

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.

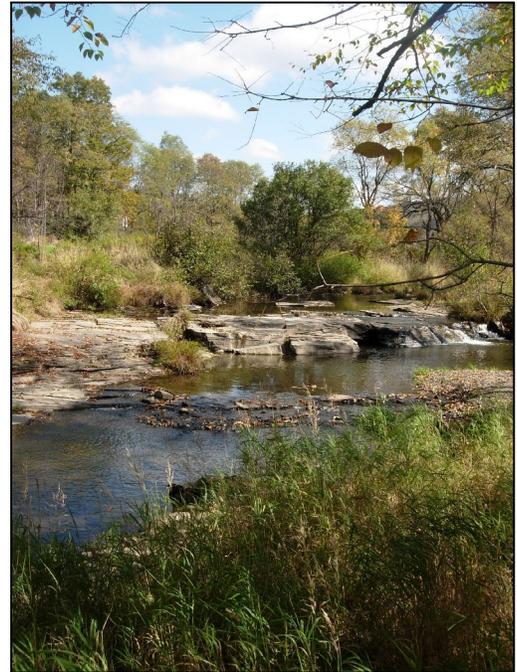
CHALLENGE

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.