



Department of  
Environmental  
Conservation

# Clean Water Planning

April 12, 2018

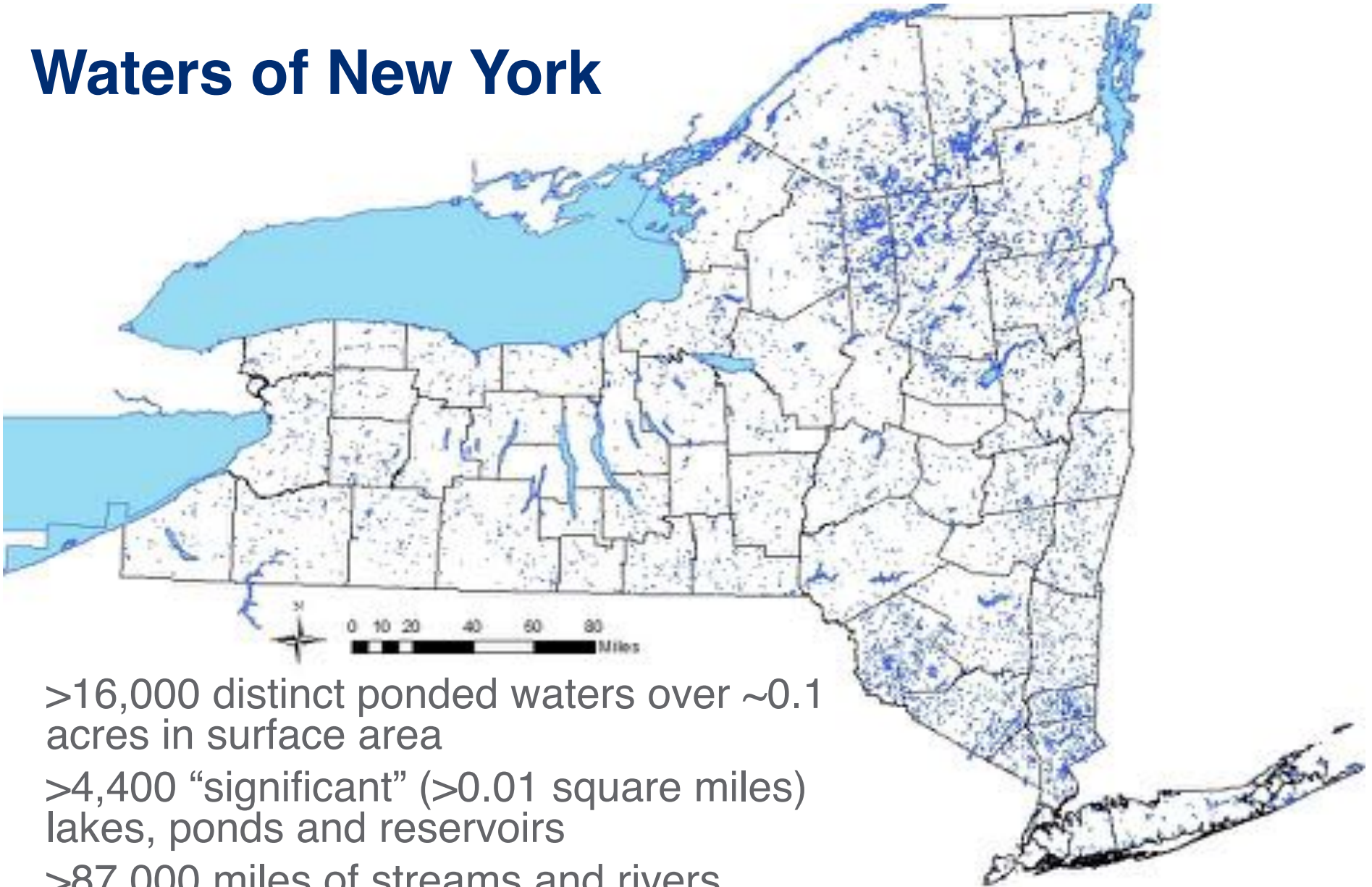
Healthy Streams, Healthy Water:  
Introduction to Watershed Planning

# What are clean water plans?

- Watershed-based approach to that outlines a strategy to improve water quality.
- TMDLs, 9E Plans
- These plans document the:
  - Pollutant sources and loads
  - Allowable pollutant level
  - Actions will improve water quality



# Waters of New York



>16,000 distinct ponded waters over ~0.1 acres in surface area

>4,400 “significant” (>0.01 square miles) lakes, ponds and reservoirs

>87,000 miles of streams and rivers

# How are waterbodies prioritized—303(d) & beyond?

DEC developed a strategy to prioritize waterbodies listed on the 303(d):

1. Identified pollutants of concern—nutrients & pathogens
2. Identified priority uses (impaired or unimpaired)--public
3. Scored & ranked waterbodies based on water quality data, public health & access, public interest, ecological importance
4. Developed list of waterbodies for TMDL or alternative plans

## Old model v. new strategy



Name	Class	T or TS	Access	Multiple Pollutants	Multiple Use Impairments	Proximity	BAP Score	Ecological Importance	Score
Saw Mill River	A	-	Public	DO, Path, Nut	Bath, Rec, Aquatic Life	5	3.57	TBD	
Steele Creek	A	TS	None/Private	Nut, Slt, Alg	Water supply	1	Need Data	TBD	



Name	Class	T or TS	Access	Multiple Pollutants	Multiple Use Impairments	Proximity	BAP Score	Ecological Importance	Score
Saw Mill River	1	0	1	0.75	0.75	0.5	0.5	0	4.5
Steel Creek	1	2	0	0.75	0.25	0.25	0	0	4.25

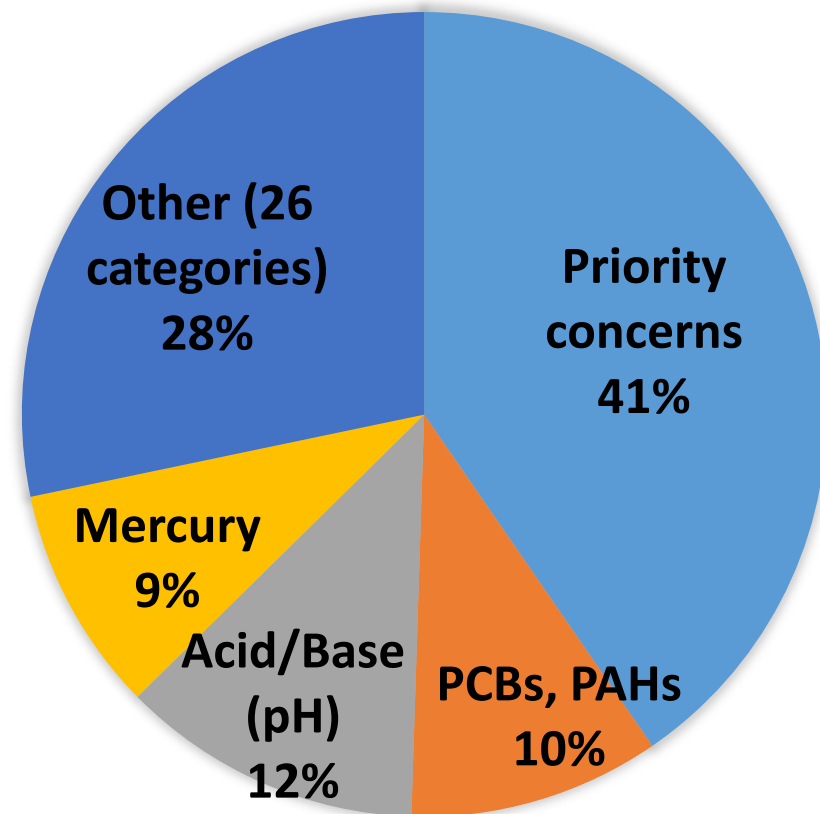
# Priority concerns

## Pollutants of Concern

- Nutrients
- Pathogens
- Dissolved oxygen

## Priority Uses—Public

- Drinking water supply
- Primary contact recreation
- Shellfishing



## 9E Plans v. TMDLs

Feature	9E Plan	TMDL
Pollutant sources	Better for Nonpoint	Better for Point (regulatory)
Implementation	Required	Optional
Public comment period	No (public participation throughout)	Yes
Agency approval	NYS DEC	EPA
Funding eligibility	Eligible for state & federal	Eligible for state & federal

Element	9E Plan	TMDL
A—Sources pollutant & loads	✓	✓
B—Water quality target & needed reductions	✓	✓
C—Identify BMPs	✓	✓
D—Identify resources needed to implement (financial and technical)	✓	✓
E—Outreach	✓	✓
F—Implementation schedule	✓	✓
G—Milestones to implement plan	✓	✓
H—Criteria to assess water quality improvement	✓	✓
I—Monitoring	✓	✓



## What about 9E plans?

- 1987- Section 319 Nonpoint Source Management Program was added to Clean Water Act
- Watershed-based plans part of program goals
- EPA & states re-envisioned Clean Water Act programs
  - 319 – Nonpoint Source
  - 303(d) – Impaired Waterbodies
- Program integration
- Water quality priorities
- Restoration & protection plans





## 9E Funding

### Planning

- Department of State Local Waterfront Revitalization Program (LWRP)
- Watershed Programs (e.g., HREP, Great Lakes Program)
- Clean Water Act Section 604(b)

### Implementation

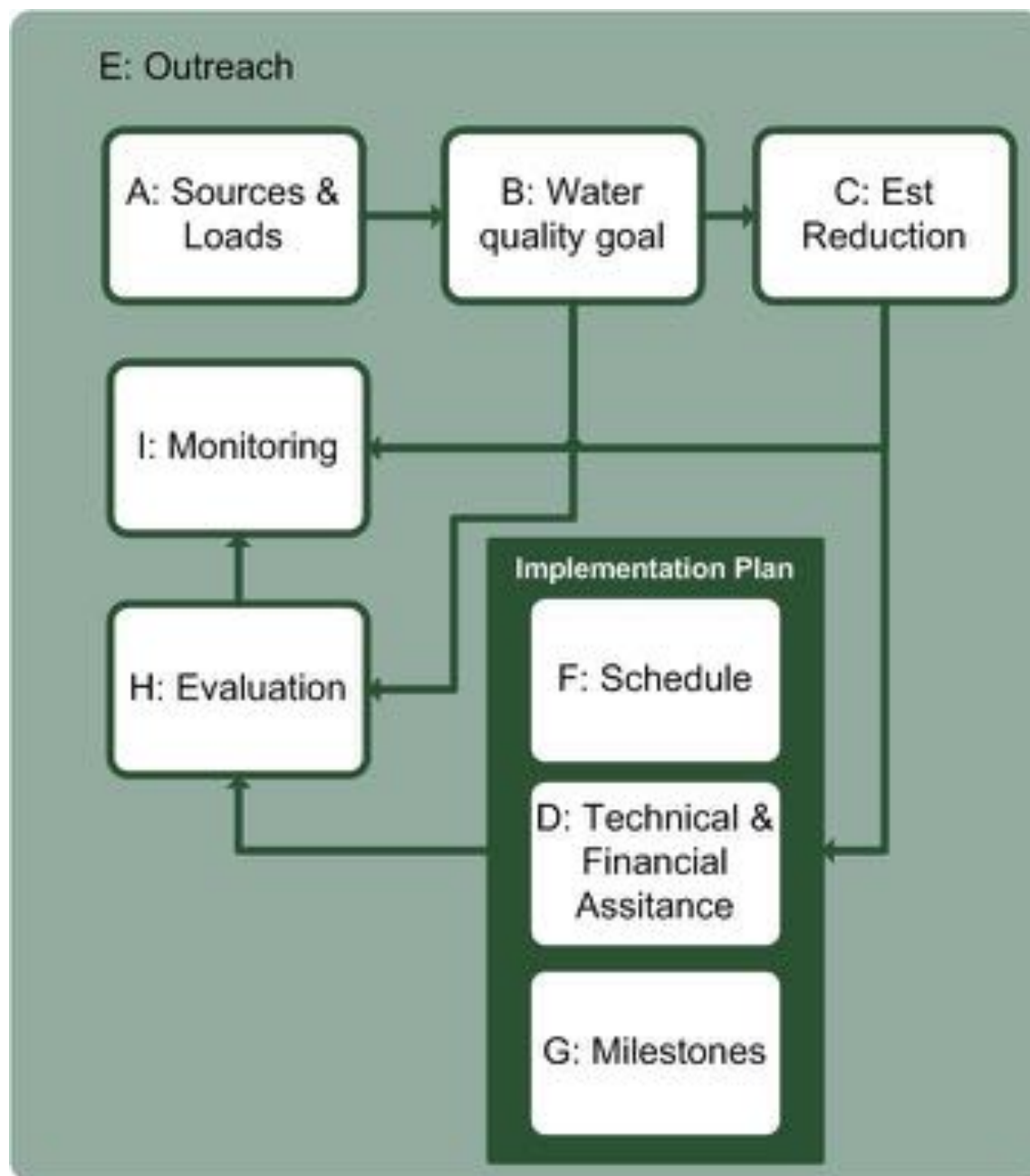
- Water Quality Improvement Project (WQIP)
- Great Lakes Restoration Initiative (GLRI)



# The 9 elements

- A. pollution loads sources identified & quantified in watershed
- B. identify target or goal to reduce pollutant load to reach water quality goal(s)
- C. BMPs to get reductions (estimated load reduction/BMP to achieve total reduction needed to improve WQ)
- D. how to pay for and implement BMPs identified in C
- E. Stakeholder input & getting help at local level to implement plan
- F. schedule to implement C
- G. progress on implementation of BMPs
- H. criteria to assess water quality improvement due to implementation of BMPs
- I. monitoring plan to collect water quality data to measure water quality improvement against criteria in H





## Very first step

- Review guidance on DEC website
- Review EPA 9E guidance
- Contact DEC regarding interest and to get questions answered

<http://www.dec.ny.gov/chemical/103264.html>



Department of  
Environmental  
Conservation

## Element E—outreach

- Watershed plans need partnerships to be successful
- Coordinate efforts
- Combine resources
- Build awareness
- Identify new ideas

*Stakeholders are defined as those who make and implement decision, those who are affected by the decisions made, and those who have the ability to assist or impede implementation of the decisions.*



## Element E—outreach

- Identify potential programs and activities relevant to your watershed
  - DEC monitoring programs stream & lake monitoring
  - DEC volunteer programs—CSLAP, WAVE, PEER
  - Watershed coalitions
  - Inter-municipal organizations
- Existing plans or activities/accomplishments
  - TMDL
  - Completed state funded projects
  - Agricultural Environmental Management (AEM)
  - Technical reports
  - Existing watershed plans
  - USDA programs

WHY REINVENT THE  
WHEEL WHEN YOU  
DON'T HAVE TO?



## Case Study: Small Pond



- Small pond in NYS
- Mix of land uses, but mostly forested
- Small watershed with residents along the shoreline
- Pond is used for recreation—swimming beach and fishing
- Pond is not a drinking water source
- Listed on 303(d) list for nutrients
- Residents have a lake association and participate in NYS DEC's CLSAP program
- Harmful algal blooms have been reported on this pond
- Residents are concerned about water quality and recreational uses



# Case Study: Small Pond



## Element E – Outreach

- Start communication at the local level
- Communicate with DEC

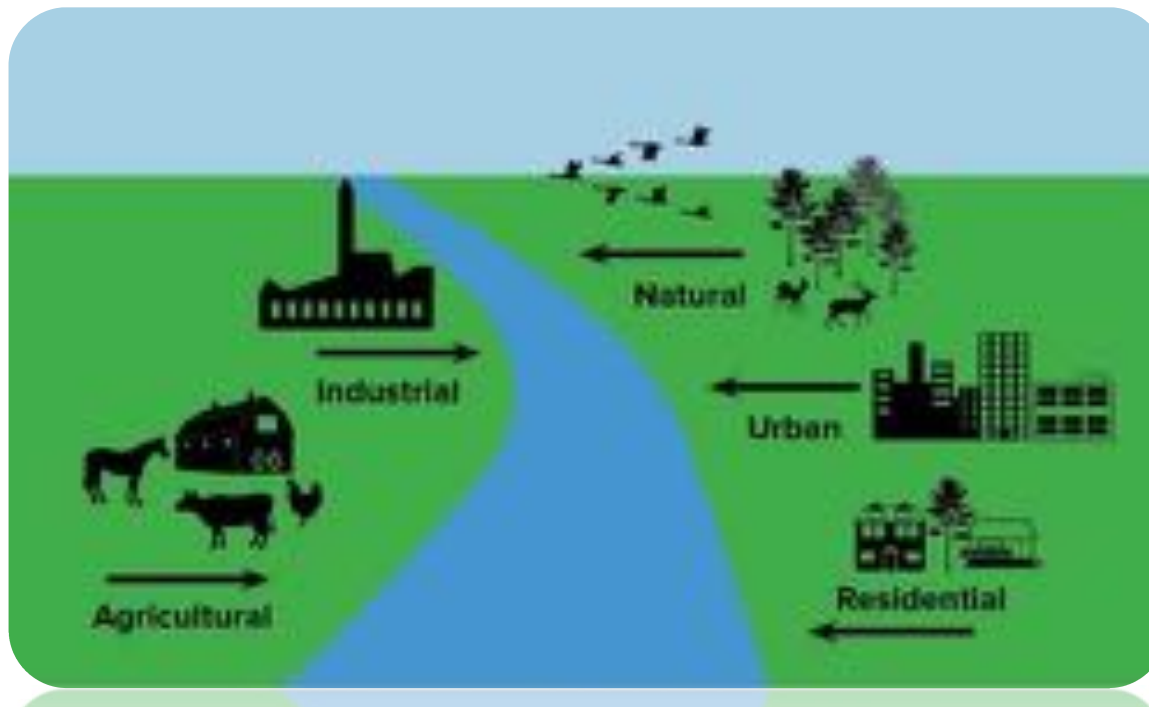
## Setting the stage

- What do you want for the waterbody
- What information (data/plans) exist
- Are their interested stakeholders
- Public meetings
  - Pitch plan
  - Identify who can help
  - Identify what is needed and why



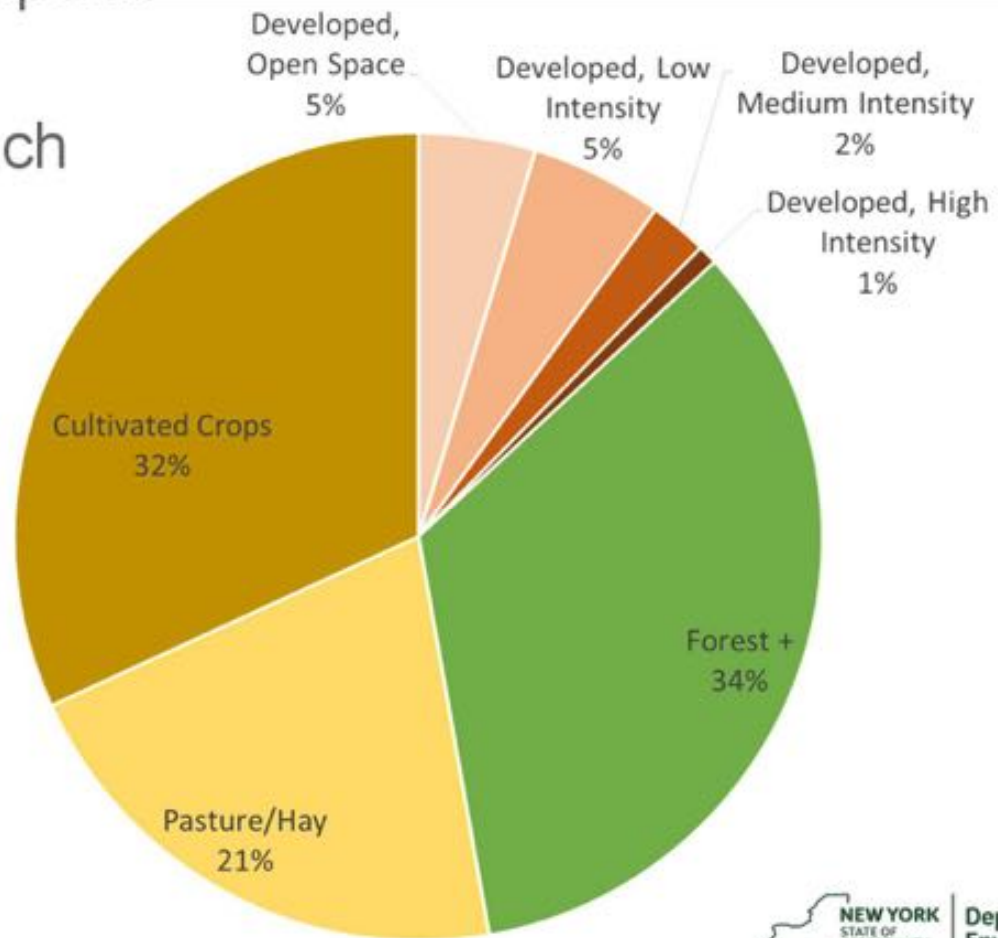
## Element A—characterize watershed & quantify loads

- Basis to develop effective management strategies
- Baseline to evaluate implementation
- Describe water quality data used & land use characterization
- Inventory of point and nonpoint sources



## Element A—quantify pollutant loads

- Identify point and nonpoint sources
- Assign loads from each source



## Element A—characterize watershed & quantify loads

- Indicates pollutants addressed by plan
- Assign loads to point and nonpoint sources
  - Modeling note: various approaches can be used for loading analysis
  - Communicate with DEC regarding modeling and data used in modeling QAPPs

*Essentially, all models are wrong, but some are useful*  
*--George E.P. Box*



## Element A—modeling...briefly

### Information be included about modeling

- Complexity of the system (e.g., watershed size, coastal influence)
- Type of model (watershed, hydrologic)
- Time scale of the analysis in relation to the pollutant of concern (i.e., pathogens—daily; DO—hourly, P—daily, monthly, annual),
- Assumptions of source load contributions from land uses
- Summary of model inputs (rainfall data, soils, etc..)
- Explanation that model output is sufficient to show water quality goals can be achieved, and
- Description of user experience with model



# Element A

## Watershed Analysis

### Land use

- Developed, low intensity
- Developed, medium intensity
- Developed, high intensity
- Forest
- Pasture/Hay
- Cultivated crops

### Point sources

- Wastewater treatment plants
- Other permitted facilities that discharge pollutant of concern

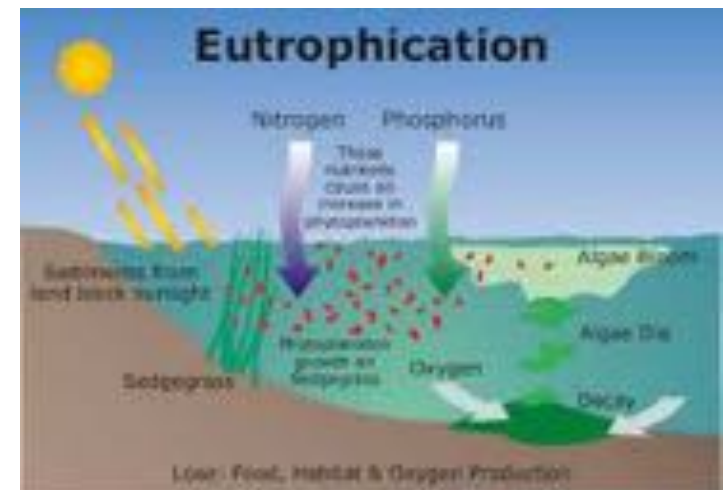
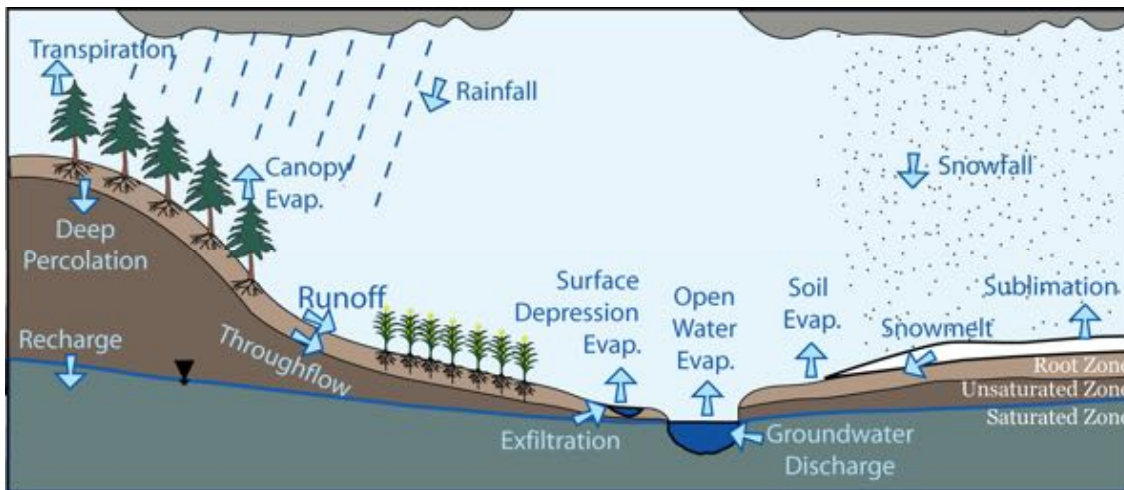
## Septic system loads

- Number within watershed
- Number within a specified distance of the waterbody (e.g., 250 ft)
- Number of seasonal homes with septic systems within a specified distance of waterbody (e.g., 250 ft)



# Types of models

## Watershed vs. Waterbody





# Watershed modeling – commonly used models

- Export Coefficient
- Simple Method
- Spreadsheet Tool for Estimating Pollutant Load (STEPL)
- Watershed Treatment Model (WTM)
- Nitrogen Loading Model (NLM)
- Mapshed
- Soil and Water Assessment Tool (SWAT)
- Hydrological Simulation Program—Fortran (HSPF)
- SWMM
- WASP

Increasing Complexity



Department of  
Environmental  
Conservation

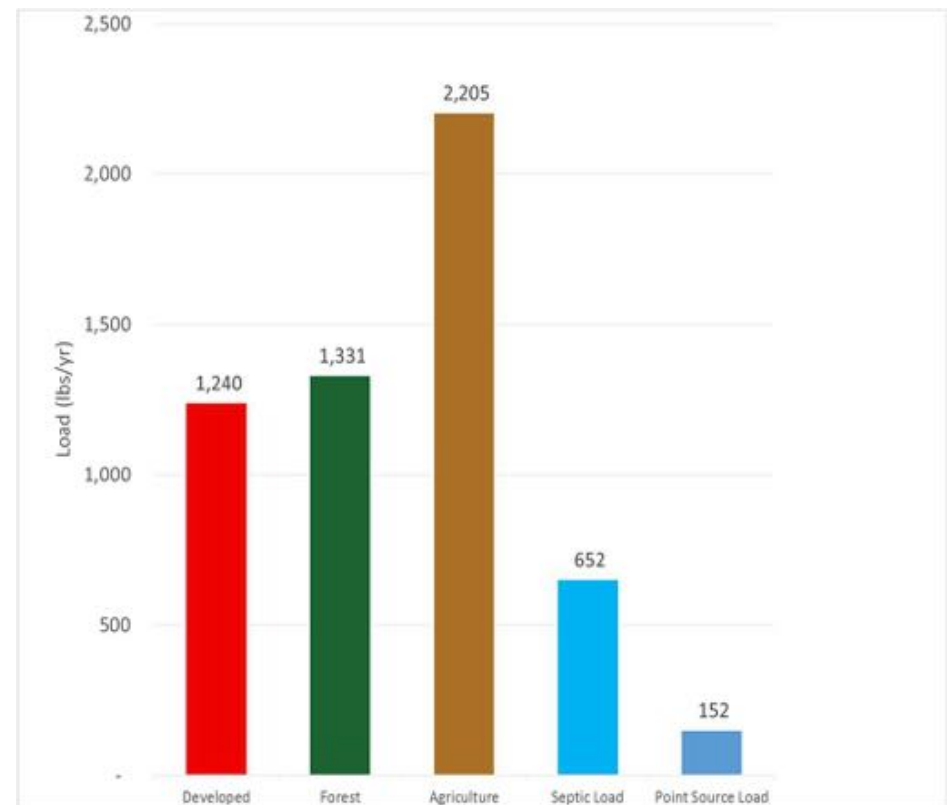
# Modeling – categories

## Simple

- Usually spreadsheet based
- Annual time scale
- Steady state (constant input/output)
- Not event based
- Event mean concentration
- Limited parameter adjustment
- Suitable for small watersheds

## Examples

- Simple method, export coefficient, PLoad, WTM, STEPL, NLM



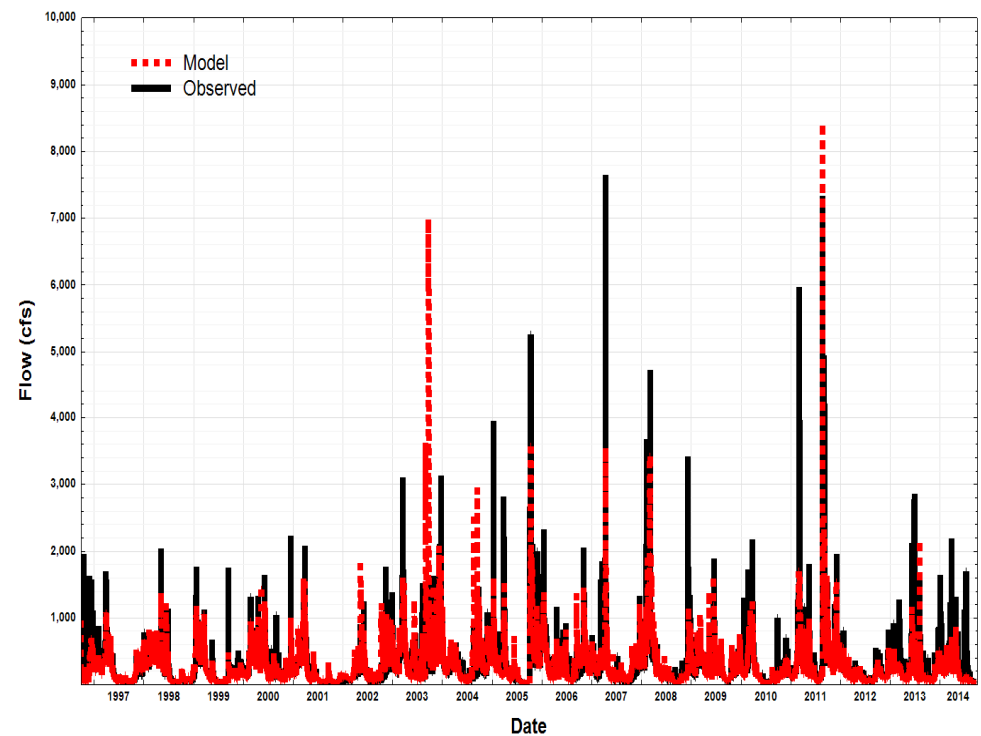
# Modeling – categories

## Complex

- Variable time scale monthly, daily, hourly, sub-hourly
- Dynamic (variable input/output)
- Extensive data requirements (e.g., hourly rainfall)
- Event based
- Expansive parameter adjustment
- Suitable for all watershed sizes

## Examples

- Mapshed, SWAT, HSPF, SWMM



# Modeling – pollution reductions

Accepted Best Management Practice Efficiencies

Management Practice	Land Use	Average Nitrogen Efficiency (%)	Average Phosphorus Efficiency (%)	Average Sediment Efficiency (%)
Barriard runoff control (roofs and covers)	Agriculture	20%	20%	40%
Bioretention/raingarden with underdrain	Urban	40%	40%	80%
Bioretention/raingarden without underdrain	Urban	100%	100%	100%
Bioswale with underdrain	Urban	40%	40%	80%
Bioswale without underdrain	Urban	100%	100%	100%
Cover crop	Agriculture	25%	11%	15%
Dirt and gravel road erosion and sediment control	Agriculture	—	—	2.77 lbs/ft
Ditch/channel stabilization	Urban	40%	40%	80%
Dry ponds	Urban	40%	40%	80%
Infiltration trench	Urban	100%	100%	100%
Permeable pavement with underdrain	Urban	40%	40%	80%
Permeable pavement without underdrain	Urban	100%	100%	100%
Prescribed grazing/rotational grazing	Agriculture	10%	24%	30%
Riparian buffer/filter strip	Urban	40%	40%	80%
Riparian forest buffer	Agriculture	42%	38%	50%
Riparian grass buffer	Agriculture	30%	38%	50%
Rooftop runoff disconnection	Urban	40%	40%	80%

# Modeling – managing pollution

Practical load reduction scenarios for phosphorus

- Developed land: 0-20%
- Forest: no reduction
- Agriculture: 0-60%
- Septic load: 0-100%
- Point source: effluent limits should consider technology capabilities (0.05 - 1.0 mg/L TP)



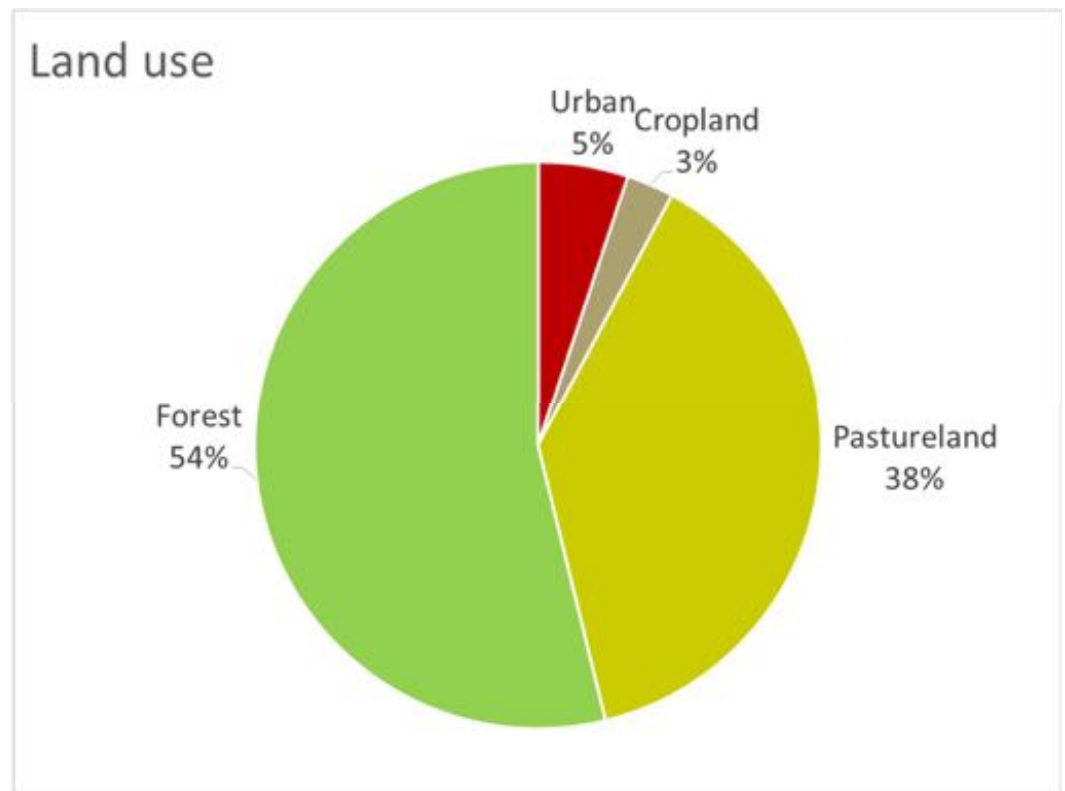


## Case Study: Small Pond

Element A (pollution loads sources identified & quantified in watershed)

### Watershed Characterization

- Area – 522 Acres
- Septic - 21 septic systems
- Point source - none



## Case Study: Small Pond



Element A (pollution loads sources identified & quantified in watershed)

Simple spreadsheet loading model -> STEPL

Series of empirical relationships which relate load to average waterbody concentration of TP and CHL-a

- Vollenweider and others
- Steady state
- Annual average

# QAPP



Department of  
Environmental  
Conservation



# QAPP—what?!

- Quality Assurance Project Plans (QAPP)
  - Outlines how environmental data will be collected: directly, other sources, or compiled
  - Outlines model selection or selection process, how model will be setup, run, calibrated, and validated
  - How data will be analyzed
  - Identifies quality control steps to ensure data collected meets intended objective

*Ensures that the data collected are of known quality and quantity to meet project objects.*



## QAPP—what?!

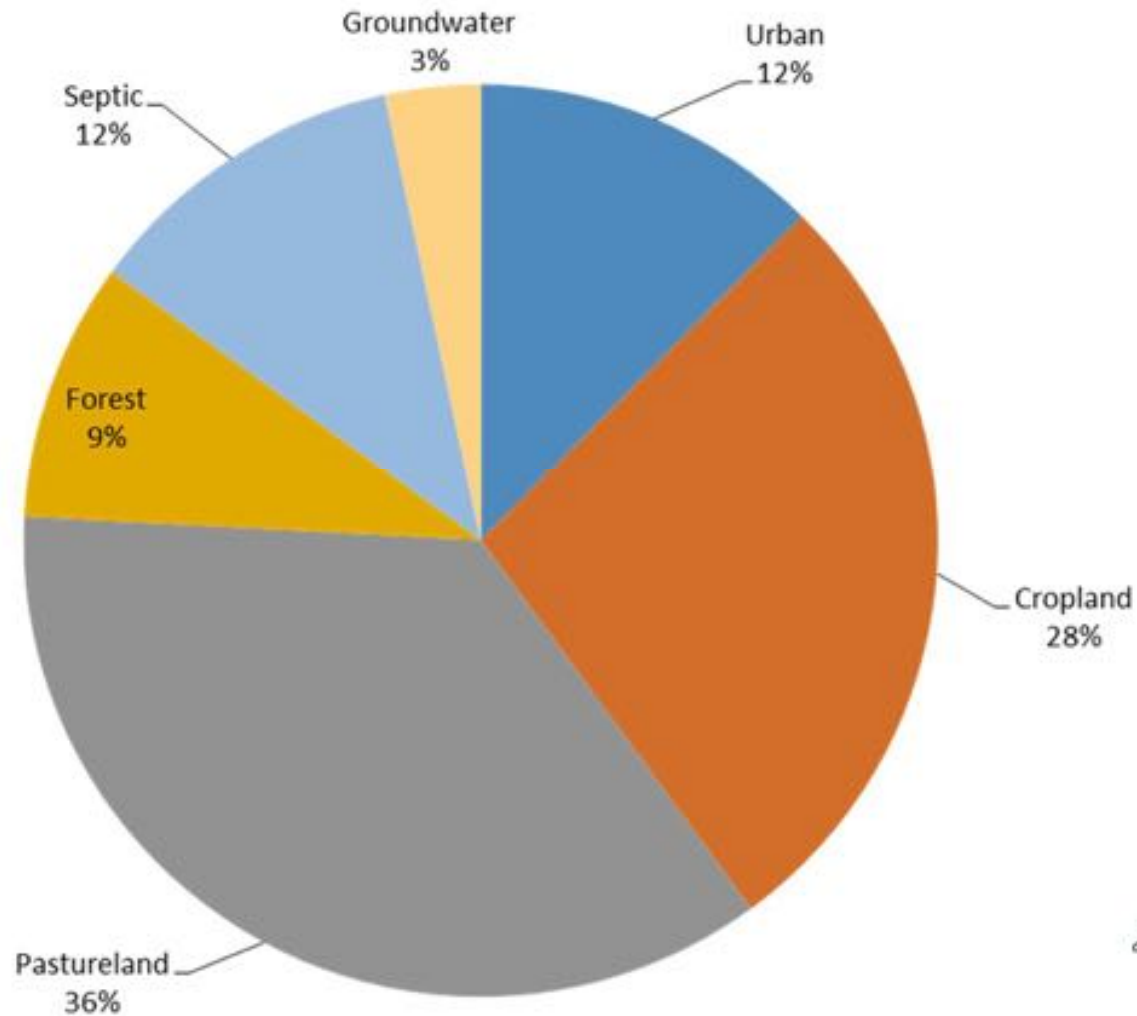
- Consistent data collection overtime
- Historical documentation of project
- Required for DEC and EPA projects



# Case Study: Small Pond



Total P Load by Land Uses (lb/yr)



## Element B—water quality goal

- Identify water quality target or goal
  - Meet water quality standards or best uses
- Determine pollutant reductions needed to reach water quality goal(s)
  - How much of the pollutant needs to be reduced from the sources



## Element B—water quality goal

Identify target or goal to reduce pollutant load to reach water quality goal(s)—the issues of concern to stakeholders (this is part of Element E)

- Goals may be based on improving water quality to achieve standards or best uses
- Identification of goal will help to determine the effective best management practices (Element C)
- Help to identify most appropriate evaluation criteria (Element H)



## Element B—water quality goal

### Resources to help identify

- Waterbody Inventory/Priority Waterbody List ( WI/PWL) (state identified concerns)—uses & impairments
- Stakeholder meetings (local identified concerns)—trash, protecting wetlands
- Analysis of watershed information (Element A)
- Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations)—numeric or narrative

DECinfo Locator:

<https://www.dec.ny.gov/pubs/109457.html>



Department of  
Environmental  
Conservation

## New York State narrative water quality standard for phosphorus:

“None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.”

Guidance value—20ug/L for ponded waterbodies





# Case Study: Small Pond



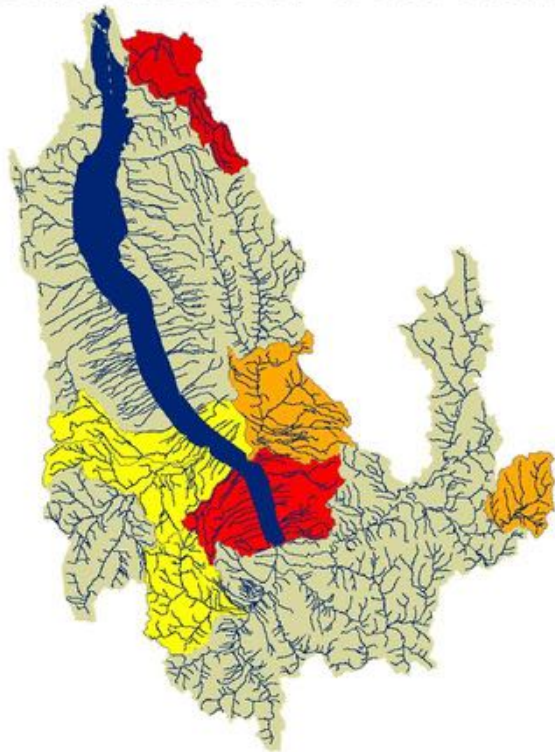
Element B: water quality goal(s)

- Remove from waterbody from 303(d)
- Less frequent HABs as reported to NYSDEC
- 20 ug/L ambient total phosphorus concentration
- 25% reduction in total phosphorus and evaluate ambient concentration



## Element C—how to meet the goal

- Identify best management practices (BMPs)
- Determine priority areas
- Rationale for selection



## Element C—how to meet the goal

Things to consider

- Existing plans documents?
- What's working now?
- What can be implemented?
- Will the identified practices achieve the reductions needed?
- Who will be implementing?
- What practices have been implemented?
- How is implementation going to be tracked?

WHY REINVENT THE  
WHEEL WHEN YOU  
DON'T HAVE TO?

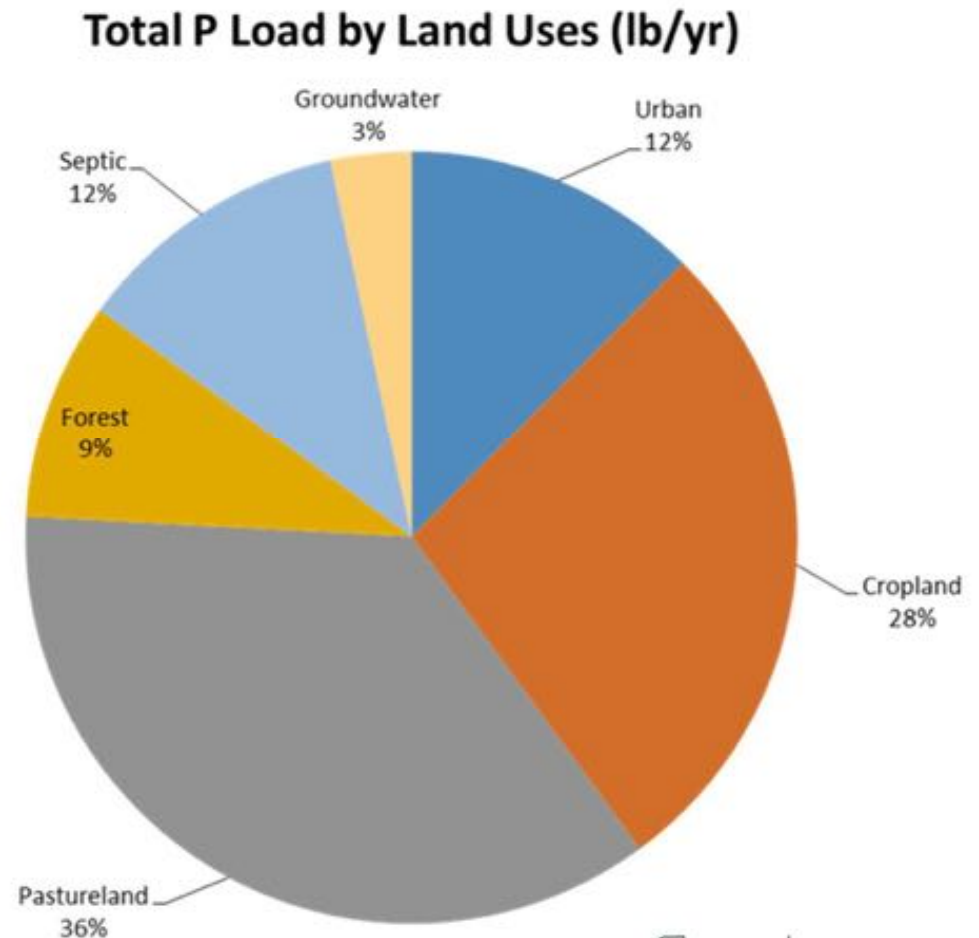




## Case Study: Small Pond

Element C: how to meet the goal

- Goal is to achieve a 25% reduction in TP load
- Pastureland and cropland accounts for 64% of load.



Department of  
Environmental  
Conservation





## Case Study: Small Pond

Element C: how to meet the goal

Practices to consider

- Stream fencing – 38% efficient (pastureland)
- Riparian forest buffer – 38% efficient (cropland)
- Cover crops – 11% efficient (cropland)
- Prescribed grazing – 24% efficient (pastureland)



# Case Study: Small Pond



Element C: how to meet the goal

25% reduction in TP load can be achieved by applying the following BMPs:

- Cropland – 14 ac of cover crops, and
- Cropland – 14 ac need to be directed through a forest buffer,
- Pastureland – 200 ac need to have stream fencing,
- Pastureland – 200 ac need to have prescribed grazing,



Department of  
Environmental  
Conservation

## Element D—assistance to support implementation actions

- Estimate of technical & financial assistance
- Describe potential funding sources, options for leveraging and opportunities for collaboration
- State & federal funding opportunities
  - Water Quality Improvement Program (WQIP)
  - Agricultural Nonpoint Source Abatement and Control Program (AgNPS)
  - EPA Great Lakes Restoration Initiative (GLRI)
  - USDA programs

NPS Funding Programs listed on:

<http://www.dec.ny.gov/chemical/109983.html>



Department of  
Environmental  
Conservation



## Case Study: Small Pond

Element D—assistance to support implementation actions

Financial assistance (state & federal):

- AgNPS
- WQIP land acquisition
- USDA programs
  - CREP
  - EQIP
  - Resource Conservation Partnership Program (RCPP)
  - Watershed Programs (e.g., Great Lakes Restoration Initiative (GLRI))

Technical Assistance: SWCDs, County Planning, Municipal organizations, DEC



Department of  
Environmental  
Conservation



## Element G—track progress of implementation (part of implementation plan)

- Identify measurable milestones (Element F)
  - Included in Element F (part of schedule)
  - Measurable and quantifiable
  - Appropriate measure goal/target for plan

### Examples

- Number or percentage of completed projects in critical areas
- Amount or percentage of acres/miles of BMPs installed
- Indirect (number of beach closures, frequency of blue-green algae blooms)
- Example: 10,222 acres of riparian forest buffers by 2025

## Case Study: Small Pond



Element G—track progress

- Develop system to keep track of implemented projects
- Prioritize sub-basins for BMP implementation in critical areas
- Completion of 20% of fencing acreage goal
- Completion 30% implementation of cover crops



Department of  
Environmental  
Conservation

## Element H—evaluation criteria

- Criteria used to track progress (Element G)
- Direct measurements based on monitoring data (nutrients, bacteria)
- Indirect (number of beach closures, frequency of blue-green algae blooms)
- Measurable and quantifiable
- Appropriate measure goal/target for plan

*“If you can’t measure it, you can’t manage it”*



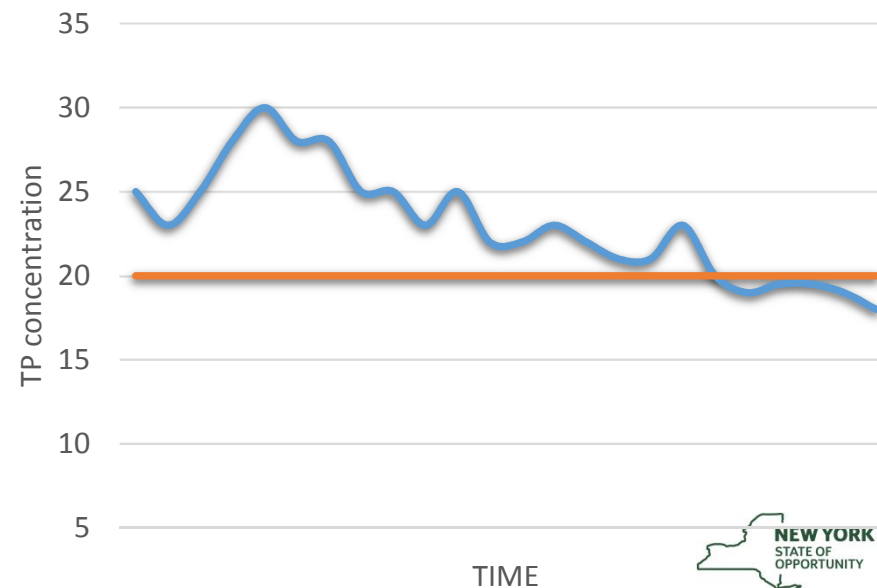
Department of  
Environmental  
Conservation

# Case Study: Small Pond



Element H—evaluation criteria (result of implementation)

- TP concentration collected through DEC CSLAP to track water quality trends
- Monitor for HABs and track reporting frequency to NYSDEC
- Fewer beach closures



Department of  
Environmental  
Conservation

## Element F—schedule

Includes:

- Management practices and associated technical and financial assistance needed to complete
- Short-term (3 yrs), mid-term (3-5 yrs) and long-term (5-10 yrs) activities
- For experienced watershed groups, implementation schedules could be estimated based on past experience.
- Milestones identified to evaluate progress
- Include when the plan would be reviewed & updated



# Case Study: Small Pond



## Element F – schedule

- Short-term(3yrs) implement ½ of BMPS
- Mid-term (3-5yrs) 100% implementation of BMPs
- Long-term (5-10 yrs)
  - assess water quality to reevaluate watershed condition;
  - update goals and implementation plan (e.g., different BMPs needed, protection efforts, stay hungry).
  - Schedule of long-term operation and maintenance of BMPs

## Element I—monitoring

Determined by elements A (pollution sources), F (implementation schedule), G (milestones) and H (criteria to evaluate load reductions):

- water quality trend analysis,
  - paired watershed designs, or
  - frequency of blue-green algae blooms (HABs)
  - tracking beach and shellfishing closures.
- Supports the criteria described in Element H
  - Requires sampling QAPP
  - Recommend use of DEC monitoring programs

***QAPP's ensure that the data collected are of known quality and quantity to meet project objects.***



Department of  
Environmental  
Conservation

# Case Study: Small Pond

Element I—monitoring

- DEC CSLAP monitoring program
- *CSLAP QAPP*



Department of  
Environmental  
Conservation



## Additional documentation for 9E plans

- Summary of qualifications & contact information
- QAPP(s)
- Other plans or reports used to develop 9E plan (TMDL, existing watershed plan, technical report)

### Recommendation:

Data collected and BMP implementation progress, as well as, model input/output and maps should be maintained in a database.

Will help to update and revise the analysis, track trends and ensure consistency of the data.

# Administrative stuff

- Technical support from DEC
  - Informal review
  - Modeling questions
  - Modeling support
  - QAPP templates & review
  - Reviewer guidance and checklist
- DEC approves QAPPs
- DEC approves final plans



# Case Study: Small Pond



## Administrative stuff

- Communicate with DEC before starting plan
- Include DEC on technical committee
- Submit QAPP to DEC for approval or QAPP guidance
- Communicate with DEC regarding modeling questions or assistance
- Submit draft plan for informal review by DEC
- Submit final revised plan to DEC for approval



# Questions?

Karen Stainbrook

Research Scientist

[karen.stainbrook@dec.ny.gov](mailto:karen.stainbrook@dec.ny.gov)

Ken Kosinski

Chief, Environmental Engineer

[kenneth.kosinski@dec.ny.gov](mailto:kenneth.kosinski@dec.ny.gov)



Department of  
Environmental  
Conservation