

Susquehanna-Chemung Action Plan



February 2012

Prepared by Southern Tier Central Regional Planning and Development Board
in conjunction with Southern Tier East Planning Development Board

Susquehanna-Chemung Action Plan

February 2012

Prepared by:

Southern Tier Central Regional Planning and Development Board (STC)
in conjunction with Southern Tier East Planning Development Board
(STERPDB)

The Susquehanna-Chemung Action Plan is a watershed management plan encompassing the Susquehanna and Chemung Watersheds of New York. It was developed using an “ecosystem-based management” approach to promote sustainable water resource management that supports the needs of natural and human systems. Supporting data, plans, and resources are available on the project website:

www.susquehannna-chemung.org

Printed copies of this plan are available upon request from Southern Tier Central Regional Planning and Development Board: (607) 962-5092 or stcrpdb@stny.rr.com.

This project has been funded by the American Recovery and Reinvestment Act (ARRA) with support from the New York State Department of Environmental Conservation and New York State Economic Recovery and Reinvestment Cabinet. For more information, please visit: www.recovery.gov or www.dec.ny.gov

Front cover: Near Waverly, NY; courtesy of Tioga County Tourism Office.

Back cover: Otsego Lake; courtesy of Otsego County Soil and Water Conservation District.

TABLE OF CONTENTS

Executive Summary	ii
Introduction	1
Section 1: Water Quality and Quantity	3
Section 2: Economic Development	13
Section 3: Land Use	19
Section 4: Streams and Rivers	24
Section 5: Flood Hazards	31
Section 6: Runoff	38
Section 7: Roads	45
Section 8: Agriculture and Forestry	51
Section 9: Plants and Wildlife	58
Section 10: Outdoor Recreation	65
Section 11: Education and Research	73
Implementation Strategy	80
References	90

SUSQUEHANNA-CHEMUNG ACTION PLAN

EXECUTIVE SUMMARY

The “Susquehanna-Chemung Action Plan” is a watershed management plan for the Susquehanna and Chemung River Watersheds in New York. It uses an “ecosystem-based management” approach that integrates human needs, economic issues, and environmental concerns. The objective is to provide a unified vision for the region and promote funding for projects that benefit the watershed’s residents.

The Action Plan is a watershed-wide plan that encompasses the missions and programs of numerous partners. It is not a work plan for any single organization. Instead it assimilates and builds on the plans, programs, and ideas of many partners and encourages continued coordination of efforts. The priorities and capabilities of these partners vary considerably across the region. Additional resources, both funding and personnel, will be needed to implement many recommendations. As a result, the Action Plan does not establish priorities and is often ambiguous about who is responsible for implementing the recommendations. Progress on implementation will be evaluated annually by Southern Tier Central Regional Planning and Development Board (STC) by contacting partner organizations and documenting accomplishments. It is anticipated that the plan will be reviewed and updated in approximately five years.

The Susquehanna-Chemung Action Plan lays the foundation for coordinated efforts to promote sustainable water stewardship throughout the watershed. It presents recommendations that support the following vision and goals.

WATERSHED VISION

Residents of the Chemung and Susquehanna Watersheds of New York recognize that water is essential to their quality of life and economic wellbeing. They embrace a sustainable approach to economic and community development that respects the natural functions of watersheds and minimizes flood risks.

WATER RESOURCE GOALS

Water Quality and Quantity: Keep the water clean and plentiful - It’s priceless.

- Protect and enhance local water quality, protect drinking water, and reduce pollution loads to the Chesapeake Bay by reducing the release of toxic substances, nutrients, and other pollutants.
- Promote groundwater recharge and water conservation.

Economic Development: Capitalize on water resources as economic assets.

- Promote economic development strategies that protect the region’s water resources and use them wisely because they are integral to the local economy.
- Foster regional collaboration to implement environmentally sensitive economic development strategies.

Land Use: Use the landscape in ways that support healthy water systems.

- Promote land use patterns that facilitate enjoyment and sustainable use of lakes, rivers, streams, and wetlands while preserving natural watershed functions.
- Promote development patterns that strike a balance between preventing sprawl, minimizing floodplain development, encouraging infill development and protecting steep slopes.

Streams and Rivers: Live in harmony with streams.

- Conserve, protect, and enhance stream and river systems so that the channels and floodplains provide beneficial functions for habitat, flood damage prevention, and water quality.
- Maintain and restore the connections between streams and their floodplains.
- Use science-based practices when stream systems are disturbed by roads, bridges, pipelines, post-flood stream work, or other projects.

Flood Hazards: Floods happen, so be prepared.

- Prevent loss of life and significantly reduce future damages from floods by mapping flood hazards, regulating use of high hazard areas, mitigating risks for existing development, restoring beneficial floodplain functions, maintaining flood control structures, and enhancing flood warning systems.

Runoff: Rainwater is good: Slow it down. Spread it out. Soak it in.

- Protect and re-establish the natural functions of floodplains, forests, wetlands, and groundwater recharge areas.
- Use better site design, green infrastructure, and standard stormwater management practices to reduce impacts from development.
- Keep clean water clean.

Roads: Navigate toward better roadway drainage.

- Recognizing the significant impacts that transportation systems have on the landscape and water resources, promote improved practices for designing new roads, managing road and railroad drainage, improving stream crossings, and preventing erosion.

Agriculture and Forestry: Support productive working lands that are part of a healthy landscape.

- Promote economically-viable agricultural practices that minimize soil loss, recycle nutrients, and protect water resources.
- Promote sustainable management of the watershed's forests in a manner that provides flood protection and water quality benefits.

Plants and Wildlife: Preserve the rich diversity of plant and animal life.

- Create, protect, and restore high quality lake, stream, and wetland habitats.
- Maintain the integrity of native ecosystems by protecting rare plants and animals, controlling invasive species, and protecting large blocks of dominant plant communities.

Outdoor Recreation: Connect people to nature.

- Enhance opportunities for watershed residents, children, and tourists to enjoy the region's rivers, lakes, and wetlands by protecting scenic vistas, revitalizing waterfronts, promoting outdoor recreation, and providing additional opportunities for water-based recreation.

Education and Research: Cultivate a watershed ethic.

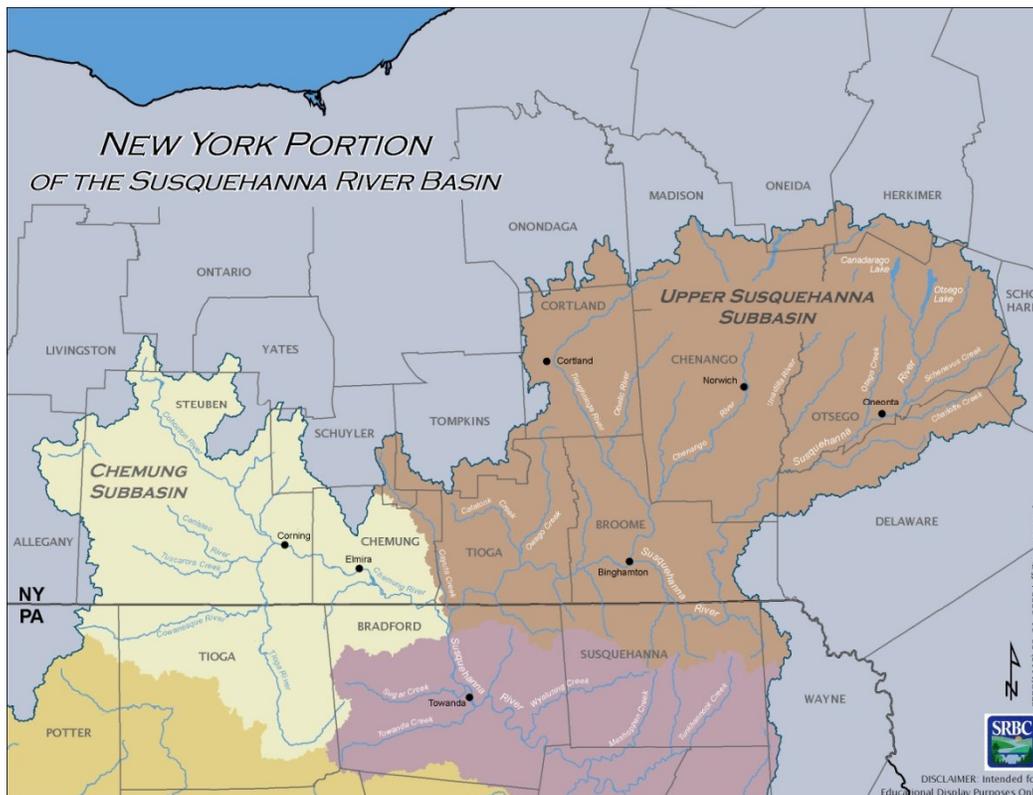
- Provide decision-makers, youth, and the public with an improved understanding of interconnected natural systems and strategies for building environmentally and economically sustainable communities.
- Support scientific research that facilitates "ecosystem-based management" of water resources in the Chemung and Susquehanna Watersheds.

INTRODUCTION

WATERSHED VISION

Residents of the Chemung and Susquehanna Watersheds of New York recognize that water is essential to their quality of life and economic wellbeing. They embrace a sustainable approach to economic and community development that respects the natural functions of watersheds and minimizes flood risks.

Water connects us all...



SUSQUEHANNA-CHEMUNG WATERSHED

The Susquehanna-Chemung Watershed comprises a 6,250 square mile area in south-central New York. The Susquehanna River flows over 440 miles from Otsego Lake (at Cooperstown, NY) to the Chesapeake Bay. The Chemung River joins the Susquehanna at Sayre, Pennsylvania. The Susquehanna and Chemung Watersheds in New York are the northern headwaters of the Chesapeake Bay. Although the quality of water leaving New York is relatively good, any improvements in the New York State portion of the watershed will benefit the Chesapeake Bay Estuary, as well as the local region.

The Susquehanna-Chemung region is in the Allegheny Plateau area, which is a plain of sedimentary rocks into which rivers and streams have cut valleys (a dissected plateau). The rivers and

What is a Watershed?

A watershed is the area of land from which water runs off into a common waterway. It includes both the network of rivers, streams, and lakes and the land surfaces from which the water drains. It is separated from adjacent watersheds by highpoints, such as hilltops and ridges. The watersheds for individual streams combine to form a larger watershed, or drainage basin, for the river that the streams flow into.

We all live in watersheds:

What we do upstream affects both the quality and quantity of water downstream.

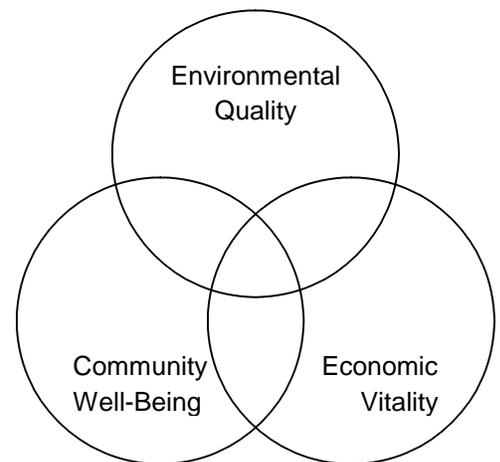
larger tributaries generally flow through wide open valleys underlain by productive valley fill aquifers. The valleys are bordered by steep hillsides through which smaller streams have eroded narrow, steep valleys (often called “hollows”). This topography, together with the region’s soils and weather patterns, make the watershed one of the most flood-prone in the nation. Glacial deposits have resulted in fertile, but highly erodible soil. Streams in the watershed are highly unstable (prone to bank erosion and channel migration), a natural condition that has been compounded by historic disturbances.

The watershed is largely rural, with hardwood forests covering about 71% of the land and about 22% used for agriculture. It contains an extensive network of roads, which have a significant impact on drainage patterns. It is home to about 650,000 people. Cities, villages, and other development tend to be concentrated in the valleys, where slopes are suitable for development. However, large portions of the valleys are prone to flooding and/or streambank erosion. In addition to the devastation caused by major river floods, such as that from Tropical Storm Lee in September 2011, the watershed frequently experiences localized washouts and flooding from flash floods.

The Susquehanna-Chemung Watershed is blessed with clean and abundant water supplies. This resource is essential to the region’s economy and quality of life. It supports residential use, agriculture, manufacturing, tourism, recreation, and healthy ecosystems. With the potential expansion of natural gas development using high volume hydraulic fracturing technologies (to develop shale resources), the region’s plentiful water is expected to also support this energy extraction industry. Protecting the quality and quantity of these water resources is of utmost importance. This is a shared responsibility that requires all watershed citizens to be good stewards of water resources.

ECOSYSTEM-BASED MANAGEMENT PLAN

The *Susquehanna-Chemung Action Plan* has been developed to support a sustainable water future for the Susquehanna and Chemung Watersheds. It uses an “ecosystem-based management” approach to conserving and protecting water resources. This approach integrates human needs, economic issues, and environmental concerns. The idea is to improve the way that natural and human systems work together. Although the project focuses on water resources, the *Susquehanna-Chemung Action Plan* differs from traditional watershed management plans by integrating a wider range of issues and perspectives. **The Action Plan provides a unified vision for the region and promotes funding for projects that benefit the watershed’s residents.**



This Action Plan is supported by an abundance of watershed information and site-specific recommendations. Existing reports, data, maps, and plans are available on the project’s website, www.susquehanna-chemung.org. An online Susquehanna-Chemung Data Atlas enables access to map-based information. A separate page for each of the key issues addressed by this plan provides links to existing data and plans, as well as additional resources.

The Action Plan has been prepared by Southern Tier Central Regional Planning and Development Board, with assistance from Southern Tier East Regional Planning Development Board. An ad hoc Advisory Committee and numerous other stakeholders have provided valuable input and suggestions. It presents goals and recommendations that can only be achieved through collaborative actions of numerous organizations. Many recommendations will require additional funding. Others require a shift in how things are done. Implementation of this Action Plan will create opportunities. Investing in water stewardship can create jobs, reduce pollution, improve human health, and promote economic growth. This plan lays the foundation for sustainable water stewardship by all of the watershed’s citizens.

The Susquehanna-Chemung Action Plan is a sustainable approach to economic and community development that respects the natural functions of watersheds and minimizes flood risks.

SECTION 1 WATER QUALITY AND QUANTITY

GOAL: Keep the water clean and plentiful - It's priceless.

- Protect and enhance local water quality, protect drinking water, and reduce pollution loads to the Chesapeake Bay by reducing the release of toxic substances, nutrients, and other pollutants.
- Promote groundwater recharge and water conservation.

CHALLENGE

The Susquehanna-Chemung Watershed is blessed with ample supplies of high-quality water. The challenge in most of the watershed is not to clean up the water, but simply to keep clean water clean. Yet this is not an easy task. The very abundance of clean water leads to it being taken for granted. Although preventing problems is much cheaper than fixing them, it is difficult to allocate limited resources to protecting healthy waters. Most grant programs are focused on improving water quality by reducing the sources of pollution, with priority given to those waters most in need of improvement.



Otsego Lake (courtesy of SUNY Oneonta Biological Field Station).

Because streams collect water, sediment, and pollutants from the surrounding landscape, land use activities anywhere in the watershed can impact the quality and quantity of the water that reaches streams, rivers, and lakes. Groundwater supplies are also susceptible to surface activities because they are replenished by infiltration of rainfall and snowmelt. The health of these water resources is thus tied to the health of the landscape. This means that responsibility for protecting and improving water supplies is shared by everyone in the watershed. Citizens and businesses need to recognize that water is a valuable asset, understand the potential effects of their activities (septic system maintenance, lawn care, etc.), and assume responsibility for minimizing adverse impacts.

The vast majority of surface and groundwater sources in the watershed exhibit good water quality. However, there are also localized problems and concerns, most of which are considered to be minor impacts. NYS classifies about 7% of the watershed's river miles as "priority waterbodies" that do not fully support appropriate uses (NYS DEC, 2007; NYS DEC, 2009). The water quality impacts on lakes are somewhat greater, with eight lakes classified as "impaired" (NYS DEC, 2010).¹ Polluted water can affect public and private drinking water supplies, particularly the surface water intakes for Binghamton and Elmira, which are downstream of most of the watershed. Although there are various causes for water quality problems, the most frequently cited sources are atmospheric deposition, agricultural activities, and streambank erosion, with inadequate on-site wastewater treatment systems (septic systems) contributing to excess aquatic weed growth in lakes.

Downstream from the Susquehanna-Chemung Watershed, the Chesapeake Bay has poor water quality and is unable to support a healthy ecosystem. To address this, the US Environmental Protection Agency (EPA) has developed a Total Maximum Daily Load (TMDL) restoration plan that requires all jurisdictions in the watershed – including New York – to reduce the amount of nitrogen, phosphorus, and sediment that reach the Bay. Although water quality leaving NYS is generally good, the TMDL requires additional pollution reduction. In other words, keeping clean water clean is not good enough. New York is faced with the challenge of making clean water even cleaner. The potential costs for New York to comply with the TMDL are enormous. These

¹ The NYS Department of Environmental Conservation is currently developing a numeric water quality standard for phosphorus (to replace the narrative standard for nutrients), which could result in additional designations of impaired waters and revised discharge limits for wastewater treatment plants and other permitted discharges.

costs would be borne by sewage treatment plants (and thus residential, commercial, and industrial rate payers), farmers, and local stormwater management programs. Because NY is so far from the Chesapeake Bay, these costs would not be offset by economic benefits from improved water quality in the Bay.

Most of the water in the basin is unseen water beneath our feet. River valleys throughout the Susquehanna-Chemung Watershed are underlain by shallow productive sand and gravel aquifers that play a critical role in supplying drinking water and maintaining the region's economic viability. When groundwater in these aquifers or in upland areas becomes polluted, the process of cleaning up the contamination can be technically difficult and extremely expensive. The cost-effective approach to managing groundwater resources is thus to prevent contamination. The most common groundwater problems result from on-site wastewater treatment systems that are either not functioning properly or are located too close to private water supplies or surface waters. Septic systems can be significant sources of nutrient pollution in lakes, contributing to excessive weed growth. In addition, the watershed contains a number of villages and hamlets with small lots that do not support the recommended separation distances between wastewater treatment system components and private wells.² The NYS Department of Health (NYS DOH) recommends municipal water supplies and/or municipal sewer service in these areas. Additional threats to groundwater resources arise from hazardous waste sites, pesticide application, animal feeding operations, fertilizer use, chemical spills, abandoned or improperly plugged oil and gas wells, and industrial discharges (NYS DEC, 2007; NYS DEC, 2009). Of particular concern at this time is the prospect of extensive natural gas development. Expansion of this industry increases the potential for groundwater contamination from surface spills, injected fluids, or flow back water.

Normally there are ample surface water and groundwater resources available to support a variety of uses throughout the watershed. However, the resource is not limitless and droughts do occur. The Susquehanna River Basin Commission (SRBC) is charged with managing the resource to avoid shortages and conflicts. SRBC review and approval are required for major surface and groundwater withdrawals. The Commission also regulates the consumptive use of water, which is defined to be "the loss of water due to a variety of processes by which the water is not returned to the waters of the basin undiminished in quantity" (SRBC, Dec. 2008). Consumptive uses that meet the regulatory threshold must either be discontinued or mitigated during low flow conditions. Although discontinuation or local mitigation is preferred, most project sponsors pay a "consumptive use fee," which is used for large-scale water storage projects. The demand for water is expected to increase significantly with expanded natural gas extraction using new production techniques (high volume hydraulic fracturing) that utilize large volumes of water.

New York State has a history of support for voluntary water resource protection activities, as well as strong environmental regulations. The NYS DOH Source Water Assessment Program has mapped drinking water supply watersheds and identified potential sources of contamination that may impact public drinking water sources. Public water suppliers prepare Annual Water Quality Reports with information about the quality of water delivered by their system. Many local governments have wellhead protection programs and engage in other activities to protect and preserve water resources. Those counties with active Water Quality Coordinating Committees (WQCCs) have developed strategies identifying local priorities and implementation tasks. However, funding for many of these efforts has become tighter in recent years. Some organizations have had to transition from trying to do more with less to accepting the necessity of doing less with less. This leads to difficult decisions about priorities. It also leads to a shift of financial responsibility to local and/or private sources. For example, the stricter permit standards necessitated by the Chesapeake Bay TMDL are not accompanied by sufficient financial resources to cover the increased costs required for sewage treatment plants to comply. Financial constraints and staff reductions have also resulted in focusing of limited state resources on enforcement of permit programs, with less attention to training, education, and technical assistance. This is unfortunate, because long term water resource protection and improvement requires responsible stewardship by well-informed individuals throughout the watershed.

"Water is the most critical resource issue of our lifetime and our children's lifetime.

The health of our waters is the principal measure of how we live on the land."

- Luna Leopold

² Current NYS DOH standards require minimum separation distances ranging from 100 to 200 feet, depending on the circumstances.

RECOMMENDATIONS

The following recommendations promote efforts to protect and restore water in the region's rivers, streams, lakes, wetlands, and aquifers. Other sections of this Action Plan contain additional recommendations for reducing impacts from construction activities, contaminated runoff, stream disturbances, roads, agriculture, forest management, and other activities. The "Waterbody Inventory and Priority Waterbody List" (NYS DEC, 2007; NYS DEC, 2009), "Watershed Restoration and Protection Action Strategy" (WRAPS; NYS DEC and others, 2001), county water quality strategies, and local watershed plans provide additional detail for targeting implementation efforts to both curb emerging issues and restore problem areas.

Organizational Capacity: Expand the capacity of local, regional, and state organizations to conduct monitoring programs, provide technical assistance, and enforce regulations that facilitate water resource protection and restoration.

- 1a. Build strong local partnerships by re-invigorating county Water Quality Coordinating Committees (WQCCs) and attracting additional participants (from state agencies, federal agencies, county departments, municipalities, watershed groups, recreational organizations, academic institutions, and other organizations). Provide annual state funding to support ongoing committee activities (planning, training, outreach, monitoring, etc.) and grant funding for committee projects.

Immediate action: Regional planning boards provide ongoing support for each county WQCC.

5-year target: Provide annual mini-grant funding to county WQCCs to enable baseline funding with minimal administrative expenses. Ranking criteria for state water quality grants support projects that are identified in county Water Quality Strategies.

Long-range target: Provide each county with the assistance needed to maintain an active WQCC that develops and periodically updates a county Water Quality Strategy. Provide the committees and member organizations with the financial resources needed to implement strategy recommendations.

Measure: Number of active WQCCs. Number of grants to WQCCs.

- 1b. Expand citizen stewardship by supporting lake and watershed associations that work toward improved local management of water resources. These organizations provide valuable links between private citizens, municipal governments, and agency representatives; and can facilitate education and public involvement activities that foster a citizen based watershed ethic.

Immediate action: Engage citizens and encourage formation of watershed-based organizations to facilitate local stewardship of water resources. Provide assistance as needed with: organization, planning, public workshops, implementation projects, and financial support.

5-year target: Establish or re-invigorate lake associations and other watershed-based organizations.

Measure: Number of newly formed watershed-based organizations. Number of watershed organizations receiving assistance from county, regional, or state organizations.

- 1c. Enhance the ability of lakeshore property owners to protect and improve water quality in their lakes by offering training opportunities and educational material (such as information sheets and "Home*A*Syst, An Environmental Risk-Assessment Guide for the Home") for existing lake association members.

Immediate action: Provide existing lake associations with handouts about lake-friendly home management topics for distribution to members.

5-year target: Work with lake associations to conduct training sessions for lake front property owners based on topics in the Home*A*Syst handbook or other resources.

Measure: Number of lake associations that distributed handouts. Number of training sessions.

- 1d. Increase NYS Department of Environmental Conservation (NYS DEC) staff to expand the Department's capacity for: (1) regulatory oversight for natural gas development and other permit programs, (2) training, technical assistance, and public education about stormwater management (for both the construction

industry and regulated MS4s), floodplain management, stream remediation, post-flood stream work, water conservation, etc., (3) implementation of monitoring and assessment programs, (4) development of nutrient criteria (acceptable nutrient thresholds for NYS waters), (5) participation in county WQCCs, and (6) other assistance.

5-year target: NYS DEC procures funding, hires staff, and strengthens water resource programs for monitoring, training, technical assistance, and public education, as well as regulatory programs.

5-year target: NYS DEC develops and implements protective water quality standards for nutrients.

Measure: Number of new staff. NYS numeric nutrient standards developed.

- 1e. Increase NYS Department of Health (NYS DOH) and county health department staff to expand the capacity for: (1) public education about water supply issues, (2) private water supply sampling, (3) training and technical assistance regarding onsite wastewater treatment systems, (4) technical assistance to local governments for drinking water protection (source water assessment, wellhead protection, existing water quality issues, emerging issues, etc.), (5) participation in county WQCCs, and (6) other assistance.

5-year target: NYS DOH procures funding and expands services for monitoring, training, public education, and technical assistance, while maintaining support for public water supplies and enforcement of drinking water standards.

Measure: Number of new staff.

Monitoring and Planning: Monitor water quality, stream flows, and groundwater levels. Document this information and develop local watershed management plans.

- 1f. Seek funding to maintain existing water quality monitoring and research programs and expand these efforts. Identify gaps in data and knowledge, targeting new monitoring efforts to fill those needs. The existing NYS DEC Routine Statewide Monitoring and Assessment Program includes: Rotating Integrated Basin Studies (RIBS) of rivers and streams, Lake Classification and Inventory (LCI), and groundwater sampling program. Existing SRBC monitoring programs include: Subbasin Surveys (conducted about every 6 years), Small Watershed Studies (additional investigation following each Subbasin Survey), Interstate Stream Assessment (annually since 1985), Chesapeake Bay Program Sediment and Nutrient Monitoring (includes 5 sites in NY), Large River Assessment (includes 5 Susquehanna River sites in NY), Remote Monitoring Network (real-time data collection at headwater locations; currently includes 9 stations in NY), and Early Warning System for Binghamton and Elmira public water supplies (continuous monitoring of key parameters upstream of water intakes).

Immediate action: Restore the 5-year cycle for NYS DEC's Routine Statewide Monitoring and Assessment Programs and updated Waterbody Inventory and Priority Waterbody Lists (WI/PWL).

Immediate action: Maintain and improve SRBC water quality monitoring and assessment programs. Coordinate with local partners on Subbasin Surveys for the Chemung Subbasin (2012 and 2013) and Upper Susquehanna Subbasin (2013 and 2014), tailoring each Year-2 project to address local monitoring needs. Evaluate potential expansion of monitoring efforts, such as monitoring and assessments for bacteria and emerging contaminants of concern.

5-year target: Additional lake associations begin or resume monitoring of lake conditions through the Citizen Statewide Lake Assessment Program (CSLAP).

5-year target: Provide technical assistance for volunteer stream monitoring programs by citizen groups and/or students (which provide water quality screening and educational benefits).

5-year target: Provide local input to the WI/PWL from county Water Quality Coordinating Committees, Soil and Water Conservation Districts, watershed organizations, researchers, and others.

Measure: Years since last RIBS, LCI, groundwater sampling, and WI/PWL for Susquehanna and Chemung Watersheds. Number of SRBC monitoring reports. Number of CSLAP reports. Number

of volunteer stream monitoring programs that received technical assistance. Number of local organizations contributing WI/PWL information.

- 1g. Secure permanent funding for the federally operated river and stream gauges that are needed for water resource planning and management. (The magnitude and frequency of stream flows are critical data for evaluating both water quality and water quantity issues.)

Immediate action: Provide local letters and other support for ongoing efforts to secure a permanent funding source for the gauge network.

Measure: Number of letters and expressions of support.

- 1h. Expand the groundwater observation well network to provide better geographic coverage, more frequent measurements, and faster reporting time so that it can be used to monitor aquifer responses to rainfall events and droughts and provides the data needed for timely water management decisions.

Long-range target: Procure funding to improve the observation well network and provide real-time monitoring capability.

Measure: Number of observation wells and frequency of measurements.

- 1i. Develop scientifically based watershed management plans that present strategies for addressing both land management and water management issues that impact local water resources.

Immediate action: In watersheds with water resource concerns or problems (lake management issues, erosion, flooding, poor water quality, etc.), engage residents in collecting data to document the extent of problems and identify non-impacted areas for protection.

5-year target: Compile and analyze citizen-collected data and other information for priority watersheds and develop local watershed management plans. Engage watershed residents and property owners in implementing the plan and reducing the impacts of their activities.

Measure: Number of groups collecting data. Number of new plans.

Improved Sewage Disposal: Reduce contamination from sewage disposal by promoting improved management of on-site wastewater treatment systems (OWTS), expanding municipal sewer service to priority areas, and funding upgrades to existing sewage treatment plants. (Additional recommendations regarding municipal wastewater treatment infrastructure are in Recommendation 2g.)

- 1j. Improve the performance of on-site wastewater treatment systems (septic systems) by providing public education, training, and technical assistance throughout the watershed. (About half of the residential population in the watershed is served by about 120,000 on-site systems. Although the steps required for proper functioning of these systems are relatively simple and inexpensive, failure to maintain septic systems is a common problem.)

Immediate action: Encourage increased municipal involvement in OWTS issues in order to promote increased compliance with state standards. Conduct workshops for municipal code enforcement officials and planning boards about system siting and operation. Promote attendance by holding workshops in the local area, minimizing the cost, and offering continuing education credits.

Immediate action: Conduct education program(s) for lake shore property owners and others about how onsite systems work, proper maintenance, and proper use.

5-year target: Expand the efforts of public health departments to provide homeowners and contractors with information about the installation and maintenance of septic systems. Include information about the long-term cost savings from proper maintenance, which reduces the potential need for costly replacement projects.

Measure: Number of workshops and educational programs.

- 1k. Conduct studies to determine the magnitude and extent of failing on-site systems, targeting areas with small lots, proximity to lakes, or other reasons for concern.
- Immediate action: Provide assistance for lake associations to inventory sanitary systems and/or conduct dye testing.
- 5-year target: Conducts well water testing in an area where small lot sizes preclude adequate separation distances between septic systems and wells.
- Measure: Number of inventories or studies.*
- 1l. Encourage municipalities and/or counties to conduct on-site wastewater system inspections and to develop management strategies. Because it is difficult (in a largely rural and economically challenged region) to tell people that they need to spend money on septic system improvements, consider funding incentives for septic system improvements and maintenance.
- Immediate action: Share information throughout the watershed about existing programs for identifying failing onsite systems through routine inspections (such as the Lamoka-Waneta Lakes septic inspection program, the Otsego Lake septic system management plan, and the Schuyler County Watershed Protection Law) for consideration in other areas.
- 5-year target: Promote development of wastewater regulations and system inspection requirements. Procure funding for inspection and enforcement.
- 5-year target: Procure funding to continue the Schuyler County program to cost-share replacement of failing or antiquated septic system components. Share information about this initiative to serve as a model in other areas. Explore other kinds of incentive programs to promote upgrading of existing systems.
- 5-year target: Explore the concept of forming septic maintenance districts as a means to improve efficiency and consistency of operation of on-site waste treatment systems.
- Measure: Number of new OWTS inspection or maintenance programs. Number of OWTS cost-share programs and amount of funding.*
- 1m. Promote development of new public wastewater treatment facilities in areas with clusters of sub-standard onsite systems and/or direct discharges, including those identified in the WRAPS (NYS DEC and others, 2001) that have not yet been addressed and additional high risk communities identified by health departments.
- Immediate action: Targeting priority areas, provide technical and financial assistance with development and upgrading of public sewer systems.
- Immediate action: Conduct workshops for municipal leaders on financing for wastewater treatment projects.
- Long-range target: Provide public wastewater treatment services in all areas where improved septic system design and management are not adequate for preventing contamination of surface water or water supply wells from septic systems.
- Measure: Number of workshops. Number of new or expanded public systems.*
- Protect Drinking Water Supplies: Support human health by protecting public and private drinking water supplies with source water protection programs and public education.** (Additional recommendations regarding municipal water infrastructure are in Recommendation 2f.)
- 1o. Support the development of source water and wellhead protection programs for public water supplies (that build on the source water assessments conducted by NYS DOH). Because local communities generally lack the technical expertise to develop plans and regulations, experienced technical staff is needed to guide these protection efforts.

Immediate action: Initiate a campaign to educate the public and municipal leaders about the need for source water protection and strategies for developing successful programs.

Immediate action: Inventory existing source water and wellhead protection plans and regulations. Assess the potential contamination risks for public water supplies that lack such programs.

5-year target: Secure funding to provide assistance and support for development and implementation of source water and wellhead protection plans. Assistance to local governments and public water systems can include: grants, workshops, guidance documents, technical assistance, and establishment of spill detection and early warning systems.

Long-range target: Implement programs for all public water systems in the watershed to protect water supplies from contamination. Periodically review and update these plans.

Measure: Number of workshops or other educational efforts. Number of source water and wellhead protection plans/regulations. Number of local governments receiving assistance.

- 1p. Educate the public about protecting private drinking water supplies.

Immediate action: Distribute educational material about source water protection for individual drinking water systems (such as the Drinking Water Well Management chapter from the Home*A*Syst handbook).

Measure: Number of events, locations, or publications in which information was distributed.

- 1q. Develop regulations and non-regulatory programs designed to protect critical aquifers from contamination. This supplements wellhead protection programs, which only provide for protection of public supply wells and only within the immediate vicinity of the wells.

5-year target: Secure resources to enable additional technical assistance to local governments.

Measure: Number of local governments receiving assistance.

Atmospheric Deposition: Reduce atmospheric deposition of mercury, nitrogen, and other pollutants, which originate from sources within and outside of the watershed.

- 1r. Prevent public exposure to mercury from fish consumption by (1) temporary use of fish consumption advisories (specifying the types and quantities of fish that can safely be consumed) and (2) long-term reductions in mercury emissions. (Mercury reaches waterbodies primarily through atmospheric deposition and is concentrated in fish. It poses a threat to humans who consume contaminated fish.)

Immediate action: Conduct additional monitoring of mercury levels in fish. Publicize information about fish consumption advisories and the risks of consuming contaminated fish. NOTE: These advisories are intended to be temporary until pollution can be reduced to levels that allow for safe fish consumption.

Long-range target: Promote implementation of the “Northeast Regional Mercury Total Maximum Daily Load,” which outlines a strategy for reducing mercury concentrations in fish based primarily on reducing atmospheric releases of mercury. This will require reductions from mercury sources within the Northeast region, in states outside of the region, and from global sources.

Measure: Number of waterbodies in which mercury levels in fish were measured. Number of fish consumption advisories due to mercury. Number of letters and expressions of support for programs that curb mercury emissions.

- 1s. Reduce atmospheric deposition of nitrogen (which accounts for about 1/3 of the Chesapeake Bay’s nitrogen loading) by managing atmospheric releases throughout the “air-shed” of the Chesapeake Bay (which is significantly different than the watershed). Nitrogen from atmospheric deposition is included in the New York pollution allocation for the Chesapeake Bay TMDL, even though it is largely from sources outside of NYS.

Immediate action: Promote federal policies to curb nitrogen emissions that impact water quality in New York and the Chesapeake Bay. This could be accomplished by nationwide reductions in the permitted levels of nitrogen oxides from power plants, motor vehicles, farms, and other sources. Nitrogen allocations in the Chesapeake Bay TMDL could be revised to encompass all areas in the “air-shed.”

5-year target: Continue efforts to reduce atmospheric nitrogen pollution from sources in New York State, document the benefits of reducing atmospheric deposition (for credit in the Chesapeake Bay Watershed Model), and support research on nitrogen transport (to improve the Model).

Measure: Number of letters and expressions of support for programs that curb nitrogen emissions. Number of studies. Change in the amount of New York’s nitrogen load to the Chesapeake Bay that is from atmospheric deposition (as calculated by the Chesapeake Bay Program).

Management of Hazardous Materials: Reduce water pollution originating from landfills, unsafe disposal practices, and chemical spills.

- 1t. Assist with proper disposal of hazardous materials in order to reduce the storage and improper disposal of hazardous substances by households, farmers, public institutions, and businesses.

Immediate action: Continue and expand county programs for periodic collection and disposal of hazardous materials.

Long-range target: Remediate all hazardous waste disposal sites in the watershed.

Measure: Number of collection events. Number of sites remediated.

- 1u. Minimize contamination of surface and groundwater supplies from hazardous material spills by implementing spill prevention practices, encouraging reporting of spills, and maintaining spill response capabilities.

Immediate action: Provide the public and municipal personnel with information about reporting spills (such as the “Reporting Polluting Discharges” information sheets developed for Chemung, Schuyler, and Steuben Counties).

Immediate action: Provide emergency personnel with the resources needed to attend training, purchase equipment, and maintain access to information resources for effective spill response efforts.

Immediate action: Provide training in spill prevention and response to natural gas industry employees.

Measure: Number of information sheets developed/distributed. Number of training sessions. Number of projects or major purchases that support spill response.

Downstream Water Quality: Reduce the pollution loads delivered to the Chesapeake Bay from the New York part of the watershed to the extent that this can be accomplished without major economic impacts. Quantify load reductions for incorporation into the Chesapeake Bay Watershed Model.³

- 1v. In order to improve the basis for future planning and implementation efforts, continue to work with EPA to refine the Chesapeake Bay Watershed Model and provide accurate input data for the NY portion of the watershed.

Immediate action: The Upper Susquehanna Coalition (USC) Scientific Support Group provides support for funding and coordination of research on the export of nutrients from headwater streams, legacy sediment, tree planting, green infrastructure, stormwater management, septic programs, and other topics that are relevant to evaluating and reducing the nutrient and sediment loads transported from New York to the Chesapeake Bay.

³ NYS DEC Chesapeake Bay Watershed Program information: <http://www.dec.ny.gov/lands/33279.html>

5-year target: Work with the EPA to adjust New York's pollution load allocations in the Chesapeake Bay TMDL so that they are fair and achievable. New York should be given "credit" for maintaining clean water to dilute downstream pollutants. Document New York's strategy for achieving the required reductions in the updated Watershed Implementation Plan.

Measure: Number of studies. Number of letters, documents, and other efforts related to the NYS portion of the Chesapeake Bay TMDL.

- 1w. Secure funding (from federal, state, and local sources) to implement cost-effective management practices that improve local water quality and support the Chesapeake Bay restoration effort.

Immediate action: Implement wastewater treatment upgrades, improved stormwater management, and agricultural Best Management Practices (BMPs) as funding permits. Document these activities for reporting to the Chesapeake Bay Program.

Measure: Nitrogen, phosphorus, and sediment loads entering the Chesapeake Bay from New York, as calculated by the Chesapeake Bay Program.

Abundant Water: Maintain abundant surface and groundwater supplies through conservation, local mitigation, drought management, flow standard guidance, water budgets, etc. Water availability should be adequate for immediate and future needs, even during droughts. Recommendations related to Land Use and Runoff (Sections 3 and 6) support this objective by protecting groundwater recharge areas.

- 1x. Conduct research on the hydrologic systems that support municipal and industrial water use, including water budget analysis, identification of critical aquifer recharge areas, and aquifer mapping. The Corning Area has been designated by SRBC as a Potentially Stressed Area where additional analysis and management may be warranted. Proposals for increased water use in small headwater basins may also trigger the need for assessment of local water availability.

5-year target: Provide local governments with technical support to identify critical groundwater recharge areas and develop strategies for safeguarding recharge functions.

Long-range target: Conduct local and regional water budget assessments (analysis of anticipated demand and expected base flow levels) in areas with existing or anticipated high water use in order to determine water availability and establish sustainable limits for water use.

Long-range target: In areas with development pressure, conduct aquifer assessment and mapping to provide improved understanding of the underground water resource.

Measure: Number of local governments receiving technical support. Number of studies.

- 1y. Promote sustainable use of water for domestic, industrial, municipal, commercial, agricultural, and recreational activities.

Immediate action: Encourage public use of water conservation practices by distributing educational information (in water bills and through other means).

Immediate action: Encourage and incentivize water conservation by water suppliers, industry, and other major water users through regulatory requirements (for NYS water supply permits and SRBC approvals for water withdrawals and consumptive use).

5-year target: Develop and conduct educational programs about sustainable water use targeted to specific audiences, including: local governments; major water users; consultants; and environmental, conservation, and citizen organizations. Develop tools these groups can use to make informed water use decisions.

Long-range target: Identify opportunities for water reuse and conservation (such as the Elmira Country Club proposal to solve a runoff issues while reducing the need for potable water for watering greens) and implement as resources permit.

Measure: Number of educational projects. Number of water conservation incentives in permit programs. Number of water re-use and conservation projects.

- 1z. Coordinate and implement low-flow water management activities, including SRBC regulation of water withdrawals and municipal land use controls.

Immediate action: Support sustainable use of water through enhancement of SRBC regulatory programs for surface water withdrawals, groundwater withdrawals and consumptive water use. The project review process and conditions for project approval are intended to prevent water withdrawal rates that exceed the sustainable capacity of the waterbody or groundwater source. Continue low flow monitoring and use these data, along with the results of the Susquehanna Ecosystem Flows Study, to establish passby flow requirements for surface water withdrawals.

Immediate action: Support NY participation in Susquehanna River Basin Commission (SRBC) multiagency committees that provide coordination of water resource data collection, planning, monitoring, and management procedures.

5-year target: Support coordinated implementation of recommendations in the “Groundwater Management Plan for the Susquehanna River Basin” (SRBC, 2005). Update this plan.

5-year target: Encourage and assist local governments with incorporation of groundwater management concepts into planning and land use control.

Measure: Changes to SRBC permit programs. Amount of NY participation in SRBC committees and groundwater management implementation. Number of local governments receiving assistance.

- 1aa. Provide for local and regional mitigation of water that is used consumptively and thus removed from the local system. Mitigation projects enable water storage and “compensation releases” during low flow conditions to support in-stream needs. This low flow augmentation should occur as close to the location of the consumptive use withdrawals as possible.

Immediate action: Encourage local mitigation of consumptive use or termination of withdrawals during low flow conditions, which is preferable to the large-scale water storage projects that have been funded through SRBC’s consumptive use mitigation program.

Long-range target: Support implementation of recommendations in the SRBC “Consumptive Use Mitigation Plan” (SRBC, March 2008), which presents a strategy for identifying and developing projects that will compensate for the impacts of consumptive water use during droughts. Implementation requires additional analyses, including the use of in-stream flow assessments to assure that mitigation occurs where it is needed and at appropriate levels.

Measure: Number of local projects to mitigate consumptive water use. Amount of progress on implementing the “Consumptive Use Mitigation Plan.”

- 1bb. Periodically review and update state and watershed drought management plans. The “Susquehanna River Basin Drought Coordination Plan” (SRBC, 2000) specifies the roles and authorities for declaring, managing, and monitoring drought conditions.

5-year target: Review periodically and revise drought plans as warranted. SRBC plan is slated to be updated in the near term.

Measure: Number of drought plans reviewed/revised.

- 1cc. Conduct local and/or regional drought contingency planning for public water supply systems.

Immediate action: Provide information and technical assistance for developing and updating plans.

Measure: Number of local governments receiving assistance.

SECTION 2 ECONOMIC DEVELOPMENT

GOAL: Capitalize on water resources as economic assets.

- Promote economic development strategies that protect the region's water resources and use them wisely because they are integral to the local economy.
- Foster regional collaboration to implement environmentally sensitive economic development strategies.

CHALLENGE

The Susquehanna-Chemung region is endowed with an abundance of environmental, scenic, historic, cultural, and recreational resources. Yet the economy continues to struggle. Steep slopes, floodplains, wetlands, and other environmental features limit the potential for economic development in many parts of the watershed. In fact, most of the region's best sites for development already support urban land uses or productive agricultural businesses.



Village of Owego (courtesy of STERPDB)

Water Resources: Water resources were the initial catalyst for development of the Susquehanna-Chemung Watershed and remain key factors in the region's economy and quality of life. Abundant surface waters and highly productive aquifers are generally able to meet residential, commercial, agricultural, and industrial demands. Preserving these resources will make this region highly attractive to water intensive industries, particularly if water shortages become more common. However, river valley aquifers are vulnerable to contamination by human activity (due to the permeability of overlying soils). And the quality of surface water is also a concern due to downstream impairment of the Chesapeake Bay. In December 2010, the US Environmental Protection Agency established a remediation plan (called a Total Maximum Daily Load or TMDL) that requires reductions in nitrogen, phosphorus, and sediment loads from throughout the Chesapeake Bay Watershed, including New York. This imposes significant challenges due to the anticipated costs of meeting higher standards for wastewater treatment facilities, agriculture (particularly livestock operations), and urban runoff. These costs may stifle economic growth.

Agriculture and Forestry: The region's climate, topography, and soils are able to support a productive landscape, with agriculture, forestry, and wood products comprising an important component of the regional economy. The importance of these industries is magnified by high economic multipliers. In addition, the ambiance of forested and agricultural areas supports the tourism industry. However, economic challenges threaten the viability of many farm operations and agri-businesses.

Tourism: Tourism sustains about 6% of all jobs in New York State (Tourism Economics, 2009) and is a key component of economic development strategies for the Susquehanna-Chemung region. This area is a perfect distance for "nearby tourists" – far enough to be a vacation yet close enough to use your own car. Watershed residents also boost the local economy when they stay near home, rather than traveling, for recreational activities. Rolling hills, scenic farmlands, rural vistas, and outdoor recreation are major contributors to the region's appeal. Tourism creates a financial incentive for maintaining and enhancing the region's charm, amenities, and environmental quality. Coordinated marketing could promote a shared identity for the Southern Tier as a vacation destination (more than just the gateway to the Finger Lakes).

Resource Extraction: The watershed has a long history of economic development based on extraction of natural resources, which has produced both economic benefits and adverse environmental consequences. Widespread logging of New York's hillsides in the 19th and 20th centuries resulted in significant soil erosion and increased runoff, causing long-term alteration of the region's hydrology. Oil and gas have been produced in

the western part of the watershed since early in the 20th century. The region is now anticipating increased development of natural gas resources from the Marcellus Shale and other deep shale formations. The hydraulic fracturing process used to produce the natural gas from shale formations utilizes large volumes of water.⁴ Water that returns to the surface requires treatment or deep-well disposal. Many residents are concerned about the potential for contamination of groundwater and surface water resources. Natural gas drilling has become a very contentious issue due to the challenge of establishing the appropriate balance between short-term economic benefits and long-term protection of local assets, particularly water resources. As with any natural resource, the extraction of gas provides income for landowners, profit for companies, employment for laborers, and increased tax revenue for government. However, learning from past mistakes, resource development should be accompanied by policies to ensure that environmental impacts are not left for future generations. At the time of this writing, the NYS Department of Environmental Conservation (NYS DEC) is attempting to develop such policies. County task forces and other organizations are actively developing strategies for preventing and mitigating potential adverse impacts from increased development of the Marcellus Shale and other energy resources. In addition, landowner coalitions are attempting to ensure that property owners throughout the region are able to negotiate fair gas leases with protections for their property and water resources. In addition to the direct impacts that energy development may have on the environment are the potential indirect impacts on industries that rely heavily on the natural environment, such as tourism and agriculture.

“The quality of place is a state of mind – It has emerged as one of the most important ingredients in developing a successful, sustainable community.”

- Jack Benjamin, Three Rivers Development Corporation

RECOMMENDATIONS

Numerous local and regional organizations are actively engaged in business retention/expansion, workforce development, and other economic development issues. The following recommendations are intended to enhance these ongoing efforts by promoting increased communication, coordination, and collaboration to facilitate economic development that is compatible with protecting the economically and environmentally valuable functions of natural watershed systems.

Tourism: Enhance and promote the region’s scenic beauty, charm, and recreational assets. (Additional recommendations regarding outdoor recreation are in Section 10).

2a. Identify who uses the river and other outdoor recreational opportunities and how the resource is used (hiking, boating, fishing, bird watching, etc.). Determine what amenities would facilitate additional use, such as: restrooms, parking, maps, campgrounds, and adjacent businesses. Develop a strategy for implementing improvements and attracting business that would enhance recreational use of water resources.

5-year target: Conduct county or regional studies of recreational assets and needs. Implement improvements as resources permit.

Long-range target: Implement recreational improvement strategies. Update them every five years.

Measure: Number of new and updated studies. Amount of implementation.

2b. Promote increased communication, coordination, and participation among people, organizations, businesses, and groups across the watershed with an interest in protecting and promoting the region’s water resources for recreational and tourist opportunities.

5-year target: Conduct regional tourism conferences on a variety of topics and in various locations.

⁴ To-date the average water use for the drilling phase has been 5.5 million gallons of fresh water for each well. However, this amount is decreasing as more companies recycle flowback water.

5-year target: Increase the coordinated promotion of recreational opportunities and facilities through various media, including the Internet as a primary public information tool.

Measure: Number of conferences. Number of promotional campaigns.

- 2c. Identify creative ways to support historic connections to the region's rivers and streams, which were important assets to early developers but have more recently been viewed as liabilities due to flooding. Although levees are needed for flood control, they have become barriers that restrict views of the rivers and limit access to the water. Address legal barriers that limit temporary and compatible uses of floodplain and riverside locations.

5-year target: Conduct a conference for waterfront communities (modeled after the 2005 Riverfront Conference in Harrisburg conducted as part of the Susquehanna Greenways project).

Long-range target: Individual communities incorporate strategies for connecting to the river into Comprehensive Plans.

Measure: Number of training and networking sessions. Number of revised plans.

- 2d. Promote economic development strategies that revitalize downtown commercial districts through historic preservation. Potential resources and assistance may be available from the NYS Main Street program and the NYS Office of Parks, Recreation, and Historic Preservation.

Immediate action: Provide training about Main Street revitalization and historic preservation.

Long-range target: Individual communities incorporate strategies for Main Street revitalization into Comprehensive Plans.

Measure: Number of training sessions. Number of revised plans.

- 2e. Develop and promote a regional identity that is incorporated into local "brands" for tourist destinations in the Susquehanna-Chemung Watershed. Utilize a regional marketing strategy, signs, and other means to attract tourists and cultivate a shared identity among watershed communities.

Long-range target: Develop and implement a regional marketing strategy for tourism.

Measure: Extent to which a regional identity is incorporated into local tourism marketing efforts.

Sewer and Water Infrastructure: The undisputed economic consequences of impaired drinking water quality must be avoided.

- 2f. Secure the funding needed to maintain municipal water infrastructure, so that the region's abundant and high quality water resources can support economic development. Implement expansions, as needed, to support economic development and protect public health, with new or expanded systems designed to prevent sprawl. Identification of needs and priorities can be based, in part, on the inventory of "Water Supply and Sewage Disposal Systems in the Southern Tier East Region," "Tioga County Infrastructure Master Plan," and "Chemung River Valley Water Study."

Long-range target: Secure funding and implement as resources permit.

Measure: Number of water systems that have implemented improvements.

- 2g. Secure the funding needed to maintain and enhance municipal sewage treatment infrastructure in order to protect public health, protect water quality, and promote economic development. Work to eliminate Combined Sewer Overflows (in which wastewater is released during periods of high runoff) through implementation of Long Term Control Plans, Flow Management Plans, and other means. Take steps to reduce the damage and environmental contamination due to flooding. Promote construction of industrial pre-treatment facilities that can be used by multiple businesses. Identification of needs and priorities can be based, in part, on the inventory of "Water Supply and Sewage Disposal Systems in the Southern Tier East Region" and "Tioga County Infrastructure Master Plan."

Long-range target: Secure funding and implement as resources permit.

Measure: Number of treatment plants that have implemented improvements.

- 2h. Work to avoid adverse economic impacts from the proposed sewage treatment standards for Chesapeake Bay restoration, which exceed the standards required to protect local water quality in New York.

Immediate action: Support ongoing efforts by the Southern Tier Chesapeake Bay TMDL Commenting Coalition and others.

Measure: Changes to the NYS TMDL allocation.



Trickling filter for Village of Addison Wastewater Treatment Plant; ring levee (by the fence) provides flood protection (courtesy of Village of Addison).

Manufacturing/Commercial Development: Establish a balance between short-term economic development needs and the long term protection of rivers and natural resources.

- 2i. Because New York's new Smart Growth law now prohibits state funding of projects that contribute to sprawl, there is an immediate need to educate municipalities, developers, and economic development organizations about how to incorporate smart growth strategies into proposed development projects. Modification and tailoring of these principles will be necessary to accommodate the unique needs of the rural portions of the watershed. Develop educational resources and conduct training about applicable smart growth strategies. (Additional smart growth information and recommendations are in Section 3, Land Use).

Immediate action: Assemble and distribute resource materials. Conduct Smart Growth training in each county.

5-year target: Integrate Smart Growth principles into economic development priorities and infrastructure planning.

Measure: Number of educational resources and training sessions. Number of economic development strategies that incorporate smart growth principals.

- 2j. Unilaterally support the reuse of existing structures rather than new construction. Create an inventory of vacant or under-utilized industrial/commercial structures and actively market and/or seek alternative uses for these buildings. Promote revision of the Leadership in Energy and Environmental Design (LEED) certification system to adequately reward re-use of existing structures.

5-year target: Conduct inventories of buildings and sites that represent redevelopment opportunities. Integrate these opportunities into county and regional economic development strategies.

Measure: Number of communities with inventories. Number of economic development strategies that incorporate redevelopment opportunities.

- 2k. Promote and facilitate re-development of existing brownfield areas. Create an inventory of brownfield sites that may offer opportunities for redevelopment (such as the Broome County inventory developed by the County Environmental Management Council). Support new and continued community involvement in the NYS Brownfield Opportunity Areas (BOA) program.

5-year target: Inventory brownfield sites and incorporate brownfield redevelopment opportunities into county and regional economic development strategies.

5-year target: Complete the feasibility studies and attract tenants for each BOA project in the watershed (Brandywine Corridor, City of Norwich, Endicott-Johnson Industrial Spine, and Erwin-Painted Post-Riverside BOAs).

Measure: Number of economic development strategies that include brownfield redevelopment opportunities. Number of BOA projects advancing to the next BOA 'stage.'

- 2l. Site selection and design for new industrial, commercial, and infrastructure development should minimize adverse impacts on drainage systems, river corridors, stream processes, floodplain functions, wetlands, and critical environmental areas. Public and private utility uses and rights-of-way should be concentrated to minimize impacts.

Long-range target: Develop and implement strategies for evaluating proposed economic development projects that identify the impact on significant resources and compare the environmental impacts with the economic benefits, particularly in relation to water quality.

Measure: Number of economic development projects evaluated for environmental cost vs. economic benefits.

- 2m. Integrate the region's abundant and high quality surface and ground water resources into "asset based" economic development strategies that capitalize on these resources, while also providing long-term protection.

5-year target: Conduct an Asset-Based Economic Development conference.

Measure: Number of training and networking sessions.

- 2n. Promote Leadership in Energy and Environmental Design (LEED) certification for retrofitting, design, and construction as a means for promoting water efficiency, stewardship of resources, and other "green" objectives. (See also Recommendation 3o in the Land Use section.)



Immediate action: Educate the business community and the public about what LEED certification is and how buildings can be certified. Publicize LEED training events.

Long-range target: Surpass LEED standards in promoting the re-use of existing structures.

Measure: Number of training resources and events. Number of LEED certified projects and projects that exceed LEED standards.

Natural Resource Utilization: Industries that utilize or extract natural resources (stone quarries, oil and gas wells, wind farms, etc.) can be expected to utilize and impact the region's water resources. "Reasonable use" by these businesses (like other industries) involves operating in a manner that enables long-term protection of groundwater and surface water resources.

- 2o. Facilities associated with resource extraction industries (storage sites, wellheads, roads, pipelines, surface mines, tower sites, etc.) are typically located in rural landscapes, rather than in industrial parks, and thus require project-specific assessment of location and site design issues. This development should be located in a manner that minimizes fragmentation of habitat, avoids adverse stormwater impacts, does not encroach on floodplains, and minimizes impacts on the view shed.

Immediate action: NYS DEC and local task forces develop and share strategies for preventing environmental impacts from land use changes and restoring the environment after any such impacts.

Measure: Number of new low-impact strategies developed and promoted.

- 2p. The Susquehanna River Basin Commission (SRBC) has regulatory authority over water withdrawals and use. All projects subject to Commission approval are required to follow water conservation standards. The Commission maintains information about pending applications and approved projects on their Water

Resource Portal.⁵ Local stakeholders should monitor this information and provide input regarding pending applications or possible violations when warranted.

Immediate action: NYS DEC and local partners coordinate with and provide information to SRBC to promote effective implementation of regulations.

Measure: Amount of agency and public involvement in SRBC regulatory program.

- 2q. Promote beneficial use of uncontaminated byproducts, treatment of contaminated wastes, and safe disposal of all waste materials from resource extraction. Due to safety and environmental concerns related to the storage of contaminated liquid wastes from hydraulic fracturing processes, recycling and/or treatment facilities should have sufficient capacity prior to generation of such wastes.

Immediate action: NYS DEC works with the natural gas industry, waste treatment facilities, and others to develop, finance, and implement effective waste management practices and requirements.

Immediate action: SRBC continues to encourage water conservation and water reuse practices for all projects (in addition to water conservation requirements for approved projects).

Measure: Number of new waste management requirements from NYS DEC. Number of new waste management practices implemented in the region.

- 2r. As gas drilling and other extractive industries move to new areas or utilize new technologies, local communities should work with the industry to identify potential spill locations (on-site, along transportation routes, etc.) and put in place systems for containing spilled materials and procedures for rapid response and clean up.

Immediate action: NYS DEC and local task forces develop and implement strategies for minimizing environmental contamination from spills.

Measure: Number of mitigation strategies developed.

⁵ SRBC Water Resource Portal: www.srbc.net/wrp

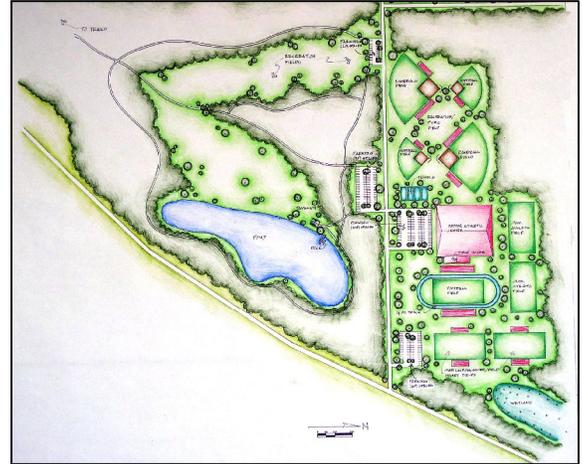
SECTION 3 LAND USE

GOAL: Use the landscape in ways that support healthy water systems.

- Promote land use patterns that facilitate enjoyment and sustainable use of lakes, rivers, streams, and wetlands while preserving natural watershed functions.
- Promote development patterns that strike a balance between preventing sprawl, minimizing floodplain development, encouraging infill development and protecting steep slopes.

CHALLENGE

Water flows through our communities and the health of that water is tied to the health of the landscape. The Susquehanna-Chemung Watershed is primarily rural, with scenic rolling hills and a handful of medium sized cities. Although the region has not experienced population growth, increased development still threatens water resources and the sustainability of communities. This new development has brought to light the hazards and water quality impacts of building in floodplains, on steep slopes, and near waterways. However, there is a perception among many developers, elected officials and residents that land use controls place unreasonable limitations on development. Further, the challenging economic climate fuels a desperate strategy of approving any type of new development in any location in hopes of boosting the local economy and increasing taxable properties in the municipality.



The quality of water resources and the quality of life are both inextricably bound to the health of the landscape. Poorly planned development can lead to deteriorating water quality, encroachment on streams and wetlands, increased flood risks, and erosion damage. Because many existing communities are located between steep hillsides and waterways, good land use decisions require careful balancing between development on slopes, re-development in floodplains, and the loss of agricultural land. In order to grow sustainably, the region must tackle the challenge of growth and economic vitality while also protecting natural resources and preventing high-risk development.

Land Use Survey: A survey of planners, planning board members, code enforcement officers, and elected officials for local governments in the Susquehanna-Chemung Watershed highlighted the challenges faced by communities. These include: Marcellus Shale natural gas extraction, economic development (or lack thereof), farmland and open space protection, steep slopes, old infrastructure, and lack of land use knowledge among residents. Many of these challenges are overwhelming to volunteer planning boards, which are often tasked with finding the solutions.

The respondents also indicated that comprehensive planning is an excellent tool for municipalities to tackle these challenges and achieve their community goals. 68% of the respondents' communities have comprehensive plans, but less than a quarter of those are accessible to the public via the internet. It was also noted that many comprehensive plans are outdated and need updating.

Training, training, training. Watershed municipalities are screaming for more training on all of the topics mentioned in the survey. Many respondents were not familiar with the new New York State Smart Growth law, Smart Growth principals, Better Site Design/Low Impact Development, or Critical Environmental Areas. Few are using these valuable tools to address land use challenges. Excellent planning resources exist, but they must be placed in the hands of community decision makers, most of whom are not trained planners.

Sprawl Without Growth:

A 2003 land use study of upstate New York showed a 30% increase in land development between 1982 and 1997, but only a 2.6% growth in population during the same period.

RECOMMENDATIONS

Education, Training, and Technical Assistance: Education is the key to improved land use decision-making. Educate municipal leaders, county organizations, volunteer planning boards, and the public about planning strategies and tools.

3a. Train municipal planning boards, municipal leaders and residents about:

- Comprehensive Planning
- Stormwater Impacts
- Better Site Design/Low Impact Development
- Critical Environmental Areas
- State Environmental Quality Review (SEQR)
- Flood mitigation
- Floodplain permits
- New York State Smart Growth Law
- Marcellus Shale natural gas extraction

Immediate action: Conduct, coordinate, and promote training sessions on all of these topics, reaching out to urban and rural municipalities throughout the Susquehanna-Chemung Watershed.

Measure: Number of training sessions.

3b. Notify all municipalities about the availability of planning resources and training opportunities, using multiple communication methods: email, mail, flyers, websites, and phone calls. Increase communication with county planners and state contacts to whom questions can be directed.

Immediate action: Make resources related to all of these topics available on county and regional web pages (including the Susquehanna-Chemung Action Plan website). Advertise the availability of these resources and the “go-to person” for questions on each topic.

Measure: Number of websites that mention and promote available resources.

3c. Implement Circuit Rider programs to provide professional planning assistance to municipalities throughout the region, such as the program in Delaware County.

Immediate action: Identify funding sources and lead organizations for developing county-wide or regional programs that provide increased levels of planning assistance to municipalities on an as-needed basis.

Long-range target: Establish Circuit Rider programs (or other mechanisms) that provide direct planning assistance to local governments throughout the Susquehanna-Chemung Watershed.

Measure: Number of municipalities that receive technical assistance.

Land Use Planning: Plan for a sustainable future by preparing (new and updated) comprehensive plans that guide future growth and enhance the quality of life.

3d. Evaluate existing municipal comprehensive plans for consistency with good planning principles and current conditions. Identify where improvements can be made and update plans as warranted.

Immediate action: Work with municipalities to evaluate and update their comprehensive plans.

Measure: Number of comprehensive plans updated.

- 3e. Develop comprehensive plans that document the community's vision for municipalities that do not yet have them, utilizing sustainable planning approaches.

Immediate action: Initiate the comprehensive planning process in municipalities.

Measure: Number of municipalities that initiate comprehensive plans.

- 3f. Post model laws, sample language, and other planning resources on county and regional websites to provide reference materials for comprehensive planning and land use decisions. Make hard copy formats available by request.

Immediate action: Gather and post planning materials on the internet and notify municipalities about the availability of resources.

5-year target: Work with communities to make their comprehensive plans accessible via the web (in addition to the traditional hard copies). Create a database of electronically available comprehensive plans for the watershed.

Measure: Number of municipalities notified of available planning resources. Number of comprehensive plans posted on the internet.

- 3g. Develop model laws and sample language for municipal planning, including: comprehensive plans, wellhead and source water protection plans, stream corridor management plans, hazard mitigation plans, etc. Post these resources on county and regional planning websites and distribute to interested municipalities.

5-year target: Seek funding to find and create model laws and sample language for municipal plans.

Measure: Number of model laws and sample language sections developed and made available.

- 3h. Provide internet access to map-based information that is relevant to land use and site plan decisions. Encourage developers and planners to use these resources.

Immediate action: Maintain, update, and expand on the GIS information and interactive mapping tools developed for the online Susquehanna-Chemung Data Atlas.⁶

Long-range target: Counties and/or regions host interactive mapping tools and data warehouses.

Measure: Number of data sets available through the Data Atlas. Number of counties encompassed by interactive mapping tool(s).



Courtesy of STERPDB.

Encourage Sustainable Land Use Patterns: Promote land use patterns that facilitate enjoyment of waters and preservation of natural watershed functions.

- 3i. Educate the public about the benefits of good land use decisions. Frame land use restrictions/controls in a positive light as protective measures that improve the quality of life and property values.

Immediate action: Utilize public meetings, newsletters, and press releases to publicize changes to

⁶ Susquehanna-Chemung Data Atlas: <http://24.97.219.74/SCAtlas/>

municipal land use regulations and the positive community benefits that will result.

Measure: Number of public meetings and articles promoting new land use regulations.

- 3j. Promote a better understanding of urban ecology and the benefits of trees, gardens, greenways, and other habitat within developed areas.

Immediate action: Conduct training on urban ecology and its importance for healthy, well managed communities. Target municipal and county planners as well as developers. Post educational materials on regional and county planning websites.

Measure: Number of training sessions.

- 3k. Train municipalities on the long-term benefits of integrating drainage concerns into the design of development projects (Better Site Design principles) and how local land use policies and requirements can encourage the use of these practices.

Immediate action: Conduct training on Better Site Design principles. Post resources on regional and county planning websites.

Measure: Number of training sessions.

- 3l. Help municipalities understand how designation of Critical Environmental Areas, overlay districts, and other land use tools can be used to protect important natural areas within the community.

Immediate action: Integrate information about strategies and tools for protecting natural areas into land use training and make resources available through the STC and STERPDB websites.

Measure: Number of training sessions and websites that include information about natural area protection.

Smart Growth and New York State

Smart growth is planned growth that balances the need for economic development with the desire to enhance the natural and built environments. Smart Growth protects forest, agricultural, and environmental resources by encouraging growth in developed areas with existing infrastructure. This means that urban, suburban and rural communities are designed with housing and transportation choices near jobs, shops and schools.

In 2010, legislation was passed requiring that New York State infrastructure funding be consistent with Smart Growth principles. Project proposals are reviewed based on the following Smart Growth Public Infrastructure Policy Act Criteria:

- Does the project use, maintain, or enhance existing infrastructure?
- Is the project occurring in an already developed area? Is it at least proposed for an area that a community has selected for development in a comprehensive plan?
- Does it protect natural resources, agricultural land, and areas of historic or archaeological significance?
- Does it encourage mixed land uses and compact development; downtown revitalization; brownfield redevelopment; diverse and affordable housing close to places of employment, recreation, and commercial development; and integration of different age and economic groups?
- Does it improve access to and quality of public transit? Will it help to reduce dependence on automobiles?
- Does it encourage community involvement in planning? What about intergovernmental cooperation?
- Does it reduce greenhouse gas emissions?

Smart Growth: Promote the use of good planning and project design principles, such as Smart Growth strategies for preventing sprawl. Consider the unique needs of rural municipalities and apply smart growth strategies where applicable.

- 3m. Educate municipalities about the economic, environmental, and quality-of-life benefits of maintaining open space and tools for achieving open space objectives.

Immediate action: Conduct training sessions on Smart Growth principles and other strategies for protecting open space. Post resources on the regional and county planning websites.

5-year target: Lobby the state to restore funding to the Restore New York program, which enables restoration of aging infrastructure and reuse of abandoned downtown buildings. Encourage NYS and local officials to support the restoration of aging unused buildings as a Smart Growth strategy.

Measure: Number of training sessions. Number of aging downtown buildings revitalized.

- 3n. Update municipal land use policies and regulations (zoning, subdivision, site plan review, etc.) to integrate Smart Growth principals, where appropriate. A potential tool is SmartCode, a model development code that uses a “rural-to-urban transect” approach to integrate Smart Growth principles into land use regulations.

Immediate action: As comprehensive plans are updated (or originated), train planning boards to integrate Smart Growth principals into the project review process.

5-year target: Create resource sheet/checklist for planning boards to use in their site plan review process and post on regional and county planning websites.

Measure: Number of comprehensive plans that include smart growth principals. Number of municipalities receiving resource checklist.

- 3o. Promote voluntary use of “green” building design by educating the public, design professionals, and municipal building officials about green building design and the Leadership in Energy and Environmental Design (LEED) building certification system.

Immediate action: Conduct training about various components of green building design (energy savings, water efficiency, CO₂ emissions reduction, stewardship of resources, etc.) and/or the LEED certification program. Post resources on regional and county planning websites.

Immediate action: Find green building success stories and promote these projects through various outreach methods.

Measure: Number of training sessions. Number of green building success stories promoted.

SECTION 4 STREAMS AND RIVERS

GOAL: Live in harmony with streams.

- Conserve, protect, and enhance stream and river systems so that the channels and floodplains provide beneficial functions for habitat, flood damage prevention, and water quality.
- Maintain and restore the connections between streams and their floodplains.
- Use science-based practices when stream systems are disturbed by roads, bridges, pipelines, post-flood stream work, or other projects.

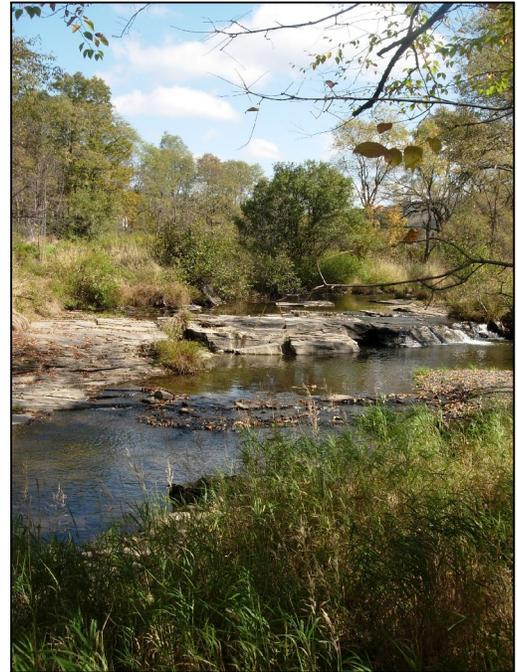
CHALLENGE

Streams and rivers are active systems. When natural or human-caused changes occur in a watershed, the stream adapts by changing the shape and even the location of its channel. The geology and soils in the Susquehanna-Chemung Watershed result in streams that are highly susceptible to these channel adjustments (due to flashy stream flows and easily eroded soils). In addition, the region has a long history of human actions that have disrupted the “dynamic equilibrium” of stream systems. An unintended consequence is that many, many streams and rivers are now “maintenance problems.” Watershed residents are faced with the difficult (and costly) challenge of restoring stream systems so that they are assets to the rural and developed landscapes through which they pass.

Historically, large portions of the watershed were cleared of forest cover for timber; and wetlands were drained for agricultural production and development. These widespread changes reduced the ability of the landscape to absorb water. As a result, more water now flows into the streams and it gets there faster. So the streams and rivers must accommodate higher flows when it rains and receive less water during dry periods. This results in more frequent and intense flood events, which damage floodplain development and also have an egregious effect on the stability of the stream systems. Unstable streams respond by eroding their channels, leaving unstable eroded banks in some areas and sediment deposits in other locations. These problems are most pronounced in areas where the stream corridor is no longer forested. When a forested buffer area is retained, the root complexes of trees, shrubs, and grasses work to bind the soil together, increasing its erosion resistance. In addition, the leaves and trunks slow down runoff and floodwater, reducing the potential for erosion.

Additional de-stabilization of stream systems has been caused by development in adjacent floodplains. These low areas where water flows during flood events are valuable parts of the stream system. As water spreads across a floodplain, it slows down and loses the energy that would otherwise cause erosion. Construction of roadways along streams is common, resulting in narrower floodplains and the need to harden stream banks to protect the road. This bank protection and other maintenance practices often contribute to further destabilization of the stream. Bridge sites also encroach on floodplains and interrupt floodplain flow. When water is funneled through a narrow bridge opening, its velocity increases and so does its erosive potential.

In an effort to manage unstable stream systems and reduce flood damage, many stream alterations have resulted in additional problems. Activities such as dredging, removal of gravel bars, straightening of stream channels, and construction of berms are quite common. Unfortunately, execution of these activities without consideration of long-term channel stability often leads to a condition where makeshift stabilization efforts are short-lived and lead to increase impairment over time. When a stream is dredged or straightened, the velocity



Courtesy of Schoharie County SWCD.

increases significantly (due to increased slope and disconnection from the floodplain). These “maintenance” techniques thus lead to excessive scour of the streambed and banks. Accelerated erosion may actually increase the threat to adjacent development and also generates excess sediment that is deposited somewhere downstream, where it degrades the stream system.

Stream bank erosion problems are quite widespread. An assessment of the Sugar Creek Watershed (in Bradford County, Pennsylvania) found that 13.6% of stream banks are eroding. If this is representative of neighboring areas in the southern tier, then the Susquehanna-Chemung Watershed may have more than 3,000 miles of eroding stream banks, with hundreds of erosion sites in each county. This threatens adjacent development and results in degraded stream ecosystems. It also results in thousands of tons of sediment, which is transported downstream. As much as 50% of the fine sediment particles, along with associated pollutants, could reach the Chesapeake Bay.

In order to rehabilitate the watershed’s ailing stream system, the Upper Susquehanna Coalition (USC) has formed a Stream Committee, trained Soil and Water Conservation District staff, and prepared a draft Watershed/Stream Corridor Strategy. The committee recognizes that the underlying causes of many of the region’s stream impairment problems are “anthropogenic” impacts of stream “maintenance” practices, stream corridor development, and land uses in the watershed. In addition to addressing the “physical” challenges of stream channel and bank instability, the strategy also proposes an aggressive education program to effect a “cultural change” in how the region interacts with streams.

“...ten thousand river commissions, with the mines of the world at their back, cannot tame that lawless stream, cannot curb it or define it, cannot say to it “Go here,” or “Go there,” and make it obey; cannot save a shore which it has sentenced, cannot bar its path with an obstruction which it will not tear down, dance over, and laugh at.”

- Mark Twain

RECOMMENDATIONS

Because land use activities anywhere in a watershed affect the stream (due to changes in sediment and flow) all sections of this Action Plan support the objectives of this section, particularly the recommendations related to Land Use (Section 3), Flood Hazards (Section 5), Runoff (Section 6), and Roads (Section 7).

Assessment: Quantify and qualify the condition of streams and stream corridors.

- 4a. Document stream rehabilitation needs and estimate potential costs for the Susquehanna-Chemung Watershed by assessing stream conditions, beginning with one representative watershed in each county, and compiling results.

Immediate action: Select a sub-watershed in each county that best represents the geography, geology, and land use of the county. Walk the stream system of each selected watershed to document channel and corridor conditions. Analyze these data and historical stream assessment results collected by SRBC and other agencies to develop rough estimates of the extent to which streams in the watershed are degraded and the resulting water quality impacts.

Immediate action: Conduct “triage” site evaluations and develop rehabilitation alternatives for identified sites in the inventoried watersheds. Develop a cost/benefit analysis by compiling triage data and estimating potential costs for the entire region.

“Triage” is a process for moving from the recognition of a stream problem to selection of an appropriate intervention. The idea is to make a relatively quick assessment of the problem, the causes, and the urgency of the situation before proceeding.

- *Physically inspect the condition of the stream and its tributaries.*
- *Identify sources of instability*
- *Develop and prioritize appropriate rehabilitation strategies.*

Long-range target: Develop and periodically update a stream needs report for the watershed by conducting additional inventories and triage evaluations and compiling results.

Measure: Number of watersheds inventoried. Number of triage reports. Stream needs report for USC region.

4b. Document and prioritize stream rehabilitation needs throughout the Susquehanna-Chemung Watershed.

5-year target: Inventory channel and corridor conditions in additional priority watersheds. Develop a report for each watershed that includes inventory data and additional state-of-the-watershed information, such as water quality monitoring results, biological assessments, flooding history, and watershed land use.

5-year target: Conduct triage evaluations of all identified channel and bank instability problems. For each site, document the scope and urgency of the problem, probable cause, recommended actions, and anticipated cost.

5-year target: Evaluate all identified debris jams (which are often serious contributors to the overall instability of a stream reach) and develop an appropriate remediation strategy for each, specifying the severity/urgency of the problem, whether debris removal is recommended, and if so, whether additional stabilization will be needed.

Long-range target: Inventory all watersheds with stream impairments and conduct triage evaluations of problem areas to develop implementation priorities and strategies.

Measure: Number of watersheds inventoried. Number of sites with triage reports.

Stream Stewardship: Effect a regional “cultural change” in how communities and individuals manage stream corridors to reflect a more comprehensive environmentally sensitive approach. General principles of stream stewardship should be adopted at the personal, municipal, and regional agency level.

4c. Develop and implement an aggressive educational program on environmentally sensitive maintenance of streams aimed at all watershed stakeholders (public officials, contractors, and the general public).

Immediate action: Review and update the Environmentally Sensitive Maintenance modules for streams developed for Pennsylvania’s Dirt and Gravel Roads program. Hold train-the-trainer workshops for Soil and Water Conservation Districts (SWCDs), followed by targeted education sessions in each county.

Immediate action: Develop handouts, website language, and other information about stream processes, stream management practices, and riparian buffers. Provide new materials and existing resources (such as *Stream Processes: A Guide to Living in Harmony with Streams*) to each county (Water Quality Coordinating Committee or others) for dissemination.

Long-range target: Repeat this stream training periodically. Conduct additional public education about streams following flood events, including news articles and other programs.

Measure: Number of workshops and education programs. Number of counties that disseminate educational resources.

<p>Stream Stewardship Principles</p> <ul style="list-style-type: none"> • <i>Work toward the protection and/or restoration of</i> <ul style="list-style-type: none"> ○ <i>the environmental services provided by streams and floodplains</i> ○ <i>the health of stream and floodplain ecosystems</i> ○ <i>the naturally effective channel form and function of streams</i> ○ <i>floodplains as part of the natural stream system</i> ○ <i>riparian buffers</i> • <i>In the process of managing streams to protect public safety and infrastructure, avoid threatening</i> <ul style="list-style-type: none"> ○ <i>stream health upstream or downstream</i> ○ <i>the upland ecosystem through which the stream runs</i> ○ <i>the streambank stability of neighboring properties</i> <p style="text-align: right;">- from “East Branch Delaware River Stream Corridor Management Plan”</p>

- 4d. Establish and support community watershed groups for the purpose of developing an educated, informed advocacy group for healthy watershed management. Empower these groups by developing watershed-specific information and promoting an understanding of complex watershed systems.

Immediate action: Hold a facilitated watershed organizational meeting in one watershed per county (those assessed in Task 4a). If possible, this should be a 2-day workshop. Invite a full range of watershed stakeholders (landowners, municipal officials, agency representatives, business representatives, sportsmen, etc.).

Immediate action: Work with new and existing watershed organizations to develop watershed background reports. Train watershed volunteers to inventory channel and stream corridor conditions. Compile stream inventories with other watershed information to develop a watershed report for at least one watershed in each county.

Immediate action: Provide technical assistance and general direction to all community watershed groups and government entities that are actively engaged in grassroots stream stewardship and management activities. Guidance can range from that which is administrative in nature (organizational structure and identifying funding sources) to the more technical (providing training, planning assistance, project design, etc.). Support river/stream bank cleanup efforts and other projects.

Long-range target: Establish and maintain active watershed organizations that encompass “problem” streams in order to build local advocates through education and hands-on involvement in watershed planning. Empower each organization by facilitating development of a watershed background report. Fund county or regional staff to provide ongoing assistance and support to each group, as needed.

Measure: Number of active watershed organizations. Number of organizational meetings and training sessions for watershed volunteers. Number of watershed background reports.

- 4e. Encourage local legislative boards to incorporate principles of stream stewardship into new or revised municipal comprehensive plans and local land use regulations. This would enable development activities within the municipality to be reviewed with an eye toward improved stream stewardship.

Immediate action: Conduct workshops about stream processes and watershed functions for municipal planning boards, floodplain managers, stormwater managers, and elected officials. Present strategies for protecting and enhancing stream and floodplain functions, including (1) higher standards for floodplain development, (2) identification and regulation of erosion hazard areas, (3) stream dumping regulations, (4) stream setback requirements, and (5) site plan review of stream corridor projects.

Immediate action: Provide county planning departments with sample language for incorporating stream stewardship principles into the goals and objectives of a local comprehensive plan.

Immediate action: Meet with municipal comprehensive planning committees to promote understanding of how human activities affect streams and develop strategies for including stream corridor management and stream protection issues into each new or revised plan. Inclusion of stewardship principles in the comprehensive plan enables creation and/or revision of land use regulations to afford additional protection of waterways.

Immediate action: Provide county planning departments with sample language for including best stream management practices into local laws (zoning, subdivision, site plan review, floodplain regulations, etc.).

Immediate action: Meet with interested municipalities to incorporate criteria for protecting stream functions and/or mitigating impacts into new or revised local laws.

Measure: Number of training sessions. Number of counties distributing sample language. Number of municipalities receiving direct assistance.

- 4f. Facilitate a change in how stream corridor projects are permitted and funded to increase consideration of long-term stability.

Immediate action: County SWCDs share locally-developed guidance and stream management information with agencies that regulate and fund stream corridor projects. Coordination is needed to work toward common objectives and provide the public with consistent information. Provide technical assistance and advice to facilitate development of alternatives and options that consider stream stability as a long term goal. Following each flood disaster, meet with FEMA Public Assistance staff to promote development of sound projects with appropriate mitigation and discourage federal reimbursement for activities that destabilize streams.

Measure: Number of meetings.

Stream Rehabilitation: Rehabilitate impaired stream reaches in a manner that is science-based and sensitive to stream function and stability.

- 4g. Develop a trained and knowledgeable team of stream resource specialists to implement and oversee stream projects throughout the watershed.

Immediate action: Maintain a Stream Coordinator to manage the USC stream program, with oversight by the USC Stream Committee. Hold regular Stream Committee meetings to review progress and recommend actions. Utilize the existing system, in which coordination is provided by the Bradford County Conservation District, and expand as funding permits. The Stream Coordinator conducts training for county SWCD staff, provides technical assistance with project design, provides quality control for work performed by Soil and Water Conservation Districts, and coordinates the USC stream program.

“The traditional engineering approach to river development has failed to incorporate the practical, physical, aesthetic and financial advantages of approaching river management as maintenance of natural tendencies in river channel behavior.”

- Luna Leopold

5-year target: Identify and train Stream Resource Specialists located throughout the watershed to implement and oversee stream projects. Develop agreements with SWCDs to host these specialists.

Measure: Number of Stream Committee meetings and percent of Stream Coordinator’s time devoted to regional USC program. Number of Stream Resource Specialists. Number of training sessions.

- 4h. Develop a program in each county that pro-actively addresses the need for emergency stream interventions so that post-flood projects are conducted in a manner that is sensitive to stream function and stability. This may be modeled on the Delaware County Emergency Stream Response Program.

5-year target: Develop a post-flood stream intervention manual for each county. These should be consistent across the watershed and should include: guidance for assessing post-flood intervention needs, regional hydraulic relationship curves for use in emergency stream projects (to properly size stream channels), strategies for re-connecting floodplains, and guidance about other restoration principles and techniques. Work with regulatory and funding agencies to facilitate use of the developed approach/tool in authorizing and financing emergency work.

5-year target: Train municipal highway departments and local contractors on post-flood emergency stream intervention, based on the post-flood stream intervention manual.

Measure: Number of counties with emergency stream programs. Number of workshops.

- 4i. Develop county and watershed programs to provide funding for implementation of priority stream intervention projects that address channel and bank instability problems, debris jams, loss of floodplain function, and other concerns. Re-engineer culvert outfalls so they enter streams at acute angles to reduce the potential for erosion. Trained Stream Resource Specialists should oversee all in-stream projects.

Immediate action: Maintain, expand, and replicate existing county and regional programs for funding and cost-sharing of stream remediation projects.

5-year target: Based on the stream rehabilitation needs identified in Recommendations 4a and 4b, seek funding (from property owners, grants, and/or other sources) to implement stream projects, beginning with the highest priority sites.

Measure: Number of county or regional stream programs. Number of stream remediation projects.

Roads, Bridges, and Culverts: Protect transportation infrastructure and minimize adverse impacts on streams by avoiding encroachments onto floodplains and buffer areas, maintaining stream functions, stabilizing channels adjacent to stream crossings, and avoiding direct runoff into surface waters. (Additional road recommendations are in Section 7.)

- 4j. Provide training and technical assistance on environmentally sensitive practices for managing streams in proximity to roads, as well as the design, installation, and maintenance of bridges and culverts.

Immediate action: Provide training on environmentally sensitive stream management and stream crossings for highway department staff and industries involved in road construction and maintenance. Consider making this training a pre-condition for local stream project funding for municipal projects (through county or USC programs).

Immediate action: Assist highway departments with culvert sizing, design, and placement.

Immediate action: Provide information and technical assistance to property owners installing private stream crossings. Include information about potential liability for damage caused by improperly designed structures.

5-year target: Implement stream crossing demonstration projects that provide local examples of good design practices for roads, bridges, and culverts. Potential demonstration projects include: high-water bypass (low section of road designed to serve as a stable overflow area during high flows), culverts connecting upstream and downstream floodplains, and diversion of ditch drainage away from the creek (directing water into stable vegetated buffers).

Measure: Number of workshops. Number of counties providing assistance to municipal highway departments. Number of demonstration projects.

- 4k. Evaluate existing bridges and culverts following geomorphic principles and assess the ability of each to accommodate stream flow patterns and sediment loads. Use this information to assess the needs and prioritize structures for retrofitting or replacement. Procure funding for prescriptive measures.

Immediate action: Assist highway departments with developing an inventory of stream crossing structures (map location and characteristics) and maintenance of inspection records. (See Recommendation 7a in the Roads section of this Action Plan.)

Immediate action: Following federally-declared flood disasters, provide highway departments with information about mitigation opportunities through FEMA's Public Assistance program (Section 406 Mitigation), which enables funding to improve damaged features during the repair. Encourage departments to look for mitigation opportunities and request funding for improvements, such as increasing the size of a damaged culvert or including wing walls.

5-year target: Assist highway departments with conducting geomorphic assessments of existing culverts and bridges and developing priorities for retrofitting or replacement.

5-year target: Seek funding for priority projects to improve stream crossings or replace structures (in addition to that currently available through the state Consolidated Highway Improvement Project System, CHIPS).

Long-range target: Each highway department develops, implements, and updates a highway management plan that addresses the impacts that roads and bridges have on stream systems.

Measure: Number of highway departments receiving assistance. Number of stream crossing improvement projects. Number of up-to-date highway management plans.

Riparian Corridors: Promote improved stewardship of streamside property in order to protect and restore beneficial functions of floodplains and streamside vegetation.

- 4l. Provide information, technical assistance, and cost-sharing to streamside landowners to promote voluntary adoption of good stream corridor management practices. Encourage riparian buffer preservation as a preferred technique for meeting stormwater permit requirements for construction projects.

The easiest, most effective way to protect a stream is to maintain a strip of plants along the bank. This is known as a riparian buffer.

Immediate action: Provide each county with educational resources about floodplain function, stream processes, and desirable streamside vegetation for distribution to municipalities and property owners.

5-year target: Develop staff resources so that each county can provide individual assistance to streamside landowners to improve and maintain stream processes and streamside buffers, including the control of invasive species and management of desirable native vegetation.

5-year target: Promote and assist with local efforts to inventory and remove floodplain debris that poses a threat to water quality, stream stability, and/or bridge capacity. (See also Recommendation 5k regarding stream dumping.)

Measure: Number of counties distributing information and number providing assistance to landowners.

- 4m. Protect stream corridor functions and prevent high risk development through planning and regulation. (Additional floodplain management recommendations are in Section 5.)

Immediate action: Provide county planning departments with sample regulatory language for preventing stream corridor development and protecting riparian and floodplain functions.

Immediate action: Meet with interested municipalities to develop regulatory language for managing stream corridor development.

5-year target: Map riparian corridor land use and develop stream corridor management plans with strategies for preserving healthy riparian corridors, restoring degraded riparian corridors, and providing for long-term management of protected riparian corridors.

Long-range target: Map active stream corridors (erosion hazard areas) and implement regulatory strategies for restricting or preventing new development and re-development in these high risk areas. Promote removal of existing development from active stream corridors. The Vermont River Management Program may serve as a model.

Measure: Number of counties distributing sample language. Number of municipalities receiving direct assistance.

- 4n. Restore riparian and stream corridor functions by excluding livestock, planting riparian buffers, removing berms, and other projects. (Additional floodplain management recommendations are in Section 5.)

Immediate action: Promote the NYS DEC Trees for Tribs program that promotes planting of native trees and shrubs along streams.

Immediate action: Develop a berm removal program in which gravel berms along streams are identified and removed. Incorporate training for municipalities and property owners.

5-year target: Provide technical support to promote increased eligibility for the USDA Conservation Reserve Enhancement Program (CREP), which cost-shares the establishment of riparian buffers on agricultural land. Assistance is needed to stabilize stream banks so they are eligible for CREP participation.

Measure: Number of restoration projects and length of buffer/floodplain restored.

By allowing a stream to utilize its floodplain and its tendency to meander as much as practical, we can effectively reduce many of the flooding and erosion problems associated with streams.

SECTION 5 FLOOD HAZARDS

GOAL: Floods happen, so be prepared.

- Prevent loss of life and significantly reduce future damages from floods by mapping flood hazards, regulating use of high hazard areas, mitigating risks for existing development, restoring beneficial floodplain functions, maintaining flood control structures, and enhancing flood warning systems.

CHALLENGE

The Susquehanna-Chemung region is “flood alley.” Flood damage is an ongoing problem, as it has been throughout recorded history. The streams, rivers and lakes are naturally subject to rising and falling water levels, relocation of stream channels, flooding of valley bottoms, and wave action on lake shores. Intense storms of local and regional extent have repeatedly resulted in flooding of low-lying areas throughout the region including the “Finger Lakes Flood” of 1935, Tropical Storm Agnes in 1972, the 2006 Flood in the Susquehanna Basin, and most recently, the Tropical Storm Lee flood in 2011. In addition to these large-scale flood events, the region experiences numerous smaller floods and flash floods almost every year. Unfortunately, many communities are located along waterways (because of flat land and water-based transportation), where the hazard of flooding is an environmental fact of life. The resulting economic and personal costs have been significant.



Washington Street footbridge, Binghamton, June 2006
(courtesy of the City of Binghamton).

After every flood, the tendency has been for residents to rebuild their lives and pray that “this is the last destructive one.” Structural projects have been built in hopes of controlling future flood waters. Municipalities have enacted floodplain management regulations based on National Flood Insurance Program (NFIP) standards. As time passes, people tend to forget about flooding and become complacent. Additional development and filling occurs in flood-prone areas. Deforestation and upland development increase the amount of runoff. Stream channels are allowed to become clogged with debris. Wetlands are filled and new ones not created. People forget that these actions all increase the risk of future flood damage. In short, residents of the watershed continue to grossly underestimate the destructive powers of their rivers, streams, and lakes. If future flood damages are to be reduced, flood mitigation measures will need to be incorporated into many different programs in a manner that outlives the all-too-short memories of area residents.

Although floods are natural phenomena that cannot be prevented, their effects are amplified by human activities. Loss of life, property damage, and mental anguish can be reduced by applying corrective and preventive measures.

“Floods are ‘acts of God,’ but flood losses are largely acts of man.”
- Gilbert F. White

RECOMMENDATIONS

The following recommendations encompass a broad array of actions at the local, regional, state, and federal levels that can reduce the vulnerability of the Susquehanna-Chemung region to flood damages. Recommendations in other sections of this Action Plan also support this goal, particularly those for Streams and Rivers (Section 4) and Runoff (Section 6).

Flood Hazard Mapping: Maps should accurately depict and communicate varying levels of flood hazard.

5a. Advocate for FEMA to develop updated and accurate Flood Insurance Rate Maps (FIRMs) for the entire watershed and additional products (such as depth grids that can be used in flood mitigation planning) for high risk areas. In order to develop high quality mapping products that are embraced by local communities, FEMA must communicate with local officials, the press, and other stakeholders throughout the mapping process. This requires allocation of local staff resources, as well as coordination by FEMA. (Eight counties currently have preliminary or final digital FIRMs.)

Long-range target: Updated mapping for the entire watershed, with new flood studies where warranted and active engagement of local partners in the mapping process.

Measure: Number of counties with updated flood hazard mapping.

5b. Identify priority stream and river reaches for improved flood hazard mapping and promote flood studies for these areas.

Immediate action: Evaluate flood “hot spots” that have sustained severe or repeated flood damage. Request and review the Validation Process Documentation developed by FEMA for recent mapping projects. Use this information to identify areas where improved flood hazard mapping is needed and communicate these mapping needs to FEMA.

Immediate action: Conduct post-flood evaluations and collect time-stamped high water mark data for validating hydraulic modeling and flood inundation mapping.

5-year target: Seek funding for a validation study to review and validate the engineering analyses on which the effective FIRMs are based and communicate mapping needs to FEMA.

Long-range target: Conduct restudies and revise FIRMs for priority areas.

Measure: Number of counties with initial or engineering evaluation of mapping needs. Number of invalid stream miles restudied for revised FIRMS.

5c. Refine the Flash Flood Potential Index developed by the National Weather Service (NWS) and disseminate maps showing the potential for flash flooding based on land characteristics.

Immediate action: Post existing maps on the internet. Update as resources permit.

Measure: Number of counties for which maps are available.

Floodplain Management: Vigorously enforce existing regulations and promote higher standards.

5d. Train local building officials, planning boards, and elected officials on flood hazards, risk reduction strategies, implementation of floodplain development regulations, post-flood reconstruction, and how to address flood hazards during planning board review. All municipal Floodplain Administrators should either have floodplain management training or have a means for obtaining assistance from a Certified Floodplain Manager for all floodplain development permits (through shared service agreements or county/regional floodplain administration).

Immediate action: Facilitate floodplain management training for Local Floodplain Administrators with continuing education credits. This training is generally provided by NYS DEC, but can also be taught by other qualified instructors. There is a clear need for training related to post-disaster code enforcement (mutual aid during the response/recovery, substantial damage determinations, etc.).

Immediate action: Deliver training to municipal boards (planning boards, zoning boards of appeals, and elected officials) to provide familiarity with basic floodplain management requirements. County or

regional capacity and staff time are needed to deliver this training to local governments throughout the watershed and repeat as personnel change.

Immediate action: Provide each county planning department with floodplain management resources for use and dissemination (such as presentations and the fact sheets developed by STC⁷). Develop additional floodplain management fact sheets about gas drilling, substantial damage requirements, historical structures, and other topics.

Measure: Number of trainings conducted. Number of counties distributing reference materials. Number of new reference materials.

- 5e. Targeting flood-prone municipalities that effectively enforce existing floodplain development standards, provide recommendations and sample language for: (1) local enactment of higher standards for floodplain development, (2) increased implementation of No Adverse Impact approaches, (3) improved integration of flood risk reduction into comprehensive plans, (4) strategies for identifying and protecting high value floodplains and erosion hazard areas, and (5) ways to discourage or prohibit floodplain development. Priority areas for improved floodplain management strategies include floodplains delineated on FEMA maps, areas with high flash flood potential (based on Flash Flood Potential Index maps), erosion hazard areas, and areas that have previously flooded.

5-year target: Provide sample language and other resources to county planning departments for distribution to appropriate municipalities. Provide implementation assistance as needed.

Measure: Number of counties and municipalities receiving information.

Flood Mitigation: Protect or relocate existing flood-prone development.

- 5f. Secure funding (from FEMA's mitigation grant programs or other sources) to implement the specific mitigation projects identified in county hazard mitigation plans and to periodically update those plans.

Immediate action: Update county plans every five years, as required by FEMA. Provide training in Hazus, a tool developed by FEMA for estimating potential losses from natural hazards, which can be used in the assessment step of the mitigation planning process.

Immediate action: Provide training on the FEMA mitigation grant programs including project identification and development, benefit-cost analysis, and the application process.

Long-range target: Implement hazard mitigation plan recommendations as resources permit.

Measure: Number of plans updated. Number of training sessions. Number of mitigation projects implemented.

- 5g. Train local building officials and the construction industry on floodproofing techniques for retrofitting existing flood-prone development (building elevation, protecting utilities, flood damage resistant material, sewer backup protection, etc.). Trained personnel provide owners of flood-prone development with information and technical assistance, particularly after flood events. (A 3-hour course and reference materials⁸ have been developed by Chemung County and STC.)

Immediate action: Conduct training in a variety of locations (enabling increased outreach to property owners).

Long-range target: Provide technical floodproofing assistance (and financial assistance if possible) to owners of flood-prone buildings. This is a high priority immediately after floods before rebuilding starts.

Measure: Number of training sessions. Number of municipalities providing information and technical assistance to property owners.

⁷ Floodplain management fact sheets and forms are available from STC at: www.stcplanning.org/index.asp?pagelD=108

⁸ Floodproofing information sheets and other resources are available from STC at: www.stcplanning.org/index.asp?pagelD=107

- 5h. Promote overhauling of the National Flood Insurance Program (by Congress), so that the program more effectively prevents flood damage and flood insurance becomes a more desirable tool for financial protection against flood losses. Of particular concern is the cost of insurance in levee-protected areas. Train insurance, mortgage, and real estate professionals on the National Flood Insurance Program. Encourage owners of flood-prone property to have insurance coverage for flood damage.

Immediate action: Provide local letters and other support for improved federal flood insurance policy. This can build on the NFIP policy paper developed by the NYS Floodplain and Stormwater Managers Association (NYSFSMA, 2011).

Immediate action: Conduct flood insurance training. Provide counties and municipalities with public education materials.

Measure: Number of letters or other expressions of support for changes to federal policy. Number of training sessions. Number of counties and municipalities receiving public education materials.

- 5i. Increase municipal participation in the Community Rating System (CRS; to reduce the cost of flood insurance and increase local resilience to flood damage) and improve ratings for the 14 municipalities that currently participate by: (1) promoting a more streamlined program to alleviate administrative burdens on municipalities, (2) providing increased technical support, (3) implementing county-level activities, and (3) forming a NYS CRS Users Group.

Immediate action: Establish a CRS Users Group to facilitate training, information sharing, and promotion of program improvements.

Long-range target: Provide technical support to existing and new CRS communities.

Measure: Number of Users Group meetings/workshops. Number of CRS communities and number of those with classification of 8 or better.

Beneficial Functions of Floodplains and Drainage Systems: Enhance the effectiveness of floodplains to store and slow flood waters without damage to development.

- 5j. Train local public works officials on the value of riparian buffers, beneficial floodplain functions, and maintenance procedures for roadside ditches, drainage structures, stormwater systems, streams, and other drainageways. (Roadway and Roadside Drainage training is provided by Cornell Local Roads Program. Delaware County developed and conducts post-flood emergency stream training. A booklet about stream maintenance was prepared by NYS Office of Emergency Management.) Provide sample language for a drainage system maintenance plan and record keeping format that qualify for CRS credit.

Immediate action: Conduct training sessions in varied locations.

5-year target: Provide sample drainage system maintenance plan to counties, CRS municipalities, and others.

Measure: Number of training sessions. Number of counties and municipalities that receive sample plans.

- 5k. Develop public education materials to discourage stream dumping and storage of floatable materials near streams and drainageways. Disseminate examples of stream dumping regulations that qualify for CRS credit (several examples exist).

5-year target: Provide resources to CRS municipalities and others.

Measure: Number of municipalities that receive information.

- 5l. Identify river and stream reaches with debris, gravel piles or berms along the banks (not engineered flood control levees) and encourage property owners to remove these obstructions and restore floodplain

functions. Municipalities and SWCDs can distribute Stream Processes Guide (Chemung Co. SWCD, 2006) when interacting with property owners.

Long-range target: Inventory problem sites and periodically contact property owners. Provide assistance with removal of streamside berms and other obstructions.

Measure: Number of obstructions identified and number removed.

Structural Projects: Maintain the safety and reliability of existing flood damage reduction structures and dams built for other purposes. Although non-structural flood mitigation measures are preferred, opportunities also exist for new small-scale structural projects.

5m. Seek FEMA recognition of the level of protection provided by well-maintained flood control levees (engineered structures), particularly those that meet FEMA's freeboard requirements (Corning area, Elmira area, Hornell area, and Villages of Avoca, Bath, Canisteo, Lisle, Nichols, and Whitney Point).

Immediate and long-range target: Each levee that meets FEMA freeboard requirements is certified prior to the release of final FIRMs and the protection is shown on the maps.

Measure: Number of levees certified.



Levee patrol training, Elmira (courtesy of NYS DEC).

5n. Secure funding to assess the condition of engineered levees with unknown status and remediate deficiencies of levees that fail to meet safety standards or have inadequate freeboard for 100-year flood protection. Evaluate and/or remediate: Ithaca Road levee in Horseheads, Big Creek levee in North Hornell, and Owego Creek levee in Owego. Increase the flood protection level: Addison, Binghamton, Johnson City, Owego, and Vestal.

Immediate and long-range target: Each levee is assessed, remediated, and certified prior to the release of final FIRMs and the protection is shown on the maps.

Measure: Number of levees assessed, remediated, and certified.

5o. Develop an inventory of levees and other structural flood control projects with information about location, ownership, project status, FEMA accreditation, etc. (SRBC has assembled some of this information.)

5-year target: Validate existing information and complete the inventory.

Measure: Number of flood control projects inventoried.

5p. Promote improved state and federal policies regarding levees, including flood hazard mapping in areas with levees (including levee certification and accreditation), insurance rating in protected areas, liability, levee safety programs, and recommendations of the National Committee on Levee Safety (2009).

Immediate action: Local letters and other support for improved policies.

Measure: Number of letters or other expressions of support.

5q. Routinely inspect and maintain all dams. Educate private dam owners about NYS dam safety requirements. Provide technical and financial assistance to dam owners with the inspection and maintenance requirements.

5-year target: Expand and enhance the assistance that is currently provided by SWCDs, county emergency managers, and NYS DEC to ensure compliance with NYS dam safety requirements.

Measure: Number of dam owners assisted.

- 5r. Develop and maintain Emergency Action Plans for all high hazard dams (those that pose significant risk to life and property if they fail), including those located upstream in Pennsylvania. County Emergency Management Offices should participate in development of emergency plans.

5-year target: Full compliance with NYS dam safety requirements.

Measure: Number of emergency action plans.

- 5s. Identify and evaluate opportunities to alleviate flooding problems using structural projects that do not impair the benefits of existing floodplain functions (such as small impoundments, high flow channels, wetland creation, etc.). Seek implementation funding for cost-effective projects. (Ongoing assessments include USACE reconnaissance study in Susquehanna Basin and Sidney Center study.)

Long-range target: Potential projects identified in county hazard mitigation plans and implemented as resources permit.

Measure: Number of projects implemented.

Flood Forecast and Warning: Timely warnings are communicated effectively to the public and emergency responders.

- 5t. Protect federally operated precipitation and river gauges from the repeated threats of budget cuts and expand existing data collection and data processing capabilities as warranted.

Immediate action: Local letters and other support for permanent funding of the gauge network (including ongoing efforts by the Susquehanna Flood Forecast & Warning System, NYS Floodplain and Stormwater Managers Association, Environmental Emergency Services, and others).

Measure: Number of letters and other expressions of support.

- 5u. Expand the IFLOWS network of precipitation and stream gauges (which supplements the federal gauge system) and ensure ongoing maintenance of the existing gauges. (Existing IFLOWS gauges are located in Allegany, Steuben, Chemung, Broome, Chenango, and Schoharie Counties and upstream in Tioga County, PA. Sidney Center Central High School operates seven stations.)

5-year target: Broome County system fully functional.

Long-range target: Identify local partners and install additional gauges as resources permit.

Measure: New local partners and gauges.

- 5v. Promote effective utilization of existing flood inundation maps (which indicate areas inundated by various river levels) by increasing the availability of this information and providing periodic training in its use. Develop additional maps for priority damage locations. (SRBC has recently developed maps for some reaches of the Susquehanna and Chenango Rivers. Older maps exist in other areas.)⁹

Immediate action: Conduct training for emergency personnel and local officials on use of inundation maps for flood planning and response.

Long-range target: Secure resources to develop inundation maps in conjunction with updating of FEMA flood hazard maps.

Measure: Number of training sessions. Number of new inundation maps.

- 5w. Support implementation of the strategic plan for the Susquehanna Flood Forecast and Warning System (SFFWS), including recommendations developed following the June 2006 Flood. (The SFFWS is an interagency partnership working to increase lead-time of flood warnings and improve forecast accuracy.) It is critical that funding for the SFFWS be maintained. Local support and participation are needed to expand the river ice monitoring network, promote awareness of forecast services, etc.

⁹ Maps can be viewed on the Susquehanna Inundation Mapping Viewer: <http://maps.srbc.net/simv/>

Immediate action: Local letters and other support as needed to reinstate funding for the SFFWS and to facilitate system maintenance and enhancements.

Immediate action: Recruit ice observers and conduct ice monitor training.

Measure: Number of letters of support. Number of ice monitor training sessions.

- 5x. Review and improve emergency operations plans for counties, municipalities, and facilities to enhance the effectiveness of transportation (including emergency traffic routes), communication, public notification, and other emergency procedures before, during, and after floods.

Immediate action: County Emergency Management Offices, municipalities, and facility operators periodically review and update emergency plans, with particular attention to shortcomings identified during exercises or flood events.

Measure: Number of plans reviewed.

- 5y. Develop a strategy to improve flood warning dissemination to the public through multiple paths. Promote use of NOAA Weather Radios and NY Alert. Evaluate implementation of reverse 911 call systems. (Seven counties and three communities participate in the NWS “StormReady” program.)

Immediate action: NWS and county Emergency Management Offices periodically review the effectiveness of warning dissemination procedures and revise as warranted.

Measure: Number of StormReady counties and communities.

Public Education: The public understands that floodplains are not suitable sites for human development. Those who choose to occupy flood-prone areas are responsible for the consequences of those decisions. Understanding flood risk is essential for cost effectively mitigating flood risks.

- 5z. Develop a regional flood risk communication strategy that identifies key messages and multiple dissemination methods to engage individual citizens, non-profit organizations, business, industry, and local governments in more effective flood risk reduction. Program should: (1) increase the awareness of flood risks, (2) educate about the benefits of preserving and restoring floodplain functions, (3) facilitate improved preparedness (floodproofing measures, family emergency plans, etc.), (4) promote safety during and after floods, and (5) capitalize on teachable moments such as flood events and flood hazard mapping projects. This education effort should be implemented by schools, environmental education centers, government entities, and others. Target audiences include: property buyers, owners of existing flood-prone development, developers, students, motorists, and the general public. (Utilize existing programs and resources, such as: NWS “Turn Around; Don’t Drown” Campaign, FEMA FloodSmart, SFFWS website,¹⁰ STC educational materials, Stream Processes Guide, Chemung County home buyer’s brochure, county Conservation Field Days, local news media, etc.)

5-year target: Develop a strategy and begin implementation of a regional flood education program.

Measure: Number of counties with a strategy. Number of public education programs.

- 5aa. Expand the use of strategically located signs that inform the public about flood hazards (such as “Flood Zone Regulations in Effect” in Schoharie County; 2006 flood depths in Tioga County; and NWS “Turn Around; Don’t Drown” signs).

5-year target: Secure funding to purchase needed signs and educate elected officials about the positive value of this information.

Measure: Number of flood-related signage projects.



Courtesy of Tioga County Flood Mitigation Task Force.

¹⁰ Susquehanna Flood Forecast and Warning System website: www.susquehannafloodforecasting.org

SECTION 6 RUNOFF

GOAL: Rainwater is good: Slow it down. Spread it out. Soak it in.

- Protect and re-establish the natural functions of floodplains, forests, wetlands, and groundwater recharge areas.
- Use better site design, green infrastructure, and standard stormwater management practices to reduce impacts from development.
- Keep clean water clean.

CHALLENGE

Water runs downhill. Along the way it picks up sediment and other pollutants. It may also pick up speed. As flowing water joins with runoff from other areas, concentrated flow often contributes to washouts and flooding. But it doesn't have to be this way!

The new paradigm for managing drainage is to treat rainwater as a resource that is used and managed as close to where it falls as possible. The idea is to preserve, restore, or mimic natural hydrologic systems so that the balance between infiltration, evapotranspiration, and surface runoff is retained. On a regional scale, this is accomplished by preserving and restoring natural landscape features, such as forests, floodplains, and wetlands. This is coupled with policies that reduce the area disturbed by new development, such as: infill development, redevelopment, and cluster development. On the local scale, various practices are used to reduce and mitigate the impacts from paving, grading, soil compaction, de-forestation, and other aspects of development.



Photo from www.bina.com/images.

New York State has embraced a “green infrastructure” approach for stormwater management that reduces the impacts of new development on aquatic systems through the use of site planning, reduction of impervious cover (roads, roofs, and other surfaces that prevent rainfall from soaking into the ground), and localized techniques for reducing runoff. Traditional “end-of-pipe” stormwater management practices (such as stormwater ponds) are also used where needed, particularly to manage flood flows from large storm events. This green infrastructure approach to stormwater management was included in the NYS Stormwater Management Design Manual in 2010. As a result, developers are struggling with the learning curve associated with the new runoff reduction requirements that now apply to many construction projects. The use of numerous small-scale practices presents new challenges for ensuring long-term maintenance. In addition, the mandated 5-step stormwater planning process requires integration of site planning and drainage concerns early in the project design process. This expands the role of municipal planning boards in stormwater management design.

NYS administers three general permits for managing stormwater runoff:

- A Stormwater Construction Permit is required for construction activities that disturb one acre or more of soil. This permit requires development and implementation of a plan for reducing erosion and sediment during construction and long-term management of water quality and quantity from many sites after construction is complete.
- The Multi-Sector General Permit addresses stormwater runoff from certain industrial activities.
- Municipalities in urban areas are required to get MS4 Stormwater Permits (for discharges from Municipal Separate Storm Sewer Systems). This permit requires development and implementation of a Stormwater Management Program to reduce the discharge of pollutants. The Susquehanna-Chemung Watershed includes MS4 municipalities in the Elmira area, Binghamton area, and part of the Ithaca

area. Individual municipalities and coalitions are working to implement and enhance local stormwater programs in these areas.

Although these state permit programs target concentrated sources of polluted runoff, most of the rain that falls in the watershed is not covered by stormwater permits. Existing development, roads, timber harvesting, agriculture, and other activities affect the amount of water that flows off the land, drainage patterns, and pollution loads. There are thus numerous opportunities for protecting beneficial runoff characteristics and integrating practices to slow down runoff and use it for irrigation, habitat, recreation, and groundwater recharge.

Since it rains everywhere in the watershed, there is widespread potential for contact with contaminants that are then washed downstream into lakes and rivers. Chemicals and pathogens from automobiles, fertilizers, pesticides, sediment, animal wastes, and numerous other sources can contaminate runoff. Studies indicate that a significant proportion of pollutants in urban and suburban waters are the result of deliberate or inadvertent discharges of hazardous substances, including sewage, chemical spills, waste oil, and trash. To address this issue, MS4 municipalities are required to have illicit discharge programs to detect and eliminate those pollution sources. The challenge of keeping clean water clean is also addressed through a wide variety of other efforts, including agricultural management practices, pet waste management, spill response, septic system maintenance, street sweeping, erosion control, integrated pest management, and anti-littering campaigns.

“No single raindrop believes it is to blame for the flood.”

- author unknown

RECOMMENDATIONS

Education: Promote public understanding of how activities on the land can cause water quality and flooding problems. Foster public support and personal responsibility for improved drainage practices, even when long-term benefits require increased short-term costs.

6a. Educate children about the water cycle, how it is altered by human activities, and ways to mitigate negative impacts.

Immediate action: Continue to implement and enhance stormwater education by informal educators (such as nature center staff and stormwater coalitions) using a variety of resources, such as the stormwater-floodplain model, Project Wet activities, Ronnie Raindrop outfit, etc.

5-year target: Facilitate increased integration of water cycle and stormwater information into the classroom curriculum through peer-to-peer training of teachers and lending programs for educational resources (such as the stormwater-floodplain model). Promote extensive classroom projects to assess runoff characteristics at school or in neighborhoods and service projects that improve drainage (such as planting trees or constructing rain gardens).

Measure: Number of stormwater education programs, classroom projects, and service projects.

6b. Conduct public education about proactive strategies for managing runoff, targeting land owners, developers, landscape architects, construction industry, municipal leaders, and other audiences. Promote increased integration of drainage concerns into land use decisions and responsibility for the consequences of those decisions (positive and adverse).

Immediate action: Continue and enhance public education programs by MS4 municipalities and the active stormwater coalitions.

Immediate action: Conduct public outreach about drainage issues through exhibits at public events, in newsletters, on websites, through the distribution of information sheets, and other means. This is done by a variety of water resource professionals and environmental educators.

Immediate action: Seek opportunities to facilitate media coverage of stormwater management issues, including recognizing outstanding management efforts through awards and news articles.

Immediate action: Publicize stormwater demonstration projects through news stories and signage (such as the educational signs posted at rain gardens in Chemung, Schuyler, and Steuben Counties).

5-year target: Conduct hands-on public workshops that provide skills for improving local drainage, including information about: rain gardens, tree planting, riparian buffers, ephemeral wetlands, lawn maintenance, and other topics.

Measure: Number of community outreach events, news reports, and workshops.

New Construction and Reconstruction: Work toward full compliance with NYS permit conditions for sediment control and stormwater management from construction activities by providing training and technical assistance (to promote good planning, design, and construction) backed up by enforcement actions when needed. Promote improved drainage for all construction and reconstruction projects (regardless of size) through voluntary measures and/or municipal regulations.

- 6c. Strengthen the state's capabilities to effectively promote and enforce the NYS Stormwater Construction Permit. Sufficient staff is needed to conduct training, provide technical assistance, review Stormwater Pollution Prevention Plans (SWPPPs), conduct on-site inspections, and undertake enforcement activities when necessary. If designers have questions, there should be regional staff available to provide clarification and assistance. If expansion of the natural gas industry fosters increased development in rural parts of the watershed, state resources should expand to accommodate additional program needs.

Immediate action: Establish permanent staff positions to provide non-regulatory assistance, training, and enforcement for NYS stormwater permit programs throughout the watershed.

Immediate action: Facilitate statewide implementation of construction and post-construction standards by providing training, clarification, and technical assistance, particularly regarding new provisions in the 2010 NYS Stormwater Design Manual.

5-year target: Secure funding for research efforts to document the effectiveness of green infrastructure practices for reducing runoff and protecting water quality.

Measure: Number of staff dedicated to providing non-regulatory assistance. Number of workshops. Number of studies.

- 6d. Maintain and enhance the capabilities of MS4 municipalities and coalitions to effectively implement construction and post-construction programs (Minimum Control Measures 4 and 5), including contractor training, design review, site inspections, and verification that permanent practices function properly.

Immediate action: Conduct stormwater conferences and programs in the watershed (in addition to those in other parts of the state) to provide training and networking opportunities for municipalities.

Immediate action: Periodically offer erosion and sediment control training for contractors and others.

5-year target: Secure reliable funding to support trained staff to conduct the review, inspections, and enforcement needed to ensure full compliance with NYS construction and post construction standards for all projects within MS4 municipalities.

Measure: Number of conferences and trainings. Number of programs that meet MS4 permit requirements and number that exceed requirements.

- 6e. Train design professionals (engineers, architects, and landscape architects) on stormwater management strategies, with particular emphasis on the new green infrastructure requirements and cost effective practices for reducing runoff.

Immediate action: Conduct stormwater training. When possible these classes should be accompanied by networking opportunities or roundtable discussions to facilitate peer-to-peer information sharing. Promote attendance by providing continuing education credit.

Immediate action: Find existing and new sites that can be used as demonstration projects for green infrastructure planning and management practices. Document the design considerations and costs of these projects for inclusion in the “STC Low Impact Development (LID) Sampler” (STCRPDB, 2007) and integration into training.

5-year target: Seek funding to enable development of demonstration projects that incorporate numerous green infrastructure practices. Publicize these locations and provide on-site descriptions of the green infrastructure features through signs and/or fliers.

Measure: Number of training sessions. Number of demonstration projects.

- 6f. Train municipal planning boards, code enforcement officers, zoning boards of appeals, and elected officials on stormwater management strategies, with particular emphasis on green infrastructure planning and site design. Integrate information about costs and emphasize practices that are less expensive than conventional designs (such as parking reduction or use of grass pavers). Provide examples of green infrastructure strategies that contribute to multiple community objectives.

Immediate action: Add additional data to the Susquehanna-Chemung Data Atlas¹¹ and promote its use by municipal planning boards to obtain site information for consideration during the review of development proposals (such as slopes, drainage, floodplains, and images of land cover).

Immediate action: Conduct stormwater training sessions for municipalities.

5-year target: Document examples of stormwater green infrastructure successes. These local examples may include existing projects, new development projects, and retrofit projects.

Measure: Information and features added to the Data Atlas. Number of training sessions. Number of documented success stories.

- 6g. Review and revise local codes for consistency with green infrastructure strategies for avoiding and reducing drainage impacts. Incorporate additional stormwater requirements where warranted (such as standards or incentives for small projects that do not require NYS permit or that require only erosion and sediment control measures).

Immediate action: Assist MS4 and rural municipalities with review of local codes for compatibility with green infrastructure practices. Follow up with technical assistance to eliminate incompatible provisions and integrate green infrastructure principles as warranted.

Long-range target: All local codes in the watershed are consistent with good drainage practices and green infrastructure approaches for managing stormwater.

Measure: Number of municipalities receiving assistance.

Maintenance: Establish mechanisms for ongoing maintenance of permanent stormwater management practices, including localized (lot-specific) green infrastructure practices (such as rain gardens, tree planting, and cisterns).

- 6h. Maintain and enhance the capabilities of MS4 municipalities and coalitions to facilitate maintenance of stormwater facilities, including inventories, inspection, and requiring maintenance. This will become increasingly challenging due to the high number of localized practices that may be installed to fulfill green infrastructure requirements.

¹¹ Susquehanna-Chemung Data Atlas: <http://24.97.219.74/SCAtlas/>

Immediate action: Complete the inventories of permanent stormwater management practices in MS4 municipalities, expanding this effort to include older structures (installed prior to 2003) as resources permit.

5-year target: Secure the funding needed to enable adequate operation and maintenance of all stormwater management practices in MS4 municipalities, including structures that pre-date current regulations.

Measure: Number of programs that meet MS4 permit requirements and number that exceed requirements.

- 6i. Develop and implement strategies for improved inspection and maintenance of stormwater management practices in rural (non-MS4) areas, including increased municipal involvement if appropriate.

Immediate action: Address maintenance issues in municipal stormwater management training (for planning boards, highway departments, and others). Follow up with technical assistance for those municipalities interested in establishing drainage districts, inspection programs, or other mechanisms for improving operation and maintenance of stormwater practices.

5-Year target: Assemble information and resources to help municipalities develop programs that enhance the maintenance of stormwater management practices. This could take the form of a website with descriptions of successful programs (one or more per county), information about drainage districts, sample language for maintenance agreements, and other resources.

Measure: Number of municipalities receiving assistance. Amount of resources assembled and available.

- 6j. Conduct targeted educational efforts in neighborhoods where small-scale green infrastructure practices are implemented (in compliance with the 2010 NYS Stormwater Design Manual), to provide the owners of those practices with information about the value of those systems and maintenance needs.

Immediate action: Develop information sheets about the function and maintenance of green infrastructure practices. Provide copies to county Soil and Water Conservation Districts (SWCDs) and Cornell Cooperative Extension (CCE) offices for distribution. Post on the internet.

Immediate action: Provide Master Gardeners with resources and training about stormwater green infrastructure practices and maintenance requirements so that they can provide technical assistance and education.

5-year target: Develop and implement targeted educational programs for residential neighborhoods and other areas where green infrastructure practices are used for stormwater management. This can include signs, targeted mailings, neighborhood work parties, and other strategies.

Measure: Number of educational resources developed/distributed. Number of training sessions. Number of community education events or projects.

Retrofit: Promote proactive local stormwater management projects to remediate past shortcomings in design, construction, and maintenance.

- 6k. Promote urban forestry programs to enhance the use of trees for managing runoff and providing other ecosystem services.

Immediate action: Select (or develop if necessary) educational resources about the value of trees in addressing stormwater runoff (along with other benefits) and recommended species for different conditions. Involve Master Gardeners and environmental education centers in the dissemination of these resources at garden centers, on websites, in municipal offices, and other means.

5-year target: Utilizing GIS analysis and the suite of i-Tree Tools developed by the National Forest Service (or other tools), analyze tree cover in the watershed's cities, villages, and hamlets to identify priority areas for targeting urban tree planting programs.

5-year target: Work with priority communities to conduct additional urban tree assessments and then develop, fund, and implement urban forestry projects.

Long-range target: An urban forestry team provides technical assistance (including information about funding strategies) to all municipalities with urban areas to facilitate integration of urban forestry into municipal plans and programs. Cities and villages achieve "Tree City USA" designation by the Arbor Day Foundation.

Measure: Number of educational resources. Number of urban tree assessments and urban forestry projects. Number of "Tree City USA" communities.

- 6l. Provide property owners with resources and technical assistance to facilitate voluntary use of improved practices to manage runoff. This includes disconnection of down spouts from storm sewers, improved drainage from driveways, soil restoration, and landscaping practices that reduce runoff.

Immediate action: Disseminate information sheets about driveway drainage, rain gardens, and other topics through SWCD and CCE offices, environmental education centers, Master Gardeners, websites and other means.

Immediate action: Lobby for the inclusion of green infrastructure in the streetscape portion of NYS Main Street grants and increased credit for green infrastructure practices in the Leadership in Energy and Environmental Design (LEED) certification program.

5-year target: Secure funding to enable county SWCD and/or CCE staff to provide increased technical assistance to individual property owners.

Measure: Number of events, locations, or publications in which information was distributed. Number of letters and expressions of support for green infrastructure. Number of agencies providing assistance to property owners.

- 6m. Implement retrofit stormwater management projects to improve drainage from existing development, targeting parking lots, roads, and other areas where it is cost-effective and/or local drainage problems can be alleviated. Utilize these projects as demonstration sites for public education and training.

Immediate action: Identify priority areas where improved stormwater management is needed to alleviate existing local drainage or water quality problems. Conduct preliminary analysis to develop remediation strategies that may be cost-effective.

5-year target: Conduct an analysis of the watershed's public road systems to identify areas where retrofit stormwater management practices have the potential for providing cost-effective nutrient reductions for the Chesapeake Bay TMDL. Secure funding to implement priority projects to retrofit roadway drainage.

Long-range target: Implement retrofit stormwater management projects and develop educational materials in order to establish at least one urban demonstration project in each city and one rural demonstration project per county.

Measure: Number priority areas identified and retrofit projects implemented. Number of demonstration projects.

Contaminated Runoff: Prevent the contamination of stormwater runoff through education, improved management practices, cleanup of accidental releases, and enforcement.

- 6n. Maintain and enhance the capabilities of MS4 municipalities and coalitions to implement Illicit Discharge Detection and Elimination (IDDE) programs that include drainage system mapping and procedures for eliminating illicit discharges.

Immediate action: Secure reliable funding to support trained staff to continue and improve the implementation of MS4 IDDE programs.

Measure: Number of programs that meet MS4 permit requirements and number that exceed requirements.

- 6o. Promote improved reporting of spills and polluting discharges that violate environmental conservation law.

Immediate action: Develop information sheets for each county that encourage voluntary reporting of spills and polluting discharges and provide telephone numbers for the appropriate contacts (such as those developed for the STC counties). Distribute to highway departments and others.

Measure: Number of counties that have developed and disseminated information.



Photo from www.bing.com/images.

- 6p. Maintain and enhance the capabilities of MS4 municipalities and coalitions to implement pollution prevention/good housekeeping programs that reduce potential contributions of pollution from municipal operations and facilities.

Immediate action: Secure reliable funding to enable MS4 municipalities to continue and enhance their stormwater good housekeeping programs, including staff training, self assessments, and improved management practices for highway garages, road management, parks (including pet waste management), and other facilities. Training should include recognition of successful programs, distribution of printed resources, and opportunities for municipalities to exchange information.

Measure: Number of programs that meet MS4 permit requirements and number that exceed requirements.

- 6q. Educate private sector and rural municipalities about pollution prevention practices, including spill prevention.

Immediate action: Include spill prevention, spill reporting, proper disposal of waste materials, septic system maintenance, and other pollution prevention information in the stormwater public education programs conducted by MS4s and others (reaching the public through news segments, public service announcements, online resources, hand outs, and other means).

Immediate action: Continue to install storm drain markers at visible locations in Chemung County (“No Dumping; Drains to Waterway”) and assess the effectiveness of these markers as a public education tool.

5-year target: Expand public education programs about pollution prevention strategies, including storm drain marking and increased technical assistance for managing septic systems.

Measure: Number of public education events or projects.

SECTION 7 ROADS

Goal: Navigate toward better roadway drainage.

- Recognizing the significant impacts that transportation systems have on the landscape and water resources, promote improved practices for designing new roads, managing road and railroad drainage, improving stream crossings, and preventing erosion.

CHALLENGE

The Upper Susquehanna and Chemung Watersheds have more than 15,000 miles of public roadways and untold additional miles of private roads and driveways. This extensive road network and the associated roadside drainage systems can have significant impacts on drainage patterns, water quality, and flooding. Paved and compacted road surfaces prevent water infiltration into the underlying soil. Roadside ditches capture water running off the road surface and also drainage from uphill areas. This concentrated drainage tends to erode ditches, banks, outfall areas, and the road itself, particularly if soils are exposed. Approximately 30 tons of material can be eroded from a mile of ditch before the damage can be seen. In addition to the maintenance headaches arising from this concentrated flow along roads, increased erosion contributes sediment and other pollutants to receiving waters. The water in roadside ditches also tends to reach streams quickly, contributing to increased peak flows — which means increased flooding and destabilized stream channels. Because less water soaks into the ground, this can also result in increased susceptibility to droughts, decreased base flow in streams, and impaired in-stream habitat.

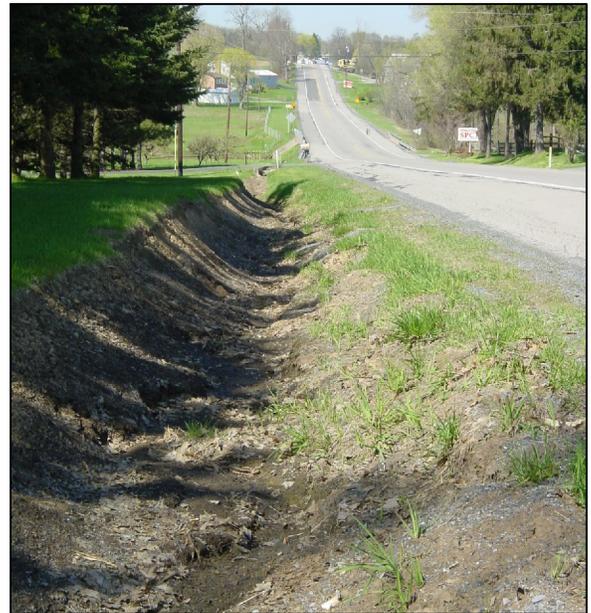


Photo by Penn State Center for Dirt and Gravel Roads.

Streams and roads are closely related in the Susquehanna-Chemung region. As a result of the hilly terrain, many roads follow the streams, often resulting in threats to both the road (from erosion or flooding) and the stream (due to reduced floodplain capacity). Stream-road crossings frequently contribute to stream instability due to channel alterations and loss of floodplain flow. Maintenance activities, such as dredging, that are intended to protect this infrastructure may destabilize the stream and make problems worse.

The watershed has:

- 15,600 miles of road
- 14,100 miles of stream

The extensive network of roadside ditches and other drainage structures provide numerous conduits that can convey sediment and other pollutants (deicing materials, etc.) directly into streams. The resulting water quality impacts are most pronounced when soils are exposed, enabling erosion of sediment from the ditches, slopes, and un-stabilized outfall areas.

Stabilizing road ditches and road banks is a local priority, not only to minimize stream pollution, but also to improve highway safety, prevent washouts, and reduce maintenance expenses. Every year, the most serious roadway erosion problems are addressed by implementing drainage improvement and soil stabilization projects. Unfortunately, the problem areas typically exceed the resources available for restoration. And new erosion problems continue to develop. This highlights the need for improved maintenance practices and “re-build smarter” policies. In the long run, it is less costly to prevent erosion problems than to fix them.

Public roadways are maintained by numerous municipal, county, and state highway departments. These public entities have access to training and technical assistance from the Cornell Local Roads Program, County

Soil and Water Conservation Districts, and other sources. However, they often lack the resources and experience needed to implement recommended management practices. Additional drainage concerns arise on private roads and driveways, for which financial considerations may be compounded by limited knowledge about roadway management practices. The anticipated expansion of the natural gas industry may provide additional resources for improving roads (to support the industry's transportation needs), but is also likely to result in construction of many new roads, with the associated impacts on rural landscapes and water resources. Sustainable design, construction, and maintenance thus pose ongoing challenges for roads and driveways throughout the watershed.

RECOMMENDATIONS

Although there are many issues associated with the road system, the following action recommendations focus on improved drainage, reduced erosion, and improved water quality. Highest priority is given to those practices that protect and enhance the watershed's lakes and streams, while saving money in the long run through reduced maintenance expenses. Recommendations related to stream crossings and stream management issues are addressed in Section 4.

Drainage: Maintain and improve roadway, driveway, and railroad drainage systems, with increased use of practices that disperse water, rather than concentrating flow. Spreading out the water also slows it down, which reduces the potential for erosion and flooding.

- 7a. Map and inventory highway drainage infrastructure. Use this information as the basis for routine inspection of all drainage structures, documentation of problems, records of maintenance/repairs, and prioritization of improvement projects.

Immediate action: Building on existing information (such as data available through the NYS Department of Transportation (NYS DOT), culvert mapping conducted for the STC region, and Highway Management Plans developed for Delaware County towns), provide municipal and county highway departments with technical assistance to develop inventories and maps of drainage structures (culverts, bridges, storm sewers, and other infrastructure).

Immediate action: Using infrastructure inventories and existing resources (such as the database format developed by STC), provide municipal and county highway departments with technical assistance to improve recordkeeping for routine inspection, maintenance, and repairs to drainage infrastructure. These records can be used to verify that all structures are routinely inspected, schedule routine work, and prioritize drainage improvement projects.

Measure: Number of highway departments receiving technical assistance.

- 7b. Promote increased implementation of drainage improvements, with an emphasis on preventing problems (rather than just making repairs) and utilizing strategies that disperse and slow down runoff from roads and surrounding areas. When appropriate, involve Soil and Water Conservation District (SWCD) staff or professional engineers in project design. (Chapter 8 of the NYS DOT Highway Design Manual concentrates on drainage.)

Immediate action: Provide training and technical assistance on roadway drainage issues for highway department staff and industries involved in road construction and maintenance. Topics include: drainage solutions, off right-of-way issues (for managing water entering and leaving the right-of-way), strategies for reducing impervious surfaces, drainage law, and roadway standards.

Immediate action: Implement road drainage demonstration projects that



Courtesy of Steuben County Emergency Management Office.

provide local examples of the benefits (and limitations) of new or innovative management practices. Potential demonstration projects include: grade breaks (to force water to flow off of the road), French mattresses (instead of a cross pipes), and eliminating ditches (by removing berms, changing the road slope, or elevating the road).

Immediate action: Following federally-declared flood disasters, provide highway departments with information about mitigation opportunities through FEMA's Public Assistance program (Section 406 Mitigation), which enables funding to improve damaged features during the repair. Encourage departments to look for mitigation opportunities and request funding for improvements, such as increasing the size of a damaged culvert or including wing walls.

Immediate action: Promote improved driveway drainage by distributing educational materials (such as the "Building a Rural Driveway" handout developed by STC) and providing technical assistance. Assist interested municipalities with development of regulatory language regarding drainage from driveways and private roads (including logging roads).

Immediate action: Support county-led efforts (by natural gas task forces and others) to develop and implement strategies for requiring the gas industry to maintain and improve roadway drainage when they are involved in construction of new, improved, and repaired roads. Provide information and assistance to local highway departments, including options for road condition assessment, road use and repair agreements, road protection ordinances, posting and bonding roads, and adopting an industrial driveway permitting system.

5-year target: Seek funding to enable increased training, technical assistance, research, and project funding for roadway drainage projects. Project funding should supplement that currently available through the state Consolidated Highway Improvement Project System (CHIPS), which is not sufficient. Pennsylvania's Dirt and Gravel Road Program may serve as a model program.

5-year target: Seek funding to develop model culvert and ditch standards that can be adopted by municipalities. Distribute to all municipal governments in the watershed.

Measure: Number of workshops. Number of municipalities utilizing road use agreements or adopting road protection ordinances. Number of roadway drainage improvement projects.

Erosion Control: Utilize roadway maintenance practices that prevent erosion. Implement stabilization projects to correct existing erosion problems and sediment management practices where needed to prevent sediment pollution.

7c. Conduct periodic assessments of road bank and road ditch conditions to identify and prioritize unstable sites. Maintain inspection results in geo-referenced databases.

Immediate action: Seek funding for interns to conduct road bank and road ditch assessments and enter data into a GIS database. Train interns and highway department staff on assessment methodology and documentation procedures. Prioritize documented problem areas based on soil erosion estimates and other criteria.

Long-range target: All public and private roads are inspected for erosion problems every three years by trained staff. Permanent erosion control structures and known erosion hot spots are checked more frequently. These inspection results are used to prioritize implementation measures.

Measure: Miles of roadway assessed.

7d. Adopt maintenance practices that reduce the potential for erosion of roadside ditches, culvert inlets and outfalls, unpaved road surfaces, and adjacent areas.

Immediate action: Provide highway department staff with training and technical assistance on erosion and sediment control. This should include the 4-hour contractor training (for the NYS Stormwater Construction permit), as well as topics related directly to roads, such as maintenance of drainage ditches, road grading, and road surface materials.

Immediate action: Provide highway departments with resources and training about beneficial roadside trees that provide bank stabilization benefits versus those that pose a threat due to the potential for fallen branches and blow downs.

Immediate action: Expand existing SWCD programs that assist municipal and county highway departments with establishing protective vegetation on disturbed soils. This assistance can include: hydroseeding, loaning equipment, providing manpower, and discounted price on seed. (Many districts already provide this assistance, but additional funding is needed to expand these programs.)

Timely re-vegetation of road ditches and banks is the single most effective deterrent to water pollution originating from roads and road ditches. Vegetation slows the flow of water, consumes water, encourages infiltration, and anchors the soil.

5-year target: Monitor demonstration areas where environmentally sensitive maintenance practices have been used and document the effectiveness and long-term costs compared to traditional maintenance practices. For example, are the increased cost and labor required to seed and mulch ditches after cleaning offset by reduced cleaning frequency? Provide assistance as needed so that each highway department can evaluate costs and benefits within their own operations to determine which erosion control practices pay for themselves and what extra costs are warranted due to the environmental benefits.

Measure: Number of training events. Number of municipalities receiving assistance. Number of demonstration sites monitored for performance and cost.

- 7e. Promote roadway improvements and stabilization projects that prevent erosion and reduce sediment transport into waterways. When appropriate, involve SWCD staff in project design.

Immediate action: Implement erosion control demonstration projects that provide local examples of the benefits (and limitations) of new or innovative management practices. Potential demonstration projects include use of geotextile products in road ditches and driving surface aggregate with the particle size distribution developed by Penn State's Center for Dirt and Gravel Road Studies (to evaluate the local cost and effectiveness of this product and work with local gravel companies to provide it).

5-year target: Seek funding to enable increased training, technical assistance, research, and project funding for roadway erosion control projects. (Existing CHIPS funding is not sufficient.) Pennsylvania's Dirt and Gravel Road Program, which ties project funding to training, may serve as a model program.

Measure: Number of stabilization and erosion control projects. Number of demonstration projects.

Downstream Water Quality: Implement and document cost-effective measures that reduce the pollution loads delivered to the Chesapeake Bay. Quantify load reductions for incorporation into the Chesapeake Bay Watershed Model. Roadway Best Management Practices (BMPs) may represent an important opportunity for cost-effective projects that benefit both the Bay and local roadway drainage.

- 7f. Promote implementation of roadway drainage improvements and erosion control practices that support Chesapeake Bay restoration objectives and contribute to New York's sediment and nutrient load reductions for the Chesapeake Bay TMDL (such as bio-retention and infiltration).

Immediate action: Provide the research support needed to evaluate the nutrient and sediment reduction associated with potential improvements in the design and of maintenance practices of roadside drainage. Work with EPA to integrate this information into the Chesapeake Bay Watershed Model.

Immediate action: Develop and implement a strategy for documenting roadway drainage BMPs for incorporation into the watershed model.

5-year target: Develop funding opportunities for roadway drainage projects that provide nutrient and sediment reductions for the Chesapeake Bay TMDL.

Measure: Number of studies. Number of roadway BMPs reported to the Chesapeake Bay Program and the pounds of nitrogen, phosphorus, and sediment reduction credited for these practices.

- 7g. Promote increased street sweeping to remove contaminants that would otherwise be washed into waterways. Document the miles and frequency of sweeping for incorporation into the Chesapeake Bay Watershed Model.

Immediate action: Develop a system for documenting street sweeping of paved roads and parking areas throughout the watershed for reporting to the Chesapeake Bay Program.

5-year target: Explore opportunities for sharing equipment and other strategies for encouraging increased sweeping of paved roads and parking areas.

Measure: Miles of road sweeping documented and reported to the Chesapeake Bay Program.

Chemical and Waste Management: Prevent pollution through responsible use, storage, and disposal of hazardous substances, chemicals, waste, and other materials.

- 7h. Select and use deicing materials in a manner that minimizes environmental impacts without compromising safety.

Immediate action: Provide highway department staff with snow and ice management training, including: procedures for determining the most cost effective chemical application rates (based on weather and pavement conditions), use of calibration devices, alternative deicing materials, disposal strategies for accumulated snow (discourage dumping into surface waters), and guidance for identifying environmentally sensitive areas where alternative practices (such as sand or gravel) are recommended.

Measure: Number of training events.

- 7i. Store road salt and other deicing materials in structures that prevent contact with stormwater and are located outside of flood-prone areas.

Immediate action: Seek funding to construct salt barns for those highway departments that currently store deicing materials in open locations. Consider shared services for the storage of salt and seek funding through the NYS Department of State shared services grant program to fund construction of shared facilities.

Long-range target: Eliminate outdoor storage and loading of road salt and other deicing materials.

Measure: Number of outdoor salt storage practices eliminated.

- 7j. Minimize roadside dumping and the use of environmentally harmful substances along roadways.

Immediate action: Provide highway departments with training and technical assistance on environmentally sound practices for weed management, pest management, dust control, bridge cleaning, and other roadway maintenance activities.

Immediate action: Provide public recognition of Adopt-a-Highway volunteers (through news reports, newsletters, signage, or other means).

5-year target: Distribute to counties and MS4 municipalities examples of anti-litter campaigns, local litter and dumping laws, and local Adopt-a-Highway programs (such as that in Steuben County).

Measure: Number of training events. Number of publications or news reports providing public recognition of volunteers. Number of counties and municipalities receiving information.

- 7k. Incorporate pollution prevention strategies into daily operations of highway department facilities. This is part of the “stormwater good housekeeping” requirement for regulated MS4 municipalities. It encompasses vehicle washing, fueling, vehicle maintenance, chemical storage, waste disposal, and stormwater runoff.

Immediate action: Provide training and assistance with facility self-audits to identify opportunities for improved pollution prevention practices at highway garages. Share self-audit forms for MS4 Good Housekeeping programs (such as that developed by the Chemung County Stormwater Coalition) with other MS4s and rural municipalities.

5-year target: Seek funding to implement facility and operational improvements identified during highway department self-audits.

Long-range target: All municipal and county highway departments conduct periodic self-audits of highway garages to assess the potential for pollution and incrementally implement improvements as resources permit. The recommended Best Management Practice is to perform a self-audit twice a year, once prior to summer operations and once prior to winter operations. (NYS DEC requires each municipality operating under a MS4 Permit to perform a self-audit once every three years.)

Measure: Number of training events. Number of MS4s that conduct self-audits more frequently than required. Number of self-audits by rural highway departments.

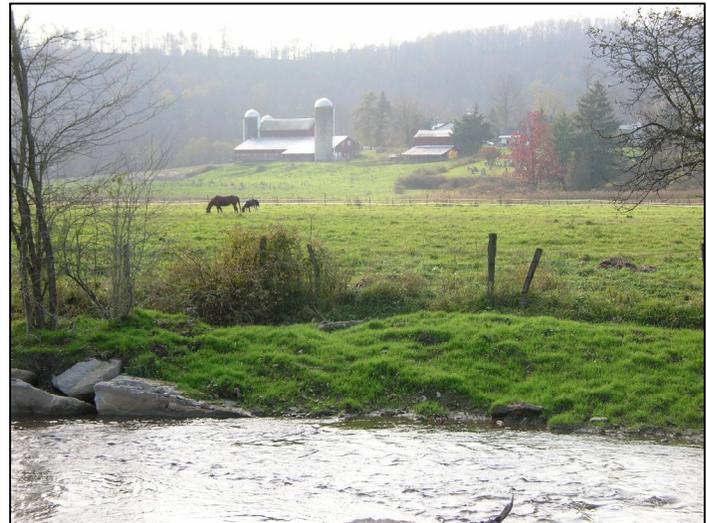
SECTION 8 AGRICULTURE AND FORESTRY

GOAL: Support productive working lands that are part of a healthy landscape.

- Promote economically-viable agricultural practices that minimize soil loss, recycle nutrients, and protect water resources.
- Promote sustainable management of the watershed's forests in a manner that provides flood protection and water quality benefits.

CHALLENGE

Working farms and forests give the Susquehanna-Chemung Watershed its scenic charm and are economic drivers for its rural communities. Agriculture is the leading industry in the watershed, comprising 22% of the land use. About 71% of the watershed is forest land; and forest-dependant industries are a vital part of the regional economy. The recreational and scenic benefits of these working lands also support the tourist industry and the quality of life for residents. In addition, well-managed rural lands provide innumerable “ecosystem services,” such as moderating floods, wildlife habitat, groundwater recharge, and carbon sequestration. Wise use of productive farm land and forests is thus the key to building sustainable communities.



Courtesy of Tompkins County SWCD.

Mismanagement of working lands poses some of the greatest threats to water quality, particularly related to sediment loading, nutrient transport, and applied chemicals (herbicides and pesticides). Steps must be taken to keep soils in their place, ensure complete uptake of nutrients (natural and applied), implement environmentally friendly pest management strategies, and manage runoff from all activities. Because most of the working lands in the watershed are privately owned, management decisions are based on family or business considerations that include—but are not limited to—stewardship of natural resources. Resource professionals have a key role in providing these landowners with technical advice and assistance on the management of their lands. In addition, financial incentives have proven to be an effective means of promoting the use of recommended Best Management Practices (BMPs). Financial support for “ecosystem services” and other public benefits facilitates implementation of agricultural and forest management practices that are both environmentally and economically sustainable.

The greatest challenge facing agriculture is low profitability. The open space and watershed benefits may be lost when a farm goes out of business or chooses not to implement voluntary management practices that protect water quality at the expense of the bottom line. Within the Susquehanna-Chemung Watershed, the TMDL for Chesapeake Bay restoration is seen as a serious threat to the viability of working farms, particularly small animal operations. It is estimated that this program could cost New York farmers \$250-450 million over 15 years for agricultural upgrades. This is in addition to the voluntary steps NY farmers have already taken to reduce and eliminate manure and fertilizer runoff.

Although forestland in the New York portion of the Susquehanna-Chemung Watershed increased nearly 9% (200,000 acres) between 1993 and 2004 (primarily due to abandonment of grazing lands), sustainable management of these forests is a significant challenge. Almost 40% on the forests are classified as “wild land-urban interface,” meaning that the forests occur in small blocks adjacent to developed areas. This pattern develops in areas with large lot residential development. Additional forest fragmentation is likely to result from natural gas development, which will lead to new production facilities, roads, and pipelines in rural areas. Many

of the watershed's forests are family-owned, with a trend toward more forest landowners holding smaller forest parcels. The majority of family forest owners are not currently managing their land or seeking professional assistance. Although technical assistance programs exist, there are property taxes to pay and few incentives for sustainable forest management. The lack of forest management planning or desire to maximize short-term profit often leads to the problematic practice of "cutting the best and leaving the rest" – also known as high grading. This leaves only less fit or poorer quality trees to regenerate the forest, which diminishes the health of the ecosystem, reduces watershed services, and limits future economic returns. The forest composition and health are also threatened by invasive plants, forest pests, and high populations of white-tailed deer (whose selective feeding patterns result in low regeneration rates for many important tree species and other plants).

Agricultural and forest resources in the Susquehanna-Chemung Watershed can support thriving rural communities, contributing to the environmental, social, and economic quality of life. The area can grow excellent, high value hardwoods and a wide range of other products. Strong research and technical assistance programs support steadily improving environmental management practices. Economic opportunities are being created by biofuel projects, developing markets for niche products, income from natural gas, and the potential for increased utilization of forest resources. The working lands of this watershed are a tremendous asset – as long as they are managed in a manner that is both economically and ecologically sustainable.

*“A nation that destroys its soils destroys itself.
Forests are the lungs of our land, purifying the air and giving fresh strength to our people.”
- Franklin D. Roosevelt*

RECOMMENDATIONS

The following suggestions are regional in nature, highlighting some of the many excellent and detailed recommendations presented in other plans and strategies, most notably those developed for the NYS Agricultural Environmental Management (AEM) program, NYS Farmland Protection Program, Resource Conservation & Development Council Area Plans, State of Chesapeake Forests, NYS Forest Resource Assessment & Strategy, and economic development plans that support the agricultural and forest product businesses.

Agricultural Management Practices: Promote sound conservation and management practices to reduce environmental impacts from agricultural activities.

- 8a. Promote research that evaluates the effectiveness of conservation tools and accelerates development and adoption of new conservation technologies. This may include techniques for reducing nutrient losses (into streams and groundwater), controlling erosion, improving soil fertility, managing pests, etc. Priority should be given to research into strategies for reducing the cost associated with achieving environmental objectives. For example, are there forms of agricultural production that are compatible with riparian forest buffers, such as forest products or silvopasturing (woodland grazing for short periods)? Deliver the research findings to farmers.

Immediate action: Support additional agricultural research at Cornell University and other institutions.

Immediate action: Maintain and enhance the strong local technical assistance programs that assist farmers with implementation of recommended management practices. Secure funding for additional staff as needed.

Measure: Number of published studies. Number of workshops. Number of staff providing technical assistance.

- 8b. Use the NYS Agricultural Environmental Management (AEM) program to help farmers identify and address water quality concerns on farms. This voluntary program enables county Soil and Water Conservation District (SWCD) staff to work with individual farmers to assess environmental stewardship, provide technical assistance, and coordinate financial assistance.

Immediate action: Lobby for consistent state funding for the AEM program, as needed.

Measure: *Number of farmers participating.*

- 8c. Ensure professional management of manure from medium and large livestock farms to protect water quality by supplementing the NYS Concentrated Animal Feeding Operation (CAFO) regulatory program with technical assistance (through SWCDs) and financial assistance for BMP implementation (see Task 8d). Explore options for turning CAFO regulatory requirements into profit through participation in water quality certification programs such as the “Chesapeake Milk” model successfully piloted in the Pennsylvania portion of the watershed.



Courtesy of Schuyler County CCE.

Immediate action: Maintain staff resources to enable technical assistance to livestock farmers.

Measure: *Number of regulated CAFOs that participate successfully, without violations.*

- 8d. Provide financial incentives to promote voluntary implementation of agricultural practices that protect water quality through the NYS Agricultural Nonpoint Source Abatement and Control Program, USDA Farm Bill programs, and other funding sources.

Immediate action: Lobby for funding and other improvements to cost-share programs, as needed.

Immediate action: Maintain a strong local implementation team, with close coordination between county, state, and federal agencies.

Immediate action: Secure funding for continued technical and financial assistance through the Upper Susquehanna Coalition Sustainable Agriculture program, which uses AEM to prioritize projects and promotes prescribed grazing techniques, cow exclusion from streams and riparian buffers, nutrient management, cover crops, conservation tillage, barnyard clean water exclusion, and other agricultural BMPs.

Immediate action: Share information about initiatives that promote increased participation in USDA Farm Bill programs through additional cost sharing and technical support (such as the Otsego County Conservation Association program to assume the 25% farmer cost-share for water quality improvement practices).

5-year target: Seek funding to enable reduced farmer costs and additional technical assistance to increase local implementation of USDA Farm Bill Programs, including the Conservation Reserve Enhancement Program (CREP).

Measure: *Number of water quality BMPs implemented through cost-share programs.*

- 8e. Contribute to Chesapeake Bay restoration efforts through voluntary programs and incentives, without increasing regulatory requirements for New York’s farmers.

Immediate action: Continue to promote voluntary implementation of agricultural BMPs for nitrogen, phosphorus, and sediment; document those practices for the Chesapeake Bay Program. Support improvements to the Chesapeake Bay Watershed Model to more accurately represent agricultural sources in New York.

5-year target: Work with the EPA to adjust New York’s pollution load allocations in the Chesapeake Bay TMDL so that they are fair and achievable. If additional agricultural load reductions are required from New York, secure funding for implementation of all required practices.

Measure: *Reduced loads and/or adjusted allocations.*

- 8f. Build partnerships and increase coordination by bringing together farmers, agencies that serve the farm community, lenders, agri-business owners, environmentalists, town officials, and others.

5-year target: Sponsor agri-business forums for sharing of information.

Measure: Number of conferences or meetings.

Farmland Protection: Protect farmlands (which are important to protecting water resources, open space, and scenic resources) by maintaining the viability of agricultural businesses, implementing farmland protection plans, and increasing the sustainability of agricultural practices.

- 8g. Develop, update, and implement local Agricultural and Farmland Protection Plans (with funding from County Farmland Protection Planning Grants).

Immediate action: Maintain active committees to facilitate and coordinate implementation of existing plans.

5-year target: Secure funding to develop plans for counties that lack them and update existing plans as warranted.

Measure: Number of active committees and number of new or updated plans.



Strip cropping (courtesy of Schuyler County SWCD).

- 8h. Building on recommendations in Agricultural and Farmland Protection Plans, develop and enhance programs to purchase or lease development rights on priority farmland (by counties and/or land trusts). This preserves farmland while allowing a farmer to redeem equity in the land. (Leasing is more appropriate for most farmers.)

5-year target: Identify priorities for farmland protection within each county (if not already done) based on locally-developed criteria (such as soils, agricultural productivity, development pressure, etc.). Develop funding strategies and administrative procedures.

Long-range target: Negotiate easements with willing farmers in priority areas.

Measure: Number of farmers participating and acres of priority farmland protected.

- 8i. Maintain a comprehensive network of NYS designated Agricultural Districts throughout prime farming areas of the watershed as a means of both protecting farms and highlighting the value of agriculture.

Immediate action: Each county periodically evaluates whether the most valuable farmland is included in agricultural districts and considers establishment or expansion of districts, if warranted.

Immediate action: When new districts are established or existing districts are up for review and recertification, encourage landowner participation by reaching out to owners of candidate properties.

Measure: Acres of land and number of landowners included in Agricultural Districts.

- 8j. Include agricultural protection mechanisms in municipal land use planning and regulations. Increase the participation of farmers and agri-business owners in town planning boards. (Additional recommendations concerning Smart Growth and open space preservation are included in Section 3, Land Use.)

Immediate action: Provide each County Planning Department with agricultural planning resources for distribution to municipalities. This may include: "Broome County, NY Agricultural Planning Guidelines" and additional information or sample language for: right-to-farm law, agricultural zoning districts, Critical Environmental Areas, Transfer of Density Rights programs (which create private markets that allow farmers to raise capital to continue farming), consideration of agricultural impacts in site plan review, and other information.

Immediate action: Provide planning board training about the value of agriculture and farmland, NYS Agricultural District Law, recognition of agricultural values in Comprehensive Plans, “farm friendly” land use regulations, and other farm issues.

Immediate action: Provide planning assistance, as needed, to municipalities interested in enacting agricultural protection measures.

Immediate action: Encourage towns with significant agricultural activity to appoint agricultural members to planning boards under the authority of §271.11 of Town Law.

Measure: Number of planning board members trained. Number of agricultural members appointed. Number of municipalities employing “farm friendly” planning processes.

- 8k. Strengthen agriculture and agribusiness as a major sector of the economy. Increase the integration of agriculture and agri-business into plans and programs for economic development and workforce development. Implement additional recommendations in county-level plans, which include: development of sustainable and local markets (including markets for niche farm products), coordinated marketing, business training/assistance, tax reform, insurance, promoting agricultural tourism, fostering biofuel development, training/assistance, public relations, attracting value-added businesses, information/assistance regarding gas leasing, and other suggestions.

Immediate action: Support research and information-sharing about environmentally-friendly practices that increase profitability by: reducing costs, increasing yields, supporting development of new crops, promoting diversity (to reduce financial risks), etc.

Long-range target: Implement recommendations in county-level plans.

Measure: Farm revenues and number of profitable farms.

- 8l. Promote environmentally sustainable agricultural practices that incorporate strategies for enhancing biological processes, disease and pest control, anticipating climate change, diversification, intensive small-scale production, using non-traditional agricultural practices, etc.

Immediate action: Support research and information-sharing about strategies for enhancing the long-term sustainability of agricultural operations.

5-year target: Integrate information about adapting to climate change and other sustainable practices into resources for farmers and technical assistance programs.

Measure: Number of studies, educational resources, and training events.

- 8m. Promote local food production and development of a conservation ethic by supporting home gardening and community gardens

Immediate action: Provide assistance and training to support environmentally sustainable home gardening practices.

Immediate action: Publicize existing community gardens to encourage increased utilization.

5-year target: Provide technical and financial assistance with establishing school garden plots.

5-year target: Encourage inclusion of community gardens in local parks and other public spaces by providing each county planning department with resource information to distribute to county departments and municipalities.

Long-range target: Identify and secure funding for development of new community garden sites, management expenses for existing gardens, and garden-based education programs.

Measure: Number of home gardeners receiving technical assistance. Number of community gardens and number of people using them.

Sustainable Forest Management: Manage rural and urban forests to sustain healthy ecosystems, enhance watershed services, and support economic growth. (Additional recommendations related to riparian forest buffers and forest habitat are in Sections 4 and 9, Streams & Rivers and Plants & Wildlife.)

- 8n. Protect exceptional forest resources by identifying and conserving forests that have high environmental, economic, and social value at a landscape scale (such as riparian buffers or priority habitat). Property can be acquired for parks, state forests, or other purposes. Conservation easements can be used to provide willing owners with a financial incentive for retaining and sustainably managing the forest resource.

Immediate action: Identify priority forest lands and secure funding to conserve these resources through acquisition or easements. Conservation easements should only be acquired by land trusts or government entities with the capacity to administer, monitor, and enforce the easement.

Measure: Number of parcels and acres of forest land protected by acquisition or conservation easements.

What is Sustainable Forest Management?

Sustainable forest management considers the entire forest ecosystem—all the parts of a forest—and not just the valuable timber trees. The forest should be managed to promote increased re-growth of new trees and increased diversity. A healthy, diverse ecosystem is better able to adapt to stressors such as invasive species and climate change. A Forest Stewardship Plan can be developed to enable both short- and long-term economic returns, while also protecting the future health of the forest ecosystem, including its wildlife, soil, and water resources.

- 8o. Engage local governments in conserving their forests, reducing forest fragmentation, and enhancing public benefits from trees and forests. (Additional recommendations concerning Smart Growth and open space preservation are included in Section 3, Land Use.)

Immediate action: Provide each County Planning Department with the “Municipal Official’s Guide to Forestry in New York State” for distribution to rural municipalities.

Immediate action: Provide planning assistance, as needed, to municipalities interested in enacting forest protection measures.

Measure: Number of planning boards receiving information. Number of municipalities enacting forest protection measures.

- 8p. Promote professional management of forest resources to enhance forest health and ecological services. This will require cultivation of a long-term stewardship ethic among private forest owners.

Immediate action: Expand outreach and assistance to private forest landowners. Encourage management of family-owned and other private forests and provide assistance with developing Forest Stewardship Plans. Conduct forest owner workshops and provide other training to develop woodlot management skills. Continue to provide property owners and loggers with information about drainage and erosion control practices for timber harvesting (BMP Field Guide).

Immediate action: Support research and information-sharing about preventing and managing nuisance species (such as overabundant deer), invasive plant species, invasive insects and diseases, and wildfire.

5-year target: Establish and fund County Forester positions, as needed, to fulfill the need for forest management training and assistance.

5-year target: Develop and disseminate information that promotes planting of trees that are adapted to future climate conditions. Include these species in SWCD tree sales to replace those that will no longer thrive in this region.

Measure: Number of forest land owners receiving assistance and training. Number of workshops. Number of Forest Stewardship Plans developed. Number of County Foresters.

- 8q. Promote forest stewardship by enhancing the economic viability of well-managed forests and forest products.

Immediate action: Support research and information-sharing about non-timber forest crop products (such as nuts, mushrooms, and fodder).

5-year target: Support efforts to expand markets for wood products, such as development of forest product certification systems and biofuel markets.

5-year target: Support climate change policies that provide financial assistance to private forest land owners for the carbon sequestration value of sustainable forest management.

Long-range target: Improve the Forest Tax Law program (Section 480-a) to reward active forest management and promote greater participation. Promote additional tax reform for forested land and forest income.

Long-range target: Develop and fund incentive and cost-sharing programs that promote and support sustainable forest management practices on private land.

Measure: Number of studies, educational resources, and training events. Forest product revenues. Number of landowners benefiting from reduced taxes and incentive programs.

- 8r. Promote urban forestry programs to plant and maintain healthy trees in developed areas for air and water quality benefits, energy savings, stormwater management, environmental health, and enhanced quality of life.

Immediate action: Provide MS4 municipalities (with regulated stormwater management programs), cities, and villages with information about the green infrastructure benefits of urban forests and strategies for enhancing tree cover in developed areas. Encourage MS4s to include trees and urban forestry in the public information, public involvement, and good housekeeping parts of stormwater programs.

Immediate action: Expand assistance programs, as needed, to help interested municipalities develop or expand urban forestry programs.

Measure: Number of municipalities with urban tree canopy goals or urban forestry programs.

“Acre for acre forest land is the most beneficial land use for protecting water quality, and every loss of forestland contributes to the impairment of the Chesapeake Bay.”
- from “The State of Chesapeake Forests”

SECTION 9 PLANTS AND WILDLIFE

GOAL: Preserve the rich diversity of plant and animal life.

- Create, protect, and restore high quality lake, stream, and wetland habitats.
- Maintain the integrity of native ecosystems by protecting rare plants and animals, controlling invasive species, and protecting large blocks of dominant plant communities.

CHALLENGE

The Susquehanna-Chemung Watershed is biologically diverse, with many types of habitat, plants, and wildlife. Each ecological community is formed by complex connections between plant, animal, and environmental elements. Watershed residents live within and are sustained by these natural systems, which provide food, air, and water, as well as aesthetic and recreational benefits. Because humans are among the most influential living components in most ecosystems, we are faced with the challenge of being responsible stewards. The objective is to maintain the stability, resilience, and high yields that result from diverse interconnected ecological communities.



Great blue heron in Goodhue Lake, Steuben County (by Noel Sylvester).

Efforts to restore New York's wildlife populations began in the early 1900s with the regulation of hunting (beginning in 1908) and establishment of a Conservation Fund supported by sale of hunting and fishing licenses (in 1925). Fish and wildlife conservation efforts included establishment of wildlife management areas, active management of wildlife habitats, and transplanting of game species to restore populations. Although populations of game fish and wildlife species rebounded, many non-game species continued to decline in numbers. In 1973, the Endangered Species Act targeted over 1,000 plant and animal species nationwide. However, habitat loss and other factors continued to impact many non-game fish and wildlife species. New York completed a Comprehensive Wildlife Conservation Strategy (CWCS) in 2005 to address wildlife "species in greatest need of conservation" and other wildlife-related issues (NYS DEC, 2005). This Strategy enables federal funding (through the State Wildlife Grants program) for conservation efforts aimed at preventing fish and wildlife populations from declining, including those species that might become endangered in the future if they remain unprotected.

The CWCS identifies the following priority issues in the Susquehanna-Chemung Watershed:

- Stream protection including sedimentation and nutrient reduction
- Protection and management of large forest blocks for Species of Greatest Conservation Need (SGCN)
- Protection of contiguous forest stands
- Management, restoration, and protection of stream buffers to protect SGCN
- Improved local land use planning

The most frequently cited threat to species groups occurring in the Susquehanna Basin was outright loss of habitat via conversion to a human dominated land use (NYS DEC, 2005). The state has lost over half of its wetlands since colonization, resulting in classification of many wetland-dependent species as endangered or threatened. Floodplain forests have also declined substantially from historic levels. Much of the remaining habitat is degraded by fragmentation, exotic plants, pollution, or other disturbances that compromise complex ecosystem functions. High deer populations degrade forest ecosystems by selectively feeding in certain plant

species. In-stream habitat is damaged by disturbances in and near streams. The key to wildlife survival and perpetuation is thus to protect, restore, and manage an interconnected network of diverse habitats. This should include large intact blocks, such as forests and wetland complexes, connected by corridors that serve as wildlife paths. Connecting corridors are needed to improve access to water and other resources, support larger breeding populations, and enable animals to shift their ranges with seasons or changing conditions. Stream and river corridors are ideal places for wildlife paths because of the multiple benefits of undeveloped floodplains (including improved stream stability and reduced flooding risks). The challenge of maintaining an interconnected network of open space is expected to become increasingly difficult due to the construction of infrastructure (roads, pipelines, etc.) to support the natural gas industry, as well as other rural development. Existing, healthy ecosystems warrant protection, because it is generally far more cost-effective to protect existing habitat than to take corrective action after degradation has occurred.

The structure and function of many of the watershed's habitats is degraded by increasing populations of invasive species and pests. A plant or animal is considered to be invasive if it competes with native flora or fauna in a manner that harms the ecosystem. The watershed is already home to many species that impair ecosystem functions, disrupt recreation, reduce timber values, pose health risks, and necessitate high management costs. A few of the many problems and threats are:

- Giant hogweed can cause severe health impacts and should not be touched.
- Zebra mussels, which are now found in the watershed, can have significant impacts on water quality as well as biological communities.
- Central New York has a population of feral swine that can cause serious environmental and agricultural damage.
- The emerald ash borer has been detected in Steuben County and may have a dramatic impact on both forests (in which ash is currently a dominant and valuable species) and urban areas (where ash is frequently planted).
- Monocultures of Japanese knotweed have replaced diverse plant communities along many streams, resulting in a uniform and shallow root structure that is less effective in stabilizing streambanks and preventing bank erosion.
- A new threat is hydrilla, an aquatic weed that necessitates costly management to maintain navigation, which has recently become established in the nearby Cayuga Lake inlet.

Unfortunately, once invasive species are established, there aren't many methods for successful management. Even herbicides or poisoning are rarely permanent solutions. The key is to prevent the spread of species and identify new occurrences quickly, when it may still be possible to eliminate or contain them. It is also important to maintain healthy ecosystems that are resilient to the competition by invasive species and damage caused by other pests.

*"Our task must be to free ourselves by widening our circle of compassion
to embrace all living creatures and the whole of nature in its beauty."*

- Albert Einstein

RECOMMENDATIONS

The Susquehanna Basin section of the "Comprehensive Wildlife Conservation Strategy for New York" (NYS DEC, 2005) includes conservation recommendations that support the Plants and Wildlife goals of this Action Plan. The detailed recommendations in that Strategy (called CWCS) are supported by this Action Plan, but are not reiterated herein. (They are referenced briefly as CWCS recommendations.) The goals of this section are also supported by other parts of the Action Plan, particularly Sections 1 (Water Quality and Quantity), 3 (Land Use), and 4 (Streams and Rivers). Watershed-wide coordination of many of the following recommendations is provided by the Upper Susquehanna Conservation Alliance (facilitated by the US Fish & Wildlife Service).

Habitat: Preserve the ecological integrity of existing high quality habitat and enhance the quality of impaired habitat that has a high potential for successful restoration. Place emphasis on large blocks

of intact habitat and corridors connecting the blocks. The watershed's unique ecological communities rely on rivers, streams, lakes, ponds, perennial wetlands, vernal ponds, forests, shrub land, and grassland systems, as well as transitional areas.

- 9a. Perform ecosystem monitoring and assessment to provide the data needed for effective habitat restoration and protection activities. This includes: (1) determining which ecosystems and ecosystem components are healthy and which are degraded or under stress, (2) assessing the causes of degradation, and (3) identifying trends.

Immediate action: Challenge each county in the watershed to develop a natural resources inventory (similar to that prepared by Tompkins County) to provide data on land, water, and ecological resources that can form the basis for local planning and environmental assessment. Inventories can be developed by local organizations (such as Environmental Management Councils) and/or in partnership with the NYS Natural Heritage Program (which has scientific expertise on natural ecosystems). They should build on existing information, such as the biologic and habitat assessments conducted for water quality monitoring (by SRBC, NYS DEC, and others), and lead to an increased commitment to collection of ecological and habitat data in the Susquehanna-Chemung Watershed.

5-year target: Implement "Data Collection Recommendations for Habitats" in the Susquehanna Basin section of the CWCS (NYS DEC, 2005). These relate to fragmentation, habitat degradation, and interspecific interactions.

Measure: Number of counties with natural resources inventories. Number of studies and reports.

- 9b. Develop a habitat management plan for the watershed that focuses on restoration, protection, and management of forests, wetlands, grassland, shrublands, and early successional forests. Key characteristics for identifying priority areas include: biodiversity hot spots, critical habitat for priority species, intact forests, large wetland complexes, and corridors connecting larger blocks. Other considerations include: proximity to other protected areas, property owner interest, anticipated costs, and the potential for successful protection. Place particular emphasis on areas that support multiple objectives including: recreation, watershed protection, flood mitigation, water quality enhancement, carbon sequestration, education, maintenance of natural resource industries (such as farming and forest products), smart growth principles, and preservation of historic or cultural features.

Immediate action: Pursue ongoing and new habitat planning efforts, with coordination by the Upper Susquehanna Conservation Alliance. Key partners include: Trout Unlimited, Audubon Society (Important Birding Areas), The Nature Conservancy ("functional landscape" preservation), Upper Susquehanna Coalition (wetlands), NYS Department of Environmental Conservation (NYS DEC), US Fish and Wildlife Service, Finger Lakes Land Trust, Otsego Land Trust, and others.

5-year target: Identify priority areas with exceptionally high water quality, habitat, and biological resources (based on natural resources inventories, monitoring, and habitat planning efforts) and develop habitat protection strategies for these areas.

Long-range target: Implement "Planning Recommendations" in the Susquehanna Basin section of the CWCS (NYS DEC, 2005), which includes forest management planning, grassland and wetland planning, and NYS DEC unit management planning.

Measure: Progress on watershed-wide planning efforts, including localized plans that contribute to watershed objectives.

- 9c. Develop and implement strategies for protecting critical habitat. Utilize various tools including: public land acquisition, acquisition by non-profit organizations, conservation easements, farm bill programs, permit conditions (for wetlands and protected streams), comprehensive planning, municipal land use regulations, and incentives for voluntary protection. (Additional land use planning recommendations are included in Section 3 of this Action Plan.)

Immediate action: Land trusts, state agencies, local governments, and others secure funding to permanently protect priority habitat areas, including acquisition of inholdings within state forests and

parks, stream buffer easements, and protection of other critical environmental resources (NYS DEC and OPRHP, 2009). In addition to the cost of purchasing property or conservation easements, funding is needed for transaction and stewardship costs, which can be modeled after the Trout Unlimited Coldwater Land Conservancy Fund.¹² Educate property owners about conservation easements and other protection strategies.

Immediate action: Include information about ecological resources and priority habitat areas in the Susquehanna-Chemung Data Atlas,¹³ with links to additional online resources. Promote the use of this tool by municipalities (for comprehensive planning and review of development proposals) and by the public.

5-year target: Provide county Planning Departments with information to disseminate to municipalities about the locations or priority habitat and strategies for protecting these areas (such as critical environmental area designation). Include information and sample language for protecting small wetlands and vernal pools (less than 12.4 acres) that are not regulated by the state. Recommend subdivision requirements that maintain and protect ecological functions, including large undeveloped parcels. Provide municipalities with follow up planning assistance as needed to revise comprehensive plans and revise/enforce land use regulations.

5-year target: Expand public education and assistance programs that help property owners understand the ecology of habitat on their property, develop effective management strategies, and implement habitat protection measures.

Long-range target: Implement “Land Protection Recommendations” in the Susquehanna Basin section of the CWCS (NYS DEC, 2005), which address water quality and habitat loss.

Measure: Information and features added to the Data Atlas. Number of municipalities and property owners that receive information and assistance. Number of revised plans and regulations. Acres of habitat protected.

- 9d. Develop and implement strategies for habitat restoration, focusing on areas with a high potential for restoration, opportunities for expanding habitat for priority species, and establishing corridors that connect the larger blocks.

Immediate action: Conduct stream training (see Section 4) that includes strategies for incorporating habitat considerations into stream management, stream remediation, culvert installation, and bridge projects. This includes avoiding indiscriminant dredging, leaving woody material in the stream, establishing shading riparian vegetation, removing fish blockages, restoring riffle-pool systems, etc.

Immediate action: Enhance the Upper Susquehanna Coalition Wetland Program (for wetland restoration, construction, and protection) to include additional public education through signs, media releases, and other strategies for informing the public about local projects and general issues (such as “why do watersheds need wetlands?”). Explore opportunities for using beaver to maintain wetland habitat in areas where they won’t adversely impact developed areas. Establish demonstration areas for documenting multiple benefits of wetlands (including water quality, flood attenuation, and habitat).

Immediate action: Provide information and assistance to lake associations and others for implementation of lake management programs that promote diverse lake and lake shore ecosystems. (See also the septic system recommendations in Section 1 of this plan.)

Immediate action: Promote local implementation of habitat restoration programs, including: NYS Department of Transportation mitigation projects, Natural Resources Conservation Service Floodplain Easement program, US Fish and Wildlife Service programs, and USDA Farm Bill programs (Wetland Reserve Program which benefits migratory birds, Wildlife Habitat Incentive Program which benefits grassland nesting birds, Conservation Reserve Enhancement Program for riparian corridors, etc.), and others.

¹² The Coldwater Land Conservancy Fund supports Trout Unlimited protection priorities by providing grants to land trusts and state agencies to cover the transaction costs associated with donated and purchased conservation easements.

¹³ Susquehanna-Chemung Data Atlas: <http://24.97.219.74/SCAtlas/>

5-year target: Evaluate feasibility and identify potential funding sources for fish passage or dam removal projects at the 9 dams that were determined to have a medium to high potential for restoration in “A Strategy for Removing or Mitigating Dams in New York State and Lessons Learned in the Upper Susquehanna Watershed” (US Fish and Wildlife Service, 2008).

Measure: Number of habitat restoration projects.

- 9e. Engage stakeholders in conservation of wild places and improved stewardship of all land (including urban and suburban areas) in order to protect and enhance habitat functions. Educate the public about how ecosystems work and species that occur within the watershed. Include recommendations for stream management, riparian corridors, not feeding waterfowl, mowing less grass, attracting wildlife, timber management practices that create early successional habitat, and selecting plant species that will be resilient to warming climate conditions. (See also public education recommendations in Section 11.)

5-year target: Develop and implement a public education campaign about ecosystem functions and habitat enhancement techniques (backyard ecology and rural land management). Build on existing resources, such as the outdoor exhibit at Rogers Environmental Education Center that shows how anyone can enhance wildlife habitat at home.

Measure: Number of educational exhibits, articles, and programs.

Target Species: Protect and restore sustainable populations of plant and animal species in need of conservation, including those classified as endangered, threatened, Species of Greatest Conservation Need (SGCN), and others with important ecological functions. Target species include: Eastern hellbender, American shad, American eel, blueback herring, brook trout, Jefferson salamander, longtail salamander, pearly mussels, river otter, and American woodcock.

- 9f. Support studies of priority species to monitor populations and provide the technical basis for developing protection and restoration strategies. Research the effects of climate change on individual species and ecological communities.

Immediate action: Coordinate research on target species in the watershed through the Upper Susquehanna Conservation Alliance. Key programs include the NYS Natural Heritage Program (with an increased commitment to data collection in the Susquehanna-Chemung Watershed), Biological Field Station (pearly mussel studies), Trout Unlimited (brook trout), NYS DEC, US Fish and Wildlife Service, university research, non-profit conservation organizations, and others.

5-year target: Implement “Data Collection Recommendations for SGCN” in the Susquehanna Basin section of the CWCS (NYS DEC, 2005). This includes population, habitat, and life history research on a number of priority species to address critical data gaps. It also includes monitoring of contaminants in animals and evaluating population restoration efforts.

Measure: Number of studies and reports.

- 9g. Develop restoration plans for priority species that are both biologically feasible and socially acceptable.

Immediate action: Complete the hellbender recovery plan, under development by NYS DEC.

5-year target: Implement “Planning Recommendations” in the Susquehanna Basin section of the CWCS (NYS DEC, 2005). This includes population, habitat, and life history research on a number of priority species to address critical data gaps. It also includes monitoring of contaminants in animals and evaluating population restoration efforts.

Measure: Number of species restoration plans.

- 9h. Implement management and restoration activities to protect and restore populations of priority species.

Immediate action: Coordinate protection and restoration activities through the Upper Susquehanna Conservation Alliance. Maintain NYS participation in the Susquehanna River Anadromous Fish

Restoration Cooperative (SRAFRC) and implementation of recommendations of the “Strategic Plan for Restoration of Migratory Fishes to the Susquehanna River” (which currently focus on fish passage for American shad and eel at 5 downstream dams and research on the declining population of American shad). Implement conservation strategies developed by the Eastern Brook Trout Joint Venture to protect, enhance, and restore brook trout. Implement recommendations of the management plan for American eels recently prepared by the US Geological Survey for NYS DEC. (Eel restoration will restore important ecosystem functions to streams and rivers in the watershed.)

Long-range target: Implement “Management and Restoration Recommendations” in the Susquehanna Basin section of the CWCS (NYS DEC, 2005). This includes habitat management strategies, invasive species control techniques, and recommendations regarding human-wildlife interactions.

Measure: Number of projects that protect and/or restore populations of target species.

- 9i. Educate property owners, land managers, and municipalities about target species and protection/restoration strategies in order to facilitate informed decisions about activities that may help or harm SGCN. Include information about management strategies for beavers, which have hydrologic benefits and create attractive habitat for many wetland species. Provide individual technical assistance as needed.

Immediate action: Publicize and maintain the Conservation Guides on the NY Natural Heritage Program website, which help land managers, decision-makers, planners, scientists, consultants, and the interested public better understand the rare species and natural communities.¹⁴

Immediate action: Provide information about biologically important areas to the counties (for natural resources inventories; Recommendation 9a), municipal governments (for planning and land use decisions; Recommendation 9c), and landowners. Assist property owners and managers with development of conservation strategies. Provide municipalities with planning assistance as needed to implement zoning controls (such as an overlay protection district) or establish Critical Environmental Areas so that new development would be required to protect the endangered species.

5-year target: Implement “Information Dissemination Recommendations” in the Susquehanna Basin section of the CWCS (NYS DEC, 2005). This includes recommendations concerning rare species, agriculture and silviculture practices, exotic species, and human-wildlife interactions.

Measure: Number of educational exhibits, articles, and programs. Number of counties, municipalities, and property owners that receive information and assistance.

Invasive and Harmful Species: Manage the adverse ecological impacts of invasive species and pests by (1) preventing introduction of new species, (2) early detection and rapid response, (3) public outreach and education, and (4) focused, ecologically sound control and management activities (where feasible).

- 9j. Monitor the occurrence and ranges of invasive species, conduct research to determine the best control strategies, and prepare a comprehensive invasive species management plan. These efforts should include monitoring for species not yet established to enable early detection and rapid response (during the critical early stage when eradication may be feasible).

Immediate action: Document invasive species in conjunction with water quality monitoring (by SRBC and others) and other data collection efforts. Fund



Feral swine (courtesy of NYS DEC).

¹⁴ Conservation Guides on the NY Natural Heritage Program website provide population trends, habitat information, conservation strategies, information about identification, and other useful resources for hundreds of individual plant and animal species and biological communities: www.acris.nynhp.org

additional invasive species monitoring and research (by universities, non-profit organizations, and government agencies).

Long-range target: Implement the information and research recommendations of the NYS Invasive Species Task Force, which include: (1) establish a center for invasive species research, (2) develop a state-wide database clearinghouse for all taxa of invasive species (integrating existing databases and information clearinghouses), (3) recognize and fund demonstration projects, (4) convene a regular invasive species conference, and (5) prepare and implement a comprehensive invasive species management plan for New York state.

Measure: Number of studies and reports.

- 9k. Conduct education and outreach about invasive species targeting land managers, landscaping businesses, lake associations, and the general public. This should include information about: (1) the negative effects of invasive species, (2) techniques for preventing the introduction and spread of invasive and exotic species, (3) identification assistance to facilitate early detection and reporting, (4) promotion of native species as alternatives to invasives, (5) techniques for preventing colonization by invasive species when an area is disturbed, (6) resources for managing healthy ecosystems that are resilient to the impacts of introduced species, and (7) control and management strategies for individual species.

Immediate action: Support regional coordination of invasive species education through the Finger Lakes Partnership for Regional Invasive Species Management (FL-PRISM), Catskill Regional Invasive Species Partnership (CRISP), New York Invasive Species Clearinghouse,¹⁵ and Mid-Atlantic Panel on Aquatic Invasive Species.

Immediate action: Support county-based invasive species experts (trained Master Gardeners, Cooperative Extension staff, or others) who can disseminate information, make presentations, conduct workshops, provide assistance to the public, and serve as an early detection network.

Immediate action: Conduct targeted public awareness campaigns for specific species of concern, particularly emerging problems like hydrilla, the emerald ash borer, and feral swine.

5-year target: Provide educational signage and boat washing facilities at all public boat launch sites. Signs should provide information about the dangers posed by the spread of exotic species and the role of boats in their spread.

5-year target: Provide nurseries and landscapers with information about landscaping plants that can become nuisance species and appropriate native species substitutions. Encourage labeling of native species. Provide handouts for distribution to customers.

Measure: Number of educational exhibits, articles, and programs.

- 9l. Where feasible, implement ecologically sound invasive species control and management activities to slow the spread of harmful species and mitigate the impacts of established populations.

Immediate action: Allocate funding and sufficient staff to implement invasive species management activities of the FL-PRISM, CRISP, NYS Department of Environmental Conservation, US Fish and Wildlife Service, counties, and other organizations. Maintain sufficient staff to enable early detection and rapid response to new threats as well as management of established populations.

Long-range target: Implement the "Management and Restoration Recommendations" for invasive species in the Susquehanna Basin section of the CWCS (NYS DEC, 2005), which specifies the need to control purple loosestrife, invasive aquatic plants, Japanese knotweed, and invasive species of minnows.

Measure: Number of invasive species control and management projects.

¹⁵ New York Invasive Species Clearinghouse: www.nyis.info

SECTION 10 OUTDOOR RECREATION

GOAL: Connect people to nature.

- Enhance opportunities for watershed residents, children, and tourists to enjoy the region's rivers, lakes, and wetlands by protecting scenic vistas, revitalizing waterfronts, promoting outdoor recreation, and providing additional opportunities for water-based recreation.

CHALLENGE

It is hard to imagine a better place to promote outdoor activities than the Susquehanna and Chemung River Watersheds. The availability of recreation opportunities is abundant with the rolling hills, scenic drives and, of course, rivers running through the land. Yet there appears to be a disconnect between the opportunities available and recreational use of the land and water.

There are many reasons for this disconnect. For many, it is simply the lack of knowledge about outdoor recreation opportunities and sites in their own neighborhoods. Many access points are under publicized. Residents may not know where a trailhead begins or where a canoe can be rented. This information is disseminated primarily by word of mouth and deeply buried web pages.



Photo by Janet Thigpen.

A New York State survey indicates that for the age group from 35 to 44 years, the biggest impediment to outdoor recreation is time. Younger adults (20 to 34 years old) also state that lack of time is a strong impediment (NYS OPRHP, 2008). These statistics suggest that outdoor recreation facilities are used primarily by children, teenagers, and those over the age of 44. Recreational programs, information, and amenities could be targeted at these age groups.

A priority in the New York State Open Space Conservation Plan (NYS DEC & OPRHP, 2009) is “connecting our children with nature.” Today’s children spend far less time outdoors than did their parents. As a result they are learning about nature indirectly from television and the internet, rather than directly from contact and observation. In order to reverse this shift away from outdoor activities, the Open Space Plan recommends a number of actions to reverse that trend by helping children and their families rediscover the natural world.

Areas near the water are ideal for recreational facilities, which typically have less impact on water quality and lower vulnerability to flood damage than other uses. The chart on the following page identifies some of the requirements and amenities that support outdoor activities on the water, near the water, and throughout the watershed. The Susquehanna-Chemung Watershed has an abundance of publicly-owned land and many delightful recreational facilities, including trails, boat launches, and picnic areas. Recreational opportunities could be enhanced by more sites with simple access to the water and safe parking. In a 2011 survey for the Town of Vestal Local Waterfront Revitalization Program (LWRP), 40% of respondents indicated that lack of parking would prohibit them from participating in river related activities. Some outdoor activities also require equipment (such as boats, camping gear, cross country skis, fishing poles, etc.) which can be expensive to own, but very affordable to rent. The Town of Vestal LWRP survey found that over half of those surveyed wished to see more “water related equipment, instruction and rental businesses” and restaurants. Increased promotion of outdoor recreation should be accompanied by economic development strategies that include the addition of outdoor retail stores, as well as rental and shuttle services.

Ammenities and Requirements for Outdoor Recreation

		<i>Public Access / Parking</i>	<i>Clean Water</i>	<i>Park/ Tables / Seating / Pavillion</i>	<i>Boat Launch</i>	<i>Swimming Area / Life Gaurds</i>	<i>Multi-Use Trail</i>	<i>Camp Sites</i>	<i>Ski Resort</i>	<i>Golf Course</i>	<i>Scenic Byway</i>	<i>Equipment</i>	<i>Restrooms</i>	<i>Knowledge of Location</i>	<i>Signage/ Markers/ Maps</i>	
On the Water																
Boating			R	R	R								R	R	R	R
Fishing	R		R	R									R	R	R	R
Swimming*			R	R		R							R	R	R	
Near the Water																
Walking	R			R			R						R	R	R	
Biking				R			R				R	R	R	R	R	R
Cross Country Skiing				R			R					R	R	R	R	
Birdwatching/ Wildlife Observation	R	R		R									R	R	R	
Picnicking	R			R									R	R		
In the Watershed																
Camping	R			R				R					R	R	R	
Hunting	R												R	R	R	
Skiing (downhill)	R			R					R				R	R	R	
Golfing	R			R						R			R	R	R	
Sightseeing / Historic Sites				R							R		R	R	R	

*Rivers are not safe for swimming due to currents and debris.

Although the watershed has many places to enjoy the great outdoors, the resources needed to maintain trails, parks, and other facilities are often lacking. Recreational facilities are often low priorities for tight municipal, state, and federal budgets. Many volunteer groups of recreational enthusiasts are being tasked with maintaining trail systems, mowing lawns around launch site, and simply keeping these sites available to the public. It is difficult to recruit these folks and even more difficult to find funding to maintain recreational facilities. An additional concern is the lack of insurance coverage for “work parties” and other volunteer activities. Organizations with the best of intentions are often thwarted by liability concerns and red-tape.

Safety considerations must be incorporated into all programs that support outdoor recreation. The lack of knowledge about opportunities for outdoor activities goes hand-in-hand with a lack of experience and knowledge about how to undertake those activities safely. Many people underestimate the hazards of recreation on and near water. Programs that promote water-based recreation must also promote the use of life jackets, discourage swimming in rivers, and discourage consumption of alcohol while boating.

Why is outdoor recreation important?

The New York State Comprehensive Outdoor Recreation Plan (NYS OPRHP, 2008) states the following:

- 24% of adult Americans get no exercise
- 60% of NYS adults are overweight or obese
- Obesity among children and adolescents has tripled over the past 30 years
- Obesity-related illnesses cost the state more than \$7.6 billion per year
- Children spend half as much time outdoors as they did 20 years ago
- One third of New York’s children are obese or overweight
- There is a growing “nature deficit disorder”

The nation’s obesity and public health problems led the First Lady, Michelle Obama, to make combating childhood obesity one of her top priorities. Outdoor activities can be an important part of the solution, providing enjoyable, low-cost ways to stay in shape and reduce stress. Almost all of us can benefit from a walk in the woods and the beauty of an unspoiled view.

Furthermore, recreation provides economic benefits to the local economy. Hunting, fishing, and other outdoor recreation contributes more than \$6 billion to the New York economy annually, and are important components of the tourism economy in the Susquehanna-Chemung Watershed. Trail users spend an average of \$342 per year on equipment for trail activities. About 86% of trail users are local people who live within 20 miles and spend an average of \$10 per visit. The other 14% have come from farther away and spend an average of \$180 per trail visit (NYS OPRHP, 2008). Trails and other recreational facilities are thus an important element of a sustainable local economy.

***“When we walk, we naturally go to the fields and woods:
What would become of us if we walked only in a garden or mall?”
- Henry David Thoreau***

RECOMMENDATIONS

On the Water: Provide public access to lakes, rivers, and streams to facilitate safe use of these waters for boating, fishing, and other recreation.

10a. Revitalize existing sites and build additional boat launches to establish a network that supports short and long excursions, with safe parking and signage at each site that can be seen from the closest road.

Immediate action: Revitalize existing boat launches by updating amenities, improving signage, maintaining vegetation, and making other improvements.

5-year target: Conduct a full assessment of all boat launch sites within the watershed to determine ownership/responsibility, assess hazards, document facility needs (including rest rooms), and identify gaps where additional boat launches are desired. Address any dangerous situations immediately. Seek sponsors and funding for other needs.

5-year target: Develop a water recreation park at the Rock Bottom dam in Binghamton and/or at the Chase-Hibbard dam in Elmira (such as the one in Watertown).

Measure: Number of boat launches revitalized.



Chemung River Float (by Noel Sylvester).

- 10b. Provide water safety information (such as the River and Boating Safety brochure developed by Environmental Emergency Services) at all boat launches within the watershed and a safety briefing prior to each organized trip.

Immediate action: Place pamphlets and/or signs at each boat launch to communicate relevant safety information, such as: prohibiting swimming in unsafe locations, urging boaters to wear (and fasten) life jackets, providing information about NYS boating laws, alerting users to local hazards, providing emergency contacts, or conveying other water safety messages.

Measure: Number of boat launches with water safety information.

Near the Water: Provide an interconnected system of marked, maintained, and accessible trails that enable walking, biking, and cross country skiing along and between the region's waterways.

- 10c. Implement existing plans for riverside trail systems and amenities, such as the Southeast Steuben River Vision, Chemung County River Trail Master Plan, Local Waterfront Revitalization Plans, Susquehanna Greenway plan, trail components of transportation plans, and the NYS Bicycle and Pedestrian Plan. Include all trails in the statewide Trail Finder site.¹⁶

Immediate action: Pursue funding to implement recommendations from existing plans, with emphasis on projects that connect existing trails.

Immediate action: Add trails to statewide Trail Finder website. Promote the expansion of the NYS Department of Transportation 511NY.org website to include trails.

Measure: Number of waterside trail projects implemented. Number of trails in the Trail Finder site.

- 10d. Implement tangible projects that enhance the "Quality of Place" and build support for resource protection by providing access to natural resources and facilitating outdoor recreation. Possible projects include creation, revitalization, or improved signage for: parks, picnic facilities, public access points (with parking), fishing access sites, recreation areas, trails, etc.

5-year target: Create or revitalize outdoor recreation facilities.

Measure: Number of projects.

- 10e. Recognizing that the watershed does not end at the state line, work with Pennsylvania agencies to interconnect water and land trail systems in New York with those in Pennsylvania.

¹⁶ New York State Trail Finder site: www.ptny.org/Trailfinder.org/wp

Immediate action: Increase cooperation and communication with Pennsylvania agencies and outdoor recreation groups through inclusion on currently existing lists (such as BACPAC group, STC newsletter list, Chemung River Friends list, etc.) and invitations to relevant meetings and events.

5-year target: Work with recreation groups in Pennsylvania to identify land and water trails that could connect across the state line and complete those trail connections (with amenities and signage as needed).

Measure: Number of trails connected across state lines.

- 10f. Support existing community groups and volunteers that maintain trails and recreational facilities. Solicit additional participation as warranted.

Immediate action: Sponsor social networking events that bring together existing volunteers and professionals from throughout the watershed for sharing of ideas, building partnerships and providing technical support about funding resources. Always provide food at these events.

Immediate action: Pursue an intern position or other funding to develop a volunteer recruitment program that will enable a sustainable network of volunteers to maintain and promote trails and other facilities (from recreation groups, local colleges, high schools, boy scouts, girl scouts, YMCAs, etc.).

5-year target: Create and publish an online mechanism for outdoor recreation enthusiasts to network and schedule group outings. Include groupings for different types of activities (i.e. paddling, hunting, hiking, fishing) with message boards where individuals can announce a trip and invite others to join.

Measure: Number of networking events. Number of volunteer organizations that maintain and promote trails.

In the Watershed: Promote and support businesses, government agencies, non-profit organizations, and other groups that facilitate outdoor recreational opportunities. These partners sell and rent equipment, provide shuttle services, provide training, construct and maintain facilities, promote healthy lifestyles, publish maps, etc.

- 10g. Integrate outdoor recreation into economic development plans as a viable part of the business sector. Support existing outdoor recreation businesses and encourage their expansion.

Immediate action: Work with existing outdoor-related businesses to encourage expansion of services to include additional equipment rental, shuttle services, and an increased variety of merchandise.

Immediate action: Assist new and existing businesses by providing them with a list of community outdoor recreation groups that they could reach out to with presentations, training, or promotional sales.

Immediate action: Businesses offer training and education to the public on the use of equipment and safety for the types of merchandise the businesses sell and rent.

5-year target: Work with local economic development agencies to establish new outdoor-related businesses.

Measure: Number of businesses that receive assistance or information. Number of business-sponsored public presentations. Number of new outdoor-related businesses established.

- 10h. Identify funding opportunities that support outdoor recreation objectives and provide interested groups with the assistance needed to access those resources.

Immediate action: Lobby to re-fund programs that benefit outdoor recreation and work to make that funding accessible to local non-profit organizations, municipalities, and others.

Immediate action: Identify funding for maintenance or improvement of outdoor recreation facilities and notify eligible applicants, such as municipalities, non-profit organizations, and recreation groups.

Immediate action: Host grant writing training targeted at volunteer organizations.

5-year target: Create an umbrella state-wide organization, modeled after Pennsylvania Organization for Waters and Rivers (POWR) or Pennsylvania Parks and Forest Foundation, that provides assistance with volunteer recruitment and retention, insurance coverage, and fundraising for stewardship and promotion of recreational facilities. This group could also maintain and organize online resources.

Measure: Number of letters or expressions of support for funding. Number of grant writing training sessions. Establishment of a program to support volunteer organizations.

- 10i. Encourage golf courses and other recreational businesses (as well as other water users) to use water efficiently and provide for local mitigation for water used during low flow conditions.¹⁷ (Other water conservation recommendations are in Section 1.)

Immediate action: In conjunction with the Susquehanna River Basin Commission (SRBC), educate the operators of golf courses about sustainable water management practices, encouraging the development of drought management plans and implementation of water conservation and mitigation measures that exceed permit requirements.

Measure: Number of golf courses receiving information or assistance.

Publicity, Education, and Outreach: Provide residents and visitors with information about the region's recreational assets and how to enjoy them safely. (Additional tourism recommendations are in Section 2.)

- 10j. Map the recreational resources of the Susquehanna-Chemung Watershed. Provide maps in different formats and for different types of activities so that residents and visitors can identify recreational opportunities and find the locations for taking advantage of them.

Immediate action: Distribute existing maps of trails, launch sites, fishing access points, parks, etc; and encourage individuals to post pictures from their outings on Google maps and Bing Maps of the region.

Immediate action: Include public land, available hunting land, and outdoor recreation facilities in the online Susquehanna-Chemung Data Atlas,¹⁸ with links to websites, maps, and other online resources.

5-year target: Develop comprehensive watershed-wide maps of boat launches, parks, restrooms, and other outdoor recreation amenities. Distribute this mapping in multiple formats, such as print, internet, and mobile phone. This could be paid for with grants, donations, and/or advertising.

Measure: Number of new maps. Number of means for distributing maps.

- 10k. Promote the region's recreational treasures.

Immediate action: Get trails published in hiking and biking trail guides (people use these!) and shown on road maps by providing information about routes and facilities to existing publications. Update and re-submit annually.

Immediate action: Work with New York State Parks and Trails to update, maintain, enhance, and promote their Trail Finder website.

Immediate action: Write articles and submit for publication in local and/or regional outdoor enthusiast publications.

Immediate action: Provide increased information about boat launches, fishing access sites, trails, and other recreational opportunities through county websites.

Immediate action: Conduct a regional "eco-recreational event" to get people outside and introduce them to a recreational gem somewhere in the watershed. Encourage the organization of additional

¹⁷ Golf course irrigation can use large volumes of water, which is often withdrawn from small headwater drainage areas. In the Susquehanna Basin golf courses use more water than power plants and more than the anticipated water use for natural gas extraction, though less than 15% of those golf courses are in New York (SRBC, Dec. 2008).

¹⁸ Susquehanna-Chemung Data Atlas: <http://24.97.219.74/SCAtlas/>

sojourns throughout the watershed and invite community leaders to participate in these events. Integrate geo-caching into these events and sojourns.

Immediate action: Reach out to sponsors of previous outdoor recreation events to build a regional network of businesses and organizations that can work together to promote outdoor recreation and support future projects and events.

Immediate action: Lobby New York State government to expand the Office of Parks, Recreation and Historic Preservation to better serve outdoor recreation groups and to assist with coordination of safety programs, facility upkeep, and promotion of outdoor recreation opportunities.

5-year target: Develop a water trail guide with a map of boat launch sites and additional information for river users (such as hazard areas, availability of services, road directions to access points, etc.). This collaborative project of the Headwaters River Trail Partnership and the Friends of the Chemung River Watershed will encompass the entire Susquehanna-Chemung Watershed in NY. Incorporate an online resource that indicates “navigable” water levels with links to current river gauge data.

5-year target: Seek funding to work with local economic development agencies and advertising firms to brand the Susquehanna-Chemung Watershed as a place to vacation.

Measure: Number of articles, publications, and websites promoting outdoor recreation in the Susquehanna-Chemung Watershed. Number of “eco-recreational” events. Number of networking opportunities for outdoor recreation sponsors. Development of a “brand” for the Susquehanna-Chemung Watershed.

10l. Promote the pleasures and health benefits of outdoor activities.

Immediate action: Conduct a public relations campaign promoting the health benefits and joys of outdoor recreation, accompanied by specific information about local resources and special places. Promote this message at festivals, events, and publications throughout the watershed. Utilize schools, colleges, and senior centers to target those under 20 and over 44, who have time to go outside and enjoy themselves. This message can be revised and repeated every year.

Immediate action: Collaborate with local health professionals, planning departments and university programs (such as SUNY Cortland's Community Health and Outdoor Recreation program) to host trainings for community leaders (in the public and private sectors) about the importance of outdoor recreation and open space for the health benefits, economic possibilities, and overall “quality of place.”

Immediate action: Promote New York State's Junior Hunters and Trappers program and New York State Parks and Trails' “Healthy Trails, Healthy People” program throughout the watershed through the distribution of published information.

5-year target: Conduct focus groups to develop strategies for promoting outdoor recreation to under-represented demographics, with a strong emphasis on children and combining recreation with science education.

Measure: Number of advertisements. Number of training events. Number of organizations that distribute published information. Number of focus group meetings.

10m. Promote and educate about water safety.

Immediate action: Distribute water safety publications to outdoor recreation groups, at local community organizations, and local community functions.

Immediate action: Develop a water safety webpage and encourage outdoor recreation groups, municipalities, and businesses to link to this information from their websites.

Immediate action: Seek funding for signs indicating that rivers are not safe places to swim and post at appropriate public access sites.

Immediate action: Distribute and publish information about water safety, boating safety classes (offered by the U.S. Coast Guard Auxiliary), and learn to swim clinics.

5-year target: Establish sign-in/sign-out registers at all boat launches and trail heads, to enable verification that users have safely completed their excursions.

Measure: Number of organizations that distribute information. Development of a water safety webpage. Number of water safety signs. Number of boat launches and trail heads equipped with sign-in/sign-out registers.

10n. Recognize that development within the watershed and near the water has direct impacts on recreational use of the rivers.

Immediate action: Provide the Susquehanna River Basin Commission with information about river trails, fishing access sites, and other amenities so that recreational water uses are considered during the project review process for water withdraw permits.

Immediate action: Train and educate public officials and municipal planning boards about the benefits of preserving riparian buffers through regional training and distribution of printed materials.

Measured: Number of training sessions.

SECTION 11 EDUCATION AND RESEARCH

GOAL: Cultivate a watershed ethic.

- Provide decision-makers, youth, and the public with an improved understanding of interconnected natural systems and strategies for building environmentally and economically sustainable communities.
- Support scientific research that facilitates "ecosystem-based management" of water resources in the Chemung and Susquehanna Watersheds.

CHALLENGE

Water is a precious resource. The ability of citizens to be good stewards of that resource begins with understanding. What is a watershed? How do the interconnected systems work? How have humans impacted water quality and the water cycle? What changes are occurring over time? What can be done to protect and restore watershed resources?

For future management decisions to be based on sound science, citizens and community leaders must be both knowledgeable and engaged. To accomplish this, water resource information needs to be readily available in user friendly formats. Learning should be engaging.

The foundation for watershed stewardship is built in childhood, through formal education and other learning opportunities. Incorporation of environmental and water resource studies in youth programs helps to form adults that understand and value environmental and natural resources. Building on this foundation, outdoor education centers, internet resources, mass media outreach and other educational programs establish a citizenry that is knowledgeable about natural resources and primed to support wise management decisions. In addition, scientific research and technical assistance are needed to enable land managers, municipalities, and others to develop creative solutions to complex issues at the local level.



Stormwater-floodplain model at Bath-Haverling School (by Janet Thiboen).

Key educational messages and research topics for building a “watershed ethic” in the Susquehanna-Chemung Basin are summarized in the other Action Plan goals:

- *Keep the water clean and plentiful – It’s priceless.*
- *Capitalize on water resources as economic assets.*
- *Use the landscape in ways that support healthy water systems.*
- *Live in harmony with streams.*
- *Floods happen, so be prepared.*
- *Preserve the rich diversity of plant and animal life.*
- *Rainwater is good: Slow it down. Spread it out. Soak it in.*
- *Support productive working lands that contribute to a healthy landscape.*
- *Navigate towards better roadway drainage.*
- *Connect people to nature.*

Financial resources are an ongoing challenge for schools, nature centers, research institutes, and others. Knowledge is another. Teachers, scout leaders, and other educators may not be comfortable with their ability to undertake a citizen science project or Soil and Water Conservation merit badge. Visiting educators with expertise about natural resources or training with environmental curricula can be a valuable resource.

The school curriculum doesn’t include the time or the flexibility needed to engage students in local resource issues. Science is not a priority at the elementary level and the high school curriculum is driven by the Regents exam. A few teachers manage to

integrate science and environmental issues into other subjects. But all students need in-depth projects, field trips, and hands-on activities that promote “minds-on learning.”

Strong science is needed to effectively prioritize, implement, monitor, and evaluate the actions and policies that enhance the health of the Susquehanna-Chemung Watershed. This will require improved monitoring, computer models, and research. Research results must be integrated into science-based strategies for addressing environmental challenges, including: protecting and restoring water quality (locally and downstream in the Chesapeake Bay), identifying and managing flood hazards, preparing for drought, restoring ecosystem functions, protecting threatened and endangered species, increasing the sustainability of food production, and promoting healthy lifestyles. Most of this research is conducted by colleges and universities or by regional and federal agencies (Susquehanna River Basin Commission, US Geological Survey, and National Oceanic and Atmospheric Administration). The development of public policies based on this research is generally a government function. In addition, science-based technical assistance is provided by organizations such as Cornell Cooperative Extension (CCE), the Cornell Local Roads Program, and Soil and Water Conservation Districts (SWCDs). It is important to maintain intellectual resources within all of these organizations, secure financial support for essential research, and foster the communication needed to facilitate science-based policies and programs.

*“Education is the most powerful weapon which you can use to change the world.”
- Nelson Mandela*

RECOMMENDATIONS

Watershed Education for Children: Promote water resource education for school aged children: (1) in the school curriculum, (2) through after school clubs and groups, and (3) elsewhere in their lives. Each student should have at least one “meaningful watershed educational experience” before graduating from high school.¹⁹

11a. Increase the priority given to natural resource and water cycle issues in the elementary, middle school, and high school curriculum so that watershed schools graduate environmentally literate students.

Immediate action: Support ongoing efforts to develop and then implement an “Environmental Literacy Plan for New York,” which offers the framework for enhancing outdoor and environmental education.

Immediate action: Support efforts to improve science and environmental curriculum (by NYS Outdoor Education Association and Science Teachers Association of NYS), including increased use of “Project Based Learning” strategies, “21st Century Learning” strategies, and integration of Science, Technology, Engineering and Mathematics (STEM) into the rest of the school curriculum.

Immediate action: Promote integration of flood safety information into Driver’s Education and other programs by incorporating the “Turn Around Don’t Drown” message and resources.

5-year target: Establish a peer-to-peer training network through which teachers with experience using environmental curriculum and resources (such as Project Wet or stream models) provide training for other teachers.

5-year target: Develop a list of science fair ideas (and supporting resources) that relate to water and environmental issues. Distribute to teachers.

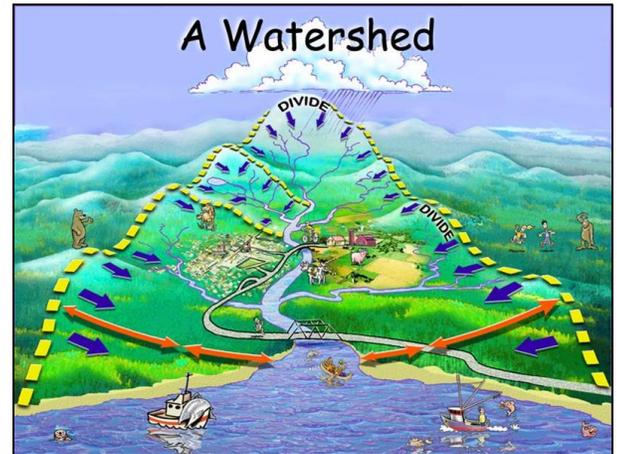
5-year target: Develop a resource list of interesting and technically accurate environmental books that are recommended for school and public libraries (such as the “Gaia Girls” adventure novels by Corning author Lee Welles and Envirothon resources). Survey libraries to determine which have these resources (or others). Share the results with community groups that may be able to purchase these resources for local libraries. Identify authors included on this resource list who are willing to meet with classes (in-person or by Skype), and provide libraries with contact information for these authors.

¹⁹ This is the goal of the Meaningful Watershed Educational Experience initiative for the Chesapeake Bay.

5-year target: Make “Masters of Disaster” boxes (with safety curriculum developed by the American Red Cross) available to all schools in the watershed and provide training in use of these instruction modules.

Long-range target: Make stream testing kits and training on their use available to all science teachers within the watershed. Establish an online database for data sharing.

Measure: Number of training sessions. Number of peer-to-peer training networks. Number of schools that receive resources.



- 11b. Integrate environmental education projects into school curricula to provide students with “meaningful watershed educational experiences.” These are not one-day activities, but are extensive projects that engage students in hands-on outdoor investigations, classroom work, and restoration projects.

Immediate action: Seek funding to continue to offer the Chesapeake Bay Academy annually to provide teachers and other educators with in-depth training in water resource education.

Immediate action: Enhance and expand teacher training and networking opportunities through list serves, associations, and other means.

5-year target: Fund and establish a program that provides financial support for the additional costs required to implement “meaningful watershed educational experiences” (such as transportation expenses, equipment for monitoring, plants for restoration projects, etc.).

5-year target: Encourage “block” scheduling, which enables classes to be long enough for hands-on/minds-on activities and field trips.

Measure: Number of in-depth training opportunities, networking opportunities. Number of mini-grants for “meaningful watershed educational experiences.”

- 11c. Support and expand Conservation Field Day programs that provide a day of outdoor education at which students (usually 6th graders) rotate among stations. Some counties in the watershed offer this program, with coordination by Cooperative Extension offices or Soil and Water Conservation Districts.

5-year target: Find sponsoring agencies to run a Conservation Field Day program for each county in the watershed. Encourage organizers to work with volunteer presenters so that each station is engaging, hands-on, and educational (rather than demonstrations).

5-year target: Work with local schools to promote participation in Field Days, with the goal of 100% participation. If funding for transportation or substitute teachers is an impediment, solicit support from local civic groups.

Measure: Number of Conservation Field Day programs throughout the watershed. Percentage of schools participating in Field Days.

- 11d. Expand the availability and improve the skills of informal educators who deliver environmental programs to school groups, youth organizations, summer camps, and at public events. Educational resources include: Ronnie Raindrop (used by SWCDs to educate young children about the importance of water conservation and water protection), Enviroscape (large environmental model that demonstrates how polluted water and eroded soils move through the ecosystem), groundwater model (shows the movement of groundwater and contaminants through various types of soil), Project Wet (hands-on water-related activities for kindergarten through 12th grade), stormwater-floodplain model (demonstrates the relationship between land use and flooding), Emriver model (demonstrates stream behavior and erosion), and Focus on Floods educational materials (including classroom posters, coloring sheets, and activity worksheets).

Immediate action: Conduct train-the-trainer sessions to provide volunteer presenters and master teachers with the skills needed for fun and interesting presentations on water issues using existing models and other resources. Use these sessions as a networking event for nature center staff and other environmental educators in the watershed; encourage trainees to participate in Conservation Field Days, volunteer with youth organizations, and offer peer-to-peer teacher training.

5-year target: Procure funding to maintain, expand, and enhance the water resource educational programs conducted by nature centers, SWCDs and other organizations. This may include such things as: increased participation in schools and other programs, volunteer training/coordination, additional models or other supplies, development of new resources, printing costs, etc.

Measure: Number of train-the-trainer sessions. Number of education programs.

- 11e. Increase the integration of environmental issues into youth organizations and events. Promote existing environmental clubs and the creation of new clubs, which can provide opportunities for in-depth learning beyond what can be accomplished in the classroom.

Immediate action: Compile a resource list of existing water resource presenters, topics, materials (such as posters or activity worksheets), and other resources for each county (including models and other items that can be borrowed). Distribute this information to schools, youth organizations, camps, etc. Update and re-distribute annually.

5-year target: Identify schools that have existing environmental clubs. Document the successful strategies and distribute to schools, nature centers, and other potential sponsors.

Measure: Number of schools that receive information.

- 11f. Promote increased participation in the New York State Envirothon by recruiting teachers to identify interested students and serve as team advisors. Publicize the accomplishments of local teams. (Candor High School in Tioga County is a model for success, having repeatedly won the state competition.)

Immediate action: Ask teachers who have conducted successful Envirothon programs to mentor other teachers by conducting workshops or webinars and then being available to answer questions.

Immediate action: Compile a list of Envirothon subject experts in each county who can provide lessons on various topics (for Envirothon teams, classes, or other groups). Distribute this list to schools with Envirothon information.

5-year target: Increase the number of teams from watershed schools participating in the New York State Envirothon.

Measure: Number of Envirothon mentors. Number of counties that distribute subject expert lists. Number of Envirothon teams.

Watershed Literacy for Citizens: Foster understanding of natural systems and expand citizen stewardship of those resources.

- 11g. Provide media outreach pieces to increase understanding of watershed issues.

Immediate action: Write articles about watershed issues and release to all local media.

Immediate action: Write articles and work with local news stations to present “Environmental Stewards” segments highlighting local volunteer projects.

Measure: Number of articles and TV news segments.

*An **environmentally literate citizen** has a connection to the outdoor environment and a sense of place, understands the interconnectedness of all Earth systems, and is engaged and empowered to address environmental issues and their impact.*
 - working definition in the “Draft Environmental Literacy Plan for NY”

- 11h. Work with outdoor education centers and environmental groups to hold hands-on and interesting presentations about water resource issues, such as flooding, water quality, wildlife, etc.

Immediate action: Provide water-related environmental education programs each year at nature centers, fairs, and other public events using models when available.

Measure: Number of education programs.

- 11i. Establish internships or other opportunities to engage high school and college students in implementing recommendations in this Action Plan. Environmental education recommendations in this section that would make excellent intern projects include developing county resource lists (11e) and assessment of school library resources (11a).

5-year target: Identify funding opportunities to create a Youth Conservation Corps.

5-year target: Develop a funding stream to establish an ongoing intern program.

Measure: Number of intern projects.

- 11j. Encourage environmental studies programs in the watershed's colleges and universities in order to promote environmental literacy among all graduates and to expand the number of students receiving in-depth training in water resource issues.

Immediate action: Meet with college and university educators to find out where environmental education already exists and identify barriers to expanding those programs.

Immediate action: Continue to pursue funding for undergraduate and graduate research on water resource issues.

Measure: Number of environmental education programs and student research projects.

- 11k. Enhance the network of places where people go to learn about the watershed. This includes nature centers, parks, museums, boat launches and other places.

5-year target: Develop a watershed display at each nature center, including information about the local connection to the Chesapeake Bay.

Measure: Number of watershed displays.

- 11l. Inspire love for the natural wonders of the watershed through photo contests (such as those conducted by the Broome County Environmental Management Council and the Otsego Land trust).

Immediate action: Encourage other organizations to sponsor photo contest highlighting the wonders of their location.

Measure: Number of environmental photo contests.

Research: Strengthen science to support ecosystem-based adaptive management.

- 11m. Maintain and enhance ongoing programs that collect fundamental watershed data, such as the stream gauge network (operated by the U.S. Geological Survey) and water quality monitoring programs (by the Susquehanna River Basin Commission and the NYS Department of Environmental Conservation).

Immediate action: Provide local letters and other support for ongoing efforts to secure a permanent funding source for the federally-operated network of river gauges, precipitation gauges, and climate stations.

Measure: Number of letters and other expressions of support.

- 11n. Provide for coordination of water resource-related research in the Susquehanna River Basin.

Immediate action: Continue and improve the ongoing communication and coordination of research efforts that is provided by the Susquehanna River Basin Commission (for the entire Susquehanna Basin), Upper Susquehanna Conservation Alliance, and others.

Immediate action: Organize a consortium of universities and agencies to coordinate research efforts and help avoid duplication of efforts.

Immediate action: Hold annual water science forums (such as those held by the New England Interstate Water Pollution Control Commission). A portion of the forum could be devoted to presentations and papers, with another portion devoted to discussions that would help guide and develop research activities in the basin.

Measure: Number of universities and agencies that participate in consortium. Number of water science forums held.

11o. Seek additional funding for research on priority water resource topics.

Immediate action: Evaluate monitoring needs, identify research gaps, and continue to pursue funding for priority research projects.

Measure: Amount of funding dollars received for priority water resource projects.

11p. Improve the communication and technical assistance needed to promote science-based policy decisions.

Immediate action: Invite university researchers to participate in training for local governments and water resource professionals.

Long-range target: Improved scientific basis for water quality protection, water resource management, and hazard mitigation programs.

Measure: Number of researchers that participate in training or assist with developing public policy.

Research needs in the Susquehanna-Chemung Basin stem from a fundamental question: **How do human and natural systems impact the sustainability of water resources in the basin?** Some of the research needs are:

- Obtain a better understanding of the water quality impacts associated with natural gas development, including the impacts from infrastructure, industrial activities, water withdrawals, soil erosion, and stormwater runoff.
- Collect empirical data on watershed water budgets and evaluate water availability, particularly in the headwaters.
- Conduct additional research on the export of nutrients from headwater streams.
- Perform studies of freshwater mussels and the benefits they provide in filtering nutrients and sediment from the water column.
- Perform studies of surface water/groundwater interactions, especially as they relate to nutrient trading.
- Evaluate the impacts of climate change on the watershed hydrology and on human demands for water.
- Identify and quantify the benefits provided by wetlands in helping to manage both water quality and quantity.
- Evaluate strategies for promoting outdoor recreation and healthy lifestyles.
- Evaluate the barriers to outdoor and environmental education.
- Investigate the sociological aspects of why it is difficult to get people to engage in environmental stewardship.

11q. Promote citizen science projects that engage children and adults in collecting and evaluating data.

Immediate action: Increase the awareness of existing citizen science projects (such as those conducted by the Cornell Lab of Ornithology and Project BudBurst of the Chicago Botanic Garden) by distributing information about the best programs (fliers, web links, etc.) and providing training if needed.

5-year target: Initiate new water quality monitoring programs to collect data on local streams or lakes. Technical oversight and data evaluation can be provided by county Water Quality Coordinating Committees, Soil and Water Conservation Districts, the NY Citizens Statewide Lake Assessment Program (CSLAP), university researchers, or other partners.

Measure: Number of citizen science programs promoted. Number of groups that receive assistance with water quality monitoring.

Implementation Strategy

The Susquehanna-Chemung Action Plan presents a vision, eleven goals, and numerous recommendations for improving the quality of life and economic wellbeing in the watershed. The next step is, of course, to implement it. This Action Plan is not a work plan for any single organization. Rather, it is watershed-wide plan that encompasses the missions and programs of numerous partners. Many of the recommendations are ongoing activities of partner organizations, which are included to emphasize the need for ongoing funding or the potential for replication in other parts of the watershed. Other recommendations will require new or additional funding for new initiatives or expansion of existing programs. A recurring theme is the sharing of information and successes to facilitate watershed-wide achievements. The anticipated contributions of key partners (though certainly not all partners) are summarized below. Also presented is a strategy for coordination, tracking of progress, and periodically updating the Action Plan.



Confluence Park, Binghamton (photo courtesy of Broome County SWCD).

“Strategy without action is a daydream; action without strategy is a nightmare.”

- old Japanese proverb

WHO WILL IMPLEMENT?

This Action Plan will be implemented by existing organizations. It was developed by Southern Tier Central Regional Planning and Development Board (STC), with input and assistance from Southern Tier East Regional Planning Development Board (STERPDB), ad hoc Advisory Committee members, and other key stakeholders. These partners will continue to be the key players in implementing the Action Plan. Much of the on-the-ground work will continue to be accomplished by local and county organizations. Regional organizations and the NYS Department of Environmental Conservation are best situated to provide regional coordination and watershed-wide information sharing. Successful implementation of many Action Plan recommendations will require increased funding and/or additional staff.

ACTION PLAN COLLABORATORS

The following organizations have regional programs that encompass multiple Action Plan Goals and will thus be key partners for program coordination as well as implementation.

Southern Tier Central Regional Planning and Development Board (STC)

Southern Tier Central Regional Planning and Development Board is the primary author of this Action Plan and will continue to provide leadership and coordination for plan implementation. The STC region encompasses Chemung, Schuyler, and Steuben Counties in the western part of the watershed (mostly the Chemung Watershed). STC has worked with these counties for forty years on economic development, water resources, hazard mitigation, and other issues. This assistance includes grantwriting, education, training, data management (including GIS mapping), and regional coordination for numerous programs. Strong water resource and flood assistance programs have enabled STC to build partnerships beyond the region, with other counties in the Susquehanna-Chemung Watershed and statewide. STC programs that will contribute to implementation of this Action Plan include:

- **Water Resources:** STC participates in and actively assists the three county Water Quality Coordinating Committees, the Chemung County Stormwater Coalition, the three-county Rural Stormwater Coalition, and the Upper Susquehanna Coalition. This assistance includes developing county Water Quality Strategies and assistance with addressing various water resource issues. STC also aids the NYS Department of Environmental Conservation with the local delivery of state water programs and NYS initiatives related to Chesapeake Bay issues. STC provided leadership for the Chemung Basin River Trail Partnership and works with the recently-formed Friends of the Chemung River Watershed. STC also has strong working relationships with the Susquehanna River Basin Commission and has assisted them with documentation of New York water resource activities for many years.
- **Flood Assistance:** The STC Flood Assistance Program (administered by a Certified Floodplain Manager) provides technical assistance for floodplain management, flood mitigation, flood warning, stormwater management, stream management, and other topics. STC staff has facilitated development of flood mitigation plans, multi-hazard mitigation plans, and numerous educational documents. STC serves on the Board of Directors for Environmental Emergency Services (a three-county non-profit organization that supports emergency response through a Flood Warning Service, Chemical Hazard Information Team, and public education efforts) and is an active member and committee chair for the NYS Floodplain and Stormwater Managers Association. STC will co-chair the recently-formed Flood Working Group of the Upper Susquehanna Conservation Alliance.
- **Economic Development:** STC is the local administrator of the Appalachian Regional Commission (ARC) and Economic Development Administration (EDA) programs. In this capacity, the agency is active in developing economic development strategies for the region and working with local, state, and federal funding sources to support economic development projects. STC is also facilitating a Brownfield Opportunity Area project. The annual “Comprehensive Economic Development Strategy” (CEDS) for the region encompasses a broad range of economic opportunities, including agriculture, forestry, tourism, manufacturing, commercial development, and resource extraction activities. Significant progress has been made to increase the integration of water resource issues, flood hazards, and Susquehanna-Chemung Action Plan goals into the recent CEDS’.
- **Energy:** In anticipation of New York State approval of high volume hydraulic fracturing techniques for Marcellus Shale gas drilling, STC employs a planner who concentrates on issues related to natural gas extraction. STC attends the meetings of and coordinates activities between the three counties and their energy task forces. Further, STC contracted for a Marcellus Tourism Study and coordinated development of an Energy Planning Guide for Energy Impacted Communities.
- **Planning:** STC provides municipal planning assistance to local governments, including development of comprehensive plans and municipal land use regulations. Environmental planning efforts have included waterfront revitalization plans and watershed management plans.
- **Transportation:** STC is active in transportation planning efforts, supports various committees, and assists highway departments with drainage system mapping and water quality issues.
- **Training:** Lastly, STC has a long history of providing training to municipal governments. STC hosts a regional leadership conference yearly that attracts over 500 municipal officials. Municipal officials receive a day of training and information sharing on a wide range of topics such as planning, zoning, environmental issues, municipal bonding, grantwriting, and code enforcement. STC will continue and grow their training programs to ensure the training needs of the region are being met. STC will also continue to produce training resources, recommendations, and outreach materials to help educate the watershed communities.

Southern Tier East Regional Planning Development Board (STERPDB)

Southern Tier East Regional Planning Development Board provides assistance on a regional basis to eight counties within the watershed: Broome, Chenango, Cortland, Delaware, Otsego, Schoharie, Tompkins, and Tioga Counties. STERPDB works with their counties on regional issues by providing technical assistance for planning and economic development and seeking funding for county projects with regional impacts. STERPDB serves as the delivery mechanism for the ARC and EDA programs. As the Local Development District for EDA, STERPDB is responsible for a Comprehensive Economic Development Strategy (CEDS), which identifies projects and activities for which EDA funding will be sought. Projects funded by EDA include infrastructure supporting local industry, as well as business planning and workforce development.

STERPDB will assist with implementing recommendations of this plan through current and future programming, for instance:

- **Economic Development:** STERPDB's Regional Engagement of Communities will involve identification of underutilized lands, areas of disinvestment, and/or blight in order to work with communities to develop strategies for addressing the causes. Further, STERPDB facilitates cooperative efforts to update municipal officials, developers, and Industrial Development Agencies about the monetary benefits of protecting and enhancing the natural environment.
- **Planning:** STERPDB organizes quarterly Planners Roundtable discussions at which county planners share ideas, thoughts, concerns, and positive and negative feedback about specific planning issues and programs. STERPDB also administers a circuit rider program that provides planning assistance and training throughout its region.
- **Water Resources:** STERPDB has recently initiated a water quality management planning program, providing assistance and support to County Water Quality Coordinating Committees and their subcommittees. STERPDB is also assembling existing water quality data for its region to identify possible gaps, potential projects, and successful activities. The agency plans to increase their involvement in water quality issues in future years.
- **Agriculture:** STERPDB is working to create partnerships (with agricultural nonprofits and the Center for Agricultural Development and Entrepreneurship) to develop a revolving loan fund that will provide microloans and funding to assist with agricultural production and processing. Due to recent flooding, STERPDB is also looking at working with agriculture professionals to establish educational programs to diversify the placement of crops to lessen the financial impacts and catastrophic losses in the case of floods or natural disasters.
- **Roads:** STERPDB is working with municipalities to analyze infrastructure capacity and deal with traffic-related development, and the public's perception of traffic appropriateness particularly in light of Marcellus Shale development.

NYS Department of Environmental Conservation (NYS DEC)

The NYS Department of Environmental Conservation supports the development of this and other ecosystem-based watershed management plans throughout the state. The Susquehanna-Chemung Action Plan updates and builds on the Watershed Protection and Restoration Action Strategy (WRAPS) previously developed by NYS DEC for this watershed. NYS DEC is a fundamental partner in the quest for funding to implement recommendations of this plan, as well as an active participant in many of the recommended actions. The agency is involved in regulatory enforcement, grant administration, program implementation, and public education related to most of the issues addressed in this Action Plan. Relevant programs and plans include:

NYS DEC Mission: *To conserve, improve and protect New York's natural resources and environment and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being.*

- **Chesapeake Bay Watershed Program** and Watershed Implementation Plan
- **Water quality monitoring and assessment programs:** including Routine Statewide Monitoring, Waterbody Inventory/Priority Waterbodies List, Section 303d List of Impaired Waters, and Total Maximum Daily Loads (TMDLs)
- **Chemical and pollution control programs**
- **Water supply and conservation programs**
- **Open space:** 2009 NYS Open Space Conservation Plan
- **State Environmental Quality Review (SEQR):** NYS DEC issues regulations regarding the SEQR process
- **NYS Smart Growth Cabinet:** DEC is an active participant
- **Protection of Waters Regulatory Program:** stream disturbance and wetland permits
- **Floodplain management program:** NYS DEC provides technical assistance to communities and coordination for flood hazard mapping

- Flood control projects: NYS DEC conducts and oversees operation and maintenance of levees and other structural flood control projects
- Dam safety program: NYS DEC conducts safety inspection of dams and issues permits for dam construction and modification
- Stormwater permit programs: including Green Infrastructure requirements
- Permits for Concentrated Animal Feeding Operations (CAFOs)
- Forestry programs: including Forest Landowner Assistance and stewardship of state forest lands
- Species conservation programs: including *Comprehensive Wildlife Conservation Strategy*, NY Natural Heritage Program, and State Wildlife Grant Program
- Fisheries, habitat, and wildlife programs
- Maintenance of recreational amenities: including boat launch sites and fishing access easements
- Environmental education programs

The Upper Susquehanna Coalition (USC)

The Upper Susquehanna Coalition consists of 19 Soil and Water Conservation Districts (SWCDs) in the Upper Susquehanna and Chemung Watersheds in New York and Pennsylvania. The New York counties that participate are: Allegany, Broome, Chemung, Chenango, Cortland, Delaware, Herkimer, Livingston, Madison, Oneida, Onondaga, Otsego, Schuyler, Steuben, Tioga, and Tompkins. The USC is a regional group with experience in taking a regional approach, advocating for better policies, and getting work done. The main program areas are:

USC Mission: *To protect and improve water quality and natural resources in the Upper Susquehanna River Basin with the involvement of citizens and agencies through planning, education, coordination, funding, project implementation and advocating for our water resources.*

- Stream corridor rehabilitation: USC Stream Team utilizes a rigorous technical approach to assess and rehabilitate streams.
- Wetland restoration: USC projects include wetland and buffer restoration, wetland construction, vernal pool evaluation and education, and watershed analyses to target high quality wetland restoration sites.
- Environmentally and economically sustainable agriculture: USC Grazing Initiative promotes prescribed grazing techniques and exclusion of livestock from streams and riparian buffers.

The member Districts are also active in county Water Quality Coordinating Committees and engage in numerous water resource activities.

Cornell Cooperative Extension (CCE)

An overarching theme that has emerged from this plan's recommendations is education. Cornell Cooperative Extension has an office in every county, with the resources and the expertise to educate communities on a variety of topics. Topics on which Extension educators share expertise include:

CCE Mission: *The Cornell Cooperative Extension educational system enables people to improve their lives and communities through partnerships that put experience and research-based knowledge to work.*

- Environment and Natural Resources: including environmental land use, invasive species, water quality, wildlife management, and forestry
- Community and Economic Vitality: including Community and Regional Development Institute
- Agriculture: including environmental management, production agriculture, and sustainable agriculture
- Gardening: including Master Gardener Volunteer Program and community gardening
- Energy: including a Natural Gas Resource Center

Susquehanna River Basin Commission (SRBC)

The Susquehanna River Basin Commission coordinates water resources efforts of three states and the federal government in the Susquehanna River Basin. To accomplish their mission, the SRBC works to: reduce damages caused by floods;

SRBC Mission: *To enhance public welfare through comprehensive planning, water supply allocation, and management of the water resources of the Susquehanna River Basin.*

provide for the reasonable and sustained development and use of surface and ground water for municipal, agricultural, recreational, commercial and industrial purposes; protect and restore fisheries, wetlands and aquatic habitat; protect water quality and in-stream uses; and ensure future availability of flows to the Chesapeake Bay. The priority management areas identified in SRBC's comprehensive plan are:

- Water supply: including regulation of water use and consumptive use
- Water quality: including water quality monitoring
- Flooding: including coordination of the Susquehanna Flood Forecast and Warning System and preparation of inundation maps
- Ecosystems: including monitoring and assessment of in-stream ecosystems
- Chesapeake Bay
- Coordination, cooperation, and public information

PARTNERS FOR WATERSHED ISSUES

Many additional partners will be instrumental in implementing programs related to each issue addressed by the Action Plan. This participation is contingent on the availability of funding and staff resources.

Water Quality and Quantity

County Water Quality Coordinating Committees (WQCCs) and member organizations are the key local partners for addressing water quality and quantity issues in each county. These committees concentrate on protecting and improving water quality within the county. They monitor current water resource issues and serve as the local water quality experts. The WQCCs can use this plan to guide their local efforts to:

- engage and educate the public,
- seek funding for priority projects,
- implement local projects, and
- lobby for improved policies.

These county efforts complement the monitoring, regulatory, planning, and funding activities of regional, watershed, and state organizations (summarized above). In addition, the NYS Department of Health drinking water protection activities include programs that prevent contamination, protect water supplies, and educate the public.

Economic Development

Integration of water resource concerns and economic development require ongoing efforts to strengthen communication, coordination, and partnerships both within the economic development community and with other public and private sector entities. There are numerous economic development partners that work within the Susquehanna-Chemung Watershed. While watershed management is not their primary mission, many of the recommendations of the Susquehanna-Chemung Action plan also support the region's economic development objectives. With STC and STERPDB providing regional strategic planning and coordination, the following organizations will also be key partners to implement the economic development recommendations of the Susquehanna-Chemung Action Plan:

- Empire State Development
- Chambers of Commerce
- County and Local Planning and Economic Development Offices
- County and Local Industrial Development Agencies (IDAs)
- Workforce Investment Boards
- Business Associations
- Labor Organizations
- Educational Institutions
- Center for Agricultural Development and Entrepreneurship (CADE)
- Pipeline 4 Progress Network
- Southern Tier Economic Growth (STEG)

Land Use

In New York, municipal boards and planning boards bear the primary responsibility for land use decisions. However, most municipalities do not have professional planners and thus need both training and technical assistance to facilitate improved land use planning and local regulations. Agencies can also assist with land use regulations by developing and distributing sample regulations or ordinances. This training and assistance will be provided by the following key partners:

- County Planning Departments provide planning assistance and training to municipal boards and will attempt to secure funding to implement appropriate land use recommendations. County planning departments will make training materials, information, sample language, and other resources available to municipal planning boards. They will also collaborate with regional planning boards and other planning agencies to develop circuit rider programs.
- NYS Department of State participates in the state Smart Growth Cabinet, conducts municipal training on land use and other topics, and provides other assistance to municipal governments.
- STC and STERPDB also provide training and planning assistance and will facilitate sharing of resources and information among watershed counties.

Streams and Rivers

The Upper Susquehanna Coalition (USC) has developed a trained Stream Team that provides watershed-wide leadership and coordination for stream and river management issues. This group provides training, technical support, and funding for stream assessment and rehabilitation projects. The USC Stream Committee is seeking additional funding to expand this program and support additional recommendations in the Streams and Rivers Section of this Action Plan. County Soil and Water Conservation Districts (with support from the USC Stream Team as needed) provide local leadership for stream management issues in each county and technical support for municipal and county Highway Departments. The NYS Department of Transportation is also active on stream issues associated with highway and bridge projects. In addition to on-the-ground projects, these groups will work with multiple partners to facilitate the “cultural” changes needed to improve local management of stream corridors. This will require education of landowners and community leaders about natural stream functions and stream stewardship.

Flood Hazards

Implementation of Action Plan recommendations for reducing flood risks requires ongoing efforts to strengthen inter-jurisdiction and inter-agency communication, coordination, and partnerships. The recently-formed Flood Working Group of the Upper Susquehanna Conservation Alliance (USCA) will provide a forum for watershed-wide coordination. Key partners for implementation of Action Plan recommendations include:

- STC will seek funding to continue and expand its Flood Assistance Program and provide leadership for the USCA Flood Working Group.
- SRBC coordinates the Susquehanna Flood Forecast and Warning System (SFFWS), conducts public education about flood safety, develops inundation mapping, and supports other efforts to reduce flood losses.
- NOAA National Weather Service conducts public education through presentations and brochures, trains volunteer weather observers through SKYWARN and other programs, conducts ice monitoring training, participates in the SFFWS, and provides support for flood safety activities.
- NYS DEC is involved with reducing flood losses and preserving beneficial floodplain functions through floodplain management, flood control, dam safety, and other programs.
- NYS Office of Emergency Management maintains the state Hazard Mitigation Plan, supports emergency response activities, conducts public education, and administers FEMA’s mitigation grant programs.
- Environmental Emergency Services provides flood warning support and conducts public education for Chemung, Schuyler, and Steuben Counties.
- Counties actively manage flood risks through the efforts of Hazard Mitigation Coordinators, Emergency Management Offices, Planning Departments, Highway Departments, and SWCDs. Hazard mitigation

plans have been developed by each county in the watershed. In addition, several counties have formed flood task forces that engage in training, education, advocating for better policies, assistance with procuring funding, and other efforts.

- Municipalities have authority for local emergency situations, managing floodplain development, land use controls, and managing local roads. Thirteen watershed municipalities undertake additional flood hazard reduction efforts to participate in the Community Rating System of the National Flood Insurance Program (to enable reduced flood insurance costs).
- Other local organizations may be active in flood response, education, and mitigation, particularly following flood events.

Runoff

Stormwater management activities in New York are driven by the NYS DEC stormwater permits for construction, Municipal Separate Storm Sewer Systems (MS4s), and industrial activities. Design standards have been developed by NYS DEC to support these permit programs (“New York Standards and Specifications for Erosion and Sediment Controls” and “New York State Stormwater Management Design Manual,” which was revised in 2010 to incorporate stormwater planning and green infrastructure requirements). NYS DEC provides STC and STERPDB with funding to assist with local delivery of the stormwater management and green infrastructure programs (through CWA 604(b) grants for regional water quality management planning programs). This enables the regional boards to provide training, technical assistance, and coordination to support Action Plan recommendations. Four stormwater coalitions have been formed to support, coordinate, and facilitate stormwater management efforts:

- Chemung County Stormwater Coalition encompasses the entire county, providing staff support for both MS4 programs and rural stormwater management efforts.
- Broome-Tioga Stormwater Coalition enables coordination of MS4 programs for the regulated municipalities in the Binghamton urban area.
- Tompkins County Stormwater Coalition enables coordination of MS4 programs for the regulated municipalities in the Ithaca urban area.
- Rural Stormwater Coalition was formed to promote improved stormwater management practices in rural (non-MS4) areas of Schuyler, Steuben, and Chemung Counties.

Municipalities play an important role in facilitating local implementation of improved runoff practices. County SWCDs, planning departments, and highway departments support and supplement municipal programs, providing training, design assistance, planning assistance, and other support. The NYS Department of State (DOS) also provides training and technical assistance to municipalities through their division of local government services. The NYS Department of Transportation is active in managing runoff associated with the state road system and implementing a MS4 program. Private developers, contractors, and industries also have a significant part to play in managing runoff, since they are the ones that obtain stormwater permit coverage for construction and industrial activities.

Roads

Public road systems are the responsibility of state, county, and local highway departments. Training and technical assistance are provided by the Cornell Local Roads Program, SWCDs, and county highway departments. Technical resources are developed by Cornell Local Roads program and distributed with assistance from county and regional organizations. Some regional coordination will also be achieved through STC and STERPDB involvement in transportation planning and roadway drainage issues.

Agriculture and Forestry

County Soil and Water Conservation Districts (SWCD) implement the Agricultural Environmental Management (AEM) program at the local level and are actively involved in the agriculture and forestry issues addressed in this Action Plan. Watershed-wide coordination is provided through the USC Agriculture program. Additional partners for implementing Action Plan recommendations include:

- County Agriculture and Farmland Protection Boards facilitate implementation of recommendations in Agriculture and Farmland Protection Plans.
- USDA Natural Resources Conservation Service provides technical and financial assistance through Farm Bill programs.
- New York State Farm Bureau promotes agriculture, supports farmers, and advocates for improved policies.
- NYS Department of Agriculture and Markets has numerous agricultural programs, including Agricultural Districts, AEM, and funding opportunities.
- County Planning Departments update Agricultural Districts and assist municipalities with district requirements.
- Cornell Cooperative Extension conducts research, provides technical assistance, and implements educational programs.
- County Foresters provide forest management training and assistance.
- NYS DEC implements the Confined Animal Feeding Operation permit program, manages state forest lands, and provides forestry assistance to landowners.

Plants and Wildlife

The Upper Susquehanna Conservation Alliance (USCA) was formed to coordinate conservation efforts in the Susquehanna and Chemung Watersheds in New York. This alliance and its working groups will enable coordinated implementation of Action Plan recommendations by member organizations. The Natural Resources Working Group has three subgroups: the Brook Trout, Hellbender, and Eel/Shad Working Groups. Some of the principle partners in implementing the Plants and Wildlife recommendations of this Action Plan include:

- US Fish and Wildlife Service
- NYS DEC
- Land conservancies and other non-profit conservation groups (Finger Lakes Land Trust, Otsego Land Trust, Central NY Land Trust, the Nature Conservancy, Trout Unlimited)
- NYS Department of Transportation
- USC
- University researchers

Outdoor Recreation

Encouraging increased enjoyment of the watershed's recreational treasures requires ongoing efforts to maintain parks, trails, and access sites. Although many public facilities are owned and operated by NY State and municipalities, others are managed by non-profit groups and rely on volunteers for funding and labor. The following organizations are key partners in promoting water-based recreation and maintaining recreational facilities:

- NYS Office of Parks, Recreation, and Historic Preservation manages and promotes state parks and historic sites.
- Municipal and County Planning and Parks Departments operate and maintain numerous local parks and other open space. The planning and parks departments also plan future recreation facilities.
- Volunteer organizations, including recreation groups, river trail partnerships, trail conferences, nature centers, and land trusts, have taken on the burden of maintaining trails and providing volunteers to build and maintain facilities. These groups also lobby the government for funding for outdoor recreation amenities and education. Some obtain grant funding to assist with the acquisition, construction, and maintenance of parks, trails, boat launches and many other types of recreation facilities.



Boaters Landing boat launch, Chemung County (by Janet Thigpen).

Education and Research

Cultivation of an environmental ethic is a long-term effort that requires the collaboration of teachers, non-formal educators, parents, researchers, and the community at large. Key partners in implementing the education and research recommendations of this Action Plan are:

- Nature and environmental education centers: Finch Hollow Nature Center, Hoxie Gorge Nature Preserve, Nature Preserve of Binghamton University, Rogers Environmental Education Center, Spencer Crest Nature Center, Tanglewood Nature Center, and Waterman Conservation Education Center.
- Public schools
- NYS DEC
- NYS Department of Education
- Colleges, universities and research centers
- Soil and Water Conservation Districts
- Regional, county, and municipal planning boards and departments

Every section of the Susquehanna-Chemung Action Plan includes recommendations for additional training and public education. There is also a need for ongoing research on each issue to support implementation of science-based programs. This means that education, training, and research will be integral parts of many of the programs and projects that contribute to implementation of various parts of this Action Plan. It also means that all implementation partners will be involved in conducting and/or promoting education and research efforts.

HOW TO IMPLEMENT

The Susquehanna-Chemung Watershed has the necessary groups, partnerships, and knowledge to fully accomplish the recommendations of the Susquehanna-Chemung Action Plan. However, successful implementation will require additional funding. This is clearly reflected in the wording of many recommendations (“seek funding to...”), but applies to other items as well. Additional buy-in from business owners, residents, political leaders, county agencies, and organizations is also needed to support implementation. The plan partners and collaborators will need to disseminate science-based information and engage the public in meaningful dialog to facilitate this buy-in. County level officials and politicians will be important partners in facilitating this dialog, as well as advocating for better policy at the state level and nationally.

Watershed-wide coordination will be provided by the regional, watershed, and state organizations indicated above. STC has included promotion and maintenance of the Action Plan in the work plan for the STC Water Quality Management Planning Program (Clean Water Act, Section 604(b) project). This work will include corresponding with the ad hoc Advisory Committee, maintaining the Action Plan website (www.susquehanna-chemung.org), maintaining the online Susquehanna-Chemung Data Atlas (www.stcgis.org/SCAtlas), and preparing progress reports on plan implementation (annually if possible). However, limited program funding and other program priorities may limit the amount of implementation detail that can be assembled for progress reports and/or the frequency of these assessments. STC will explore options for supplemental funding and/or increased participation of other partners in documenting accomplishments and other maintenance activities.

ADAPTIVE MANAGEMENT STRATEGY

“Adaptive management” is the process of evaluating progress, testing alternate management approaches, and readjusting the management strategy as new information becomes available. STC proposes to track progress on implementing the Susquehanna-Chemung Action Plan through an annual assessment process (if resources permit). Each year, project partners will be contacted (through surveys and/or interviews) about implementation activities and the success or failure of those actions. Criteria for measuring progress are indicated in the Action Plan as “measures” for each recommendation. The accomplishments will be compared with the target implementation timeframes presented in the Plan. Action Plan recommendations and implementation targets will be re-evaluated in light of these accomplishments, the successes, and the failures. For those recommendations that are unaddressed, the reasons will be evaluated (insufficient resources, low

priority, etc.) to assess whether the recommendation should be removed or revised. An Action Plan Progress Report will be prepared to document implementation activities and the lessons learned. This report will also propose revisions to Action Plan recommendations, implementation timeframes, or measures, if warranted.

Information learned through the assessment of Action Plan progress and other program activities will be used to update the resources and data on the Susquehanna-Chemung Action Plan website and in the Susquehanna-Chemung Data Atlas.

It is anticipated that the Susquehanna-Chemung Action Plan will be updated in approximately 5 years. The Progress Reports, updated website, and updated Data Atlas will inform the process of reviewing and revising the Action Plan. However, additional stakeholder outreach and involvement will be required to facilitate an in-depth review of the plan, exploration of alternative strategies, and development of an updated document. Additional funding will be required to achieve this.

REFERENCES

Additional supporting material is on the project website: www.susquehanna-chemung.org

- Chemung County Soil and Water Conservation District (SWCD), August 2006, "Stream Processes: A Guide to Living in Harmony with Streams," <http://www.stcplanning.org/index.asp?pageID=103>
- National Committee on Levee Safety, January 2009, "Draft Recommendations for a National Levee Safety Program, A Report to Congress from the National Committee on Levee Safety," http://www.leveesafety.org/rec_reporttocongress.cfm
- New York State Department of Environmental Conservation (NYS DEC) and others, April 2001, "New York State Watershed and Restoration and Protection Action Strategy, Susquehanna and Chemung River Basins" (WRAPS), <http://www.stcplanning.org/index.asp?pageID=48&catID=67>
- NYS DEC, September 2005, "Comprehensive Wildlife Conservation Strategy for New York" (CWCS), <http://www.dec.ny.gov/animals/30483.html>
- NYS DEC, May 2007, "The 2004 Chemung River Basin Waterbody Inventory and Priority Waterbodies List" (WI/PWL), <http://www.dec.ny.gov/chemical/36746.html>
- NYS DEC, August 2009, "The Susquehanna River Basin Waterbody Inventory and Priority Waterbodies List" (WI/PWL), <http://www.dec.ny.gov/chemical/36734.html>
- NYS DEC, June 2010, "The FINAL New York State 2010 Section 303(d) list of Impaired Waters Requiring a TMDL/Other Strategy" and "Impaired/DeListed Waters NOT Included on the 2010 Section 303(d) List," <http://www.dec.ny.gov/chemical/31290.html>
- NYS DEC and Office of Parks, Recreation and Historic Preservation (OPRHP), 2009, "2009 New York State Open Space Conservation Plan," <http://www.dec.ny.gov/lands/47990.html>
- NYS Floodplain and Stormwater Managers Association (NYSFSMA), January 2011, "Rethinking the National Flood Insurance Program (NFIP)," http://ny.floods.org/images/NFIP_Reform_White_Paper_NYSFSMA.pdf
- New York State Office of Parks, Recreation and Historic Preservation (OPRHP), December 2008, "Statewide Comprehensive Outdoor Recreation Plan, 2009-2013" (SCORP), <http://nysparks.com/recreation/trails/statewide-plans.aspx>
- Southern Tier Central Regional Planning and Development Board (STCRPDB), August 2007 and subsequent online chapters, "Low Impact Development (LID) Sampler," <http://www.stcplanning.org/index.asp?pageID=48&catID=18>
- Susquehanna River Basin Commission (SRBC), August 2000, "Susquehanna River Basin Drought Coordination Plan," Publication No. 212, http://www.srbc.net/hydrologic/drought_center.htm
- SRBC, June 2005, "Groundwater Management Plan for the Susquehanna River Basin," Publication No. 236, <http://www.srbc.net/programs/groundwater-management.htm>
- SRBC, March 2008, "Consumptive Use Mitigation Plan," Publication No. 253, <http://www.srbc.net/planning/CUMP.htm>
- SRBC, December 2008, "Comprehensive Plan for the Water Resources of the Susquehanna River Basin," <http://www.srbc.net/planning/compplanfiles.asp>
- Tourism Economics, April 2009, "The Economic Impact of Tourism in New York State"
- US Fish and Wildlife Service, May 2008, "A Strategy for Removing or Mitigating Dams in New York State and Lessons Learned in the Upper Susquehanna Watershed," <http://www.fws.gov/northeast/nyfo/fwc/UpperSus/UpperSusqDam%20ReportFinalMay08.pdf>

