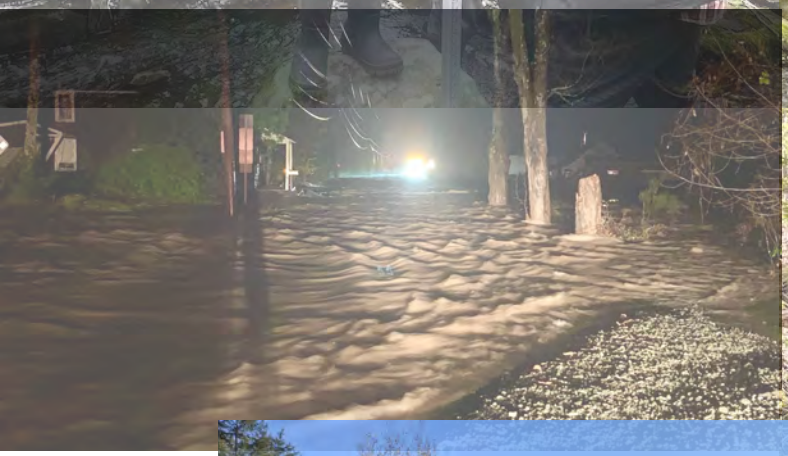
Ashokan Watershed
Stream Management Program

Action Plan 2022-2024



Ashokan Watershed
Stream Management Program

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To: Dave Burns, Project Manager, NYC DEP Stream Management Program
From: Leslie Zucker, CCE Ulster County, and Adam Doan, Ulster County SWCD
Date: May 1, 2022
Re: Ashokan Watershed Stream Management Program 2022-2024 Action Plan

Cornell Cooperative Extension of Ulster County (CCE) and Ulster County Soil & Water Conservation District (SWCD) with support from the NYC Department of Environmental Protection (DEP) have developed the 2022-2024 Action Plan for your review. The purpose of the Action Plan is to identify the Ashokan Watershed Stream Management Program's planned activities, accomplishments, and next steps to achieve recommendations derived from stream management plans and stakeholder input. Program activities were reviewed by our Stakeholder Council at an April 2022 meeting and their comments are reflected in this 2022-2024 work plan.

The Action Plan is divided into key programmatic areas:

A. Protecting and Enhancing Stream Stability and Water Quality
B. Floodplain Management and Planning
C. Highway Infrastructure Management in Conjunction with Streams
D. Assisting Streamside Landowners (public and private)
E. Protecting and Enhancing Aquatic and Riparian Habitat and Ecosystems
F. Enhancing Public Access to Streams

The Action Plan is updated annually. This proposed plan will run from June 1, 2022 until May 31, 2024, at which time the recommendations will be revised based on new stream assessments and program needs.

Cornell University
Cooperative Extension
Ulster County

ULSTER COUNTY
Soil and Water
Conservation District
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NYC
Environmental
Protection

2022-2024 Action Plan
Ashokan Watershed Stream Management Program

PURPOSE

This Action Plan identifies goals and makes recommendations for implementation by the Ashokan Watershed Stream Management Program for the period 2022-2024. The Action Plan also provides a framework for reporting progress on planned activities to the public.

How to read this document: The Action Plan is organized around key programmatic areas. Under each topic area is a list of action recommendations, derived from Stream Management Plans and the program's working groups. Under the list of recommendations, ongoing projects funded through the Stream Management Implementation Program (SMIP) are listed.

BACKGROUND

In 1997, the NYC Watershed Memorandum of Agreement (MOA) was reached between New York State, New York City, the U.S. Environmental Protection Agency, watershed communities and counties, and several non-profit environmental organizations. The MOA included establishing a set of watershed partnership programs to help ensure that the NYC water supply watersheds were adequately protected.

The Ashokan Watershed Stream Management Program (AWSMP) was established as a joint effort between Cornell Cooperative Extension of Ulster County (CCEUC), the Ulster County Soil and Water Conservation District (SWCD), and the New York City Department of Environmental Protection (DEP). The three agencies work collaboratively to protect and restore the stability and ecological integrity of streams in the Ashokan Reservoir Watershed.

Action planning in the Ashokan Watershed began with the development of stream management plans for the Broadstreet Hollow Creek in 2003, Stony Clove Creek in 2004, and the Upper Esopus Creek in 2007. In subsequent years, AWSMP completed stream assessments of the Woodland Creek (and reassessment), Beaver Kill, Warner Creek, Birch Creek, Bush Kill, Bushnellsville Creek, Stony Clove Creek (and reassessment), Stony Clove Creek tributaries, Little Beaver Kill, and most recently, Lost Clove, Hatchery Hollow, McKinley Hollow, Elk Bushkill, Little Peck Hollow and Panther Kill headwater tributaries to the Esopus Creek.

A Filtration Avoidance Determination (FAD) granted to NYC in December 2017 requires DEP and its partners to develop an Action Plan for the coming year to show how the findings and recommendations of the stream management plans will be implemented. The first post-implementation phase Action Plan for the Ashokan Watershed covered the period June 1, 2009 - May 31, 2011. This newest Action Plan covers the period June 1, 2022 - May 31, 2024, and includes actions identified in five-year contracts beginning in late 2019 and early 2020 between the DEP and county partner organizations CCEUC and SWCD.

The AWSMP moved its primary focus from planning to implementation in 2008. During that year the program staff, with input from local stakeholders, developed a process for distributing funding to watershed communities to help implement stream management plan recommendations (the "Stream Management Implementation Program"). In 2014, a Local Flood Hazard Mitigation Program was implemented to address the protection of water quality and flood hazard mitigation. To date, over $8,200,000 in community grant funding has been awarded to implement stakeholder-driven projects throughout the watershed.

A. Protecting and Enhancing Stream Stability and Water Quality

Includes stream corridor assessments, stream stabilization/restoration projects with a goal to restore stream stability and reduce turbidity; monitoring of stream projects; and outreach, education, and technical assistance to encourage stream stewardship.

Summary of recommendations in 2022-2024 Action Plan and allocation of SMIP funding in support of recommendations

STREAM CORRIDOR ASSESSMENTS

1. Continue a program of multi-phased stream corridor geomorphic assessments, including Phase 1- GIS watershed scale assessments for most sub-basins in the watershed; Phase 2 - field-based stream feature inventories (SFI) for one stream per year or every other year; and Phase 3 - reach to site scale monitoring (e.g., BEHI, geomorphic surveys). The assessments are used to help diagnose stream corridor condition and identify stream erosion hazards and/or water quality impairment that may require treatment. The table below includes candidate streams for assessment in 2022-2024. One stream per year may be subject to a rapid Phase 2 reassessment if conditions appear to be degrading.
    a. Pilot use of unmanned aerial vehicle (UAV) to conduct rapid assessment of erosion site conditions and project planning. Exploring use of drone photogrammetry for stream assessment addresses a recommendation in the 2020 National Academy of Sciences Review of the NYC Watershed Protection Program.
2. Explore the feasibility and options for a pilot of Rosgen's Watershed Assessment and River Stability Supply (WARSSS 2009) methods for quantifying and ranking sources of sediment loading within sub-watersheds and reaches. The methods may allow us to identify and characterize high supply erosion reaches, predict sediment loading using actual watershed rates and estimate loading per reach, and predict reductions in sediment loading following implementation of stream projects.
    a. Test the use of WARSSS procedures in a sub-watershed of the Ashokan Watershed.
3. Streambank erosion prediction curves were successfully developed from data collected in the Ashokan Watershed from 2017-2020 (a SMIP-funded study now continued by SWCD) using the Bank Assessment for Non-Point Source Consequences of Sediment (BANCS) protocol. Additional data-gathering using BANCS was piloted during Stream Feature Inventories in the Esopus Creek headwaters in 2019-2020 and continued through 2021-2022.
    a. Continue to collect BANCS data for a range of stream types and conditions along with SFI, and use collected data to further calibrate stream bank erosion predication curves.
    b. Work with other NYC Watershed basin partners to standardize methods for BANCS survey and coordinate data collection in the NYC Watershed.

4. Review previously surveyed reference reaches and develop survey and monitoring objectives to fill gaps in the reference reach database.
5. Participate in partner meetings to review water quality analyses and prioritize stream feature inventory locations.
6. Bedload sediment is an important component of sediment transport that must be understood to better ensure the success of stream restoration projects. However, bedload data is expensive to collect. To explore the feasibility and cost-effectiveness of methods, a small-scale pilot project began in 2017 to test multiple bedload sampling and monitoring techniques at 2-3 sites and the ability to estimate the percentage of total sediment load contributed by bedload. Study results suggest bedload can be sampled successfully using traditional methods at or near bankfull flows to develop regional curves useful for design and project prioritization. The USGS collected bedload samples during five flow events at two watershed sites through a SMIP-funded project between 2017-2021. Tracer rock monitoring can be used to track the movement of larger material not captured with traditional methods. The use of hydrophones and submerged load cells was ruled out as suitable bedload sampling methods in Catskill streams using current technology.
    a. Coordinate with DEP-funded bedload monitoring carried out by the USGS. Contribute to bedload monitoring if the need arises.
7. Provide funding for study of stream condition and function, and monitoring of system condition and management practices.

Ashokan Watershed Stream Assessment Projects

Streams	Location	Current Status
Broadstreet Hollow	Towns of Shandaken and Lexington	Completed 2001
Stony Clove	Towns of Shandaken, Woodstock, Hunter, and Lexington	Completed 2001
Esopus Creek	Towns of Shandaken and Olive	Completed 2007
Woodland Creek	Town of Shandaken	Completed 2008
Beaver Kill	Towns of Shandaken and Woodstock	Completed 2010
Warner Creek	Town of Shandaken and Woodstock	Completed 2010-2012
Birch Creek	Town of Shandaken	Completed 2012
Bush Kill	Towns of Shandaken and Olive	Completed 2012
Bushnellsville Creek	Towns of Shandaken and Lexington	Completed 2013
Stony Clove Creek	Towns of Shandaken and Hunter	Reassessment 2013
Woodland Creek	Town of Shandaken	Completed mainstem reassessment 2015
Stony Clove Creek Tributaries	Towns of Shandaken and Hunter	Completed 2015
Maltby Hollow Brook	Town of Olive	Completed 2015
Warner Creek	Town of Shandaken and Woodstock	Completed reassessment 2015
Little Beaver Kill	Town of Woodstock	Completed 2017
Esopus Creek Headwaters - Lost Clove, Hatchery Hollow Brook	Town of Shandaken	Completed 2018

Stony Clove Creek	Towns of Shandaken and Hunter	Completed reassessment 2018
Esopus Creek Mainstem – Oliverea Section to Bushnellsville Creek Confluence	Town of Shandaken	Completed reassessment 2019
Stony Clove Creek Tributaries – Ox Clove and Myrtle Brook	Towns of Shandaken and Hunter	2019-2020
Esopus Creek Headwaters - Elk Bushkill, McKenley, and Little Peck Hollows	Town of Shandaken	2020
Panther Kill	Town of Shandaken	2021
Peck Hollow	Towns of Shandaken and Lexington	TBD
Fox Hollow Creek	Town of Shandaken	TBD
Ashokan Reservoir Tributaries	Town of Olive and Town of Hurley	TBD

Ashokan Watershed Turbidity Monitoring Projects

In summer 2015, DEP began a multi-year geomorphic and suspended sediment/turbidity (SS/T) monitoring study with USGS in the Stony Clove Creek watershed to understand the impacts of restoration projects on SS/T and the relative contributions of each tributary to SS/T in the Upper Esopus Creek watershed. Water quality monitoring began through an agreement with USGS in 2016 and is expected to continue through 2026.

STREAM RESTORATION/STABILIZATION PROJECTS TO RESTORE STREAM SYSTEM STABILITY AND/OR REDUCE CHRONIC TURBIDITY INPUTS

8. Identify locations in the Ashokan Watershed that are long-term, chronic suspended sediment/turbidity sources and evaluate the potential efficacy of restoration practices. Annually update and prioritize potential stream restoration and/or channel stabilization projects identified through the stream corridor geomorphic assessments. Begin the survey and design process for future turbidity reduction projects.
9. Participate in partner meetings to review water quality analyses to outline the water quality basis for project site selection. Review, select and restore three Stony Clove Creek project locations based on ongoing water quality monitoring studies.
10. SMIP funding for 2019-2024, along with funds provided to SWCD for stream restoration projects, may be used to implement additional projects expected to have a measurable reduction in turbidity. Support efforts to obtain additional funding to pursue this goal.
11. After completion of a Stream Feature Inventory of the Esopus Creek mainstem in Oliverea, coordinate with the Town of Shandaken and County DPW to determine next steps in assessment and planning to treat flood hazards and channel instability in the area.

Ashokan Watershed Stream Projects to Restore Stream Stability and Reduce Chronic Sources of Sediment *(Active 2022)*

SWCD	**Stony Clove Creek Above Jensen Road**	**$TBD**	**2020/21 design 2022 construction**
	Stabilize failing hillslope that is chronic source of suspended sediment and improve overall stream stability through a historically unstable section of Stony Clove Creek.		
SWCD	**Panther Kill Stream Restoration Project**	**$TBD**	**2020/2021 design 2022 construction**
	Stabilize failing hillslope and channel instability that is chronic source of suspended sediment from clay rich glacial till.		
SWCD	**Elk Bushkill Stream Restoration Project**	**$TBD**	**Under consideration**
	Stabilize failing hillslope and channel instability that is chronic source of suspended sediment in a headwater tributary to Esopus Creek.		
SWCD	**Hollow Tree Brook Stream Restoration Project**	**$TBD**	**Under consideration**
	Stabilize highly unstable reach of stream that has become chronic source of suspended sediment in Stony Clove Creek watershed. Site was first identified post-Irene and then reactivated during Christmas 2020 storm.		

Ashokan Watershed SMIP Projects Supporting Stream Restoration *(Active 2022)*

No active SMIP projects currently.

MONITORING OF STREAM PROJECTS

12. Annually monitor performance of stream corridor projects funded by the Ashokan Watershed Stream Management Program. See table below for specific project requirements.
13. Continue to monitor previously completed restoration projects on a case-by-case basis. Special consideration given to monitoring after bankfull and above flows.
14. Monitor turbidity and suspended sediment at stream restoration project sites before and after project construction to quantify effects on water quality. To be implemented on a case-by-case basis.
15. Refine monitoring objectives and evaluate pre- and post- restoration project conditions for changes in channel geometry and geomorphic function, habitat and biotic populations, and flow and thermal regimes. Continue monitoring stream restoration project sites for changes in water quality.
    a. Continue to implement a multi-year study to evaluate the effects of stream restoration projects on geomorphic condition, fish, water temperature, and physical habitat.
    b. Monitor turbidity and suspended sediment at a small number of stream restoration sites outside the Stony Clove Creek watershed before and after project construction to quantify effects on

water quality. Data will be provided to DEP for incorporation into the multi-year suspended-sediment monitoring study.

c. Develop a standard framework for evaluating stream project success based on goals identified for the project. Use the evaluation framework to inform post-project monitoring.

16. Develop University and agency partnerships to supplement existing funding and begin implementation of a comprehensive monitoring and evaluation program of stream management activities to better target management intervention and efficiently use resources.

Ashokan Watershed Stream Projects Monitoring

Stream Project (Year Completed)	Last Surveyed	Monitoring Goals and Permit Requirements
Stony Clove at Wright Road (2015)	2020	Completed all permit requirements in 2020. Survey following high flow events and as needed.
Stony Clove and Warner Creek Confluence (2014)	2018	Completed all permit requirements in 2016. Survey following high flow events and as needed.
Stony Clove Lane (2014)	2018	Completed all permit requirements in 2016. Survey following high flow events and as needed.
Stony Clove at Chichester #1, 2, 3, 4 (2012 – 2013)	2018 (partial)	Completed all permit requirements in 2015. Survey following high flow events and as needed.
Warner Creek Site 5 (2013)	2016	Completed all permit requirements in 2015. Survey following high flow events and as needed.
Stony Clove at Phoenicia Main Street (2011)	2018	Continue survey monitoring to track sediment deposition fluctuations per DEC permit. Survey following high flow events and as needed.
CSBI Bioengineering Project @ Bushkill (2016)	2017, 2019	Completed five years of survey. Survey as needed.
Beaver Kill at Van Hoagland (2018)	2020	Bi-annual survey and report for ACOE: 2018, 2020, 2022.
Woodland Creek at Woodland Valley Park Association (2018)	2019	Bi-annual survey and report for ACOE: 2019, 2021, 2023
Bush Kill at Watson Hollow (2018)	2019	Bi-annual survey to track change over time: 2019, 2021, 2023

Ashokan Watershed SMIP Projects Supporting Stream Corridor Assessment and Monitoring *(Active 2022)*

USGS	Monitoring and Evaluation of Changes in Suspended-Sediment Concentration and Turbidity Resulting from the Panther Kill and Wilmot Way Stream Projects in the Woodland Creek Watershed	AWSMP-2021-170	$123,554	Active	At the location of stream restoration projects at the Wilmot Way bridge on Woodland Creek and Panther Kill tributary to Woodland Creek (planned for 2022), monitor: streamflow, suspended-sediment concentrations and loads, and turbidity for at least one year before and after project construction, assess changes during the study period, compare results, and calculate concentrations/loads during construction and non-construction periods.

OUTREACH, EDUCATION AND TECHNICAL ASSISTANCE TO ENCOURAGE STREAM STEWARDSHIP

17. Distribute Stream Stewardship Principles to relevant entities.
18. Hold meetings of the AWSMP Stakeholder Council (2-3 per year) and working groups (6-12 per year) to solicit participation and input from local community members.
19. Provide outreach to municipal officials, agencies, affected landowners, and the public about findings from stream assessments and plans, and planned and completed stream restoration projects.
    a. Meet with newly elected and other key municipal officials to review stream management plan findings, provide education on stream process, and raise awareness of the stream management program.
    b. Hold landowner stream walks in the Warner Creek and Hollow Tree Brook or Esopus Creek headwater watersheds to educate landowners on stream assessment findings, stream restoration projects planned for construction, and to observe post-construction recovery of project sites in years following restoration.
    c. Distribute management recommendations and findings of the Little Beaver Kill and Esopus Creek headwaters assessments.
    d. Explore and pilot new outreach methods for distributing information and management recommendations from stream management plans, including the use of ArcGIS Online and ArcGIS Story Maps.
    e. Use remote imagery obtained with UAV to communicate project site conditions, need for restoration, and project plans with affected landowners and project consultants.
20. Provide information from stream assessments and plans in formats useable by watershed towns for integration with guidance documents such as natural resource inventories, open space plans, and climate smart plans.
21. Conduct a scientifically rigorous landowner survey to update the 2006 survey of Esopus Creek streamside landowners. A survey not only helps to improve the program's understanding of watershed demographics, but can provide insight into educational needs, preferred outreach methods, trusted sources of stream management information, and perceptions of historic and contemporary stream management projects and activities.
22. Provide education, outreach, and training to municipal officials on the topics of the stream management program, floodplain management, and stream processes.
    a. Offer trainings on the basics of stream process ("Stream Process 101") to municipal officials throughout the year. Produce the training as an educational video and make available online.
    b. Offer Stream and Floodplain Training Scholarships to local municipal officials and key staff, allowing town supervisors, highway superintendents, local code enforcement officers, and floodplain managers to attend state and national courses and receive certifications in floodplain management and policy and stream management.

c. Work collaboratively with other SMP basin staff to develop and create online municipal official training courses.

23. Coordinate technical stream education trainings for staff, partners, and stakeholders.
    a. Coordinate staff training on WARSSS methods during a pilot WARSSS implementation project in the Ashokan watershed (Action #2 above).
    b. Collaboratively develop and deliver a technical training on construction inspection and representation methods for AWMSP staff and other SMP basin staff.
24. Deliver a youth education program in partnership with the Onteora Central School District to teach stream and watershed science to students through field studies, and after-school and classroom programs. All programs to be delivered using virtual education methods as necessary.
    a. Hold the Stream Explorers Youth Adventure one-day conference to engage local youth grades 3 through 7 in outdoor studies about streams and watersheds.
    b. Engage youth grades 4 through 8 in the Watershed Detectives After School Club.
    c. Deliver Onteora School District Classroom Enrichment programs on water and watershed science as invited by teachers.
    d. Deliver stream science education activities for youth and families at local streams during the summer.
25. Fund public education and outreach activities that promote stream stewardship.
26. Develop written education and outreach materials for streamside landowners and other watershed stakeholders. Use a variety of media (newsletters, factsheets, press, video, website, and social media) to disseminate information about the program and encourage stream stewardship (1-2 fact sheets or professional videos per year).
    a. Develop or update Stream Guides (fact sheets) on flood preparedness, laws and regulations affecting streams, and native shrub willow identification and live staking procedures.
    b. Develop a series of educational videos for landowners and stream and floodplain managers on stream best management practices.
    c. Continue to promote the *Ashokan Watershed Adventure Guide* developed by AWSMP*;* a 27-page illustrated guide to 11 educational stops in the Ashokan Watershed for anyone to learn more about streams and how they are managed.
    d. Distribute a field methods manual and data sheets for use of the Multi-Objective Stream Crossing Assessment Protocol (MOSCAP) to partners within the NYC Watershed.
    e. Update and modernize the AWSMP website to improve functionality and accessibility.
27. Participate in local community events to promote the goals of the Ashokan Watershed Stream Management Program.
28. Organize an Ashokan Watershed Conference to provide general education to watershed residents and train municipal officials in specific topics (1 every two years). Incorporate virtual education delivery methods into regular programming.

29. Co-organize a Catskill Environmental Research and Monitoring (CERM) conference to disseminate the results of river and watershed studies (1 every two years). The next CERM conference will be held in October 2022.
30. Hold stream walks and other public engagement events (5-10 per year).
31. Develop citizen stewardship volunteer programs and opportunities for adult and youth volunteers.

Ashokan Watershed SMIP Projects Supporting Education, Outreach and Technical Assistance to Encourage Stream Stewardship *(Active 2022)*

No active SMIP projects currently.

B. Floodplain Management

Includes floodplain assessments; coordination with floodplain management planning and implementation efforts; and outreach, education, and technical assistance for floodplain management in the Ashokan Watershed.

Summary of recommendations in 2022-2024 Action Plan and allocation of SMIP funding in support of recommendations

FLOODPLAIN ASSESSMENT

1. Pro-actively assist communities with the review, understanding, and interpretation of data, reports, studies, and other information to reduce future flood risk. Examples include FEMA Flood Insurance Studies and Flood Insurance Rate Maps (FIRMs), NYS-adopted climate change / future flow projections, FEMA flood risk assessment tools, and local flood analyses. Seek updates to maps where projects have lowered flood elevations.
2. Using updated hydrologic models, stream assessments and other tools, identify natural floodplain areas that enhance sediment, wood, and water storage and reduce flood elevations in downstream areas.

COORDINATION OF FLOODPLAIN MANAGEMENT

3. Work with communities to coordinate the implementation of projects recommended in completed Local Flood Analyses within eligible population centers. Make available $2,500,000 for Local Flood Analysis projects through September 2024. Assist communities with obtaining additional state and federal funding for project implementation.
4. Assist communities with preparing for and entering the NFIP Community Rating System in the Ashokan Watershed. The Town of Shandaken successfully entered the Community Rating System in 2021.
5. Coordinate with flood commissions and working groups (e.g., SAFARI, Olive Flood Advisory Committee) in the watershed. Encourage the prevention of inappropriate development in areas of high flood or erosion risk and foster uses that are compatible with the anticipated flooding and erosion conditions.
6. Work with local planners and landowners to identify protection strategies for critical areas identified during floodplain and stream assessments.
7. Where critical community structures and facilities are in at-risk locations, support community planning as a next-step where needed, and the application of flood-proofing or relocation measures as a means of mitigation.

8. Assist municipalities with completing and implementing local flood analyses in watershed population centers that require engineering and modeling studies and public input to select projects that will lower flood elevations and/or reduce flood risk.
    a. Assist the Town of Shandaken with completing Local Flood Analyses for the hamlets of Pine Hill, Chichester, and Big Indian.
    b. Track implementation of projects. Assist municipalities with completing procedural steps and securing resources that help to move implementation projects forward.
9. Assist communities with coordinating development of flood hazard mitigation funding applications that match NYC and other local funds to federal and state funding. Use information in the County All-Hazard Mitigation Plan and local flood mitigation plan(s) to access mitigation funding.
10. Work with towns to implement mitigation actions included in the most recent update to the County's All-Hazard Mitigation Plan.
11. Work with communities to meet outreach and technical review requirements of the NYC Funded Flood Buyout Program. The Ulster County Department of Environment and the Ulster County Soil and Water Conservation District will assist.
12. Provide information and coordinate stream and floodplain management actions with municipalities when planning for parcels acquired through the NYC Funded Flood Buyout Program and how the local community can best utilize them.

Ashokan Watershed SMIP Projects Supporting Coordination of Floodplain Management Efforts in the Watershed *(Active 2022)*

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
Ulster County Dept. of Public Works	Design and Analysis Bridge Street Bridge Phoenicia	AWSMP-2021-165	$150,000	Active	Engineering study to evaluate alternatives to the existing Bridge Street Bridge over the Esopus Creek, connecting Main Street Phoenicia to State Route 28. Includes field survey, two-dimensional and hydraulic modeling to evaluate and design alternatives, cost-estimates, and obtain public input.
Town of Olive	Construction Phase Engineering Services for Burgher Road Crossing Enlargement	AWSMP-2021-168	$84,740	Active	Construction phase engineering services during construction of the Burgher Road stream crossing replacement and upsizing in 2022.
Town of Shandaken	Local Flood Analysis for Pine Hill	AWSMP-2021-171	$112,980	Active	Local Flood Analysis for Pine Hill in the Town of Shandaken. Identify the sources and causes of hamlet flooding, model and compare flood mitigation solutions, analyze feasibility and cost benefits of actions, provide flood mitigation recommendations.

Town of Shandaken	Letter of Map Revision (LOMR) Route 28 Mt. Tremper Bridge	AWSMP-2022-172	$33,000	Active	Hire a consultant to develop a LOMR application documenting the flood reduction benefits of a completed NYSDOT Mt. Tremper Bridge and Floodplain Enhancement project.

OUTREACH, EDUCATION AND TECHNICAL ASSISTANCE FOR FLOODPLAIN MANAGEMENT

13. Provide education and technical assistance to landowners and assist towns with reaching landowners interested in mitigating flood risks for existing structures in high-risk areas.
    a. Provide property owners with information on funding programs and assistance available for property protection measures such as elevations, floodproofing, tank anchoring, etc.
    b. Provide individuals with information about potential relocation areas and opportunities when practical.
14. Continue to provide training and assistance opportunities for local floodplain managers, municipal officials, and landowners in using FIRMs (Flood Insurance Rate Maps) and other FEMA datasets and understanding NFIP requirements. Use virtual education delivery as necessary. Identify mechanisms to provide instruction to local floodplain managers. Possible training topics include:
    a. Annually provide 10 weeks of instruction to local floodplain managers preparing them to take the Certified Floodplain Manager exam.
    b. Provide flood map and NFIP trainings to local code enforcement officers and planning, conservation advisory council/committee, and zoning board members.
    c. Provide trainings on floodplain management to local real estate professionals.
    d. Provide funding for Code Enforcement Officers and Floodplain Administrators to attend training sessions on flood related issues and become Certified Floodplain Managers.
15. Increase access to flood prevention/protection information in the watershed through the AWSMP website, locally available technical publications at AWSMP, local libraries, town halls, etc. and through presentations, workshops, and other outreach events.
16. Continue to provide education through Flood Hazard Mitigation Working Group meetings on topics such as: how to access funding opportunities; emergency response protocols and coordination; structural elevations; floodproofing; elevation certificates; changes in the NFIP and local implications; benefit to cost analysis for projects; and coordination between local, county, and state partners engaged in flood response and flood mitigation.
17. Facilitate trainings on the topic of flood emergency response.
18. Prepare educational programming about the National Flood Insurance Program's (NFIP) redesigned risk rating system "Risk Rating 2.0," and offer to watershed residents with flood insurance through NFIP. Risk Rating 2.0 will ultimately reflect an individual property's specific flood risk as opposed to the current approach which uses national averages.

C. Highway and Infrastructure Management in Conjunction with Streams

Outreach, training, and financial assistance to highway departments to encourage the adoption of best management practices.

Summary of recommendations in 2022-2024 Action Plan and allocation of SMIP funding in support of recommendations

APPLICATION OF HIGHWAY BEST MANAGEMENT PRACTICES TO REDUCE WATER POLLUTION

1. Work with the Highway Manager's Working Group to identify roadway infrastructure best management practices that treat sources of turbidity and stream system degradation (e.g., under-sized and perched culverts, outfalls that are point sources of sediment discharge collected from diffuse sources of road runoff, etc.).
2. Encourage local municipalities, highway departments and NYSDOT, to prioritize vegetation management on critical areas such as roadside ditches and steep slopes to reduce sources of turbidity in the Ashokan Watershed. Continue to encourage road maintenance crews to apply to CSBI for assistance with seeding roadside ditches and using native plantings adjacent to road infrastructure. An agreement to access shared machinery for mulching seeded areas that was implemented in early 2016 is ongoing.
3. Continue working with Towns to reduce sediment loading through application of best management practices for winter road abrasives, mined locally in the Ashokan Watershed, that have a high clay and silt content and are a source of turbidity in the streams in the Ashokan Watershed.
4. Share information on best practices related to use of chemicals and high-saline products in road management.

REDUCING HYDRAULIC CONSTRICTIONS IN STREAMS: BRIDGES AND CULVERTS

4. Collaborate with state and local highway departments and stream management personnel to improve management and replacement efforts at culverts by providing sizing guidance and revegetation strategies.

    a. Assist highway managers with developing and interpreting hydraulic studies at larger culverts and bridges to adhere to natural channel design concepts of sediment connectivity and long-term channel stability.
    b. Small road-stream crossings are regularly replaced by highway departments with little guidance on sizing that would improve their functional and geomorphic capacity and reduce threats to water quality. Test and improve the accuracy of the Cornell Culverts Model

(hydrologic model) using field survey data and hydraulic modeling. Apply validated hydrology to small road-stream crossing designs.

5. Inventory and assess stream crossings in the Ashokan Watershed to rate and prioritize the structures based on their overall impact on water quality, specifically their structural condition, impact to aquatic ecology, geomorphic compatibility with the stream, and hydraulic capacity relative to expected flows from their individual watersheds. Use the Multi-Objective Stream Crossing Assessment Protocol (MOSCAP) field-tested in 2018 to regularly update and expand the road-stream crossing database.
6. Continue to work with Towns to rank priority crossings and develop proposals to complete field investigation, initial cost estimates, and conceptual designs for high priority crossings.

STREAM/ROAD STABILIZATION PROJECTS AND IMPLEMENTATION OF BEST MANAGEMENT PRACTICES ON RIGHT OF WAYS

7. Collaborate with local, county and state highway departments to apply natural channel design concepts to streambank stabilization along roadsides.
8. Seek opportunities to mitigate the impact of public infrastructure (road, railroad, and utility) encroachment on the riparian vegetation community and aquatic habitats by improved planning, management, supplemental plantings, and the improved care of existing vegetation.

Ashokan Watershed SMIP Projects Supporting Improved Stream/Road Stabilization and Improved Right of Way *(Active 2022)*

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
Town of Olive	Engineering Design for Bostock Road and Red Maple Road Crossings	AWSMP-2020-161	$145,660	Active	Design and engineering of crossing replacements at Bostock Road and Red Maple Road in the Town of Olive. The crossings over Butternut Creek are identified as a high priority for replacement and enlargement in several flood hazard mitigation plans.
Ulster County Dept. of Public Works	Plank Road Culvert Replacements	AWSMP-2021-166	$150,000	Active	Remove and upsize culvert on C.R. 160 (Plank Road) in the Town of Shandaken. The culvert will be upsized from passing the 10-year peak flows to at least a 50-year peak flow and to improve aquatic organism passage.

OUTREACH AND EDUCATION FOR HIGHWAY MANAGERS, EXCAVATION CONTRACTORS, AND ROAD-STREAM CROSSING OWNERS

9. Organize Highway Manager's Working Group meetings with relevant local, county, and state highway personnel to identify shared stream/road concerns and evaluate opportunities to support coordinated effort to use best management practices. Provide guidelines for "repairs" of streams and drainage systems with best management practices advocated by the AWSMP to reduce risk of further instability (2-3 per year).
10. After validation of the Cornell Culverts Model, develop a user interface that produces sizing information and design alternatives for small road-stream crossings that can be used by highway managers and stream managers to improve hydraulic capacity, geomorphic compatibility, and aquatic organism passage.
11. Offer trainings to Highway Department and contractor staff on stream process and best practices for working in and around streams. Annually assess training needs and facilitate and implement high priority trainings. Depending on the training subject and level of detail desired, trainings may be conducted by AWSMP staff, Cornell Local Roads Program staff, or engineering/consulting firms.
14. Host a workshop for private road-stream crossing structure owners on how to conduct a multi-objective assessment of their structures. Provide attendees with guidance on best management practices for designing or re-designing stream-crossings to reduce the amount of channel instability generated by private structures.

D. Assisting Streamside Landowners (public and private)

Provide access to training and technical information to increase the knowledge, skills, and capabilities of landowners in the watershed. Also provide support for riparian buffer restoration.

Summary of recommendations in 2022-2024 Action Plan and allocation of SMIP funding in support of recommendations

ASSESSMENT OF STREAMSIDE PROPERTY ISSUES

1. Work with towns and landowners to identify and document streamside property (public and private) where there are stream stability concerns. Provide this documentation to towns, agencies, and landowners to help inform management decisions.
2. Use watershed land cover and stream assessments to identify riparian areas with inadequate vegetative cover and buffer width or degradation by invasive species and identify sites for landowner outreach through riparian zone improvement programs.

CATSKILL STREAMS BUFFER INITIATIVE

3. Offer and encourage voluntary participation in landowner incentive programs for stream and riparian zone protection and enhancement.
    a. Continue offering the Catskill Streams Buffer Initiative (CSBI), and the Conservation Reserve Enhancement Program (CREP) in partnership with CSBI to further enhance landowner participation in riparian land restoration programs by offering monetary incentive for enrolment.
4. Provide customized Riparian Corridor Management Plans to landowners enrolled in CSBI. These plans highlight the importance of healthy riparian buffers and sustainable streamside property management practices that landowners can implement on their properties.
5. Integrate recommendations made in the New York Natural Heritage Program's report "Inventory, Classification, and Description of Riparian Natural Community Reference Types for Ashokan Watershed, New York" into riparian restoration designs. The report can be accessed at http://ashokanstreams.org/publications-resources/technical-data/.
6. Continue exploring properties that could be eligible for soil-bioengineering projects through the CSBI program to help restore riparian habitat and function as well as demonstrate best practices for stabilizing streambanks utilizing native plant materials.
7. Focus on multi-phase riparian buffer restoration projects with invasive species removal, management, and native plant establishment.

8. Explore opportunities for restoring native riparian buffers in watershed town parks and common places with volunteer assistance for demonstration and education of riparian best management practices.
9. Review data and perform Geographic Information Systems analysis to identify areas that would benefit from buffer enhancement to improve landowner recruitment into the Catskill Streams Buffer Initiative program.
10. Evaluate the ability of CSBI and related programs to shift landowner attitudes, understanding, and property management practices needed for maintenance of healthy riparian buffers. Consult with social scientists and plan a study that evaluates whether goals have been met, including a change in the attitudes and behaviors of watershed landowners, and what can be done to enhance programs to achieve desired outcomes.

Ashokan Watershed CSBI Projects

2022-2023	Install willow staking at 4 projects completed in Fall 2021 Installation of 2-3 new landowner invasive removal and planting projects in 2022 Promote positive stream stewardship and riparian buffer protection through an education and outreach panel display at the Emerson Resort & Spa CSBI project Encourage education on riparian buffers and stream stewardship by partnering with Emerson Resort to construct an outdoor living classroom where Emerson Staff can deliver programming on native plant buffers and Catskill streams Promote CSBI program and buffer protection by participating in annual Trout Unlimited Earth Day planting Production of 3-4 landowner specific Riparian Corridor Management Plans Continue project vegetation monitoring – 11 sites scheduled in 2022 Continue partnering with UC-DPW and town highway departments to improve vegetation restoration at culvert replacements

MONITORING OF RIPARIAN BUFFER PLANTINGS

11. Monitor performance of riparian buffer plantings funded by the Catskill Streams Buffer Initiative.
    a. Riparian buffer restoration sites that were installed through CSBI are monitored bi-annually for a period of 5 years after project completion. The monitoring helps inform management decisions on species selection and site characteristics: 21 sites monitored in 2021, 10 sites expected in 2022.
    b. Monitor Stream Restoration Project vegetation and bioengineering practices to ensure projects are meeting goals for vegetation establishment and restoration.
        i. Develop and implement plans to monitor and study the effects of contributing factors to buffer success, such as source material, site condition, buffer installation practices, weather/hydrology during establishment period, deer herbivory and other factors to inform project designs and improve the growth and survival of buffer plantings.

OUTREACH, EDUCATION AND TECHINICAL ASSISTANCE TO STREAMSIDE LANDOWNERS

12. Provide site visits and office consultations with watershed landowners, municipalities, contractors, and others for designing and implementing best management practices to reduce erosion.
13. Develop educational products (fact sheets, guidebooks, videos, displays, signage, etc.) to educate landowners on best management practices, such as riparian planting design and maintenance, and guidelines for proper sizing of private stream crossings.
    a. Develop riparian ecosystem educational signage for completed riparian buffer projects.
    b. Develop no-mow signage for completed CSBI projects on private and public property.
    c. Develop fact sheets on how to install willow plantings and identify native willow species.
14. Develop several riparian buffer demonstration projects that can be accessed by volunteers and members of the public for educational purposes.
    a. Enhance the Riparian Buffer Pollinator Meadow Demo at the Emerson Resort with an outdoor "riparian ecosystem living classroom" and educational signage that promotes riparian buffer protection.
15. Develop reliable local sources of native plant material for stream and riparian improvement projects. Continue maintenance of 10,000 live willow plants for cutting beds that will be used in riparian restoration projects. This material has been used on the Mink Hollow Bridge project and is planned to be utilized for the 2022 stream restoration project at Stony Clove Creek above Jensen Road. Coordinate with DEP Lands to develop a database of harvestable bioengineering materials on DEP lands and rights of way in the Ashokan watershed for on-going plant material supply. Continue to identify local native stands for harvest located in the watershed through Stream Feature Inventory and landowner outreach.

E. Protecting and Enhancing Aquatic and Riparian Habitat and Ecosystems

Support for research and education programs that encourage protection of aquatic and riparian ecosystems.

Summary of recommendations in 2022-2024 Action Plan and allocation of SMIP funding in support of recommendations

STREAM ECOSYSTEM ASSESSMENT

1. Continue research, evaluation, and monitoring of aquatic ecosystems in the watershed to improve stream best management practices. Support the characterization of physical and water-quality regimes and the condition of important species in the watershed.
    a. Determine the potential effects of current and future thermal regimes on the survival of individual trout and their species populations in the Ashokan Watershed from headwaters to Reservoir.
    b. Large wood accumulations are fundamental components of Catskill stream geomorphology and ecosystems, yet accumulations can present hazards to people and stream stability. Initiate investigations into the natural wood regime of Esopus basin streams with the intent to characterize: (1) the role of large wood in the physical processes that influence fluvial geomorphologic dynamics and aquatic ecosystem integrity and identify potential hazards; (2) the rates and distribution of wood recruitment associated with invasive pests in riparian corridor forest communities (e.g. emerald ash borer and hemlock wooly adelgid) to determine if there will be a change in the wood regime; and (3) potential role of large wood integrated into stream restoration practices. Possible projects to support this recommendation include:
        - Create a geodatabase of large wood accumulations derived from AWSMP Stream Feature Inventory mapping and review of orthophotos to record spatial and temporal distribution of large wood accumulations that can be used for monitoring and diagnostics.
        - Contribute sites and data to the Wood Jam Dynamics and Assessment Model - a data collection protocol, database, and statistical model to predict wood jam dynamics for research and restoration (Home - Wood Jam Dynamics Database and Assessment Model (colostate.edu).
        - Develop a database for large and fine instream wood in geomorphically stable and biologically productive reference reaches. The data will be applied to departure from reference assessments and establishment of performance standards used to inform stream restoration design elements that aim to increase salmonid productivity and other aquatic ecosystem diversity metrics.

2. Develop partnerships to supplement existing funding and begin implementation of a comprehensive monitoring and evaluation of stream management activities to better target management intervention and efficiently use resources.
    a. Evaluate the effects of stream restoration projects on geomorphic condition, fish and macroinvertebrate community assemblages, stream temperature, physical habitat, and turbidity and suspended sediment. Results of an ongoing study with USGS (also see Section A above) should help the stream program better understand aquatic species use of project sites and incorporate meso- and microhabitat features into future projects, addressing a recommendation in the 2020 National Academy of Sciences Review of the NYC Watershed Protection Program.
    b. Coordinate SMIP-funded USGS fish community and habitat monitoring with an inland trout stream monitoring program the NYSDEC is planning to conduct.
3. Collaborate with partners to explore the effects of forest pest infestations and develop methods for addressing impacts on streams and water quality.
    a. Participate in NYCDEP's invasives prevention working group. Employ preventative measures on sourcing plant material to minimize the risk of introducing invasive species in the Ashokan watershed.
4. Identify high priority stream reaches for conservation as the climate changes. Coordinate with the NYC-funded flood buyout program and other local conservation efforts to provide high priority areas for acquisition or conservation related to water quality, hydrologic and habitat connectivity, sediment storage and conveyance supporting overall geomorphic stability, and riparian corridor preservation. Coordination will address a recommendation in the 2020 National Academy of Sciences Review of the NYC Watershed Protection Program.

OUTREACH AND EDUCATION FOR AQUATIC AND RIPARIAN HABITAT AND ECOSYSTEMS

5. Enhance coordination and information sharing among regulators, scientists, educators, and the public.
    a. Work with regional organizations to develop and disseminate outreach materials and offer public programs.
    b. Collaborate with the Catskill Science Collaborative to hold events that engage the public in learning about the Catskill environment and the research occurring in the region.
    c. Contribute to planning and delivery of the semi-annual Catskill Environmental Research & Monitoring conference for environmental scientists, resource managers, and other professionals.
6. As feasible, involve watershed residents in macroinvertebrate sampling to make the water quality and habitat effects of stream restoration projects more visible to the public.

7. Hold Stream Ecosystem Working Group meetings to advise the program on stream assessment, research, and monitoring needs. Work with the group to coordinate research, assessment, and monitoring projects in the Watershed (1-2 meetings per year, or as needed).
8. Distribute the *2018 Research, Assessment & Monitoring Strategy for the Ashokan Watershed*; a 10-year update to the 2007 Stream Ecosystem Research & Assessment Strategy for the Upper Esopus Creek. Begin a five-year review and update of the Strategy.
9. Participate in the inter-basin Riparian Buffers Working Group, quarterly Catskill Streams Buffer Initiative meetings, and Catskill Regional Invasive Species Partnership meetings as possible.
10. Coordinate with NYC DEP to better understand the impacts of changes in Schoharie Reservoir releases on Esopus Creek stream flow quantity, temperature, water quality, and potential impacts on the fishery.

Ashokan Watershed SMIP Projects Supporting Aquatic and Riparian Habitat and Ecosystem Assessment *(Active 2022)*

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
USGS	Response of Fish Assemblages and Habitat to Stream Restoration in the Ashokan Watershed	AWSMP-2019-155	$96,722	Active	Determine the effects of stream restoration projects on fish assemblages, trout populations, and trout habitat quality. The results will help to refine expectations, resource targets, and design principles for future restoration projects. Study runs from 2020 to 2024.
USGS	Effects of Stream Restoration Projects on Water Temperature in the Ashokan Watershed	AWSMP-2020-160	$46,423	Active	Characterize the impacts of restoration projects on thermal regimes in selected stream reaches in the Upper Esopus Creek watershed. Implemented with AWSMP-2019-155.

F. Enhancing Stream-based Recreation and Public Access

Support for projects that improve the quantity and quality of public stream access and enhance stream-based recreational opportunities. These recommendations incorporate community development efforts into stream management.

Summary of recommendations in 2022-2024 Action Plan and allocation of SMIP funding in support of recommendations

ENHANCING PUBLIC ACCESS TO STREAMS

1. Identify and assess potential stream access sites in the watershed. Consider stream access improvements that engage a broad array of uses and users. Ensure that any stream access and recreation activities or projects will not harm or degrade the environment and the greater ecology of the stream system.
2. Work with DEP, DEC, Ulster County, watershed towns, and other entities to assess the possibility of using flood buy-out properties for recreational and educational purposes.
3. Investigate opportunities to develop multi-use, low-impact trail systems along stream corridors. Determine trail locations that would provide greater public access to streams. Provide information to public land managers on streamside management practices that will enhance stream stability, water quality, flood mitigation, habitat, and public education.
    a. Support the Town of Shandaken's efforts to develop community access to the Esopus Creek corridor in conjunction with the Local Flood Analysis-recommended NYSDOT Mt. Tremper Route 28 bridge enlargement.
4. Make improvements that enhance existing stream access sites to increase public access for under-represented watershed regions or communities.
5. Provide a forum that will give all stakeholders (anglers, whitewater enthusiasts, environmental conservation groups, etc.) a place to let their voices be heard and to improve relationships between these important groups.
6. Coordinate with municipal parks and/or recreation committees, Ulster County, NYSDEC, and NYCDEP and other entities engaged in developing recreation plans and document when carrying out stream and floodplain projects.
7. Work with Stream Access and Recreation Working Group and other stakeholders on developing recommendations related to Shandaken Tunnel recreational releases and ensure mutually beneficial results for all stream users that do no harm. Engage in constructive dialogue with State and City officials about future protocols and procedures for Tunnel operations.
8. Develop awareness of non-native and/or invasive species, such as Hemlock Woolly Adelgid (HWA), didymo, and Japanese knotweed, and control efforts, and remain informed about the impact of

these species on the recreational use of streams and ecosystems. Address emerging invasives such as Mile-a-Minute plant and Spotted Lantern Fly.

EDUCATION FOR RECREATIONAL USERS OF STREAMS

9. Support education on recreational stream safety that includes input and consensus from all stakeholder groups, such as educational/warning signage, hazard avoidance, and hazard removal.
10. Address stream access and recreational use topics at educational events organized by AWSMP. Potential future topics include how to disperse and manage use within the watershed, how to meet stewardship funding needs, recreational safety, in-stream wood management, potential impact to streams from invasive species and how to prevent their spread, laws and policies relating to navigable waterways, and handicap accessibility issues.
11. Help to address through education and by providing a forum for discussion, any over-use and/or site monitoring issues at popular Esopus Creek access points.
12. Advocate for and advance educational opportunities in recreational areas to improve knowledge of streams, stream management, and the watershed. Examples of this may include educational signage, kiosks, interpretative trails, and photo safaris.
13. Identify opportunities to advance stream and watershed education at the Ashokan Rail Trail that opened in 2019, in collaboration with Ulster County and DEP. Hold educational events on the Rail Trail. Integrate education on invasive species and opportunities to promote pollinator habitat by planting Catskill native species near streams and water bodies.
14. Collaborate with local and state actors to reach new residents and visitors to the watershed with messages about responsible stream access and good stream management.

Ashokan Watershed SMIP Projects Supporting Stream-Based Recreation and Public Access *(Active 2022)*

No active SMIP projects currently.

Appendix A: Summary of Completed Projects 2009-2021

Stream Assessments

Streams	Location	Status
Broadstreet Hollow	Towns of Shandaken and Lexington	Completed 2001
Stony Clove	Towns of Shandaken, Woodstock, Hunter, and Lexington	Completed 2001
Esopus Creek	Towns of Shandaken and Olive	Completed 2007
Woodland Creek	Town of Shandaken	Completed 2008
Beaver Kill	Towns of Shandaken and Woodstock	Completed 2010
Warner Creek	Town of Shandaken and Woodstock	Completed 2010-2012
Birch Creek	Town of Shandaken	Completed 2012
Beaver Kill	Town of Shandaken and Woodstock	Completed mainstem reassessment in 2012
Bush Kill	Towns of Shandaken and Olive	Completed 2012
Bushnellsville Creek	Towns of Shandaken and Lexington	Completed 2013
Stony Clove Creek	Towns of Shandaken and Hunter	Completed mainstem reassessment 2013
Woodland Creek	Town of Shandaken	Completed reassessment in 2015
Maltby Hollow Brook	Town of Olive	Completed 2015
Little Beaver Kill	Towns of Woodstock, Olive, and Shandaken	Completed 2017
Lost Clove	Town of Shandaken	Completed 2018
Hatchery Hollow Brook	Town of Shandaken	Completed 2018
Esopus Creek	Town of Shandaken	Completed reassessment 2019 to confluence of Bushnellsville Creek
Panther Kill	Town of Shandaken	Completed 2021

Stream Restoration/Stabilization Projects

Town	Project	Goal	Construction Cost	Status
Lexington	Broadstreet Hollow	Full channel restoration. Placement of in-stream structures, channel realignment, and hillslope stabilization.	$354,066 Total; AWSMP/Local Share $354,066	Completed 2001
Shandaken	Esopus Creek at Woodland Valley Demonstration	Full channel restoration. Placement of in-stream structures, channel realignment, and hillslope stabilization.	$1,027,968 Total; AWSMP/Local Share $591,593	Completed 2003
Shandaken	Woodland Valley Creek at Fawn Hill	Streambank stabilization to protect road.	$125,000.00 Total: AWSMP/Local Share $31,250.00	Completed 2010
Shandaken	Stony Clove Creek at Phoenicia (Main St. Bridge)	Post-flood emergency response.	AWSMP/Local Share $70,819	Completed 2011
Shandaken	Stony Clove at Chichester (Site # 1)	Reduce stream corridor instabilities that lead to chronic turbidity from suspended sediment loading.	$1,020,369 Total; AWSMP/Local Share $352,785	Completed 2012
Shandaken	Stony Clove at Chichester (Sites # 2,3,4)	Reduce stream corridor instabilities that lead to chronic turbidity from suspended sediment loading.	$1,636,255.70 Total; AWSMP/Local Share $791,129.59	Completed 2013
Shandaken	Warner Creek (Site #5)	Reduce chronic turbidity source and protect Silver Hollow Rd. (Town of Shandaken).	$495,465.68 Total; AWSMP/Local Share $284,862.27	Completed 2013
Shandaken	Warner Creek-Stony Clove Confluence	Protect transportation infrastructure and reduce potential future sources of chronic turbidity through grade control to mitigate upstream migration of headcut.	$1, 585,454.46 Total AWSMP/Local Share TBD	Completed 2014
Shandaken	Stony Clove at Stony Clove Lane	Protect vulnerable properties and reduce source of chronic turbidity.	$540,146.11 Total AWSMP/Local Share $135,036.49	Completed 2014

Hunter	Stony Clove Creek at Wright Rd.	Protect vulnerable properties and infrastructure, reduce source of chronic turbidity, and enhance habitat and stream stability.	$1,678,050.14	Completed 2015
Hunter	Stony Clove Hillslope Stabilization	Stabilize failing hillslope that is source for fine sediment and water quality impairment.	$1,237,177.29	Completed 2016
Woodstock	Beaver Kill at Van Hoagland Road	Project 1 - Reach scale restoration and stabilization of hillslope failure about 400-ft upstream of the Van Hoagland bridge that is a source for fine sediment and water quality impairment.	$1,383,088.42	Completed 2018
Woodstock	Beaver Kill at Van Hoagland Road	Project 2 - Reach scale restoration and stabilization of hillslope failure about 1,200-ft upstream of the Van Hoagland bridge that is a source for fine sediment and water quality impairment.	Cost included in Van Hoagland Site 1 total	Completed 2018
Shandaken	Woodland Creek at Woodland Valley Park Association	Stabilize failing hillslope that is chronic source of suspended sediment and improve overall stream stability through a historically unstable section of Woodland Creek at the upstream extent of development.	$1,006,875.09	Completed 2018
Shandaken	Warner Creek at WC-1	Treatment of a chronic source of suspended sediment, as well as adjoining stream that had become unstable.		Completed 2021
Shandaken	Warner Creek at WC-2	Treatment of a chronic source of suspended sediment, as well as adjoining stream that had become unstable.		Completed 2021

Stream Buffer Projects

Project	Town	Goal
2010	Multiple	3 projects installed totaling 452 linear feet of bank treated.
2011	Multiple	11 projects installed totaling 2810 linear feet of bank treated.
2012	Multiple	13 projects installed totaling 2590 linear feet of bank treated.
2013	Multiple	8 Projects Totaling 3,350 linear feet, including planting, willow staking, and invasive control
2013 Warner Creek Site 5	Shandaken	Project covered 45,000 sq. ft., or 1.2 acres re-vegetated. Approx. 1500 trees and shrubs and 200 willow stakes.
2013 Phoenicia Main Street	Shandaken	Installation of 800 willows total extending 300' on both banks upstream of bridge.
2013 McKenley Hollow CSBI Site	Shandaken	Installed 130 trees and shrubs plus 225 willow stakes along 250 ft of McKenley Hollow Creek. Also, utilized custom seed mix designed by Catskill Center for restoration of native riparian plant communities. 650 linear feet treated.
2013 Amy's Takeaway and Upper Esopus Rod & Gun Club	Multiple	Japanese Knotweed control sites using landscape fabric to cover and attempt to control knotweed at upstream source areas. 205 linear feet treated.
2013 Moran Repair	Olive	Repaired buffer planting damaged during Tropical Storm Irene/Lee. 400 linear feet treated.
2013 Chichester Site 2	Shandaken	Began buffer plantings on portions of the Chichester 2/3/4 restoration project. 260 linear feet treated.
2014	Multiple	4 Projects Totaling 980 linear feet, including planting, willow staking, and invasive control; Assessment and surveying for 2 potential bioengineering sites (Bushkill and Upper Esopus).
2014 Stony Clove Stream Project	Shandaken	Buffer planting along 300 feet of Chichester project. Approximately 600 tree/shrub installed.
2014 UC-DPW Ct. Rt. 47 Slope	Shandaken	Provided buffer planting for DPW project to stabilize steep slope. Approximately 96 tree/shrub installed.
2014 Lerner Planting	Shandaken	Planting along 180 feet of Stony Clove Creek. Installed approximately 94 tree/shrubs
2014 Waldron Planting	Shandaken	Planting and invasive control along 400 feet of Broadstreet Hollow Creek. 379 tree/shrub installed.
2015 Waldron Planting	Shandaken	Native seeding along 300' of Broadstreet Hollow Creek within area 8,183 ft^2.
2015 Vitalo Planting	Shandaken	Installed 125 trees/shrubs along 275' of Stony Clove Creek within area 6,516 ft^2.
2015 Trigiani Planting	Woodstock	Installed 110 trees, 150 willows and native seeding along 175' of the Beaver Kill within area 1,345 ft^2.
2015 BIMA Planting	Shandaken	Installed 210 trees/shrubs along 140' of the Elk Bushkill within area 5,461 ft^2.

Project	Town	Goal
2015 Awan Planting	Hunter	Installed 136 trees/shrubs and 1,200 willows along 170' of Stony Clove Creek within area 3,234 ft^2.
2015 Chichester Site 2 Hillslope Stream Project	Shandaken	Installed 500 trees/shrubs and 1,200 willows along 1,010' of Stony Clove Creek within area 32,176 ft^2.
2015 Willow Field Planting		
2015 Buffer Planting Monitoring	Multiple	Established and surveyed 29 monitoring plots.
2015 Technical Assistance Site Visits	Multiple	Conducted 16 landowner technical assistance site visits.
2015 Riparian Corridor Management Plans	Multiple	Completed 26 Riparian Corridor Management Plans for landowners enrolled in CSBI.
2016 Catskill Interpretative Center Demonstration Buffer (CSBI & SMIP)	Shandaken	Established a demonstration riparian buffer display for education & outreach on streamside buffers. Project included volunteer invasive removal, installation of 265 native trees and shrubs, and wildflower pollinator seed mix.
2016 Wright Road CSBI Planting	Hunter	Project involved installation of over 400 native trees and shrubs on a previously restored failing hillslope.
2016 Menla Mountain CSBI Project	Shandaken	Phase 1 of a buffer restoration underway at Menla Mountain Retreat. This project engaged volunteers for invasive species awareness. Nearly 1 acre of invasives have been removed. Phase II is scheduled for Fall 2017 to re-plant with native species.
Moran Bushkill CSBI Bioengineering Project	Olive	600 linear feet of invasive removal, buffer restoration and streambank protection all wrapped in one project that showcases proper buffer management and use of soil bioengineering as a practical approach to streambank and ecosystem protection.
2016 CSBI provided plant materials for landowner installation	Shandaken	The CSBI Program provided plant materials to two separate landowners for self-installation of recommended buffer improvements as they were recommended in Riparian Corridor Management Plans.
2016 Riparian Corridor Management Plans	Multiple	Provided 5 landowner specific Riparian Corridor Management plans for landowners enrolled in CSBI
2016 Technical Assistance Site Visits	Multiple	Conducted 12 landowner technical site visits regarding stream problems and recommendations.
2016 Buffer Planting Monitoring	Multiple	Surveyed 24 sites and 41 individual monitoring plots on CSBI project sites for vegetation
2017 Buffer Planting Monitoring	Multiple	Conducted vegetation monitoring at 22 CSBI project sites
2018 Miller CSBI Project	Shandaken	Removed invasive species and installed 200 native tree/shrub, wildflower seed, and 155 live stakes on 560 ft. of an unnamed tributary to the Beaver Kill.
2018 Panther Kill Trib CSBI Project	Shandaken	Installed 390 native tree/shrub, 270 live stakes on 706 ft. of the Pantherkill tributary.
2018 Degennars CSBI Project	Shandaken	Removed debris and installed 75 native tree/shrub, 175 live stakes and pollinator seed mix on 529 ft. of an unnamed Esopus Creek tributary.
2018 Shokan Invasive Removal	Olive	Performed intensive invasive shrub removal on 1.2 acres of a riparian property along a direct Ashokan Reservoir tributary in Shokan. Area to be monitored for effectiveness.
2018 Meislan CSBI Project	Shandaken	Installed 250 native trees and shrubs along 446 ft. of Warner Creek. Live stakes, sedge transplants, and native pollinator wildflower mix to be installed in spring 2019.
2018 CSBI Site Visits	Multiple	Conducted 19 riparian landowner technical assistance visits.
2018 CSBI Project Monitoring	Multiple	Conducted CSBI project monitoring at 17 sites documenting condition of 33 planted plots.
2019 Amenta Live Staking Project	Shandaken	Provide material, tools, and instruction for landowner self-install of 150 live willows on 175 feet of Esopus Mainstem streambank.
2019 Clugstone Invasive Removal	Woodstock	Remove invasive shrubs in planned bioengineering project area on 200 feet of a tributary to the Beaver Kill.
2019 Emerson Demonstration Buffer Project	Shandaken	Removed invasive plants and herbaceous layer. Installed 1,210 trees, shrubs, and perennial sedges on 700 feet of a tributary to Esopus. Area re-seeded with pollinator friendly wildflowers and a walking trail in 2020, with interpretive signage and outdoor classroom planned in 2021.
2019 Kaiser Buffer Improvement Project	Shandaken	Removed dense thickets of invasive shrubs and installed 213 trees and shrubs along 400 feet of an un-named tributary to Esopus Creek in Mount Tremper. Pollinator seeding of ground cover and live staking to be completed in spring of 2020.
2019 Meislan CSBI Project	Shandaken	Installed pollinator seed, 150 live stakes and 40 herbaceous plugs in spring of 2019.
2019 CREP Solicitation	Multiple	Solicited 21 individual properties eligible for CREP/CSBI partnership projects.
2019 CSBI Site Visits	Multiple	Conducted 21 riparian landowner technical site visits.

Project	Town	Goal
2019 CSBI Project Monitoring	Multiple	Conducted CSBI project monitoring at 11 project sites documenting condition on 16 planting plots.
2020 Emerson Demonstration Buffer Project	Shandaken	Installed pollinator seeding, walking trail, footbridge to complete the riparian demonstration in spring of 2020. Enrolled Emerson project into national pollinator pathway program. Enclosed area with deer exclosure in summer of 2020 and performed year 1 monitoring. Collaboration between CCE, UCSWCD & Emerson to develop educational signage and outdoor living classroom in 2021.
2020 Kaiser Buffer Improvement	Shandaken	Installed 75 live stakes and fern plugs in spring of 2020. Followed with herbaceous seeding and year 1 monitoring.
2020 Ashokan Brook Follow-up	Olive	Installed 265 trees and shrubs at Ashokan Brook in Shokan – follow-up to 2018 Shokan Invasive Spp. Removal Project. 270 linear feet of buffer installed. Yr. 1 monitoring 2021
2020 Clugstone Riparian Planting	Woodstock	Installed 130 trees and shrubs on 200 feet of tributary to Beaver Kill. Follow-up from 2019 Clugstone Invasive Removal. Live Staking along bank scheduled for spring 2021. Yr 1 monitoring 2021.
2020 Menla Brook Riparian Planting	Shandaken	Removed invasive shrubs and installed 98 trees and shrubs on both banks, comprising 270 feet of streambank, on a tributary to the Pantherkill Creek. Installed deer exclosure around planting. Yr. 1 monitoring 2021.
2020 Pantherkill Trib Buffer Replacement/Replant	Shandaken	Replaced 63 trees and shrubs with enhanced deer protection and provided deer protection for remaining live plants following high mortality of previously planted 2016 project.
2020 Walker Warner Creek Riparian Corridor Enhancement	Shandaken	Removed invasive shrubs and Installed 680 trees and shrubs plus herbaceous plugs to enhance 1,360 feet of riparian buffer along Warner Creek. Post-flood repair, seeding and staking scheduled for spring 2021. Yr. 1 monitoring 2021
2020 Birch Creekside House Buffer	Shandaken	Installed 65 trees and shrubs along 75 feet of Birch Creek in Pine Hill. Post flood repair, pollinator seeding, and staking scheduled for spring of 2021. Yr. 1 monitoring 2021.
2020 Male Family Riparian Enhancement	Shandaken	Removed invasive shrubs and installed 335 trees and shrubs, 150 sedge plugs, and 125 ferns along 350 feet of the Broadstreet Hollow Creek. Post-flood repair, live staking and pollinator seeding scheduled for spring 2021. Yr. 1 monitoring 2021
2020 5-Arch Bridge Riparian Enhancement	Olive	Removed thick understory invasive shrubs and installed 233 tree and shrubs along 260 feet of Esopus mainstem to enhance riparian buffer. Post-flood repair and follow-up seeding, and live staking scheduled for spring 2021. Yr. 1 monitoring 2021
2020 Farges of Warner Buffer Enhancement	Shandaken	Removed invasive shrubs and installed 234 trees and shrubs on 320 linear feet of Warner Creek immediately upstream of the Warner/Stony confluence Stream Restoration Project. Yr. 1 monitoring 2021
2020 Bushkill Bioengineering Deer Exclosure Removal	Olive	Removed deer fence exclosure at Bushkill Bioengineering project in West Shokan.
2020 CREP Solicitation	Multiple	Solicited 4 individual properties eligible for CREP/CSBI partnership projects.
2020 CSBI Site Visits	Multiple	Conducted 17 riparian landowner technical site visits.
2020 CSBI Project Monitoring	Multiple	Conducted CSBI project monitoring at 13 project sites. Developed enhanced monitoring protocol to better evaluate site conditions and plant sources.
2021 CSBI Site Visits	Multiple	Conducted 25 landowner technical site visits.
2021 CREP Solicitation	Shandaken	Solicited 1 individual properties eligible for CREP/CSBI partnership projects.
2021 CSBI Project Monitoring	Multiple	Conducted CSBI monitoring at 21 project sites.
2021 Griffin Buffer Enlargement	Olive	Installed 175 Trees and Shrubs in the enlarged buffer area along 350 feet of the Bushkill. Installed an 8-foot-tall deer fence exclosure to protect against deer herbivory.
2021 Ulster County DPW SMIP Funded Culvert Enhancement Planting	Olive	Removed invasive shrubs and vines and installed 200 willow stakes and 96 trees and shrubs along 150 feet of the Bushkill to restore native vegetation following culvert replacement.
2021 Brunell Sculpture Park Buffer	Olive	Removed invasive shrubs and installed 100 trees and shrubs and 75 willow stakes along 275 feet of Patchen Brook in Boiceville.
2021 James Buffer Enhancement	Shandaken	Installed 215 trees and shrubs with deer protection in the floodplain and 100 willow stakes along the bank toe along 200 feet of the Esopus Mainstem in Mt. Tremper.

Education and Outreach Projects

Publications			
Type	Title(s)	Audience	Status

Stream Management Plans	Broadstreet Hollow Stream Management Plan (2003) Stony Clove Creek Stream Management Plan (2004) Upper Esopus Creek Management Plan (2007) Beaver Kill Stream Management Plan (2015) Bush Kill Stream Management Plan (2015) Bushnellsville Creek Stream Management Plan (2015) Woodland Creek Stream Management Plan (2018)	Watershed residents, stream managers, municipal officials, project partners	Completed for mainstem of Esopus Creek and several tributaries.
Newsletter	Esopus Creek News	Streamside landowners and project partners	2009 (3 issues) 2010 (2 issues) 2011 (3 issues) 2012 (3 issues) 2013 (2 issues) 2014 (3 issues) 2015 (3 issues) 2016 (3 issues) 2017 (2 issues) 2018 (1 issue) 2019 (3 issues) 2020 (1 issue) 2020 (2 issues)
Fact Sheets	Large Woody Debris Stream Guide (2012) Flood Preparedness Stream Guide (2012) Native Plant Stream Guide (2012) Sediment Management (2021)	General public, municipal employees, and streamside landowners	4 fact sheets completed (2009-2021)
Videos	Ashokan Conf – Speaker Presentations (2014) Ashokan Conf - Why We Are Here (2014) Ashokan Conf – Bark Peeling (2014) Ashokan Conf – Climate Change (2014) Ashokan Conf – Rivers are Dynamic (2014) Ashokan Conf – Stable Rivers Need Room (2014) Ashokan Conf – Dredging (2014) Ashokan Conf – Stream Expert Panel (2015) Ashokan Conf – Invasive Species (2015) Ashokan Conf – Ashokan Reservoir (2015) Ashokan Conf – River of the Future (2015) Watershed Detectives Youth – Get to Know your Watershed (2016) Ashokan Conf – Sustainable Communities (2017) Watershed Detectives Youth – All About Water (2017) Ashokan Conf - History and Future of the Esopus Ashokan Conf - Creek Fishery (2018) Ashokan Conf - Get to Know Invasive Plants (2018) Ashokan Conf - Prevent the Spread of Invasive Species (2018) Ashokan Conf - Invasive Species Management (2018) Ashokan Conf - Sustainable Fisheries (2018) Ashokan Conf - Managing for Sustainable Ecotourism (2018) Stream Study and Snorkeling Event (2018) Stream Snorkeling Program Info (2018) Watershed Detectives Youth – The Importance of Streams (2018) Watershed Detectives Youth – Stream Ecosystems (2019) Introduction to Rocks for Youth (2020)	General public, stream managers, streamside landowners	2014-2022

	Introduction to Road Stream Crossing Assessment for Youth (2020) Sedimentary Rocks for Youth (2020) Celebrating Earth Day in the Watershed (2020) Stream Features for Youth (2020) Stream Cross Sections for Youth (2020) Igneous and Metamorphic Rocks for Youth (2020) Stream Channel Stability (2020) Sketching a Site Map for Youth (2020) Watershed Animal Spotlight-The American Beaver (2020) Watersheds and River Systems for Youth (2020) CCEUC Storytime: Little One and the Water (2020) The American Robin (2020) Stream Erosion for Youth (2020) The Movement of Stream Sediment for Youth (2020) Stream Feature Inventory in the Ashokan Watershed (2020) How to Read a FIRM Map (2020) How to Use a Flood Insurance Study (2020) Stream Restoration Project Monitoring in the Ashokan Watershed (2020) Hydrograph of Tropical Storm Isaias (2020) Bank Erosion Monitoring (2020) Reference Reach Survey (2020) The Watershed Detectives Program (2020) Watershed Detectives Youth – Snapshots from the Field (2021) Natural Beneficial Functions of Floodplains (2022) New York State Specific Floodplain Management Standards (2022) Exploring the Upper Esopus Creek Watershed (2022)		
Podcasts	Walking the Watershed: Unmuddying the Waters Walking the Watershed: Tough Choices	General public	2021
Program Brochure	Guide to the Ashokan Watershed Stream Management Program	General public	Brochure completed 2011 Updated annually 2012-2021
Displays and Kiosks	AWSMP Program Esopus Creek Demo Project AWSMP Tabletop Program Display AWSMP Banner AWSMP 3-Sided Display	General public	Displays redesigned 2019
Action Plan	2009-2011 Action Plan 2010 Update 2011-2013 Action Plan 2012 Update 2013-2015 Action Plan 2014-2016 Action Plan 2016-2018 Action Plan 2017-2019 Action Plan 2019-2021 Action Plan 2020-2022 Action Plan 2021-2023 Action Plan 2022-2024 Action Plan	Project partners, municipal officials, applicants for funding, interested members of the public, FAD regulators	Updated annually
Websites	Ashokanstreams.org CERMconference.org	Watershed residents and stakeholders, grant	Updated regularly

		applicants, event participants, public	
Social Media	https://www.facebook.com/AWSMPUlster/ Twitter@AshokanStreams https://www.instagram.com/ashokanstreams/	General public	2011 Website published 2013 Website redesign Updated weekly 2015 Logo redesign 2017 Added Instagram
Press Releases	Projects and Events	General public	2011 (6) 2012 (15) 2013 (10) 2014 (16) 2015 (22) 2016 (14) 2017 (14) 2018 (12) 2019 (12) 2020 (12) 2021 (7)
Email News Alerts	Various	Streamside landowners, municipal officials, and project partners	Annually 2011-2021
Conferences and Training Programs			
Type	Title	Audience	Status
Watershed Conference	Ashokan Watershed Conference	Watershed residents, municipal officials, and project partners	2010, 2011, 2012, 2013, 2014, 2015, 2017, 2019, 2020, 2021
Research Symposium	Catskill Environmental Research and Monitoring (CERM)	Researchers, resource managers, project partners, interested members of the public	CERM 2010, 2012, 2014, 2016, 2018
Fluvial Geomorphology and Engineering Trainings	Rosgen 5-day Training (2009) Rosgen Public Presentation (2009) Intro to ArcGIS Cornell Local Roads Training (2010) Aquatic Organism Passage Training (2012) Stream Restoration Practices (2011) River Hydraulic Modeling (2014) Knotweed Management Training (2014) Turbidity and Suspended Sediment in the Upper Esopus Creek Seminar (2015) HEC-RAS Training for Modeling Culverts & Bridges (2019) Choose Your Culvert Wisely: A New Geomorphic Approach to Culvert Assessment to Improve Resilience (2021)	Highway and DPW staff, stream managers, contractors, and program staff	2009-2021
Floodplain Management Trainings	NYS Floodplain and Stormwater Manager's Conference and Certified Floodplain Manager Training (2010-2019) NFIP Educational Session (2013) Floodplain Mapping Fundamentals (2014) Benefit-Cost Analysis Workshop (2014) Using Depth Grids (2014) Emergency Waterfront Preparedness Class (2015) Community Rating System Workshop (2015) Flood Map and Insurance Basics-For Planning Boards/ZBAs, Towns of Hurley, Olive, Woodstock, Shandaken (2015, 2016, 2017, 2018, 2019, 2020) Elevation Certificate Training (2016) CFM Review Class (2014, 2015, 2016 2017, 2018, 2019, 2020)	Code enforcement officers, planning board members, town board members, program staff, and watershed public	2010-2021

	Floodplain Management for Real Estate Professionals (2017, 2018, 2019) Understanding Flood Maps and Flood Risks (2018) Elevation and Floodproofing Workshop (2019) Elevation Certificate Basics-For Planning Boards/ZBAs, Towns of Hurley, Olive, Woodstock, Shandaken (2020) Disaster Recovery Reform Act (2020) Route 212/Mount Tremper Bridge Replacement Updates (2020) Building Resilient Infrastructure and Communities Program (2020) Flood Map Basics, Flood Insurance Basics, Elevation Certificate Basics, Floodway Encroachment Basics - For Planning Boards/ZBAs, Towns of Hurley, Olive, Woodstock, Shandaken (2021) Floodway Encroachment and No-Rise Certificate Workshop (2021)		
Stream Process/Get to Know Your Stream Management Plan Trainings	Get to Know the AWSMP (2019) Ashokan Watershed Weekend Municipal Officials Day (2020) NYSDOT Environmental & Landscape Architecture Trainings Series (ELATS) – Where the Stream Meets the Road: Stream Process & Management (2021) Stream Process 101 – Municipal Officials Day (2021)	Municipal officials	2019-2021
Contractor Trainings	Post-Flood Emergency Stream Intervention (2012)	Local contractors, highway department staff, and project partners	2012
Landowner Workshops	Native Plants (2009, 2010) Raingardens (2011) Stream Erosion Class (2011) Little Beaver Kill Stream Walk (2015) Rochester Hollow Stream Walk (2015) Riparian Pollinators and Stream Buffer Program (2015) Beaver Kill Bus Tour (2016) Beaver Kill/Mink Hollow Stream Walk (2016) Winter Snowshoe Stream Walk – Rochester Hollow (2018) Woodland Creek Stream Project Walk (2018) Woodland Creek Stream Management Plan (2018) Ashokan Watershed Weekend Landowners Day (2020) Ashokan Watershed Month Landowners Days (2021) Warner Creek Virtual Stream Walk (2021)	Streamside landowners	2009-2020
Teacher Trainings	Ashokan Center Education Staff Training (2015) Teacher In-Service (2019)	Formal and informal watershed educators	Occasional
Public Programs			
Type	Title	Audience	Status
Volunteer Events	Knotweed Pulls (2009, 2010) Stream Clean-Up (2010, 2011, 2012) Master Watershed Steward (2012) Willow Bed Planting (2012) Family, Fun & Fish Day (2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019)	General public, streamside landowners	2009-2019

Volunteer Buffer Plantings and Invasive Control	Various locations Menla Mountain Retreat (2016) Catskill Interpretative Center (2016) NYSDEC Love My Park Day (2016) Earth Day Tree Planting Wright Road (2017) Oliverea Knotweed Landowner Control (2017) Earth Day Tree Planting (2018) Invasive Removal & Ribbon Cutting Catskill Interpretive Center (2018) Van Hoagland Stream Project Volunteer Planting (2019) Catskill Visitor Center Earth Day Ashokan Girl Scout Chapter Buffer Service Project (2019) Woodland Creek Stream Project Trout Unlimited Volunteer Planting (2019) Bushkill Creek Earth Day Planting with Trout Unlimited (2021)	General public, streamside landowners, students/interns	Annually 2010-2019
Booths and Displays	Shandaken Day Big Indian Spring Festival Olive Day Woodstock Library Day Ulster County Creek Week Ashokan Hoots Ulster County Fair Ashokan Watershed Conference Emerson Festival Mountain Valley Little League Day Rondout Valley Scout Camporee Longyear Farm Day National Outdoors Day Catskills Great Outdoors Expo Woodstock Earth Day Phoenicia Farmers Market	General public, streamside landowners	Annually 2009-2021
Public Meetings	Town Board Meetings, Other Meetings Elected Officials	Municipal officials	Annual presentations to Town Board of Shandaken, Olive, Woodstock, Hunter; meetings with Town officials, as needed
NYC Watershed Partner Meetings	NYC Watershed Education & Outreach Meetings Riparian Buffer Working Group Meetings CRISP Meetings FEMA Meetings NYC Watershed Partner Meetings CWT and CWC Meetings FHM Partner Meetings US-India Delegation Watershed Tour Sediment Management Working Group Meetings FAD Regulators Tour	Project partners	Program coordination and reporting annually, as required or needed
Public Talks and Events	Trout Research (2012) Rochester Hollow Stream Walk (2012) Arm of the Sea Theater (2012) Birch Creek Stream Walk (2012) Kanape Brook Stream Walk (2013) Trout Unlimited Meetings (2009-2013) Warner Creek Stream Walk (2014) Rochester Hollow Stream Walk (2013, 2015) Little Beaver Kill Stream Walk (2014, 2015) AWSMP Open House (2015) Film Showing and Lecture: Deep Water (2015) Riparian Pollinators Program (2015)	General public	Annually, as available

	Beaver Kill/Mink Hollow Stream Walk (2016) Menla Mountain Riparian Invasives Event (2016) Streamside Plant Invaders (CIC Project – 2016) Lark in the Park – Riparian Walk & Talk (2016) Maltby Hollow Stream Assessment (2016) NYC Funded Flood Buyout Program (2017) Floodplain Management Education (2017) Ashokan Watershed 2017 Updates (2017) Inland Flooding Local Flood Analysis (2017) Managing Your Flood Risk in the Hudson Valley (2017) Shandaken-Allaben LFA Final Public Meeting (2017) Fall in Love with Your Stream Event (2018) River Webs Film Screening (2018) DOT Mt. Tremper Bridge Public Meeting (2018) Boiceville Local Flood Analysis Results (2018) Understanding Flood Maps and Flood Risk – Schoharie Watershed Summit (2018) Snowshoe Stream Walk-Rochester Hollow (2018) Historic/Modern Stream Maps Event (2019) Final Presentation Olive Townwide Flood Hazard Mitigation Plan (2019) New Farmer Series – Streams and Floodplains (2019) Maltby Hollow Stream Feature Inventory Findings (2019) Understanding How Floods Happen and How to be More Flood Resilient (2019) Walking the Watershed Bus Tour – Stony Clove Flood Mitigation & Stream Restoration (2019) Stream Snorkeling – Esopus Creek Ecology (2018-2019) Sunset Rail Pedal – Esopus Creek Flood Mitigation & Stream Restoration (2019) Painting Stream Features (2019) Understanding Ashokan Reservoir Operations (2019) Watershed Paddle – Little Beaver Creek (2019) Book Signing and Reading “Little One and the Water” – Little Beaver Creek (2019) Paleoclimate of the Catskills (2019) Esopus Creek Fish and Fly Fishing Demonstration (2019) The Importance of Watershed Wetlands (2019) Messy Streams are Healthy Streams (2019) Stream Management – Woodstock (2019) Beyond NAAC: A Multi-Objective Road-Stream Crossing Assessment Protocol (2019) Snowshoe Stream Walk-Birch Creek (2020) Kanape Brook Stream Walk (2020) Bike Hike on Ashokan Rail Trail (2020) Ashokan Quarry Trail Fall Foliage Walk (2020) Snowshoe Stream Walk (2021) Love Your Stream Video and Art Project Earth Day Stream-A-Thon (2021) Shandaken Tunnel Intake Chamber Update (2021) SUNY New Paltz Water Resources Management Class Field Trip (2021)		
Youth Education			

Type	Title	Audience	Status
Presentations and Trainings	4-H Stream Team Stream Table Demo CCE Centennial Stream Table Demo UC Fair Floodplain Model Dem UC Fair Stream Table Demo Bennett Elementary Earth Day Macroinvertebrate Phoenicia School Earth Day Event Woodstock School Go Green Day Rondout Valley Scout Camporee Ashokan Center Education Staff Training (2015) 4-H Tech Wizards (2016) Onteora Summer School Stream Watch (2017, 2018, 2019) Stream Watch for Olive Summer Recreation Program (2017, 2018, 2019) 4-H Catskill Stream Champions (2017) Freshwater Snorkeling and Stream Study for Families (2018, 2019) Catskill Interpretive Center Nature Club (2018) CSBI Collaboration with Ashokan Chapter of Girl Scouts of America – Earth Day Events (2019) Ashokan Center YESS! Conference (2020) Summer Youth Hike Series (2020) Stream Watch Program for Olive Summer Recreation Program (2021) Water Connects Us – Stream Process (2021) Fourth Grade Parking Lot Field Trip with Stream Table and Floodplain Model (2021) Fourth Grade End of Year Outdoor Activities – Watershed Scavenger Hunt (2021) Fifth Grade End of Year Outdoor Activities – Stream Health, pH and Stream Crossing Activity (2021) Sixth Grade End of Year Outdoor Activities – Stream Health, pH and Stream Crossing Activity (2021) Fourth Grade Watershed Walk / Field Trip to Kenneth Wilson State Park (2021) Ashokan Watershed Month Youth and Family Day/Family Fun & Fish Day (2021)	Youth multiple ages	Annually, as available
After-School Activities and Classroom Enrichment	Watershed Detectives Club Classroom Enrichment at Bennett, Woodstock and Phoenicia Elementary Schools Watershed Scientist in Residence	Onteora Central School District, Grades K-7	Annually Expanded to Grade 7 (2021)
Youth Conference	Stream Explorers Youth Adventure (2018, 2019, 2021)	Youth grades 3 to 7 and parents/guardians	Annually

Program Coordination

Program Coordination			
Type	Purpose	Audience	Status
Stakeholder Council (Formerly the Advisory Council)	To provide overall guidance and oversight to the program	Project partners, municipal officials, streamside landowners and other community members	Meeting 2-3x per year
Flood Hazard Mitigation Working Group	To exchange information and identify opportunities to improve floodplain management and mitigate flood hazards	Municipal officials, project partners	Meet 3-4x per year
Stream Access & Recreation Working Group	To make recommendations for stream access/recreation	Project partners, recreation groups, municipal officials, local business owners	Meet 3-4x per year

	improvements in the Ashokan Watershed		
Highway Managers Working Group	To exchange information and identify opportunities for technical or financial assistance to improve stream management	Highway managers, project partners	Meet 2-3x per year
Education and Outreach Working Group	To engage local educators in delivering educational programming and incorporate stakeholders into decision making	Project partners, watershed educators	Committee active 2012-2017 Replaced with NYC Watershed Education & Outreach Working Group 2018-2019
Stream Ecosystem Working Group	To advise on development of a program research, assessment, and monitoring agenda	Researchers, resource managers, project partners	Meet 2-3x per year
Grant Review Committee	To review grants to the SMIP and make recommendations for funding	Project partners	Meet based on need

SMIP Projects

Education and Outreach					
Organization	Proposal Title	Proposal Number	Award Amount	Status	Purpose of Grant
Bennett Elementary School	Watershed Detectives Program	AWSMP-2011-1	$4,500	Complete	Expand the Scientist in Residence Program at Bennett Elementary School located in Boiceville, NY with the addition of a new Watershed Detective's program for the 2011/2012 school year. Hands-on program that introduces students to watershed topics: basic watershed morphology, hydrologic cycle, where their drinking water comes from, learning about negative impacts from overdevelopment, pollution, erosion, etc.
Ulster County Soil and Water Cons. District	Rosgen Level 2 - UC SWCD	AWSMP-2010-2	$2,235	Complete	The Ulster County Soil & Water Conservation District requested $6,586 to send staff member James Wedemeyer to attend River Morphology and Assessment training (Rosgen Levels II and III) in Shepherdstown, WV.
Ulster County Soil and Water Cons. District	Rosgen Level 3 - UC SWCD	AWSMP-2010-3	$4,097	Complete	The Ulster County Soil & Water Conservation District requested $6,586 to send staff member James Wedemeyer to attend River Morphology and Assessment training (Rosgen Levels II and III) in Shepherdstown, WV.
Ashokan-Pepacton Watershed Chapter-Trout Unlimited	Leaping Trout Art Project	AWSMP-2010-4	$925	Complete	The Leaping Trout Art Project was used to stimulate local awareness of Trout Unlimited and conservation issues in the Ashokan Watershed. The funds were used to cover the cost of printing a brochure containing the Leaping Trout Trail Map, a 4" x 9" rack card and maintaining the project website.

Catskill Center for Conservation and Development	Catskill Kiosk Panel Project	AWSMP-2010-12	$5,000	Complete	Interpretative kiosk along Route 28 in the Town of Shandaken, NY discussing the role and importance of the Catskill Park and the NYC Watershed. The kiosk is located near the site of the proposed Catskill Interpretive Center in Mount Tremper. The kiosk serves to inform visitors to the area about what the Catskill Mountain region has to offer as well as issues facing the watershed and local ecology.
Ulster County Cornell Coop. Extension	Roadside Drainage Class for Highway Staff	AWSMP-2010-23	$874	Complete	Training for Ashokan Watershed Highway Departments on ditch and culvert best management practices.
Town of Woodstock	Woodstock Watershed Education Project	AWSMP-2010-26	$4,400	Complete	Education and outreach for Town of Woodstock Wetlands and Watercourse Law. Outreach and educational materials for town residents, local board members and businesses.
Phoenicia Library	Jerry Bartlett Memorial Angling Collection Improvement	AWSMP-2011-37	$10,000	Complete	Outreach and education to anglers of all ages and the public about the links between robust fish and macroinvertebrate populations a water quality through workshops, presentations and events, digital exhibits, and web design.
Ulster County Soil and Water Cons. District	Rosgen Level 4 - UC SWCD	AWSMP-2010-51	$5,000	Complete	The Ulster County Soil & Water Conservation District requested $5,000 to cover the costs associated with Rosgen Level IV trainings for James Wedermeyer. The trainings are to be held in October of 2011 at Pilot View, Inc. Dobson, North Carolina. They were awarded the full $5,000 requested.
Ulster County Dept. of Public Works	Rosgen Level 1 - UC DPW	AWSMP-2011-52	$3,000	Complete	Ulster County Department of Public Works requested $2,980 to send a stormwater specialist, Brendan Masterson, to Applied Fluvial Geomorphology (Rosgen Level I) training.
Ulster County Cornell Coop. Extension	Floodplain Manager Association Training Grant	AWSMP-2011-65	$2,445	Complete	Provide five scholarships for Town Floodplain Law administrators to attend the NYS Watershed Association Conference
Town of Shandaken	Floodplain Manager Training and Certifications	AWSMP-2013-71	$1,455	Complete	Send the Shandaken Town Supervisor, Code Enforcement Officer, and Highway Superintendent to the NYSFSMA 2014 conference and Certified Floodplain Manager training; and sit for CFM exam.
Town of Woodstock	Floodplain Manager Training and Certification	AWSMP-2013-72	$485	Complete	Send Town of Woodstock Code Enforcement Officer to the NYSFSMA 2014 conference and Certified Floodplain Manager training; and sit for CFM exam.
Town of Hurley	Floodplain Manager Continuing Education	AWSMP-2013-73	$325	Complete	Send Town of Hurley Code Enforcement Officer to the NYSFSMA

					2014 conference and Certified Floodplain Manager training.
Ulster County Dept. of Environment	Floodplain Manager Certification and Continuing Education	AWSMP-2013-75	$810	Complete	Send two Ulster County staff to the NYSFSMA 2014 conference and Certified Floodplain Manager training; and sit for CFM exam.
Ulster County Dept. of Public Works	Wildland Hydrology Course Training for UCDPW Staff	AWSMP-2013-76	$3,186	Complete	Send Ulster County Civil Engineer, Andrew Emrich to Applied Fluvial Geomorphology Training (Rosgen Level I) in Shepardstown, WV.
Town of Lexington	NYSFSMA Annual Conference Attendance Plus CFM Test	AWSMP-2013-85	$988	Complete	Send Town of Lexington Code Enforcement Officer to the NYSFSMA 2014 conference and Certified Floodplain Manager training; and sit for CFM exam.
Town of Olive	NYSFSMA Annual Conference Attendance Plus CFM Test	AWSMP-2014-86	$2,199	Complete	Send Town of Olive Building Inspector and Code Enforcement Officer to NYS Floodplain and Stormwater Manager's Association Annual Conference from April 27 -29, 2015 and take CFM exam.
Town of Woodstock	NYSFSMA Annual Conference Attendance and CFM Continuing Education	AWSMP-2014-88	$1,312	Complete	Send Town of Woodstock Floodplain Administrator to NYS Floodplain and Stormwater Manager's Association Annual Conference from April 27 -29, 2015 and maintain CFM accreditation.
Ulster County Dept. of Public Works	Applied Fluvial Geomorphology Training for Ulster County DPW Staff	AWSMP-2014-89	$3,410	Complete	Send UC DPW staff to Rosgen Level II training from March 15 - 20, 2015.
Town of Shandaken	NYSFSMA Annual Conference Attendance and CFM Continuing Education	AWSMP-2014-99	$3,842	Complete	Send Town of Shandaken Supervisor, Highway Superintendent, Planning Board Chair, and new Code Enforcement Officer/Floodplain Manager to NYS Floodplain and Stormwater Manager's Association Annual Conference from April 27 -29, 2015 and acquire or maintain CFM accreditation.
Catskill Center	Riparian Buffer Demonstration Project at the Maurice D. Hinchey Catskill Interpretive Center	AWSMP-2015-105	$6 ,197	Complete	Education and outreach focused on a CSBI riparian buffer planting located at the Catskill Interpretive Center on St. Rt. 28. Features native Catskill plants and education about the care and restoration of riparian areas.
Cornell Cooperative Extension	2016 Stream & Floodplain Manager Training Scholarships	AWSMP-2015-111	$20,500	Complete	Offer up to 14 scholarships for town and county officials to attend stream and floodplain management trainings in 2016.
Cornell Cooperative Extension of Ulster County	2017-2019 Stream & Floodplain Manager Training Scholarships	AWSMP-2016-117	$20,847	Complete	Offer up to 19 scholarships for town and county officials to attend stream and floodplain management trainings in 2017 through 2019.
Cornell Cooperative Extension of Ulster County	Catskill Stream Champions	AWSMP-2017-132	$10,630	Complete	Train 4-H youth to educate Catskill trail users about streams and stream management practices.

Forge Collective	Catskill Waters	AWSMP-2017-133	$22,513	Complete	Create an online space for watershed residents about the importance of Catskill waters. Record and release a video series on stream assessment and condition of the Little Beaver Kill. Develop and publish a children's book featuring a tributary stream to the Ashokan Reservoir authored and illustrated by local artist Will Lytle.
Phoenicia Library	Educational Program About Licensed Guides	AWSMP-2019-147	$1,590	Complete	A public program at the Phoenicia Library about New York State licensed guides and stream management, professionally audio record the program, and archive a podcast and photos on the library's Jerry Bartlett Angling Collection website.
Catskill Mountain Club	Ashokan Quarry Trail Educational and Interpretive Signage	AWSMP-2019-148	$3,376	Complete	Develop interpretive signage for the Ashokan Quarry Trail on NYCDEP land within easy walking distance of the Ashokan Reservoir Promenade. Highlight the Esopus Creek valley.
Milone & MacBroom	HEC-RAS Workshop for Modeling Bridges & Culverts	AWSMP-2019-149	$27,850	Complete	Deliver a 3-day workshop for up to 20 people on how to use HEC-RAS hydraulic modeling software to evaluate bridges & culverts, with field and classroom components.
Catskill Center for Conservation and Development	Riparian Buffer Demonstration Project at the Maurice D. Hinchey Catskill Interpretive Center	AWSMP-2015-105	$2,318	Complete	Provide education and outreach focused on a CSBI-funded riparian buffer planting located at the Catskill Interpretive Center. Features native Catskill plants and provides education about the care and restoration of riparian areas along Catskills streams.
Infrastructure					
Organization	Proposal Title	Proposal Number	Award Amount	Status	Purpose of Grant
Town of Woodstock	Van Hoagland Road Bridge Replacement	AWSMP-2011-29	$200,000	Complete	Extend Van Hoagland Bridge by 20' to remove hydraulic constriction.
Ulster County Soil and Water Cons. District	Bradkin Road Culvert Replacement	AWSMP-2010-31	$107,480	Complete	Replace undersized culvert that was washed out in Oct 2010 flood with appropriately sized culvert.
Ulster County Dept. of Public Works	Woodland Valley at Fawn Hill	AWSMP-2010-41	$35,075	Complete	Stabilize a failing hillslope that endangers a road. Provides matching funds to a FEMA HMGP grant received by the Town of Shandaken.
Town of Woodstock	Van Hoagland Bridge Hydraulic Study	AWSMP-2011-57	$5,000	Complete	Engineering services to conduct a hydraulic analysis prior to replacing the Van Hoagland Bridge.
Ulster County Dept. of Public Works	Maben Hollow Bridge Repair and Expansion - Post Irene	AWSMP-2011-67	$29,300	Discontinued	Install a new abutment and bridge deck for the Maben Hollow Bridge on Esopus Creek that was damaged during Tropical Storm Irene. The new bridge has a 20-foot increased span length to improve hydraulic capacity.
Ulster County Dept. of Public Works	County Route 47 Culvert Replacement —Post Irene	AWSMP-2011-68	$77,300	Discontinued	Engineering to determine appropriate sizing and design of a culvert replacement for the Hillside Drive crossing.

Town of Olive	Engineering for Dry Brook at Hillside Drive Bridge Replacement	AWSMP-2013-69	$20,000	Complete	Engineering through 60% design to determine appropriate sizing and design of a culvert replacement for the Hillside Drive crossing.
Town of Shandaken Highway Dept.	Engineering for Woodland Creek at Fawn Hill Rd. Bridge Grade Control	AWSMP-2013-78	$10,000	Complete	Engineering for grade control downstream of the Fawn Hill Bridge to stop headcut moving toward bridge.
Town of Shandaken Highway Dept.	Conceptual Design for Fox Hollow Creek at Fox Hollow Rd. Bridge Grade Control by Panther Mountain Trail	AWSMP-2013-79	$10,000	Complete	Conceptual design for project to stop headcut moving toward the upper bridge on Fox Hollow Rd. across from Panther Mountain Park entrance. Retaining walls are failing and endangering the bridge and streambanks.
Town of Shandaken Highway Dept.	Engineering for Fox Hollow Creek at Herdman Rd. Bridge Grade Control	AWSMP-2013-80	$10,000	Complete	Engineering for grade control to prevent headcut and scour endangering the Herdman Rd. bridge off Fox Hollow Rd.
Town of Woodstock	Silver Hollow Creek at Silver Hollow Rd Culvert Replacement	AWSMP-2013-81	$50,000	Discontinued	Replace flood-damaged culvert with precast concrete box culvert. Project at the Intersection of Silver Hollow Rd. and Lane Rd.
Ulster County DPW	Mine Hollow Culvert Replacement	AWSMP-2014-90	$60,000	Complete	Replace and upsize culvert on Mine Hollow, a tributary to the Bushkill in the Town of Olive.
Ulster County Dept. of Public Works	Fischer Bridge over Esopus Creek Construction	AWSMP-2016-115	$77,300	Complete	Post-Irene construction of the Fischer Bridge carrying Oliverea Rd over the Little Panther Kill tributary to Esopus Creek in the Town of Shandaken. Replaces 8-foot diameter pipe with a 61- Ulster County Dept. of Public Works foot span bridge.
Town of Woodstock	Design of Mink Hollow Bridge Up-Sizing	AWSMP-2018-137	$130,517	Complete	Engineering, surveying, and bid support to replace and increase the span of an undersized bridge on Mink Hollow Road over the Beaver Kill and stabilize the channel near bridge.
Ulster County Dept. of Public Works	C.R. 139 Culvert Replacements for Aquatic Passage	AWSMP-2019-152	$52,500	Complete	Replace two under-sized culverts on the Bushkill under County Road 139 or Watson Hollow Rd. with structures than pass a 50-year peak flow and appropriate for aquatic organism passage.
Town of Shandaken	Peck Hollow Bridge Upsizing	AWSMP-2020-162	$221,038	Complete	Construction of bridge enlargement over Peck Hollow with flood mitigation and habitat benefits. Increased span length from 27 ft. to 40 ft. to reduce hydraulic constriction. Match to $901,000 Bridge NY funds.
Town of Shandaken	Pine Hill Bridge Study	AWSMP-2020-163	$80,000	Discontinued	Hydrology and hydraulics investigation of eight bridges in the hamlet of Pine Hill incorporated into a Pine Hill Local Flood Analysis.
Local Flood Analysis Implementation					
Organization	Proposal Title	Proposal Number	Award Amount	Status	Purpose of Grant

Town of Olive Highway Dept.	Engineering & Design Upper Boiceville Road Culvert Replacement	AWSMP-2016-127	$0	Terminated and replaced with AWSMP-2018-140	Engineering and hydraulic studies for future replacement of Upper Boiceville Road culvert to reduce hydraulic constriction and maintain fish passage.
Town of Olive	Engineering Design for Upper Boiceville, DeSilva, and Burgher Road Crossings (LFA Implementation)	AWSMP-2018-140	$199,010	Complete	Engineering for upsizing of four Town crossings that are significantly impeding flood water and threatening public infrastructure and emergency access to homes. LFA recommended projects for Boiceville and West Shokan.
Ulster County Department of Public Works	Design Services for the Maltby Hollow Bridge Replacement (LFA Implementation)	AWSMP-2019-143	$80,000	Complete	Design a replacement bridge with proper sizing and abutment layout to reduce debris obstructions and prevent road flooding.
Town of Olive	Construction of Culvert Replacements – Upper Boiceville Road and DeSilva Road Crossings	AWSMP-2019-150	$265,697	Complete	Replacement of three under-sized crossings to reduce hydraulic constrictions and flood elevations; recommended for enlargement in the West Shokan and Boiceville Local Flood Analysis (May 2017). The three crossings are located at two sites: Upper Boiceville Road and DeSilva Road.
Ulster County Department of Public Works	Construction Inspection Services for Maltby Hollow Bridge Replacement	AWSMP-2019-151	$150,000	Complete	Construction inspection services for replacement of the Cty Rte 42 bridge over Maltby Hollow Brook with a new bridge that significantly increases hydraulic capacity. The project is recommended in the West Shokan and Boiceville Local Flood Analysis (May 2017). The new bridge passes the 500-year flow or 50-year flow with 50% obstruction.
Planning					
Organization	Proposal Title	Proposal Number	Award Amount	Status	Purpose of Grant
Town of Woodstock	Habitat Mapping for the Town of Woodstock	AWSMP-2010-24	$29,000	Complete	Develop a large-format habitat map and a report describing terrestrial, wetland, and stream habitats; their relationship to maintaining groundwater and surface water resources; the plants and animals of conservation concern that may use the habitats; and detailed conservation recommendations. Maps to aid the town with planning, development, and conservation decisions.
RCAP Solutions Community Resources	SAFARI Coordination with Mitigation Plan	AWSMP-2011-34	$10,000	Complete	Assist the Town of Shandaken with research and assembly of documentation of elevation certificates, repetitive loss areas, and information to support plan development, information meeting planning, advertising and coordination, other public outreach as needed.

Town of Shandaken	Phoenicia Mitigation Phase 1	AWSMP-2011-55	$32,771	Complete	Develop a design to reduce flooding from Stony Clove in Phoenicia at Rt. 212 bridge.
Town of Shandaken	Phoenicia Flood Resiliency Planning and Outreach	AWSMP-2011-56	$92,500	Complete	Hire a consultant to develop a flood hazard mitigation plan for the Town of Shandaken that provides overall coordination and improves communication of flood risks, develops flood mitigation measures and strategies, and materials for an application to FEMA's Community Rating System.
Town of Shandaken	Engineering Services for Pine Hill Trail Network	AWSMP-2013-70	$5,000	Complete	Develop plans for a hiking/ biking trail network with stream access and crossings interconnecting Smith Park to Main St., the Morton Memorial Library, and the Town of Shandaken Historical Museum (all town owned).
Town of Shandaken	Local Flood and Feasibility Analysis for Phoenicia and Mt. Tremper	AWSMP-2013-84 AWSMP-2014-101	$72,000 $20,850	Complete	Analyze flood conditions and identify hazard mitigation projects in Phoenicia and Mt. Tremper.
Town of Olive	Local Flood and Feasibility Analysis for Boiceville and West Shokan	AWSMP-2014-100	$76,631	Complete	Analysis of flood conditions and identification of hazard mitigation projects in Boiceville and West Shokan.
Town of Olive	Town of Olive Flood Hazard Mitigation Plan	AWSMP-2014-102	$18,788	Complete	Develop a Town Flood Hazard Mitigation Plan in the NYC Watershed portion of Town of Olive.
Town of Shandaken	Local Flood and Feasibility Analysis for Shandaken and Allaben Hamlets	AWSMP-2016-125	$115,000	Complete	Analysis of flood conditions and identification of hazard mitigation projects in the hamlets of Shandaken and Allaben.
Catskill Center	Pilot Chemical Control of Select Oliverea Japanese Knotweed Stands	AWSMP-2017-131	$3,065	Complete	Pilot chemical control methods on a stand of Japanese Knotweed in Oliverea across several years. Monitor treatment effectiveness and engage volunteers.
CCE Ulster County/Ulster County Dept. of Environment	Ashokan Watershed Stream Crossing Assessment and Prioritization	AWSMP-2017-136	$27,362	Complete	Assess approx. 500 public stream crossings for their potential to fragment streams and disrupt the natural movement of water, sediment, and aquatic organisms. Extend results to stream managers.
Town of Shandaken	Shandaken Flood Mitigation Plan: Required Five-Year Update	AWSMP-2018-141	$47,436	Complete	Hire a consultant to revise the Town's 2013 Flood Mitigation Plan to reflect Town's top flooding priorities in 2018 and beyond. Needed to quality for future flood disaster aid from New York State and/or FEMA.
Town of Shandaken	Enter Community Rating System	AWSMP-2016-126	$15,000	Complete	Hire a consulting firm to assist the Town of Shandaken with taking necessary steps to enter the NFIP CRS program and improve overall flood resilience in the town.
Research and Monitoring					
Organization	Proposal Title	Proposal Number	Award Amount	Status	Purpose of Grant
SUNY New Paltz	Rock Snot in Sick Rivers	AWSMP-2010-8	$4,984	Complete	A research project to investigate the causes of invasive algae

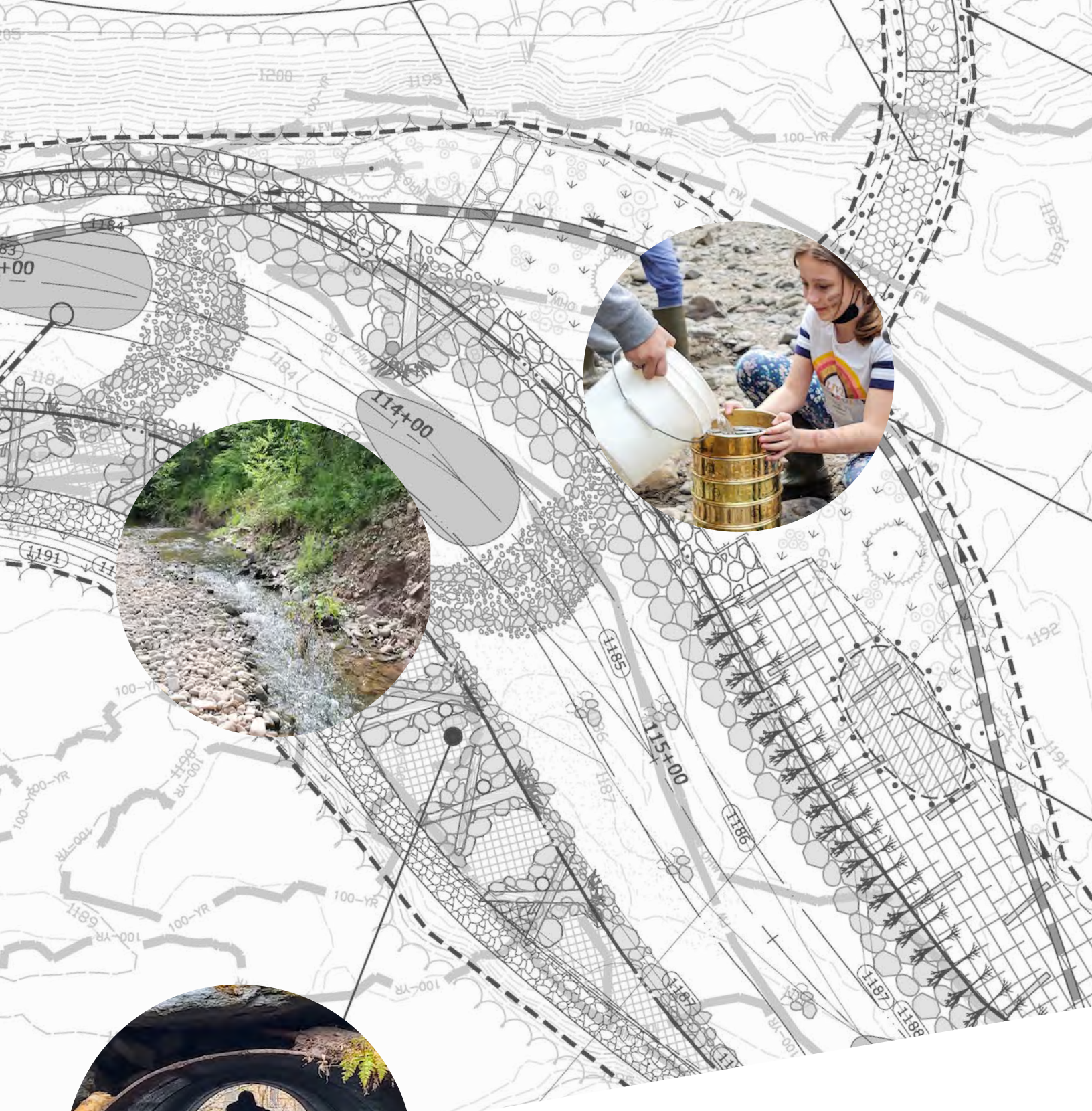
					didymosphenia geminate "didymo." This project sought to find the causes of algae blooms in streams infested with didymo and whether certain factors such as climate, land use, water chemistry or hydrology play a role in the growth and spread of didymo. Funds were used to purchase field supplies for experimentation and sampling and decontamination equipment.
USGS Aquatic	Use of Telemetry to Assess Effects of Shandaken Tunnel on Trout	AWSMP-2010-9	$8,159	Complete	Purchase telemetry equipment used by USGS, DEC, DEP, CCE, and Cornell University to research river trout movements.
USGS Aquatic	Quantitative Assessment of Water Quality in the Upper Esopus Creek	AWSMP-2010-10	$27,080	Complete	Sample fish communities and habitat conditions at sites throughout the Esopus Creek Watershed in the summer of 2010.
NY State Museum/Geological Survey	Applied 3-Dimensional Geologic Mapping in Ulster County, NY	AWSMP-2010-13	$38,037	Complete	Conduct geological mapping in the Ashokan Watershed area.
Ulster County Cornell Coop. Extension	Trimble GPS Unit	AWSMP-2010-14	$8,375	Complete	Purchase a Trimble GPS for watershed-related data collection efforts.
USGS Aquatic	Quantitative Assessment of Fish, Macroinvertebrate, and Periphyton Communities in the Upper Esopus Creek	AWSMP-2010-19	$79,700	Complete	Conduct water quality quantitative assessments in the Upper Esopus Creek. Assess fish and algae populations in the Upper Esopus, the effect of the Shandaken Portal on aquatic organisms, the potential effects of Phoenicia water quality on aquatic organisms, and quantify water quality, sediment load and turbidity throughout the Upper Esopus and in the seven major tributaries to the Esopus for 1-3 years. Characterize temporal and spatial trends in biological indices and water quality. Work conducted in 2011 and 2012 (2011 field survey).
USGS Aquatic	Use of Telemetry to Assess Effects of Shandaken Tunnel on Trout	AWSMP-2010-20	$86,800	Complete	Study the effects of discharges from the Shandaken Tunnel on trout populations in the Upper Esopus Creek. Define the effects turbidity and sedimentation have on the local economy, trout populations, and quality of drinking water in the Upper Esopus Creek and Ashokan Reservoir.
USGS	Quantitative Assessment of Water Quality in the Upper Esopus Creek	AWSMP-2010-22	$90,990	Complete	Study water quality of the upper Esopus Creek. Conduct sampling to characterize fish and other aquatic organisms as well temperature, hydrology, turbidity, sediment, and other variables. Work conducted in 2010 and 2011 (2010 field sampling water quality parameters).
USGS	Monitoring Turbidity, Suspended Sediment Concentrations, and	AWSMP-2011-27	$209,750	Complete	Extend Beaver Kill gage by 1 year and install gage on Warner Creek, collect and analyze sediment and turbidity

	Sediment Loads in the Beaver Kill and Warner Creek Watersheds				samples, measure streamflow and develop a stage-to-discharge rating curve at both stream gages, and analyze how suspended sediment concentration and associated turbidity were impacted by stream restoration and stabilization projects.
SUNY - New Paltz	Characterization of Suspended Sediment in Warner Creek	AWSMP-2011-58	$5,000	Complete	Study the effects of suspended sediment on Warner Creek's ecology and geomorphology.
SUNY - New Paltz	Role of Suspended Sediment on Warner Creek's Ecology	AWSMP-2011-59	$5,000	Complete	Extend work on Warner Creek to conduct Stony Clove Creek watershed characterization. Covers the stipend of a SUNY New Paltz senior geology student.
SUNY New Paltz	Didymo in Esopus Creek: Identification of Bloom	AWSMP-2011-60	$7,400	Complete	Study didymo algae blooms in the Esopus Creek. Continues work done in 2011 to identify locations of didymo, measure water chemistry (a precursor to didymo infestation), test cleaning agents to determine functionality, and continue public education and outreach on techniques to prevent the spread of didymo.
Syracuse University	Bank Erosion Assessment and Analysis in Stony Clove Creek, 2001-2012	AWSMP-2011-61	$45,000	Complete	Resurvey 27 Bank Erosion Monitoring Sites (BEMS) along Stony Clove Creek and establish 10-12 new BEMS. Collect detailed measurements of elevation and calculate the volume of eroded material. Assess methodologies for suitability. Collect samples of stream bank material for physical characterization. Study streamflow data. Identify events most likely to have caused erosion.
USGS Aquatic	Impact of Climate Change (floods) on Stream Ecosystems in the Catskills	AWSMP-2011-62	$30,000	Complete	Assess the impacts of historic August 2011 flooding on the Upper Esopus Creek ecosystem, quantify short- and long-term rates of ecosystem recovery, characterize the effects of emergency channel repairs on the stream ecosystem, and provide data needed to help mitigate negative ecosystem impacts that may occur more frequently than in the past.
The Research Foundation SUNY New Paltz	Assessing the Impact of Groundwater and Heterogeneous Glacial Deposits on Streambank Erosion in the Stony Clove Creek Watershed	AWSMP-2013-74	$30,001	Complete	Study detailed glacial geology and groundwater-surfacewater interactions at study sites along the Stony Clove Creek and Warner Creek to inform understanding of streambank erosion dynamics and treatment options.
USGS Aquatic	Long-Term Effects, Resilience and Recovery of Fish in the Upper Esopus Creek	AWSMP-2013-77	$30,000	Complete	Survey fish assemblages at six-to-nine previously sampled sites in the Upper Esopus Creek during summer 2014 to assess the factors affecting the long-term impacts and (or) recovery of local fish populations and communities after floods. Continues work started

					under AWSMP-2010-19 and AWSMP-2011-62.
The Research Foundation SUNY New Paltz	Assessing the Impact of Groundwater and Heterogeneous Glacial Deposits on Streambank Erosion in the Stony Clove Creek Watershed	AWSMP-2013-74	$30,001	Complete	Study detailed glacial geology and groundwater-surfacewater interactions at study sites along the Stony Clove Creek and Warner Creek to inform understanding of streambank erosion dynamics and treatment options.
USGS	Long-term Trends in Rainbow Trout Growth and Naturalized Populations in the Ashokan Basin	AWSMP-2014-94	$116,338	Complete	Study Rainbow Trout growth in the Ashokan Reservoir and long-term trends in their population sizes in the upper Esopus Creek. Conduct annual fish community surveys at six sites in 2015 and 2016.
USGS	Long-term monitoring of fish communities in the Upper Esopus Creek	AWSMP-2016-120	$35,781	Complete	Conduct annual fish community surveys in 2017 and 2018 at six previously surveyed sites to collect data that can be used to investigate long-term temporal trends in trout populations and fish communities.
Stantec Consulting Inc.	BANCS Model Calibration and Validation: Ashokan Watershed Predictive Regional Curve	AWSMP-2016-121	$260,260	Complete	Calibrate and validate the BANCS model to predict sediment supply contributed by bank erosion within the Ashokan Watershed. Pilot and test 3D laser scanning of banks.
SUNY New Paltz	Measure stream water temperature and evaluate spatial and temporal variation of thermal regime in the upper Esopus Creek Watershed	AWSMP-2016-122	$40,000	Complete	Measure stream water and air temperature in the Esopus Creek Watershed, predict dominant environmental variables controlling stream water temperature, and map thermal variation of water temperature over time and space.
U.S. Geological Survey	Analysis of Strategies to Monitor and Detect Change in Fish Assemblages of the Upper Esopus Creek	AWSMP-2018-138	$52,092	Complete	Determine the most effective strategies to monitor and detect changes in important fish resources across the Upper Esopus Creek watershed. Develop recommendations for future monitoring efforts while maintaining adequate statistical power to detect a biologically meaningful change in important natural resources.
Ashokan-Pepacton Watershed Chapter Trout Unlimited	Catskill Heritage Brook Trout Study	AWSMP-2018-142	$500	Complete	Study upper Esopus Creek tributaries for the possible existence of Catskill heritage brook trout in South Hollow Brook, a tributary to the Bushkill in West Shokan.
USGS	Continued Monitoring of the Wilmot Way Sediment and Turbidity Reduction Project in the Woodland Creek Watershed	AWSMP-2019-153	$14,953	Complete	Monitor suspended sediment concentrations and turbidity at the Wilmot Way bridge and upstream of the Woodland Creek Stream Restoration Project completed in 2018. This project continues funding for post-construction monitoring through 2020.
USGS	Continuation of Sediment Source Fingerprinting and	AWSMP-2018-145	$33,464	Complete	Contribute to production of bedload sediment discharge rating curves by sampling and measuring bedload at two locations within the upper Esopus

	Quantifying Bed Transport				Creek watershed. Collect suspended sediment samples for sediment fingerprinting analysis.
USGS	Continued Monitoring of the Wilmot Way Sediment and Turbidity Reduction Project in the Woodland Creek Watershed	AWSMP-2019-153	$14,953	Complete	Monitor suspended sediment and turbidity at the Wilmot Way bridge and upstream of a stream restoration project completed in 2018. This project continues funding for post-construction monitoring through 2020.
USGS	Fabrication and Testing of Submerged Load Cell Systems to Quantify Bed Transport in the Upper Esopus Creek / Active and Passive Tracer Monitoring	AWSMP-2019-154	$57,889	Complete	Fabricate and lab-test two submerged load cell systems as a method for estimating bedload transport. Continue monitoring active and passive tracer rocks deployed in the Stony Clove Creek.
Restoration					
Organization	Proposal Title	Proposal Number	Award Amount	Status	Purpose of Grant
Town of Woodstock	Beaver Kill Channel Protection	AWSMP-2011-16	$5,700	Complete	Repair a breached section of steam bank on outside stream bend. During medium and high flows, this section diverts into a channel behind the streambank. Repair a stacked rock wall constructed on both sides of stream.
Town of Woodstock Hwy Dept.	Beaver Kill at Mink Hollow Projects	AWSMP-2011-17	$102,900	Complete	Projects to mitigate stream and road damages along Mink Hollow Road in the Town of Woodstock. Includes: above Van Hoagland Road reconnect the floodplain previously blocked by berms; stabilize the creek bed below a failed rock wall; and remove the buildup of LWD threatening to move the creek closer to road.
Town of Shandaken	Stony Clove at Phoenicia	AWSMP-2011-18	$234,000	Complete	Implement a stream restoration project to reduce Phoenicia flooding from the Stony Clove.
Ulster County Soil and Water Cons. District	Stony Clove at Chichester Site 1	AWSMP-2011-21	$431,337	Complete	Implement a stream restoration project to improve channel stability and water quality on the Stony Clove Creek (Chichester #1).
Town of Shandaken	Mitigation Grant Match Funds (Brown Road)	AWSMP-2011-63	$200,000	Discontinued	Provides matching funds to a HMGP grant to mitigate Brown Road.
Ulster County Dept. of Public Works	Maltby Hollow Brook Restoration - Post Irene	AWSMP-2011-66	$10,475	Complete	Maltby Hollow Brook's main channel was altered during tropical storm Irene. To mitigate potential dangers of flooding from future rainfall events, the County is going to remove the trees, excess sediment and debris in Maltby Hollow Brook and stabilize banks.
Town of Olive	Maltby Hollow Stream Feature Inventory and Erosion Site Assessment	AWSMP-2014-87	$30,219	Complete	Conduct a stream feature inventory and assess bank erosion on the Maltby Hollow Creek, a tributary to the Bush Kill.

Ulster County Department of Public Works	Bushkill / Watson Hollow Slope Stabilization	AWSMP-2015-103	$68,000	Complete	Engineering and design for Bush Kill streambank stabilization along Ulster County Rt. 42 in the Town of Olive.
Town of Shandaken	Final Design and Construction Fox Hollow Grade Control by Herdman Bridge	AWSMP-2015-110	$13,694	Complete	Field survey and conceptual design memo completed to investigate the need for a grade control structure on Fox Hollow Creek at the Town of Shandaken Herdman Road bridge. No active channel instability determined and treatment not recommended at this time. Monitor and reevaluate as needed.
Ulster County SWCD	Stony Clove Creek at Wright Road Stream Restoration	AWSMP-2015-112	$500,000	Complete	Local match for the EWP for the Stony Clove Creek at Wright Road stream project, in the Town of Hunter, Greene County, NY.
Town of Olive Highway Department	Hillside Drive Culvert Replacement over Dry Brook	AWSMP-2015-113	$344,000	Complete	Replace existing culvert with culvert better aligned with stream and able to pass the 100-year flow. Current culvert is a hydraulic constriction and in poor condition. Loss of the culvert would cut off access to 15 homes.
Town of Hunter	Town of Hunter Stream Restoration Project	AWSMP-2017-135	$8,650	Complete	Town costs associated with the Emergency Watershed Protection (federal) funded stream restoration project and hillslope stabilization at Stony Clove Creek Wright Rd. The Town of Hunter was project sponsor.



Front cover photos clockwise: USGS fish community survey Elk Bushkill; CSBI riparian buffer planting; Ox Clove Creek; Warner Creek restoration project construction; flooding Oliverea Road Esopus Creek headwaters; Watershed Detectives afterschool program learning to survey streams.

Back cover photos clockwise: Learning to sample, sort, and size bar sediment at Stream Explorers youth conference; field training on road-stream crossing assessment; bank erosion at Warner Creek 1 before restoration. Background image Warner Creek 1 plan detail.

All photos taken 2021.