



**Office of Planning
and Development**

Department of State Watershed Planning Basics

**Introduction to watersheds, planning, and their
importance**

An Office of New York Department of State

April 13, 2022

Presentation Overview

- What is a watershed and its importance?
- Water quality and its importance
- What is a Watershed Management Plan (WMP)? Types of plans (i.e. 9E)
- Review of Watershed Planning
- Requirements
- Projects, Implementation and Examples
- Succeeding in implementing the WMP

April 13, 2022

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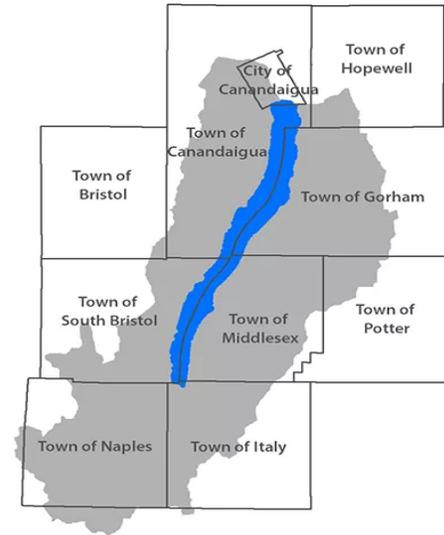
Watershed & its importance

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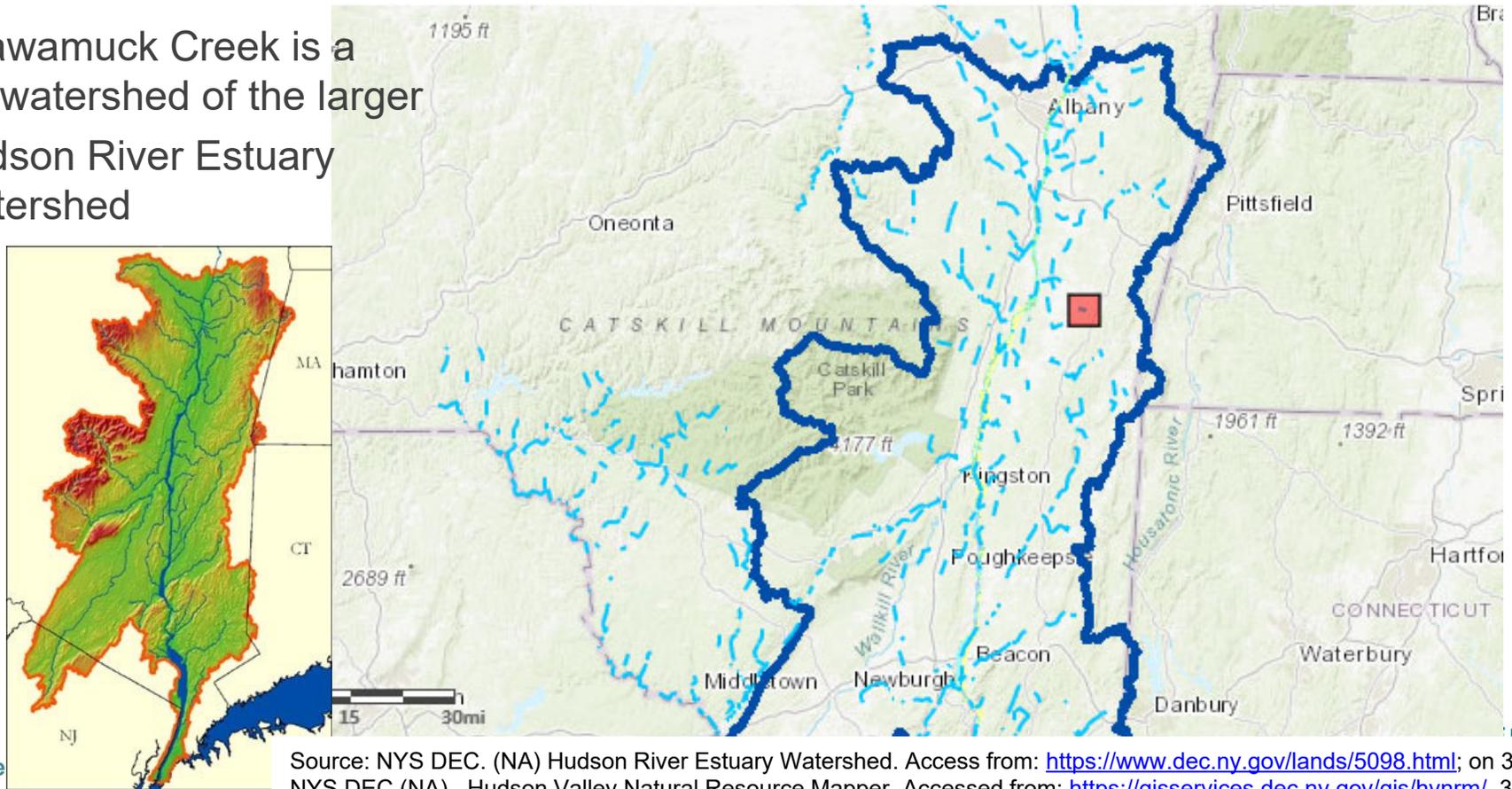
What is a watershed?

- Area of land that contains common set of streams and rivers that all drain into single, larger body of water
- Can be broken down into different sizes depending on the scale you want examine
- Example:
Each Finger Lake has watersheds (such as Canandaigua Lake Watershed), but Finger Lakes are also part of much larger Great Lakes Basin.



Hudson River Estuary Watershed

Agawamuck Creek is a subwatershed of the larger Hudson River Estuary Watershed

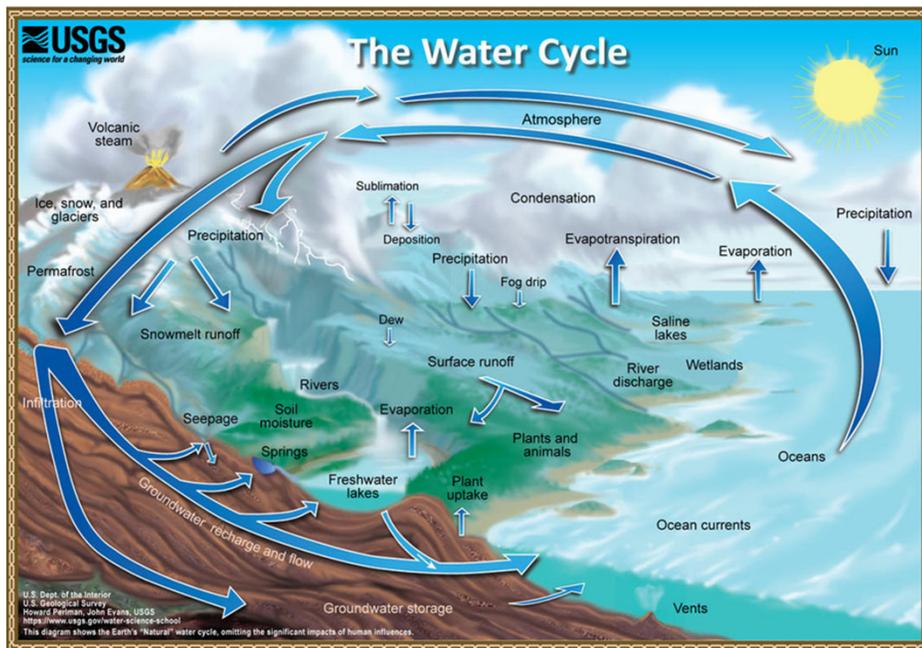


Source: NYS DEC. (NA) Hudson River Estuary Watershed. Access from: <https://www.dec.ny.gov/lands/5098.html>; on 3/18/2022.
NYS DEC (NA) . Hudson Valley Natural Resource Mapper. Accessed from: <https://gisservices.dec.ny.gov/gis/hvnrml/>. 3/18/2022



Water quality in the Watershed & its importance

The Hydrologic (Water) Cycle



- Continuous movement of water on, above, and below Earth's surface
- NY's water resources contribute to our quality of life

Surface Water Sources

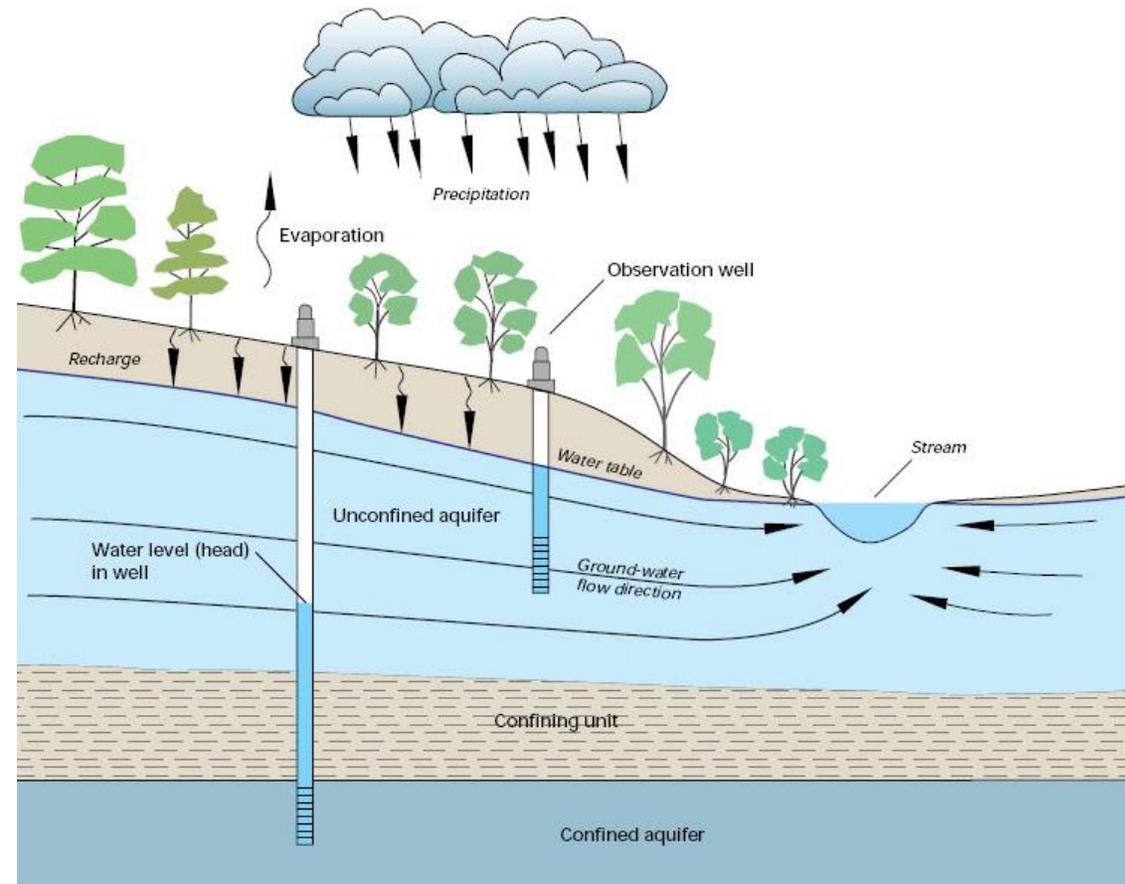
Section 5-1.1 (cv) Surface water means all water open to the atmosphere and subject to surface runoff.



Source: <http://seo.wyo.gov/surface-water>

Ground Water Sources

- Unconfined aquifer
- Confined aquifer



Where does my community get its drinking water?

Groundwater:

- Wells, usually drilled into aquifer

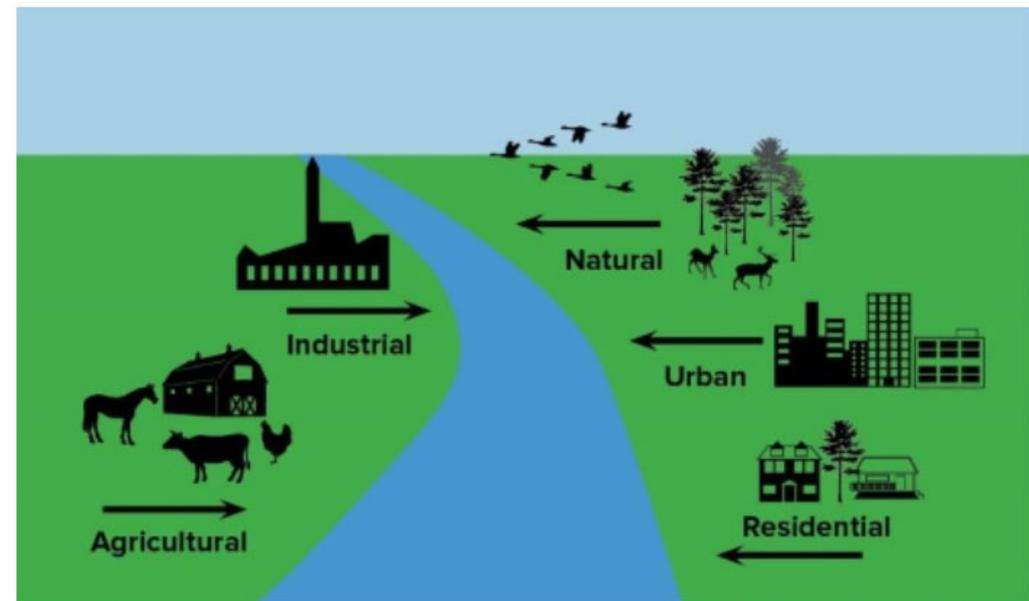
Surface Water:

- Reservoirs, Lakes
- Streams, Rivers



Water quality pollution

- Pollutants may flow directly into a pond or stream or be washed off the land.
- Some can also seep into the soil and contaminate groundwater.
- Depending on the type and level of pollution, waters may become unsuitable for fishing, swimming, or even for aquatic animals to survive.



There are many possible sources of pollution in a watershed.

Types of water quality (WQ) pollution

Point Source Pollution

"A single, identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship or factory smokestack." (U.S. EPA)

- Examples: factories, sewage treatment plants

Non-Point Source Pollution

Rainfall or snowmelt that picks up and carries away natural and human-made pollutants, depositing into lakes, rivers, wetlands, coastal waters, and ground waters

- Examples: excess fertilizer nutrients, pathogens and nutrients from faulty septic systems



Photo: U.S. Environmental Protection Agency, Region V.

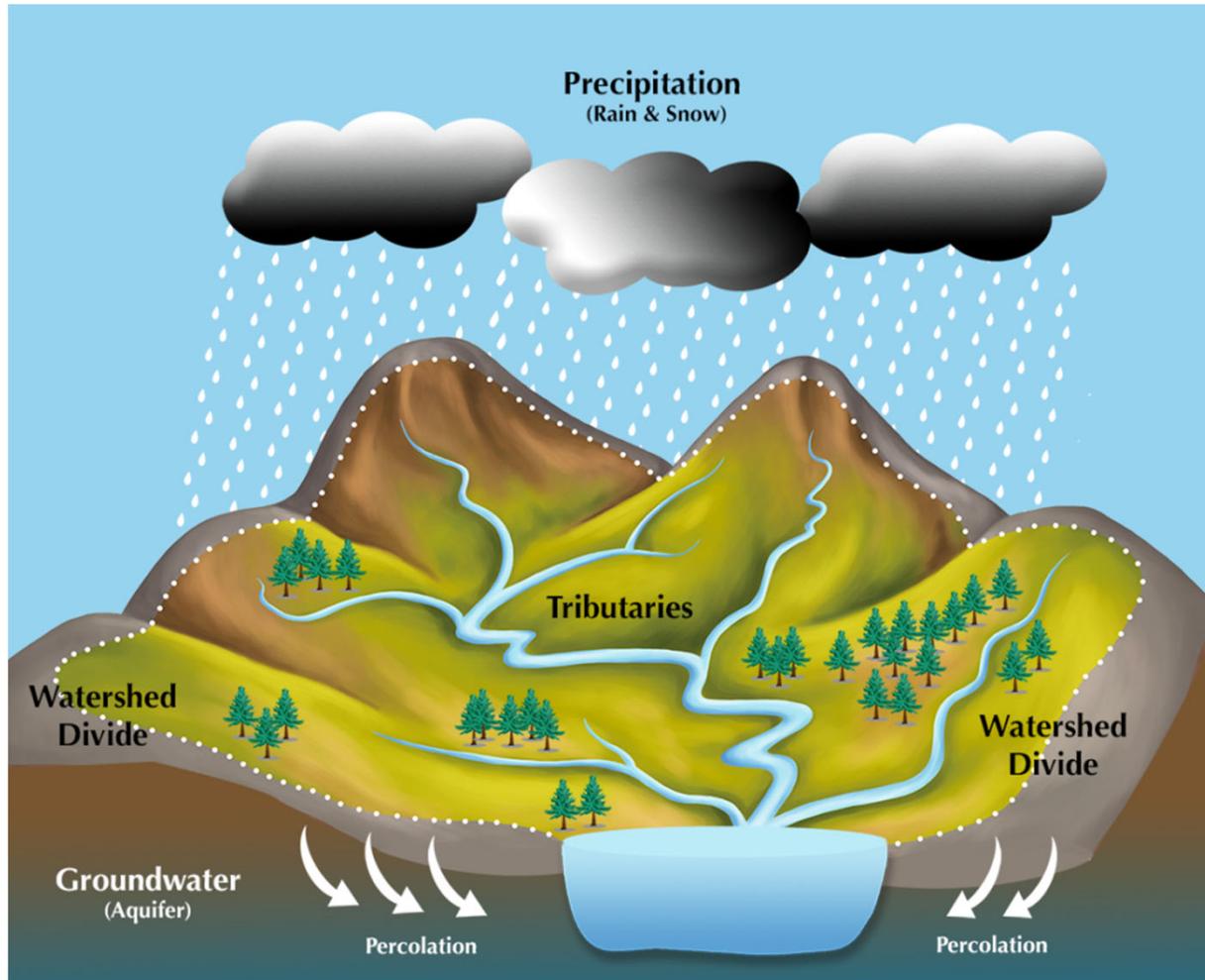


Photo: Paul Smith's College, Adk Watershed Institute, Road Salt Research

Water Quality (WQ) Topics

- Impairments
 - Sediment, excess nutrients, pathogens
- Sources
 - Stream/road bank erosion, agriculture, road maintenance practices
- Trends
 - Changes over time



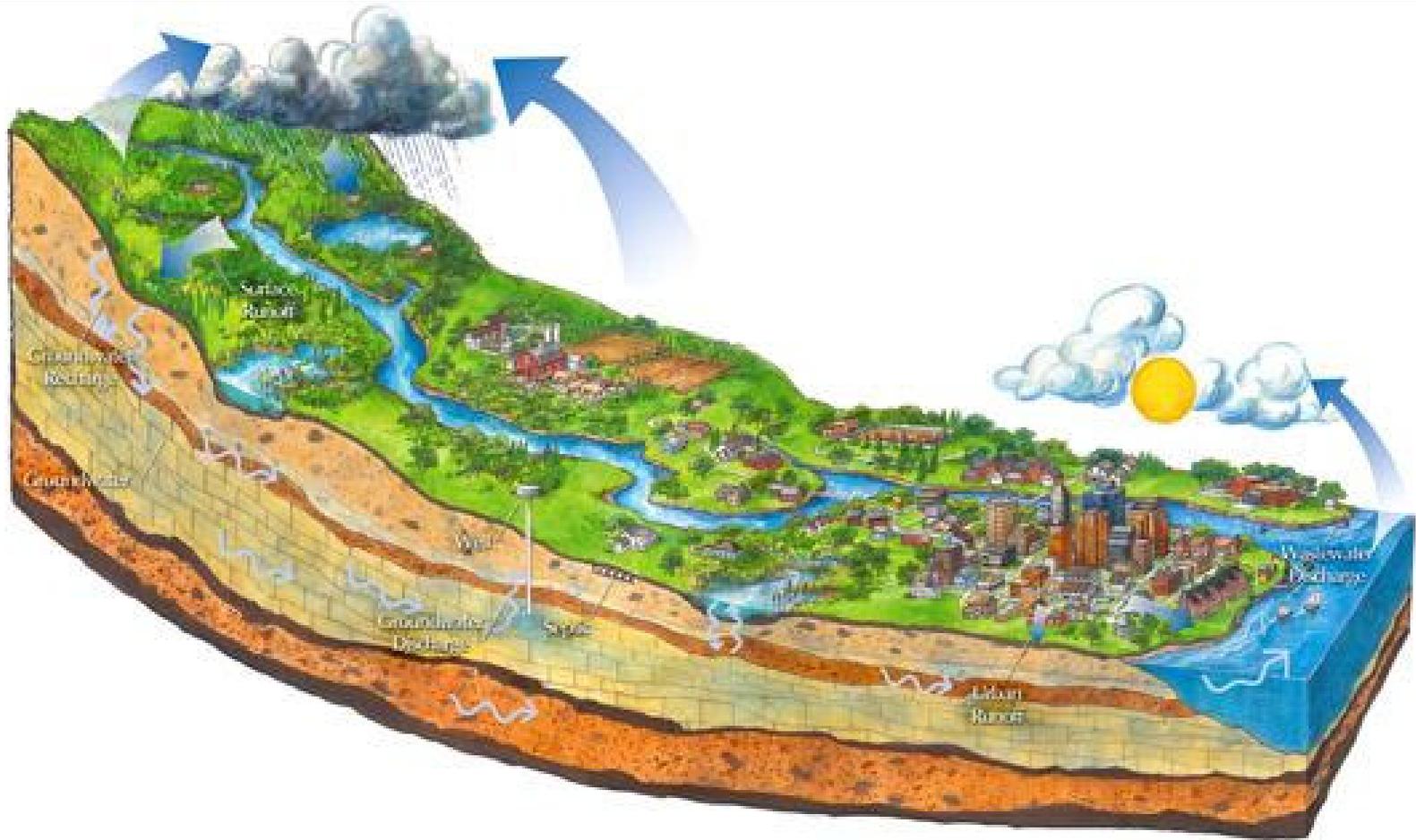


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See watershed image on Hudson River Watershed Alliance website:
<https://hudsonwatershed.org/what-is-a-watershed/>



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Source: Minnesota Pollution Control Agency (N/A). Access from: <https://www.pca.state.mn.us/water/what-watershed>

Benefits for water quality planning to my community

- Protect public health
- Avoid preventable drinking water treatment costs
- Increase community confidence
- Create long-lasting partnerships
- Utilize broad array of existing funding sources
- Save time in the long run



Local and Regional Solutions for WQ

Variety of options available to municipalities and regional groups for protecting and improving water quality:

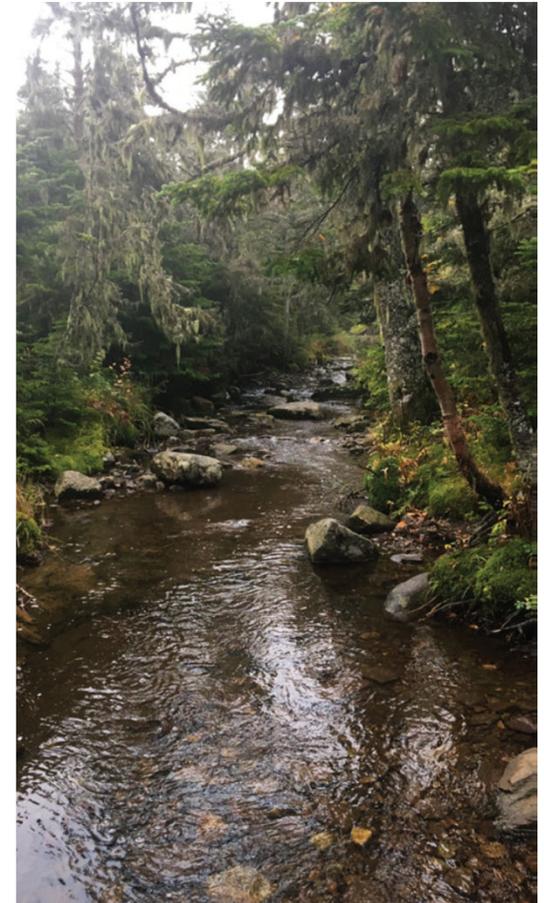
- Drinking Water Source Protection Program (DWSP2)
- **Watershed Planning** (includes 9E)
- Local Land Use



What is a Watershed Management Plan (WMP)?

Watershed planning

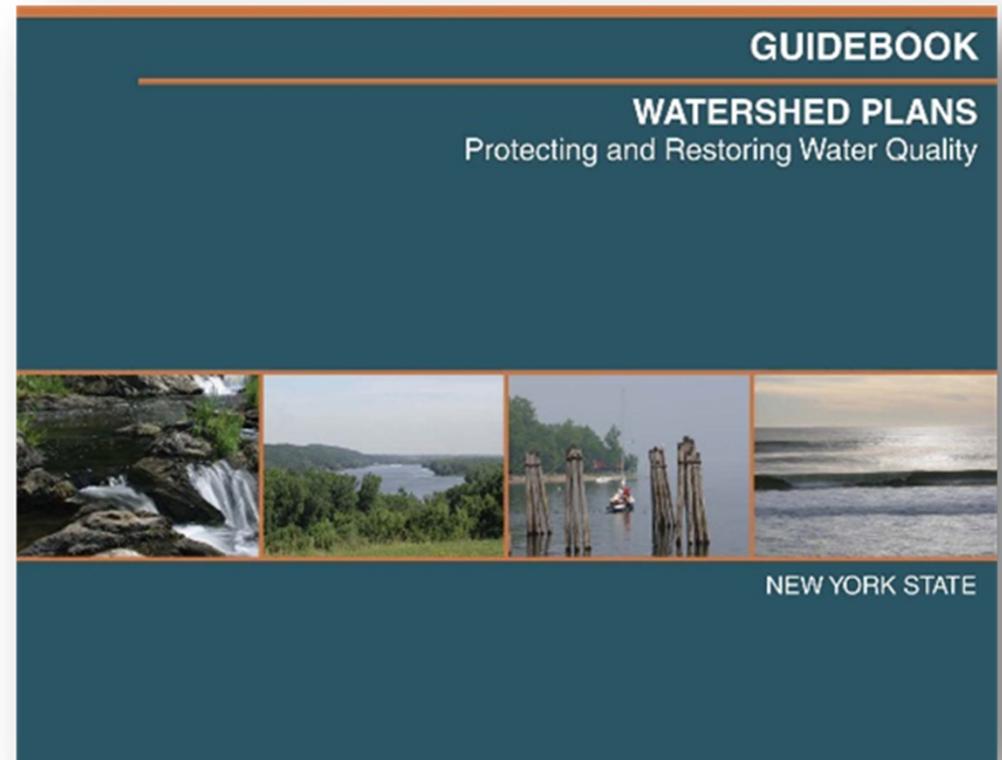
- Watershed plan looks at entire watershed or subwatershed
- Collaborative planning and protection approach
 - Addresses water resources in the (sub)watershed and all land from which water drains
 - Encourages communities to integrate water and land resource protection and restoration with growth management at local and regional level
- Explores existing conditions (i.e. local land use practices) and makes recommendations on improvements that can be made locally and regionally



Watershed Management Plans

Guidebook

- Why?
- Where?
- What?
- Who?
- How?



Water Resources Management Guidance

Overview: Watershed Planning

Watershed planning, stakeholder involvement, water quality assessment & plan components.

Watershed Plans: Protecting and Restoring Water Quality Guidebook

Process for communities to create a watershed plan to protect & improve water quality.

Watershed Plans: Protecting and Restoring Water Quality Video.

Highlights of communities benefitting from watershed planning.

Introduction to Watershed Planning

Watershed planning, including EPA's Minimum Elements of Successful Watershed Plans.

Funding Opportunities

DOS grants and other opportunities to help create sustainable & vibrant communities.

Visit: <https://dos.ny.gov/water-resources-management>

Why develop a watershed management plan?



Watershed based
management
approach



Clear direction
for future
development



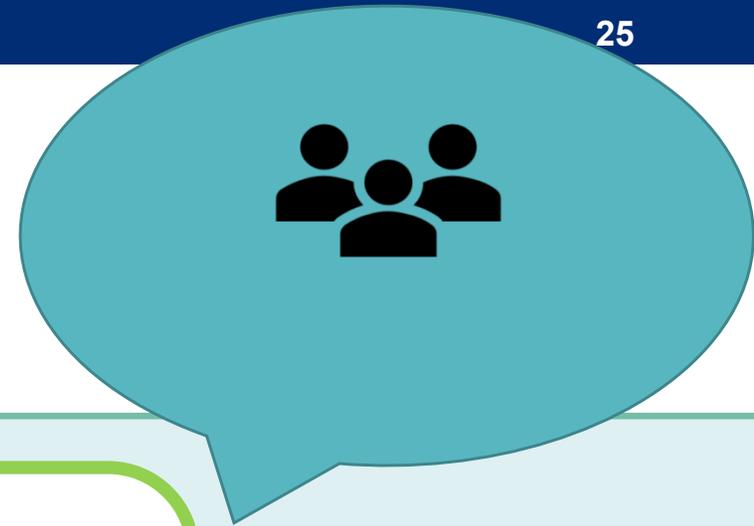
Develop long-
term
partnerships



More funding
opportunities

Types of Plans: 9 Elements (9E) Plans

The Nine Elements



Quantify
Pollutant
Inputs and
Sources



Set Pollutant
Reduction
Goals



Identify Best
Management
Practices



Schedule



Funding
Sources



Measure
Progress



Monitoring



Evaluation

Nine Element watershed planning

- Type of watershed management plan detailing community's water quality concerns and strategy to address concerns requiring additional quantification of pollutant loading and estimates of pollutant reductions to achieve water quality goals than standard watershed plans.
- NYD DEC adopted EPA's framework has nine key elements to ensure:
 - contributing causes and sources of nonpoint source pollution are identified;
 - key stakeholders are involved in planning process; and
 - Identify restoration and protection strategies to address water quality concerns.
- DOS and DEC work closely throughout process to provide assistance and coordinate approval for plans developed through Local Waterfront Revitalization Program (LWRP) grant

Nine Element Plan Continued

- Actively **engage** the public to capture local knowledge and priorities
- Use best available **science**
- Develop **quantitative tools** to predict how land use affects water quality
- **Set priorities to guide investment** in protection & remediation
- Commit to **adaptive management-** build and measure

From planning to implementation

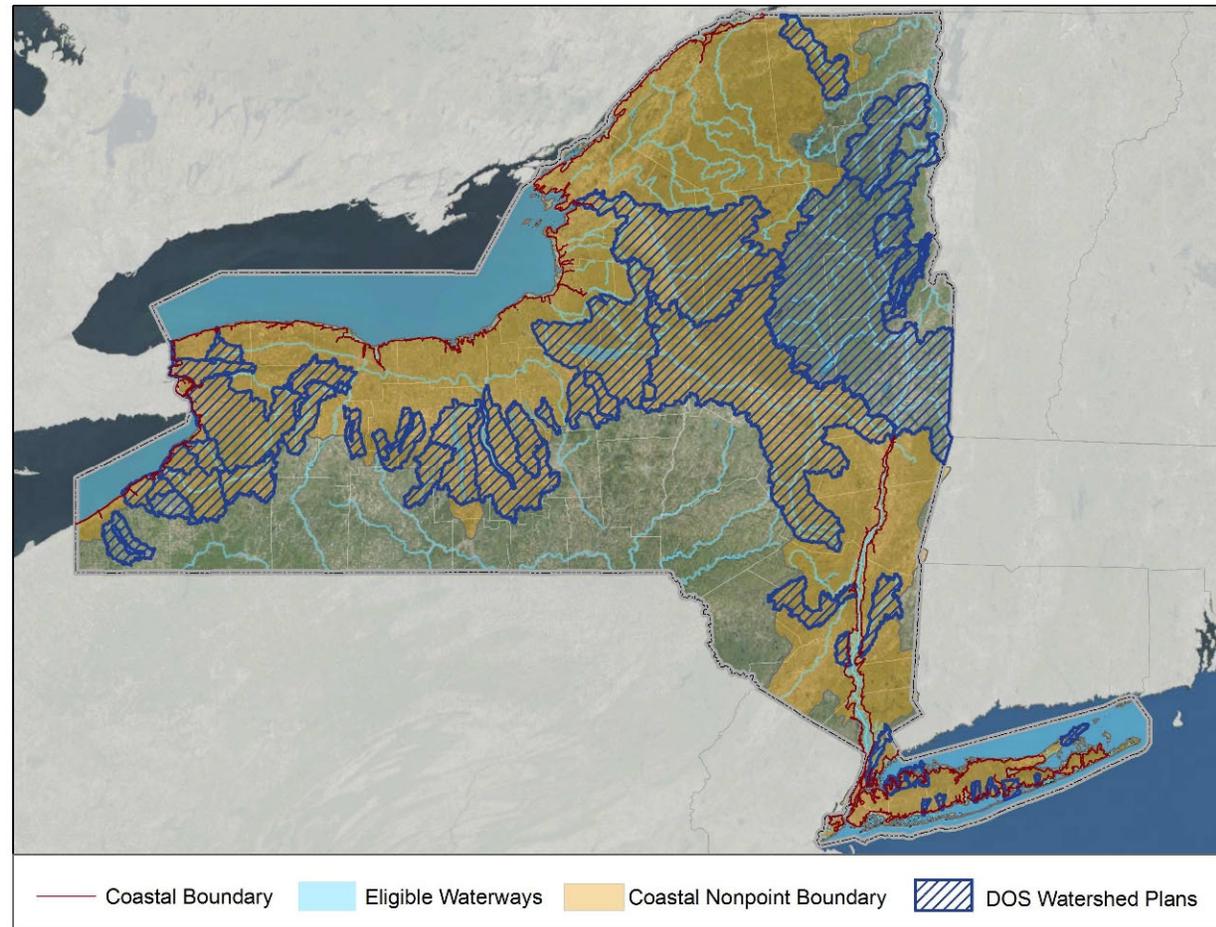
- Watershed Planning is a great program for holistic look at water quality at within your watershed. Having a completed plan will make your municipality eligible for future LWRP funding for implementation projects (e.g. implementing your projects and strategies you identified)

Types of Plans: Watershed Management Plans



Watershed Management Plans

- Coastal Waterways
- Designated Inland Waterways
 - NYS Executive Law, Article 42
- CNPCP Boundary
- 50+ Watershed Management Plans
 - 590 communities



Importance of Collaborative Approach: Intermunicipal Organizations

- Create capacity for multi-municipalities and opportunities
- Share services, implementation, education and training
- Structure: MOA/MOU, Organization



Greater Restoration and Protection

- Local land and water controls
 - Regulatory
 - Programmatic
- Municipal practices
- Stormwater BMPs
- Green Infrastructure
- Stream stabilization
- Wetland restoration



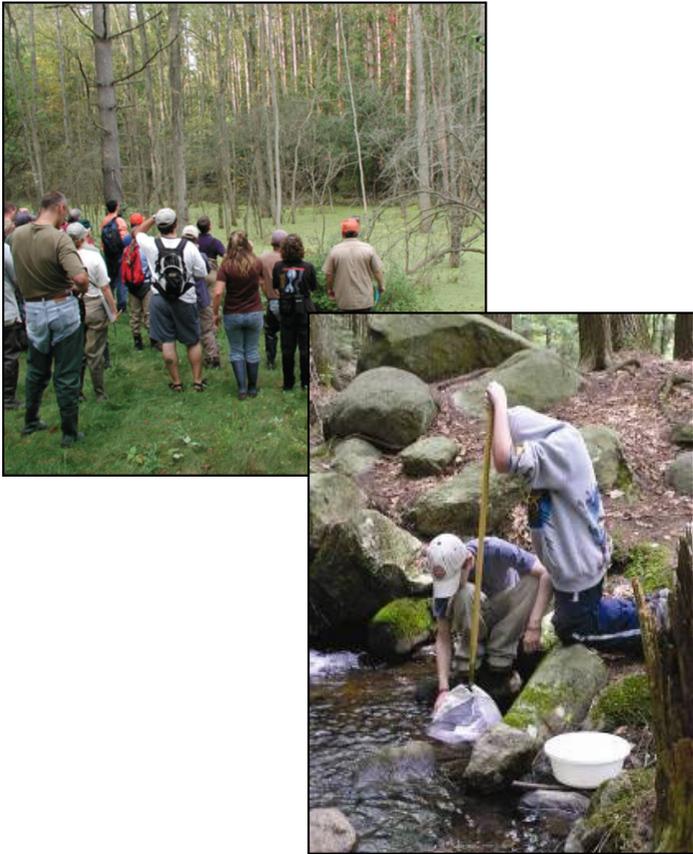
DOS Watershed Plan Framework - Chapters

- **Executive Summary**
- **Introduction**
- Characterization
(Tasks 8, 9 and 11)
- Watershed Management
Recommendations
(Tasks 16 and 18)
- Implementation Strategy
(Task 19)
- Monitoring and Tracking
(Task 20)

Your vision and goals (Task (T) 8): Examples



- Protect and enhance habitats of native plants and animals
- Adapt to a changing climate
- Ensure that communities retain their essential character while providing economic opportunity
- Resolve issues of legacy contamination and atmospheric deposition
- Increase awareness of how human actions affect the ecosystem
- Prepare for emerging issues and threats



Laying the Foundation:

- Planning for Community Involvement
 - Identify key stakeholders
 - Foster an appreciation of the watershed
 - Generate community consensus on strategies for addressing critical watershed issues



Laying the Foundation cont.:

* Establishing Partnerships

- Funding
- Data
- Technical Assistance

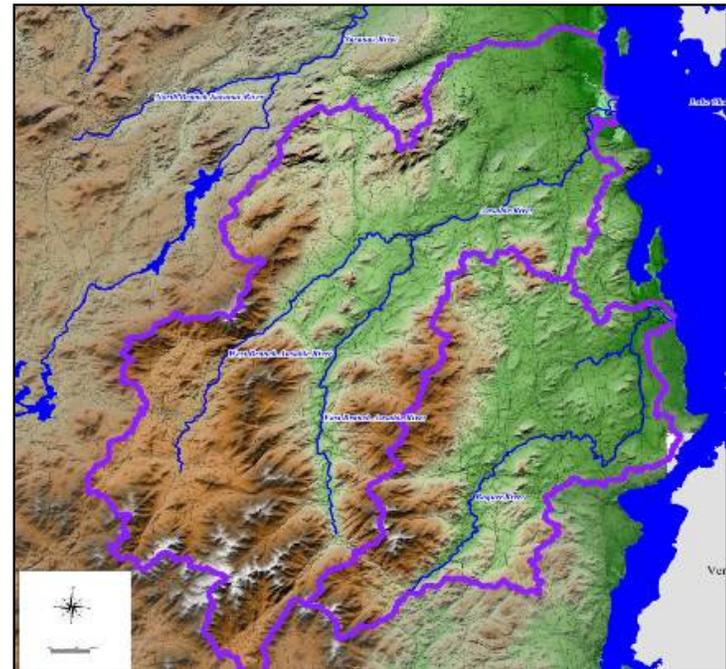
* Organizing a Watershed Advisory Committee (T2)

- Provide input on watershed issues
- Review reports, designs, and other documents
- Inform the public and local officials about the planning process



Characterization: Understanding your watershed

- Gathering existing data
 - Delineation
 - Land Use
 - Land Cover
 - Water Quality Data
 - Local controls, programs and practices



Characterization Chapter:

- Description and Assessment of Waterbody(ies) and Watershed Resources (T9)
- Description and Assessment of the Ability of Local Laws and Programs to Implement BMP to Protect Water Quality (T11)

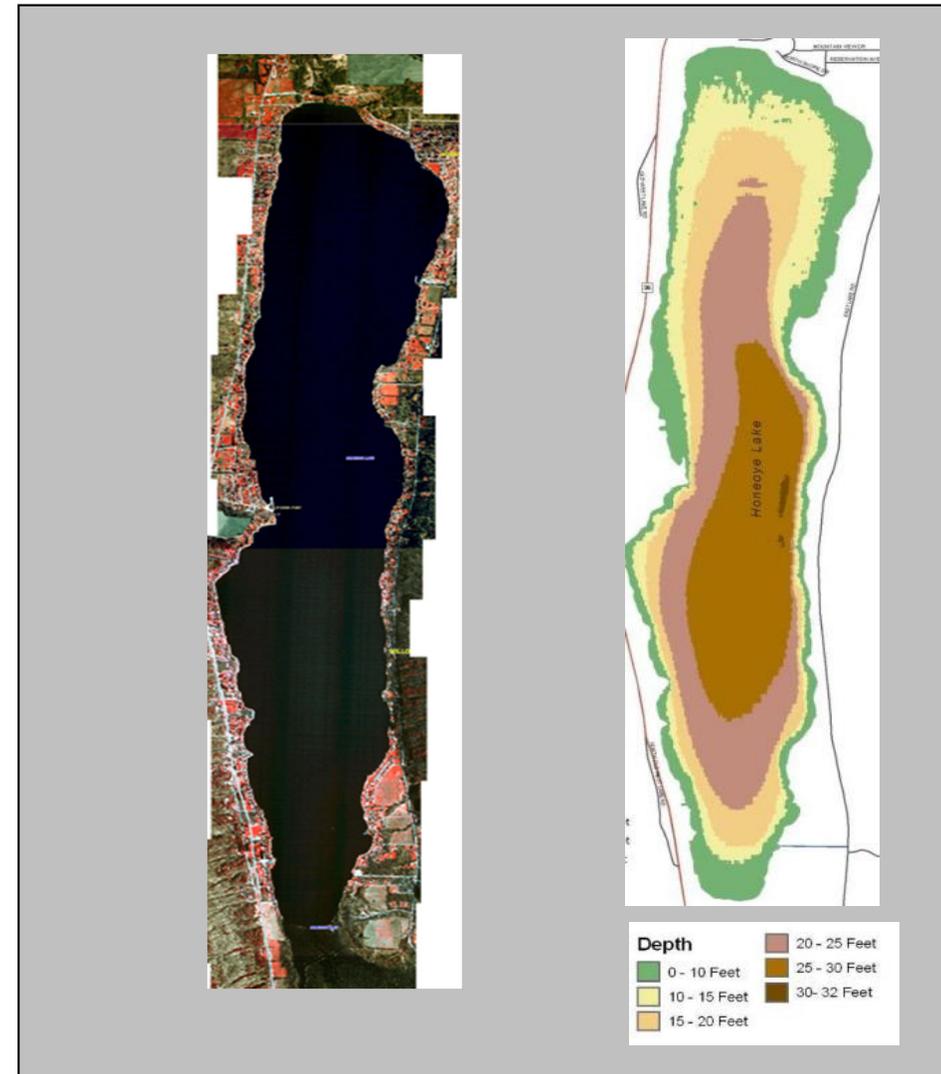


Indian Creek Nature Center, Rensselaer Falls. Photo Source: <https://indiancreeknaturecenter.us/>

Exploring Watershed Characterization

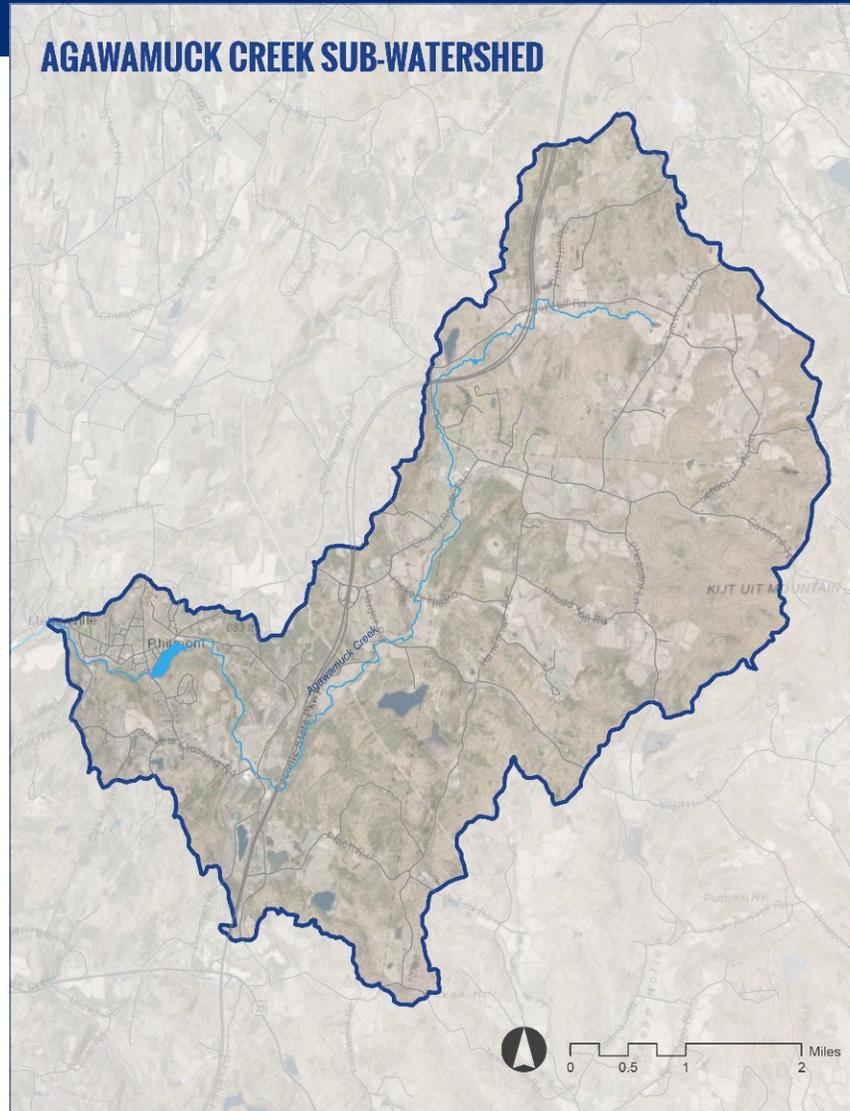
- Topography
- Subwatershed Delineation
- Soils
- Bedrock Geology
- Surficial Geology
- Land Cover
- Steep Slopes
- Sewer Districts
- Bathymetry

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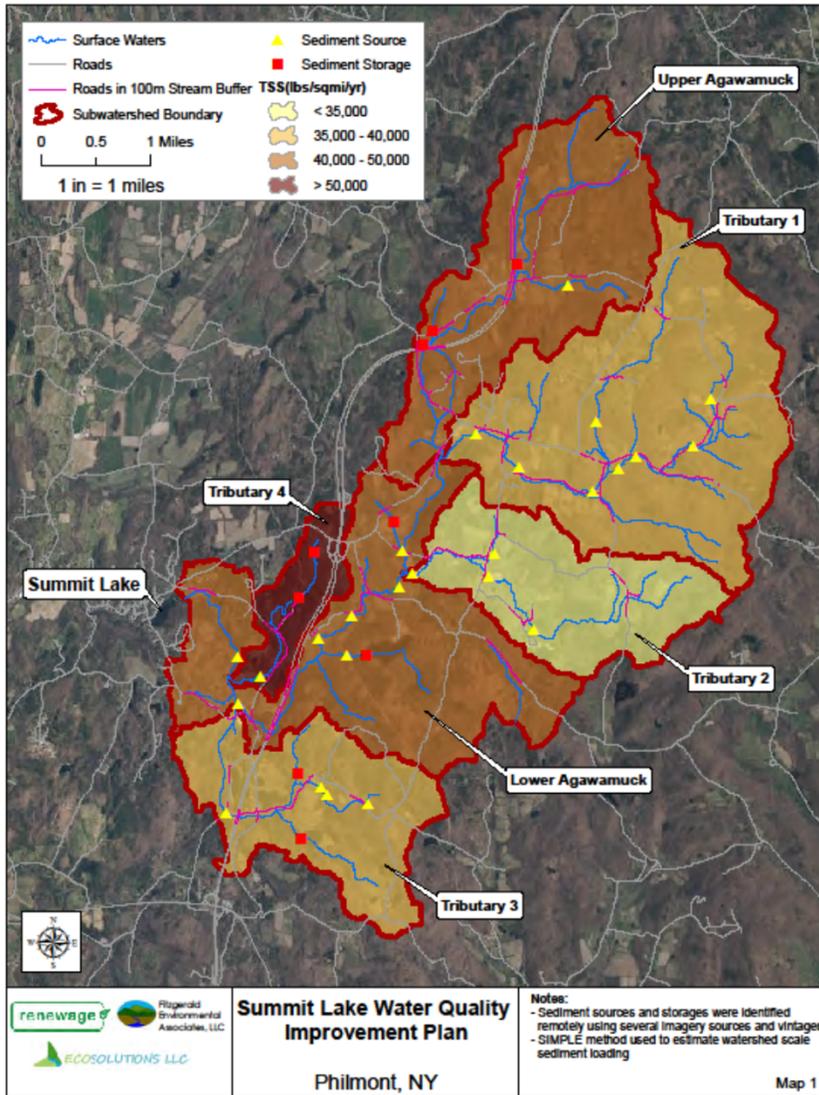


Here's an example
of the subwatershed of
the subwatershed of the
Agawamuck Creek
Watershed:

Summit Lake
Watershed



EXAMPLE:
This can be broken
down into
Units in the
Summit Lake
Watershed
based on:
- Topography
- Delineation:
Tributaries
(Subunits –
Subwatershed)



EXAMPLE:
 This can be broken down into
 Units for its Subwatershed
 based on:
 - Topography
 - Delineation: Tributaries
 (Subunits – Subwatershed)

Here the subwatersheds of tributaries
 are the subwatersheds



High Phosphorus
and Nitrogen Levels

Contamination

Invasive
Species

Explore the
Existing Issues



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Prioritization

Priority subwatersheds will generally be those that are **impaired**, are the **most vulnerable** to future development, contain **important resources**, or present the **best opportunity for improvement**.

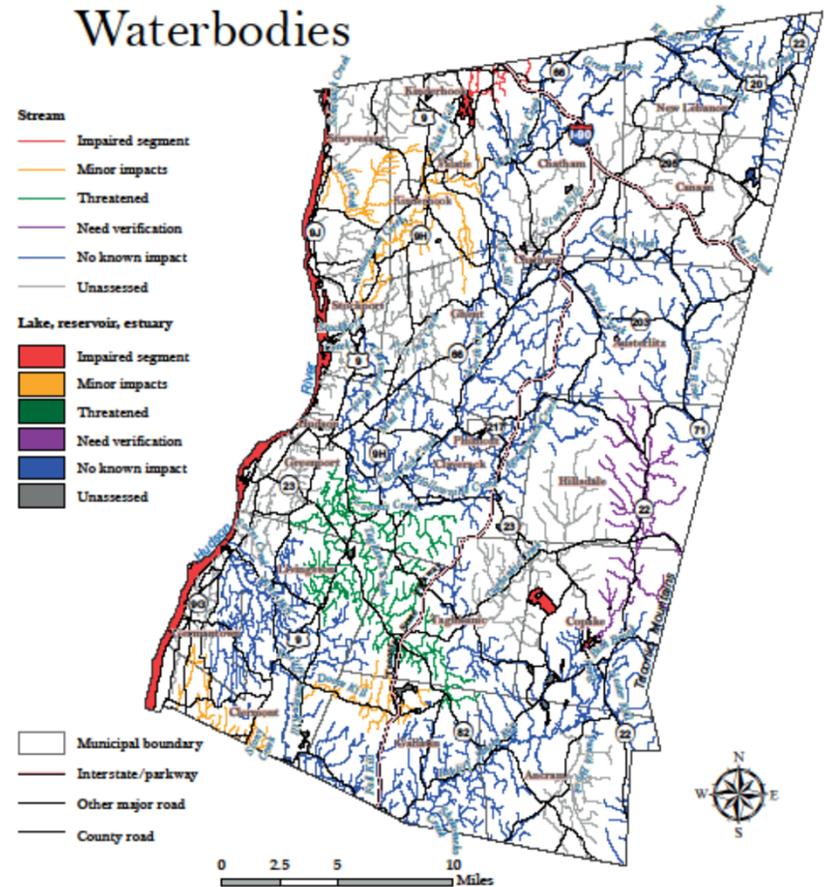
-NYS DOS Guidebook

Map part of Columbia County Natural Resources Inventory, Map 14, accessed from https://clctrust.org/wp-content/uploads/2019/11/Columbia_County_NRI_1_6_19_Part2-18.pdf on 3/19/2022

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Columbia County Natural Resources Inventory

14 Priority (Impaired) Waterbodies



Data Source: Waterbody inventory-priority waterbodies list created by the NYS Department of Environmental Conservation (NYSDEC), 2016, available from gis.ny.gov. For roads and boundaries data sources see Figure 1. Map created by Hudsonia Ltd., Annandale, NY.

Figure 14. Streams and other waterbodies in Columbia County, New York, categorized by their known level of impairment. Many small waterbodies, including headwater streams, are not included. Columbia County Natural Resources Inventory, 2018.

Excerpt from a chapter of the Upper Hudson River Watershed Management Plan (March 2020)

PRIORITY STORMWATER PROJECTS:

S-01 – Saratoga County: Purchase of trailer mounted vacuum unit. This unit to be utilized by municipalities throughout Saratoga County, is intended to benefit smaller municipalities that are anticipated to be designated an MS4 community following the 2020 Census. Many of these smaller municipalities do not have funding to purchase this equipment on their own. Through this recommended project, the Saratoga County SWCD will purchase and maintain the equipment and will contract with municipalities to perform the MS4 tasks. \$275,000.

S-04 – Hamilton County: Purchase oil water separators for all municipal and county DPW garages. This equipment will be used at the DPW garages to treat water that has been contaminated with oil so that the oil can be disposed of properly. \$25,000 each.

S-03 – Town of Schroon, Essex County: Dock Street engineering assessment and feasibility study. Dock Street is an area of heavy stormwater runoff into Schroon Lake. Engineering and feasibility studies should be conducted to evaluate the best methods for stormwater mitigation at this site.

S-04 – City of Glens Falls, Warren County: Design and implementation of separated storm sewer upgrade. The City of Glens Falls currently operates a combined system for stormwater and sewer which often leads to an overflow during heavy rain events and snow melts. A move toward a separated system would reduce CSO occurrences and lead to direct water quality improvements. \$10,000,000.

S-05 – Village of Hudson Falls, Washington County: Boulevard separated sewer design and construction. The WCSD #2 operates a system for stormwater and sewer which often leads to an overflow during heavy rain events and snow melts. A move toward a separated system would reduce CSO occurrences and lead to direct water quality improvements. \$700,000.

S-06 – Town of Greenwich, Washington County: Stormwater improvements at the Washington County Fairgrounds. The Washington County Fairgrounds lack adequate stormwater infiltration provisions which results in extreme flooding at the site during heavy rain events. \$200,000

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Watershed Management Recommendations Report Chapter (T 16 and T 18)

- Watershed Management Recommendations to Achieve Goals and Objectives
 - Identify and Describe Management Strategies and Recommendations
 - Regulatory and Programmatic Actions
 - Restoration and Protection Projects Identified
 - Prioritize Recommended Projects and Actions and Key to Maps

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Excerpt from a chapter of the Upper Hudson River Watershed Management Plan (March 2020)

4.4 RECOMMENDED PROJECTS

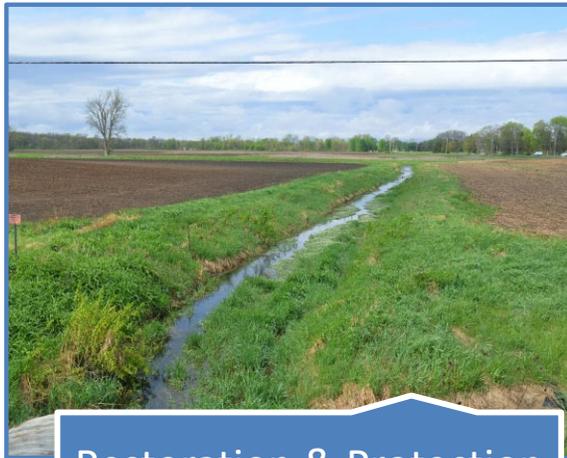
STORMWATER			
PRIORITY ID# S-01			
Municipality	Saratoga County	Directly on a surface water?	No
Latitude/Longitude:	Countywide	Name of surface water:	N/A
Jurisdiction:	Public	Project Subwatershed HUC 10:	Various
Time Frame:	Short Term	Projected Cost:	\$275,000
Potential Funding Source:	NYSDEC, NYSDOS	Involved Parties in Implementation:	SWCD, municipalities
Project Description:	Purchase of trailer mounted vacuum unit to be shared by municipalities throughout the county that will be used by MS4 communities.		
PRIORITY ID# S-02			
Municipality	Various, Hamilton County	Directly on a surface water?	No
Latitude/Longitude:	Various	Name of surface water:	N/A
Jurisdiction:	Public	Project Subwatershed HUC 10:	Various
Time Frame:	Short Term	Projected Cost:	\$25,000 each
Potential Funding Source:	NYSDEC, NYSDOS	Involved Parties in Implementation:	municipalities, county, SWCD
Project Description:	Purchase oil water separator for municipal and county DPW garages.		
PRIORITY ID# S-03			
Municipality	Town of Schroon	Directly on a surface water?	Yes
Latitude/Longitude:	43.5005, -73.4536	Name of surface water:	Schroon Lake
Jurisdiction:	Public	Project Subwatershed HUC 10:	Upper Schroon River
Time Frame:	Short Term	Projected Cost:	\$30,000
Potential Funding Source:	NYSDEC, NYSEFC, NYSDOS	Involved Parties in Implementation:	Town, LCLGRP, consultant
Project Description:	Perform engineering assessment and feasibility study for stormwater reduction on Dock Street.		
PRIORITY ID# S-04			
Municipality	City of Glens Falls	Directly on a surface water?	Yes
Latitude/Longitude:	Various	Name of surface water:	Hudson River/ Feeder Canal
Jurisdiction:	Public	Project Subwatershed HUC 10:	Snook Kill - Hudson River
Time Frame:	Medium Term	Projected Cost:	\$10,000,000
Potential Funding Source:	NYSDEC, NYSEFC, NYSDOS, NBRC	Involved Parties in Implementation:	City, SWCD

Description and Assessment of Local Laws and Programs Chapter (Watershed Management Recommendation Report)

- Ability and effectiveness of local laws and programs to implement best management practices to protect surface and groundwater quality and habitat
- This analysis should identify laws and programs in place as well as any gaps that exist
- Include analysis of:
 - Local land use plans
 - Regulations (zoning, site plan review, subdivision regulations, etc.)
 - Programs and practices (road de-icing practices, ditch maintenance, etc.)
- Analysis of the strengths and weaknesses as they relate to water quality

FINAL													
Municipality	Comprehensive Plan	Local Waterfront Revitalization Plan	Site Plan Review	Zoning Law	Subdivision	Waterbody/Shore Protection	Floodplain/Flood Protection	Waste Management/Junk Yard	Wastewater/On-site Septic	Stormwater	Agriculture	Special Permit	Others/Comments

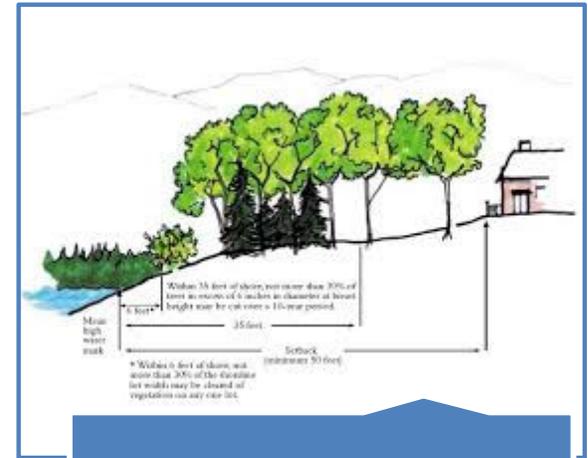
General Watershed Recommendations



Restoration & Protection Projects



Collaboration, Partnership & Education



Municipal Actions

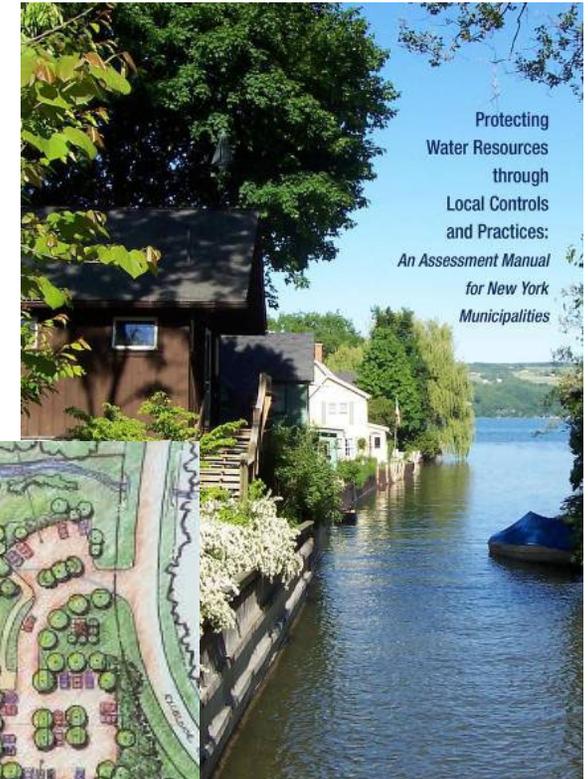
Examples of Regulatory and Programmatic

- Land use controls
- Municipal practices

Examples of Restoration and Protection Projects

- Programs
- Activities

For example....



Identify and Describe Management Strategies and Recommendations

Regulatory and programmatic actions

- Land use management (comp plans, zoning, site plan review, erosion and sediment control)
- Training, education, stewardship
- Improved stormwater management practices
- Wetland and watercourse protection (including buffer establishment)
- Groundwater and aquifer protection

Restoration and Protection Projects

- Watershed-wide and site-specific actions
- Stormwater remediation measures
- Identifying potential sites for fish and wildlife habitat restoration
- Structural activities (stream restoration or stormwater treatment retrofits)
- Educational programs to build awareness and stewardship

Prioritize Recommended Projects and Actions and Key to Map(s)

- Create a prioritized list of recommendations
 - Include justification, maps, any photographs
- Prioritization process should include:
 - Evaluating subwatersheds according to impairments or threats
 - Identifying priorities within subwatersheds
 - Ranking projects and actions within each subwatershed according to anticipated impact
 - Goals, priorities, and vulnerabilities
 - Pollutant reduction/protection afforded, water resources and/or habitat value
 - Cost, permitting, and maintenance
 - Landowner cooperation, public access, and visibility
 - Partner involvement and innovation

UPPER HUDSON RIVER WATERSHED REVITALIZATION PLAN

4.3 PRIORITY PROJECT MAPS

Once all of the recommended projects for this Plan were collected and compiled, the Advisory Committee met to identify priority projects. Each priority issue has its own priority projects that were decided on based on the Advisory Committee's personal and professional knowledge of their service areas. Project time frame, projected costs and potential funding opportunities were also taken into account for prioritization.

Priority projects were mapped by the HUC-10 subwatershed where they are located (Maps 21 - 26). These maps provide a visualization of the subwatersheds in which the priority issues are most prevalent and should be prioritized for funding.

Stormwater: Three of the seven priority stormwater projects are located within the Snook Kill - Hudson River HUC-10 subwatershed and two are within the Anthony Kill - Hudson River HUC-10 subwatershed, indicating that stormwater issues are more prevalent in the southern reach of the Upper Hudson River Watershed (Map 21).

Agriculture: Of the 17 total Agriculture projects that were identified for this Plan, three are considered priority. All three are clustered in the southern portion of the Upper Hudson Watershed with project overlap in the Snook Kill - Hudson River and Anthony Kill - Hudson River HUC-10 subwatersheds and the Walloomsac River HUC-10 subwatershed (Map 22).

Erosion: The issue of erosion is prevalent throughout the Upper Hudson River Watershed and priority issues are distributed from the most southern subwatershed to the most northern subwatershed. Of the seven priority erosion projects identified, three are located in the Middle Sacandaga River HUC-10 subwatershed. While erosion is an issue throughout the entire watershed, the Middle Sacandaga River HUC-10 subwatershed should be focused on for project implementation (Map 23).

Invasive Species: Invasive species are an increasing issue throughout the Upper Hudson River Watershed and priority projects are distributed evenly throughout the HUC-10 subwatersheds (Map 24).

Water and Wastewater: Water and Wastewater projects have high project costs and can be directly tied to water quality impairments. Priority projects are located in HUC-10 subwatersheds throughout the Upper Hudson River Watershed (Map 25).

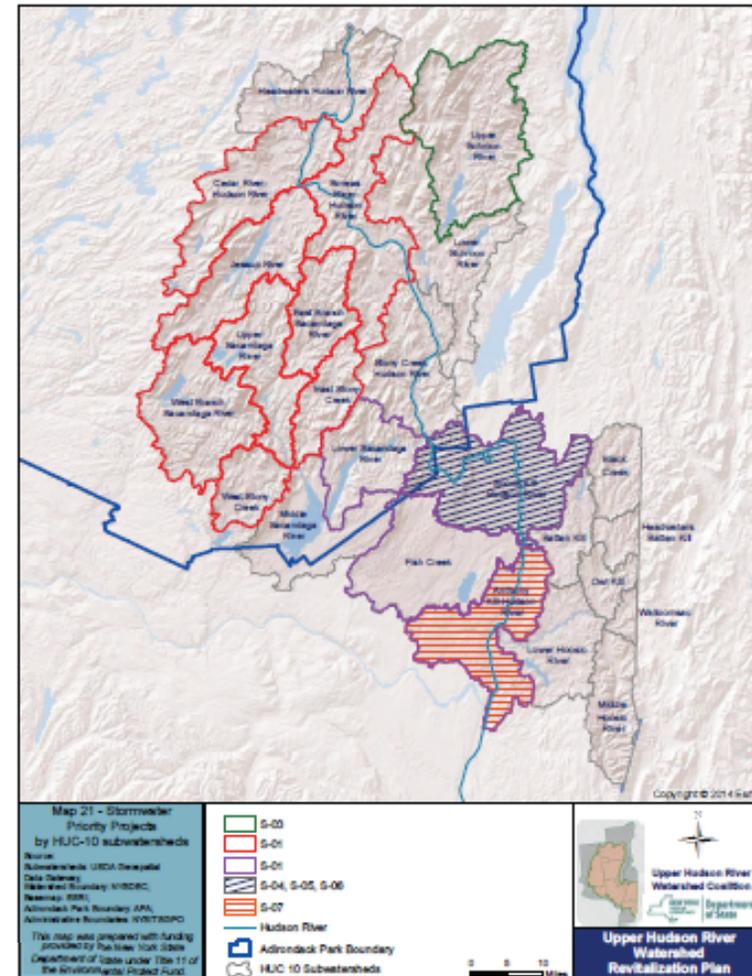
Aquatic Organism Passage: Aquatic organism passage is an issue throughout the Upper Hudson River Watershed with many of the barriers to passage tied to infrastructure such as culverts and dams. Seven priority projects are identified in this Plan, with two located in the Anthony Kill - Hudson River HUC-10 subwatershed (Map 26).

Priority – Stormwater ranked number 1, and here is the associated map with the legend to the left and below chart details for this priority.

UPPER HUDSON RIVER WATERSHED REVITALIZATION PLAN

STORMWATER

PRIORITY ID# S-05			
Municipality	Village of Hudson Falls	Directly on a surface water?	No
Latitude/Longitude:	43.1742, -73.3421	Name of surface water:	N/A
Jurisdiction:	Public	Project Subwatershed HUC 10:	Snook Kill - Hudson River
Time Frame:	Medium Term	Projected Cost:	\$700,000
Potential Funding Source:	NYSDEC, NYSDOS, NBRC, NYSEFC	Involved Parties in Implementation:	WCSD #2, Village
Project Description:	Boulevard storm outfall separated sewer design and construction.		
PRIORITY ID# S-06			
Municipality	Town of Easton	Directly on a surface water?	No
Latitude/Longitude:	43.0939, -73.5455	Name of surface water:	N/A
Jurisdiction:	Public/Private	Project Subwatershed HUC 10:	Snook Kill - Hudson River
Time Frame:	Short Term	Projected Cost:	\$200,000
Potential Funding Source:	NYSDEC, NYSDOS, WCF	Involved Parties in Implementation:	WCF, SWCD, LCLGRP
Project Description:	Implementation of stormwater infiltration improvements on Washington County Fairgrounds.		



Excerpt from a chapter of the Upper Hudson River Watershed Management Plan (March 2020)

Implementation Strategy and Schedule Chapter (T19)

Prepare a strategy and schedule to implement the identified watershed management practices and approaches

- Clearly articulate priorities, measurable objectives, and steps to implement strategies
- Include cost estimates, potential funding sources, and a phasing schedule
- Include a schedule to periodically update the plan
- Articulate the ongoing role of the watershed advisory committee

Table 5.1 Sample Watershed Implementation Strategy

Management Recommendation	Goal	Target Sub-watershed	Project Leader* & other involved organizations	Potential Funding Sources	Potential Cost†	Implementation Timing		
						1 year	2-5 years	5+ years
Build capacity of watershed organization and coordinator	1, 2, 4, 5	All	Watershed Task Force* SWCD, County Planning Dept., Town A, Town B	NYS DOS, NYS DEC, EPA	\$15,000	X		
Adopt local laws for environmental protection	10, 13, 14	All	Town A*, Town B*, NYSDOS, Regional Planning Council	NYS DOS	\$20,000-\$60,000	X		
Implement priority stream restoration	7, 10	A, C, E	Watershed Task Force*, NYS DEC, SWCD, Town B,	NYS DEC; Hudson River Estuary Program	\$260,000		X	
Install priority stormwater retrofit	11, 12	B, D, E	SWCD*, Watershed Task Force, Town A, NYS DOS, NYS DEC	NYS DEC; NYS DOS; NYS DOT	\$350,000		X	
Illicit discharge detection and elimination	11	C, E, F	Watershed Task Force*, Town B, County DOH	NYS DEC, NYS DOH, EPA	\$7,200	X		
Monitoring and project tracking	2, 3	All	Watershed Task Force*, NYS DEC, USGS			X	X	X

† Potential costs are for illustrative purposes only * Denotes project leader

Implementation Strategy

- Prioritizing recommendations
- Project leaders and involved organizations
- Timing
- Costs and funding sources

Table 5.1 Sample Watershed Implementation Strategy

Management Recommendation	Goal	Target Sub-watershed	Project Leader* & other involved organizations	Potential Funding Sources	Potential Cost†	Implementation Timing		
						1 year	2-5 years	5+ years
Build capacity of watershed organization and coordinator	1, 2, 4, 5	All	Watershed Task Force* SWCD, County Planning Dept., Town A, Town B	NYS DOS, NYS DEC, EPA	\$15,000	X		
Adopt local laws for environmental protection	10, 13, 14	All	Town A*, Town B*, NYS DOS, Regional Planning Council	NYS DOS	\$20,000- \$60,000	X		
Implement priority stream restoration	7, 10	A, C, E	Watershed Task Force*, NYS DEC, SWCD, Town B,	NYS DEC; Hudson River Estuary Program	\$260,000		X	
Install priority stormwater retrofit	11, 12	B, D, E	SWCD*, Watershed Task Force, Town A, NYS DOS, NYS DEC	NYS DEC; NYS DOS; NYS DOT	\$350,000		X	
Illicit discharge detection and elimination	11	C, E, F	Watershed Task Force*, Town B, County DOH	NYS DEC, NYS DOH, EPA	\$7,200	X		
Monitoring and project tracking	2, 3	All	Watershed Task Force*, NYS DEC, USGS			X	X	X

† Potential costs are for illustrative purposes only * Denotes project leader

Table 4-1. IMPLEMENTATION STRATEGY AND SCHEDULE FOR OWASCO LAKE WATERSHED RECOMMENDATIONS

KEY:
LEADERS/PARTNERS/FUNDING SOURCES LIST, ABBREVIATIONS

CCHD	Cayuga County Health Department
CCPT	Cayuga County Parks and Trails
CCPED	Cayuga County Department of Planning and Economic Development
Cayuga Water/Sewer	Cayuga County Water and Sewer Authority
CCE	Cornell University Cooperative Extension
CLRP	Cornell Local Roads Program
CNYEAB	Central New York Emerald Ash Borer Task Force
CNYRPDB	CNY Regional Planning and Development Board
CSWL	Cornell University Soil and Water Lab
EPF	Environmental Protection Fund (administered by several NYS agencies)
FLI	Finger Lakes Institute
FLOWPA	Finger Lakes - Lake Ontario Watershed Protection Alliance
FLT	Finger Lakes Land Trust
FL-PRISM	Finger Lakes Partnership for Regional Invasive Species Management
FPC	Farm Practices Council
GIGP	Green Innovation Grants Program (NYSEFC)
GLRI	Great Lakes Research Initiative
Hwy Depts.	Highway Departments
NRCS	Natural Resources Conservation Service

CATEGORIES OF COST

\$	=	\$1–\$1,000
\$\$	=	\$1,001–\$10,000
\$\$\$	=	\$10,001–\$100,000
\$\$\$\$	=	\$100,001–\$500,000
\$\$\$\$\$	=	> \$500,000

GOALS FOR THE WATERSHED

1. Identify and reduce the adverse water quality impacts from agricultural operations.
2. Identify and reduce nonpoint sources of nutrients, sediment, microorganisms, salts, and other chemicals to Owasco Lake and its tributary streams.
 - a. Identify model practices that will reduce adverse water quality impacts from roadway maintenance practices such as ditching and application of salt and sand, and support municipal efforts to adopt and implement such practices.
 - b. Research ways that new technologies such as innovative septic systems or stormwater treatment systems would improve water quality, and promote their adoption.
 - c. Minimize the impact of contamination from fuel and other chemicals associated with transportation and storage accidents.
3. Reduce the risk of water-related illnesses associated with using Owasco Lake as a source of drinking water and recreation.

Excerpt from a chapter of the Owasco Lake Watershed Management and Waterfront Revitalization Plan (March 2016), accessible from <https://www.cayugacounty.us/DocumentCenter/View/4889/Owasco-Lake-Watershed-Management-Plan?bidId=>.

Table 4-1. IMPLEMENTATION STRATEGY AND SCHEDULE FOR OWASCO LAKE WATERSHED RECOMMENDATIONS

A. PLANNING

Recommendation A-1: Continue to Incorporate the EPA’s Nine Key Elements of Watershed Planning into the Owasco Lake Watershed Management and Waterfront Revitalization Plan

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
A-1. Expand to nine element plan.	ALL	Entire watershed	*CCPED, SWCD, CCHD	NYSDOS (grant received to expand plan, staff time), NYSDEC, FLOWPA	\$\$\$	HIGH	X		

B. MEASURES TO REDUCE NONPOINT SOURCE POLLUTION

Recommendation B-1: Control Agricultural Nonpoint Sources

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
<i>Regulatory and Programmatic Actions</i>									
B-1-a. Identify and remove barriers to implementing improved practices.	1	Priority subwatersheds	*WQMA, SWCD, CCPED, CCE	Department and agency budgets	\$\$	HIGH		X	
B-1-b. Seek additional sources of support for programs/services aimed at reducing nutrient and sediment loss.	1, 9	N/A	*SWCD, CCE, OLWMC, WQMA	Department and agency budgets	\$	MED		X	
B-1-c. Enforce existing regulations and laws that prohibit livestock access to streams and manure runoff.	1	All watershed areas	*WIP, CCHD, SWCD, NYSDEC	Department and agency budgets	\$	HIGH	X		
B-1-d. Coordinate/improve communication between agricultural community and other stakeholders.	1	N/A	*WQMA, CCPED, SWCD, CCE, OWLA, FPC	Department and agency budgets	\$	HIGH	X		

Excerpt from a chapter of the Owasco Lake Watershed Management and Waterfront Revitalization Plan (March 2016), accessible from <https://www.cayugacounty.us/DocumentCenter/View/4889/Owasco-Lake-Watershed-Management-Plan?bidId=>.

<i>Restoration and Protection Actions</i>										
B-1-e. Implement agricultural BMPs in a strategic manner to reduce the loss of soil, nutrients, fertilizers, animal wastes, crop residues, and pesticides from the landscape.	1	Areas that are prone to saturation; are proximate to watercourses and natural conveyances; have steep slopes; have highly erodible soils	*SWCD, CCE, NRCS, farmers	NRCS Ag Lands Easements, Wetland Reserve Easements, EQIP, WHIP, SARE, Ag Conservation Easement Program, OIG; Ag Nonpoint Source Abatement and Control Program, WQIP, GLRI, Conservation Stewardship Program, Climate Resilient Farming Program, Farmland Protection Implementation Grants, Farm Bill Initiative for Conservation Practices	\$\$\$\$	HIGH (a top priority in Plan)	X			

Recommendation B-1, continued

B-1-f. Assist in implementing recommendations of the Cayuga Co. Manure Mgmt. Working Group Advisory Committee.	1	All watershed areas	*OLWMC, WQMA, CCPEd, SWCD, WIP, CCHD, CCE. See list MMWG 14-Pt Plan.	NYSDEC, NYSDOS, NYSEFC, FLOWPA, department and agency budgets	\$\$\$	HIGH (a top priority in Plan)	X			
B-1-g. Support development/use of technologies such as mobile apps, nutrient boom.	1	As/where needed	*SWCD, CCE	New Farmers Grant Fund, CIG, SARE, Small Business Innovation Research Program	\$\$\$	MED		X		
B-1-h. Provide technical assistance on emergency response procedures/resources for farms of all sizes.	1	All watershed areas	*SWCD, NYSDEC	Department and agency budgets	\$\$	MED	X			
B-1-i. Identify and promote measures to reduce the use of pesticides and loss of nutrients and sediment.	1	All watershed areas	*WQMA, SWCD, OLWMC, CCE	Department and agency budgets, NYS Integrated Pest Management Program	\$\$	HIGH	X			

Watershed Implementation Examples and Review

- Green infrastructure, Stormwater management
- Amend or adopt local land and water use controls
- Education and outreach programs and use of citizen scientist activities



Tracking and Monitoring (T20)

- Prepare a plan that includes strategies for tracking implementation of projects and actions and monitoring water and related resources to measure success at achieving project goals and objectives
- Identify methods to track implementation of projects
- Periodic monitoring of water and related resources which may include:
 - Identification of potential parties to conduct monitoring
 - Potential funding sources
 - Methods of data management

Table 5-2. Summary of Recommended Tributary Monitoring Program

Objective	Locations	Parameters	Frequency	Metrics
Assess annual external loads from major streams	Owasco Inlet Dutch Hollow Brook	Total phosphorus	Annual: March- November, strive to sample during high flow conditions	Annual load (calculated using FLUX) Annual flow-weighted average concentration
		Soluble reactive phosphorus		
		Total dissolved phosphorus		
		Total nitrogen Suspended sediment Discharge		
Provide data to calibrate and verify loading model for completing Nine Elements Plan	Multiple locations representing data gaps and under-represented land use patterns	Total phosphorus Soluble reactive phosphorus Total dissolved phosphorus Total nitrogen Suspended sediment Discharge	2016: April- November, strive to sample during high flow conditions	Per model requirements

Table 5-3. Factors to Measure Progress toward Plan Recommendations

Objective	Measured By
Improve the capacity of local government to reduce nonpoint sources of pollution	Number of municipalities with sediment and erosion control local laws
	Number of highway personnel attending environmentally-related training
	Number of municipal Departments of Public Works or Highways using sediment and erosion control best practices
Improve outreach and education on Owasco Lake watershed issues	Number of press releases regarding the Owasco Lake watershed
	Number of contacts with educational institutions
	Attendance at annual Lake Day events
	Visits to related web pages
Expand recreational access and use	Number of canoe and kayak rentals
	Attendance at local parks
	Number of beach closures
	Number of boat launches
Prevent introductions of invasive species	Labor hours of boat launch stewards
	Number of vessel inspections completed
Develop enduring partnerships and collaborations	Number of municipalities participating in the Owasco Lake Watershed Council
	Land area under conservation easement or other protection
Acquire funds from multiple sources to support remedial measures	Number of grant applications submitted
	Total amount of non-municipal/non-County funds received
	Number of voluntary contributions received
Identify and reduce adverse water quality impacts from agricultural operations	Percent acres on which agricultural BMPs are implemented, number of farms adopting BMPs, or number of BMPs.
	Reduction in CAFO violations cited by NYSDEC and WIP
	Reduction in NYSDEC citations for runoff from farms
Rules and Regulations of the Owasco Lake Watershed and the Cayuga County Sanitary Code are being enforced.	Number of inspections, number of violations, number of violation notices and number of corrections through the Cayuga County Sanitary Code Program.
	Number of violations, number of violation notices and number of corrections through the WIP.
Improve public perception of lake conditions	Periodic surveys of public opinion
	Number of people attending meetings that are open to the public

vertebrate y (counts and	One event every 3 to 5 years for each stream, during low flow conditions, target late July through early Sept.	Family biotic index (FBI), Percent model affinity (PMA), Percent of dominant family, Taxa richness, and Ephemeroptera- Trichoptera (EPT) index.
phorus active phosphorus olved phosphorus gen sediment	Before and after improvements	Flow-weighted average concentration
of concern: for phorus active phosphorus sediment	Baseline, then in response to specific hypotheses regarding effectiveness of control actions	Load of pollutants of concern over critical period (March-June)

Table 5-1. Summary of Recommended Lake Monitoring Program

Owasco Lake				
Desired Use	Goal	Key Measurements or Indicators *	Metrics for Reporting	
			Compliance	Trends
Public water supply	Finished water is safe for consumers of all ages and health conditions	Sub-part 5 of NYS Sanitary Code list for public water supply	Meets requirements of Sub-part 5 of NYS Sanitary Code	<ul style="list-style-type: none"> Total organic carbon Na and Cl Disinfection by-products HAB toxin levels
	Lake waters meet the NYSDEC ambient water quality standards and criteria in place for Class AA waters	<ul style="list-style-type: none"> Chlorophyll-a Total phosphorus (P) Total dissolved phosphorus (TDP) Soluble reactive phosphorus (SRP) Total nitrogen (N) 	Meets NYSDEC ambient water quality standards and guidance values	<ul style="list-style-type: none"> Summer average concentrations Percent of samples over bloom threshold for chlorophyll-a N:P ratio
Recreation	Water quality conditions are safe for full contact recreation	<ul style="list-style-type: none"> Indicator bacteria at bathing beaches Visual evidence of cyanobacterial blooms HAB toxin levels Days of beach closures Secchi disk transparency Macrophyte harvest 	<ul style="list-style-type: none"> Meets requirements of Sub-part 6-2 of the NYS Sanitary Code and NYSDEC Absence of harmful algal bloom Secchi disk transparency > 2m 	<ul style="list-style-type: none"> Percent of measurements in compliance at standard monitoring locations Mass of plant material and phosphorus removed by harvesting Extent of harmful algal blooms Number of beach closures
Aquatic Life protection	Water quality and habitat conditions support a diverse assemblage of native species, including sensitive life stages	<ul style="list-style-type: none"> Dissolved oxygen (DO) profiles during late summer at deepest station 	Dissolved oxygen > 6 mg/L	<ul style="list-style-type: none"> Water column depth at which dissolved oxygen is less than 6 mg/L
Ecosystem functioning	Phytoplankton community is composed of a mix of species typical of an oligo-mesotrophic lake	Plankton counts, identified to major taxa (monthly May–Sept.); every 3 years	Not applicable—no regulatory standards for compliance	<ul style="list-style-type: none"> Community composition (percent of major taxa)
	Zooplankton community is composed of a mix of species typical of an oligo-mesotrophic lake	Plankton counts, length measurements, and identify to major taxa (monthly May–Sept.); every 3 years	Not applicable—no regulatory standards for compliance	<ul style="list-style-type: none"> Average size of zooplankton Community composition (percent of major taxa)
	Lake supports a diverse assemblage of native species typical of an oligo-mesotrophic lake	Benthic surveys; macrophyte surveys: density and area colonized (one survey, late summer); every 3 years	Not applicable—no regulatory standards for compliance	<ul style="list-style-type: none"> Presence/composition of dreissenid mussels, Asian clams, and other invasive species

*Measures taken annually, unless otherwise noted.

Excerpt from a chapter of the Owasco Lake Watershed Management and Waterfront Revitalization Plan (March 2016)

Table 5-2. Summary of Recommended Tributary Monitoring Program

Objective	Locations	Parameters	Frequency	Metrics
Assess annual external loads from major streams	Owasco Inlet Dutch Hollow Brook	Total phosphorus Soluble reactive phosphorus Total dissolved phosphorus Total nitrogen Suspended sediment Discharge	Annual: March- November, strive to sample during high flow conditions	Annual load (calculated using FLUX) Annual flow-weighted average concentration
Provide data to calibrate and verify loading model for completing Nine Elements Plan	Multiple locations representing data gaps and under-represented land use patterns	Total phosphorus Soluble reactive phosphorus Total dissolved phosphorus Total nitrogen Suspended sediment Discharge	2016: April- November, strive to sample during high flow conditions	Per model requirements
Evaluate quality of stream habitat using benthic macroinvertebrates	Downstream sites in mapped streams that meet habitat requirements (sites can be monitored on a rotating basis)	Macroinvertebrate community (counts and species ID)	One event every 3 to 5 years for each stream, during low flow conditions, target late July through early Sept.	Family biotic index (FBI), Percent model affinity (PMA), Percent of dominant family, Taxa richness, and Ephemeroptera-Plecoptera-Trichoptera (EPT) index.
Monitor response to agricultural impacts and BMP implementation	Upstream and downstream during spring runoff	Total phosphorus Soluble reactive phosphorus Total dissolved phosphorus Total nitrogen Suspended sediment Discharge	Before and after improvements	Flow-weighted average concentration
Use a statistical analysis to determine whether stream conditions vary from	At an established sentinel station, establish a baseline relationship between	Pollutants of concern: for example: Total phosphorus Soluble reactive phosphorus	Baseline, then in response to specific hypotheses	Load of pollutants of concern over critical period (March-June)

Excerpt from a chapter of the Owasco Lake Watershed Management and Waterfront Revitalization Plan (March 2016)

Table 5-3. Factors to Measure Progress toward Plan Recommendations

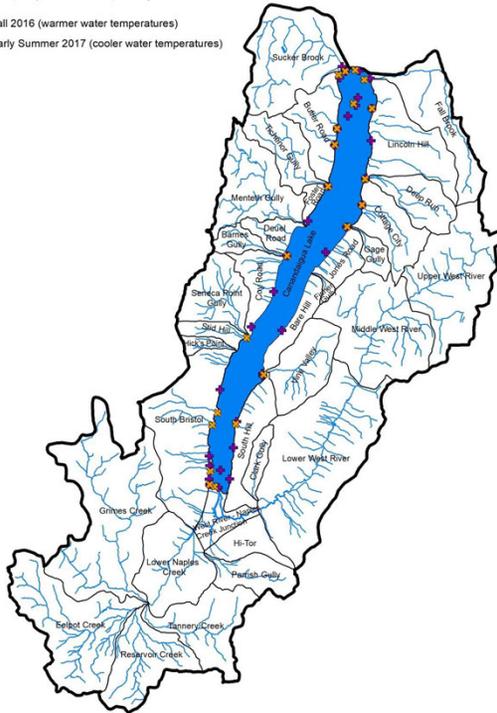
Objective	Measured By
Improve the capacity of local government to reduce nonpoint sources of pollution	Number of municipalities with sediment and erosion control local laws
	Number of highway personnel attending environmentally-related training
	Number of municipal Departments of Public Works or Highways using sediment and erosion control best practices
Improve outreach and education on Owasco Lake watershed issues	Number of press releases regarding the Owasco Lake watershed
	Number of contacts with educational institutions
	Attendance at annual Lake Day events
	Visits to related web pages
Expand recreational access and use	Number of canoe and kayak rentals
	Attendance at local parks
	Number of beach closures
	Number of boat launches

Excerpt from a chapter of the Owasco Lake Watershed Management and Waterfront Revitalization Plan (March 2016), accessible from <https://www.cayugacounty.us/DocumentCenter/View/4889/Owasco-Lake-Watershed-Management-Plan?bidId=>.

Next Step: Implementation

Macrophyte Sampling Locations

- ✦ Fall 2016 (warmer water temperatures)
- ✦ Early Summer 2017 (cooler water temperatures)



Example of Mapped Drainage Areas



Importance of WMP and How to Succeed in Implementation

Some elements of successful watershed planning:

- Broad participation
- Intermunicipal cooperation
- Realistic goals and strategies
- Data collection and analysis
- On-the-ground projects coupled with local controls
- Monitoring and tracking successes
- Maintaining momentum and consensus
- **FUNDING**

Benefits of Completing an WMP:

- Eligibility for future funding of projects and strategies through NYS DOS LWRP program
- Protect and restore waterways for the community and future generation
- Be a good “neighbor” and “steward”

Questions

NYS Department of State, Office of Planning Development & Community Infrastructure
99 Washington Ave, Suite 1010
Albany, NY 12231

[Water Resources Management | Department of State \(ny.gov\)](#)

Model Local Laws to Increase Resilience

[Model Local Laws to Increase Resilience | Department of State \(ny.gov\)](#)

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