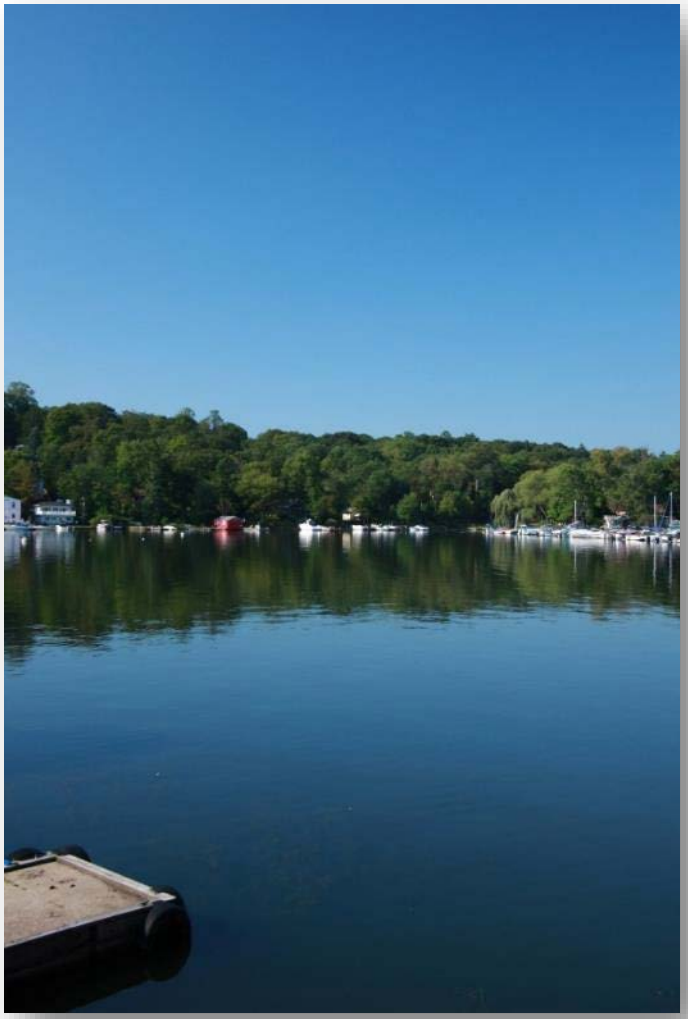
- Stormwater management
- Open Space & Asset Management

Highlands Council New Jersey

Lake Hopatcong Commission & Greenwood Lake Commission

Watershed Implementation Plans

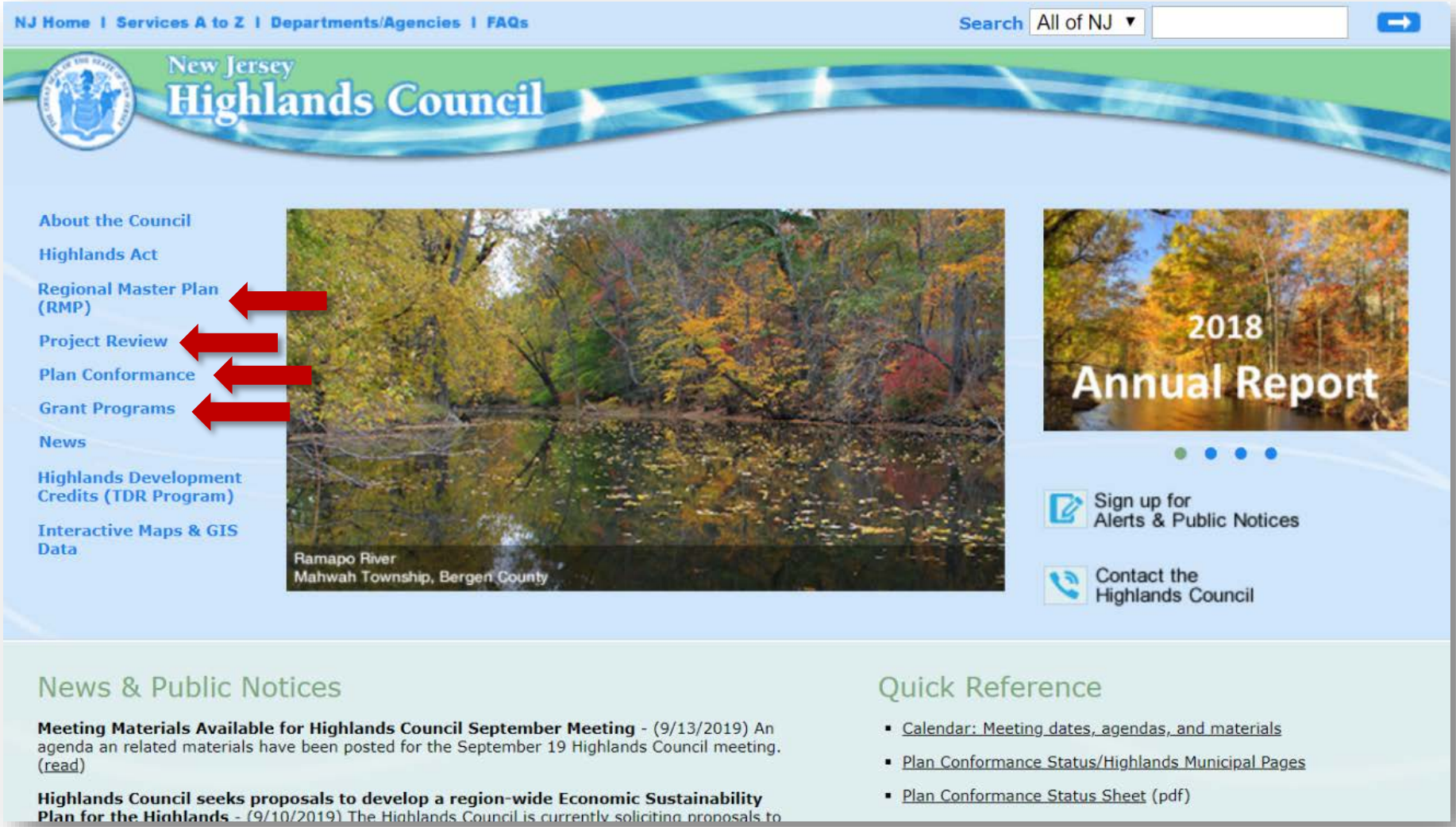
- WIPs position the watersheds for future NJDEP and USEPA funding for further watershed enhancement measures.
- Discussions on future funding for HAB prevention and planning.



Highlands Council New Jersey

Highlands Council Website

www.nj.gov/njhighlands/



Highlands Council
New Jersey

Questions?

Keri Green
Science Manager
New Jersey Highlands Council
keri.green@highlands.nj.gov
(908) 879-6737

photo by J Case