

Ashokan Watershed Stream Management Program 2015-2017 Action Plan



ASHOKAN WATERSHED
STREAM MANAGEMENT
PROGRAM

Cornell Cooperative
Extension of Ulster
County

Ulster County Soil and
Water Conservation
District

USDA Natural Resource
Conservation Service

New York City
Department of
Environmental Protection

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Cover Photo: The Esopus Creek floodplain at downtown Phoenicia, NY. The AWSMP is assisting the Town of Shandaken with completing an engineering analysis to identify flood hazard mitigation solutions for Phoenicia and Mt. Tremper.



ASHOKAN WATERSHED STREAM MANAGEMENT PROGRAM

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To: Danyelle Davis, Project Manager, NYC DEP Stream Management Program
From: Leslie Zucker, CCE Ulster County and Adam Doan, Ulster County SWCD
Date: May 8, 2015
Re: Ashokan Watershed Stream Management Program 2015-2017 Action Plan

Cornell Cooperative Extension of Ulster County (CCE), Ulster County Soil & Water Conservation District (UCSWCD), and the NYC Department of Environmental Protection (DEP) have developed the 2015-2017 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 in support of recommendations derived from stream management plans and working group input. The current set of recommendations was updated and reviewed by our Advisory Council and stakeholders in 2015.

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 and recommendations are fully revised biannually. This proposed plan will run from June 1, 2015 until May 31, 2017, at which time the recommendations will be revised based on new stream assessments and program needs.



Cornell University
Cooperative Extension
Ulster County



Soil and Water
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2015-2017 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 2015-2017. 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. For each topic area a list of recommendations, derived from Stream Management Plans and the program's working groups, are provided in *italicized text*. 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 (CCE), the Ulster County Soil and Water Conservation District (UCSWCD), 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, the Upper Esopus Creek in 2007, and the Beaver Kill in 2015. In subsequent years, AWSMP completed stream assessments of Woodland Creek, Beaver Kill, Warner Creek, Birch Creek, Bush Kill, Bushnellsville Creek, and the Stony Clove Creek was reassessed.

A Filtration Avoidance Determination (FAD) granted to NYC in 2007 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, 2015 - May 31, 2017 and spans the completion of five-year contracts for CCE and UCSWCD and the start of new five-year contracts in 2014 (CCE) and 2015 (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"). To date, over \$2,000,000 has been allocated to implementation 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 2015-2017 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 to two streams per 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 2014 and 2015. One stream per year may be subject to a rapid Phase 2 reassessment if conditions appear to be degrading.*
2. *Support stream investigations by other organizations in the Ashokan Watershed, with an emphasis on turbidity reduction.*
3. *Develop an advanced conceptual model, applicable to the Ashokan Watershed, of Catskill stream channel and sediment processes that incorporates probable channel and sediment loading responses to expected climate change. The model will assist stream managers with planning for protection of water resources, water quality and geomorphic monitoring investigations, and prioritization of stream channel stabilization practices.*
4. *Provide funding for study of stream condition and function, and monitoring of system condition and management practices through the Stream Management Implementation Program (SMIP).*
5. *Develop a strategy for consolidating existing and future Stream Management Plans and assessments into one Ashokan Watershed Plan.*

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 2003
Esopus Creek	Towns of Shandaken and Olive	Completed 2007

Streams	Location	Current Status
Woodland Valley	Town of Shandaken	Completed 2008
Beaver Kill	Towns of Shandaken and Woodstock	Completed 2010
Warner Creek	Town of Shandaken and Woodstock	Completed 2010
Birch Creek	Town of Shandaken	Completed 2012
Bushkill	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
Esopus Creek Headwaters	Town of Shandaken, Oliverea Reach	2015-2016
Woodland Valley	Town of Shandaken	Mainstem reassessment 2015
Stony Clove Creek Tributaries	Towns of Shandaken and Hunter	2015
Fox Hollow Creek	Town of Shandaken	TBD
Peck Hollow	Towns of Shandaken and Lexington	TBD
Little Beaver Kill	Town of Woodstock	TBD
Ashokan Reservoir Tributaries	Town of Olive and Town of Hurley	TBD

ASHOKAN WATERSHED TURBIDITY MONITORING PROJECTS

In summer 2015, DEP anticipates beginning a multi-year geomorphic and suspended sediment/turbidity (SS/T) monitoring study in the Stony Clove Creek watershed and SS/T monitoring study in the Upper Esopus Creek watershed. Anticipated work in 2015 is to conduct modified Phase 2 SFI and Phase 3 assessments in tributaries to Stony Clove Creek to help inform water quality monitoring station site selection in 2016. Water quality monitoring will be implemented through an agreement with USGS and is anticipated to start in 2016. This work is expected to continue through 2025.

ASHOKAN WATERSHED SMIP PROJECTS SUPPORTING STREAM ASSESSMENT & MONITORING (ACTIVE 2015)

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
USGS	Monitoring Turbidity, Suspended Sediment Concentrations, and Sediment Loads in the Beaver Kill and Warner Creek Watersheds	AWSMP-2011-27	\$209,750	Active	Extend Beaver Kill gage by 1 year and install gage on Warner Creek, collect and analyze sediment and turbidity 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	Assessing the Impact of Groundwater and Heterogeneous Glacial Deposits on Streambank Erosion in the Stony Clove Creek Watershed	AWSMP-2014-74	\$30,000	Active	Study detailed glacial geology and groundwater-surface water interactions at study sites along the Stony Clove Creek and Warner Creek to inform understanding of streambank erosion dynamics and treatment options.
Town of Olive	Maltby Hollow Stream Feature	AWSMP-2014-87	\$20,000	Active	Conduct a stream feature inventory and assess bank erosion for the Maltby

	Inventory and Erosion Site Assessment				Hollow, a tributary to the Bush Kill. Project runs June through December 2015.
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STREAM RESTORATION/STABILIZATION PROJECTS TO RESTORE STREAM SYSTEM STABILITY AND/OR REDUCE CHRONIC TURBIDITY INPUTS

7. 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.
8. A current emphasis is the Stony Clove Creek, which has been shown through water quality monitoring to be the predominant source of chronic turbidity in the Ashokan Watershed. Complete additional stream restoration projects in the Stony Clove watershed in 2014 and 2015. Utilize NRCS Emergency Watershed Protection (EWP) Program funds for implementation.
9. SMIP funding for 2014-2019, along with funds provided to UCSWCD for stream restoration projects, will be used to implement additional projects expected to have a measurable reduction in turbidity. Support efforts to obtain additional funding to pursue this goal.
10. Coordinate with the Town of Shandaken and County DPW to conduct a geomorphic assessment of the Esopus Creek at Olivera. The diagnostic assessment is to provide information needed 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 2014)

UCSWCD	Stony Clove Creek at Wright Rd.	Costs to be Determined	2015
	<i>Protect vulnerable properties and infrastructure, reduce source of chronic turbidity and enhance habitat and stream stability.</i>		
UCSWCD	Chichester Reach Hillslope Bioengineering and Channel Structure Modification	Costs to be Determined	2015
	<i>Utilize bioengineering techniques to protect soils and establish native vegetation along treated hill slope of Chichester 2 project and modify instream structure between Sites 3 and 4 to provide long-term stability.</i>		

Possible 2015-16 projects (project selection is subject to change pending annual stream corridor geomorphic assessments and affected landowner support):

UCSWCD	Woodland Creek – Esopus Creek Confluence Project	Costs to be Determined	2016
	<i>Repair Esopus Creek at Woodland Valley Demonstration Project damaged by TS Irene and extend treatment to the Woodland Creek to treat eroding bank that is a chronic source of turbidity.</i>		

UCSWCD	FAD Deliverable Turbidity Reduction Project	Costs to be Determined	2016
<i>Project to be determined.</i>			

ASHOKAN WATERSHED SMIP PROJECTS SUPPORTING STREAM RESTORATION (ACTIVE 2015)

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
Town of Woodstock	Beaver Kill at Mink Hollow Project	AWSMP-2011-17	\$102,900	Active	Projects to mitigate stream and road damages along Mink Hollow Rd. Reconnect floodplain previously blocked by berms; stabilize the creek bed below a failed rock wall; and remove the buildup of large woody debris threatening to move the creek closer to Mink Hollow Rd.

MONITORING OF STREAM PROJECTS

8. *Annually monitor performance of stream corridor projects funded by the Ashokan Watershed Stream Management Program.*
 - a. *Stony Clove at Phoenicia Main Street Project – Continue survey monitoring to track sediment deposition fluctuations per DEC permit.*
 - b. *Stony Clove at Chichester Projects (#1, 2, 3, 4) – Monitor per requirement of ACOE permit.*
 - c. *Warner Creek Site #5 – Monitor per requirements of ACOE permit.*
 - d. *Stony Clove at confluence with Warner Creek Project – Monitor per requirement of ACOE permit.*
 - e. *Stony Clove at Stony Clove Lane Project – Monitor per requirement of ACOE permit.*
9. *Monitor turbidity and suspended sediment at stream restoration project sites before and after project construction to quantify effects on water quality.*

OUTREACH, EDUCATION AND TECHNICAL ASSISTANCE TO ENCOURAGE STREAM STEWARDSHIP - RECOMMENDATIONS

9. *Distribute Stream Stewardship Principles to relevant entities.*
10. *Hold meetings of the AWSMP Stakeholder Council (3-4 per year) and working groups to solicit participation and input from local community members.*
11. *Provide outreach to municipal officials, agencies, affected landowners, and the public about findings from stream assessments and planned stream restoration projects.*
12. *Develop an outreach tool for transferring stream assessment data to managers in a user-friendly format.*

13. Provide youth education in partnership with the Onteora School District to teach stream and watershed science to students through field studies, and after-school and classroom programs.
14. Fund public education and outreach activities that promote stream stewardship through the SMIP.
15. Develop written education and outreach materials for streamside landowners and other watershed stakeholders. Use a variety of media (newsletters, fact-sheets, press, video, and website) to disseminate information about the program and encourage stream stewardship (1-2 fact sheets per year).
16. Offer trainings that promote an understanding of effective stream and floodplain management strategies for local stakeholders (1 per year).
17. Participate in local community events to promote the goals of the Ashokan Watershed Stream Management Program.
18. Organize an Ashokan Watershed Conference to provide general education to watershed residents and train municipal officials in specific topics (1 every two years).
19. Co-organize a Catskill Environmental Research and Monitoring conference to disseminate the results of river and watershed studies (1 every two years).
20. Hold stream walks and other public engagement events (10 per year).
21. 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 2015)

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
Ulster County Department of Public Works	Applied Fluvial Geomorphology Training for UCDPW Staff	AWSMP-2014-89	\$3,410.00	Active	Funding to send Ulster County Civil Engineer, Andrew Emrich to Applied Fluvial Geomorphology Training (Rosgen Level II) in Asheville, NC.
Willow Mixed Media, Inc.	Fish Tales: A Documentary Film	AWSMP-2014-95	\$31,700	Active	A documentary film about the Ashokan watershed fishery and its history.

B. Floodplain Management and Planning

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

SUMMARY OF RECOMMENDATIONS IN 2015-2017 ACTION PLAN AND ALLOCATION OF SMIP FUNDING IN SUPPORT OF RECOMMENDATIONS

FLOODPLAIN ASSESSMENT - RECOMMENDATIONS

1. *Assist communities with the review of flood studies and revisions to the existing Flood Insurance Rate Maps (FIRMs) produced by FEMA.*
2. *Provide SMIP funds for the identification of natural floodplain areas that enhance sediment, debris, and water storage; riparian and aquatic habitat; and flood elevation reductions in downstream areas. Work with local planners and landowners to identify and implement protection strategies for these critical areas.*

COORDINATION OF FLOODPLAIN MANAGEMENT EFFORTS IN THE WATERSHED - RECOMMENDATIONS

3. *Promote Town development of Flood Hazard Mitigation Plans in the Ashokan Watershed.*
4. *Coordinate with flood commissions and working groups (e.g., SAFARI, NY Rising Community Reconstruction Program) 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. Where existing communities, structures and facilities are in at-risk locations, encourage the application of flood-proofing measures or relocation.*
5. *Assist municipalities with implementation of local flood analysis in watershed population centers that require engineering and modeling analysis and public input to select projects that will lower flood elevations.*
6. *Provide \$250,000 in funds for local flood hazard mitigation analysis and \$1,750,000 in funds for LFA-recommended and Town-adopted implementation projects through 2019, and assistance with obtaining additional state and federal funding for project implementation.*
7. *Encourage towns in the watershed without All-Hazard Mitigation Plans to develop plans. Additionally, work with towns that did not adopt the County's All-Hazard Mitigation Plan (2009) to participate in and ultimately adopt the revised County Plan (to be completed 2016).*
8. *Assist all Ashokan watershed towns with using information in the County All-Hazard Mitigation Plan and local flood mitigation plan(s) to access state and federal mitigation funding following declared emergencies or for pre-disaster mitigation grant projects.*

ASHOKAN WATERSHED SMIP PROJECTS SUPPORTING COORDINATION WITH FLOODPLAIN MANAGEMENT EFFORTS IN THE WATERSHED (ACTIVE 2015)

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
Town of Shandaken	Local Flood and Feasibility Analysis for Phoenicia and Mt. Tremper	AWSMP-2013-84 AWSMP-2014-101	\$72,000.00 \$20,850	Active	Analysis of flood conditions and identification of hazard mitigation projects in Phoenicia and Mt. Tremper.
Town of Olive	Local Flood and Feasibility Analysis for Boiceville and West Shokan	AWSMP-2014-100	\$70,995	Active	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	\$24,285	Active	Develop a Town Flood Hazard Mitigation Plan in the NYC Watershed portion of Town of Olive.

OUTREACH, EDUCATION AND TECHNICAL ASSISTANCE FOR FLOODPLAIN MANAGEMENT IN THE ASHOKAN WATERSHED - RECOMMENDATIONS

9. *Provide training and assistance for local floodplain managers and municipal officials in using revised FIRMs (Flood Insurance Rate Maps) and other FEMA datasets, and understanding NFIP requirements.*
10. *Increase access to flood prevention/protection information in the watershed.*
11. *Establish a Flood Hazard Mitigation (FHM) Working Group for the Ashokan Watershed as a forum to provide technical assistance for a range of topics (at least 2 meetings per year): How to develop Flood Hazard Mitigation Plans; Review of floodplain ordinances; Participation in FEMA’s Community Rating System; Implementation of FHM recommendations; Access to funding; and Coordination between local, county, and state partners engaged in flood response and flood mitigation.*
12. *Provide funding for Code Enforcement Officers and Floodplain Administrators to attend training sessions on flood related issues and become Certified Floodplain Managers.*

ASHOKAN WATERSHED SMIP PROJECTS SUPPORTING COORDINATION WITH FLOODPLAIN MANAGEMENT EDUCATION IN THE WATERSHED (ACTIVE 2015)

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
Towns of Lexington, Olive, Woodstock, and Shandaken	NYSFSMA Annual Conference Attendance and CFM Continuing Education	AWSMP-2013-85 AWSMP-2014-86 AWSMP-2014-88 AWSMP-2014-99	\$988.15 \$2,143 \$952 \$3,842	Active	Send Town officials to floodplain manager’s conference to attend trainings and acquire or maintain Certified Floodplain Manager certification.

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 2015-2017 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. Develop programs to provide road maintenance crews with additional resources for seeding newly cleaned ditches with native ground cover appropriate for reclamation. One such program may be an agreement to access machinery for seeding or mulching to be shared by Towns.*
3. *Continue working with Towns to reduce sediment loadings 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.*

REDUCING HYDRAULIC CONSTRICTIONS IN STREAMS: BRIDGES AND CULVERTS

4. *Collaborate with state and local highway departments and stream management personnel to develop specifications for applying natural channel design concepts to bridge and culvert rehabilitation and replacement.*

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

5. *Collaborate with local, county and state highway departments to apply natural channel design concepts to streambank stabilization along roadsides.*
6. *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 2015)

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
Town of Olive	Dry Brook at Hillside Drive Bridge	AWSMP-2013-69	\$20,000	Active	Engineering for design of a culvert replacement for the Hillside Drive crossing.
Town of Shandaken	Woodland Creek at Fawn Hill Rd. Bridge Grade Control	AWSMP-2013-78	\$10,000	Active	Engineering to install grade control downstream of the Fawn Hill Bridge to stop head-cut moving toward bridge.
Town of Shandaken	Fox Hollow Creek at Fox Hollow Rd. Bridge Grade Control by Panther Mountain Trail	AWSMP-2013-79	\$10,000	Active	Conceptual design for project to stop head-cut moving toward the upper bridge on Fox Hollow Rd. across from Panther Mountain Park entrance. Retaining walls are falling and endangering the bridge and streambanks.
Town of Shandaken	Fox Hollow Creek at Herdman Rd. Bridge Grade Control	AWSMP-2013-80	\$10,000	Active	Engineering to install grade control to prevent headcut and scour endangering the Herdman Rd. bridge off Fox Hollow Rd.
Ulster County Dept. of Public Works	Mine Hollow Creek Culvert Replacement	AWSMP-2014-90	\$60,000	Active	Replace and resize under-sized culvert on Mine Hollow, a tributary to the Bush Kill.

OUTREACH, EDUCATION AND TECHNICAL ASSISTANCE TO HIGHWAY MANAGERS AND EXCAVATION CONTRACTORS

7. *Organize Highway Manager's Working Group meetings with all 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 (3-4 per year).*
8. *Hold a highway manager and contractor training on installation of stream best management practices (1 in 2015-17).*
9. *Provide SMIP funds for highway and infrastructure management projects with benefits to water quality and stream system integrity.*

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 2015-2017 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.*

STREAMSIDE LANDOWNER FINANCIAL ASSISTANCE

2. *Offer and encourage participation in landowner incentive programs to encourage voluntary participation in stream and riparian zone protection and enhancement.*

Ashokan Watershed CSBI Projects

2015	Design and implementation of Bushkill bioengineering project 2-3 standard CSBI plantings using potted materials, live stakes, and native seeding 4-5 Customized Riparian Corridor Management Plans for streamside landowners Continue CSBI project monitoring Enhance in-house native willow & dogwood cutting source areas at Coldbrook Rd & New Paltz locations
2016	Implementation of Upper Esopus bioengineering project TBD standard CSBI plantings Continue CSBI project monitoring

OUTREACH, EDUCATION AND TECHNICAL ASSISTANCE TO STREAMSIDE LANDOWNERS

3. *Provide site visits and office consultations with local landowners, municipalities, contractors and others for designing and implementing best management practices to reduce erosion.*
4. *Develop educational products (fact sheets, guidebooks, videos, etc.) to educate landowners on best management practices, such as riparian planting design and maintenance, and guidelines for proper sizing of private stream crossings.*
5. *Develop reliable local sources of native plant material for stream and riparian improvement projects. Maintain the 2012 installation of 10,000+ live willow stakes to create cutting beds that will be used in future riparian restoration projects. These fields must be maintained for a 2-year period (2013-2015) before material will be available.*

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 2015-2017 ACTION PLAN AND ALLOCATION OF SMIP FUNDING IN SUPPORT OF RECOMMENDATIONS

STREAM ECOSYSTEM ASSESSMENT

1. *Identify riparian areas of particular environmental benefit or concern and create a database of targeted properties for riparian zone improvement programs.*
2. *Continue research, evaluation, and monitoring of aquatic ecosystems in the Watershed to improve best management practices as they relate to habitat and ecosystems. Support biological monitoring and studies of wildlife, their habitats, and interactions in the watershed by public agencies and interest groups.*
3. *Provide funding for study of stream condition and function, and monitoring of system condition and management practices through the SMIP related to habitat and ecosystems.*

OUTREACH, EDUCATION AND TECHNICAL ASSISTANCE FOR AQUATIC AND RIPARIAN HABITAT AND ECOSYSTEMS

4. *Work with regional organizations to develop and disseminate outreach materials and offer public programs on critical invasive species for the West of Hudson Watersheds.*
5. *Work with watershed municipalities to evaluate local ordinances such as comprehensive plans, zoning regulations, site plan review laws, subdivision laws and floodplain ordinances to determine if adequate consideration is given to impacts on riparian and aquatic ecosystems.*
6. *Hold Stream Ecosystem Working Group meetings to advise the program on stream system 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).*
7. *Update the Stream Ecosystem Research & Assessment Strategy for the Upper Esopus Creek.*
8. *Participate in inter-basin Riparian Buffers Working Group.*
9. *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/>.*

ASHOKAN WATERSHED SMIP PROJECTS SUPPORTING AQUATIC AND RIPARIAN HABITAT AND ECOSYSTEM ASSESSMENT (ACTIVE 2015)

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
USGS	Long-term Effects, Resilience, and Recovery of Fish Assemblages in the Upper Esopus Creek	AWSMP-2013-77	\$30,000	Active	Survey fish assemblages at six-to-nine previously sampled sites in the Upper Esopus Creek during summer 2014 and 2015 to assess the factors affecting the long-term impacts and (or) recovery of local fish populations and communities after floods. Prepare a USGS web-based report (4-to-8 page factsheet) that summarizes important findings during 2014 and 2015. Continues work started under AWSMP-2010-19 and AWSMP-2011-62.
USGS	Long-term Trends in Rainbow Trout Growth and Naturalized Populations in the Ashokan Basin	AWSMP-2014-94	\$100,938	Active	Study Rainbow Trout growth in the Ashokan Reservoir and long-term trends in their population sizes in the upper Esopus Creek.

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 2015-2017 ACTION PLAN AND ALLOCATION OF SMIP FUNDING IN SUPPORT OF RECOMMENDATIONS

ENHANCING PUBLIC ACCESS TO THE STREAMS

1. *Identify and assess potential stream access sites in the watershed. Investigate opportunities to develop multi-use, low-impact trail systems along the stream corridors. Trails for hiking, biking, cross country skiing and snowshoeing could provide multiple benefits, including drawing visitors to local resorts and increasing user awareness of stream management issues. Make improvements to existing stream access sites. 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. *Explore opportunities for and impacts of operational adjustments of the Shandaken Tunnel to accommodate the needs of biota along with other stakeholders.*
3. *Work with Stream Access and Recreation Committee and other stakeholders on developing a plan of action to modify the policy related to recreational releases to the Shandaken Tunnel and ensure mutually beneficial results for all stream users that do no harm.*
4. *Determine a good area for either new trail construction or existing trail improvement that would provide greater public access to streams.*
5. *Monitor conditions at existing public access sites to determine need for repairs, enhancements and/or improvements*
6. *Utilize the Town of Shandaken Recreation Master Plan and recreation and access documents from all watershed towns when developing programs and projects. Work closely with Town of Shandaken Parks and Recreation Committee and their counterparts in other watershed towns to develop and execute projects.*
7. *Work with DEP, DEC, County, Town, and other entities to assess possibility of utilizing flood buy-out properties for recreational and educational purposes.*
8. *Explore possibility of creating educational opportunities alongside recreational areas such as interpretative nature trails, wildlife viewing areas, bird observation points, "photo safaris," hiking/biking/walking/running trails, kiosks and educational signage, etc.*
9. *Collaborate with chambers of commerce, tourism industry, and others to promote the area as a destination. This will help spread the message of good stream management to a wider audience and strengthen and improve the local economy.*

EDUCATION FOR RECREATIONAL USERS OF STREAMS

- 10. *Develop and host at least one major educational event/conference/meeting devoted to stream access and recreation issues. Past topics have included Shandaken Tunnel Recreational Releases. Potential future topics include: in-stream debris management, laws and policies relating to navigable waterways, and handicap accessibility issues.*
- 11. *Provide a forum that will give all stakeholders (anglers, whitewater enthusiasts, environmental conservation groups, et. al.) a place to safely let their voices be heard and to improve relationships between these important groups.*
- 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.*

ASHOKAN WATERSHED SMIP PROJECTS SUPPORTING EDUCATION AND OUTREACH FOR RECREATIONAL USERS OF STREAMS (ACTIVE 2015)

Organization	Proposal Title	Proposal Number	Amount	Status	Purpose of Grant
Town of Shandaken	Engineering Services for Pine Hill Trail Network	AWSMP-2013-70	\$5,000	Active	Develop plans for an extensive hiking/ biking trail network with stream access and crossings interconnecting Smith Park (town owned) to Main St., the Morton Memorial Library (town owned), and the Town of Shandaken Historical Museum (town owned).

Appendix A: Summary of Completed Projects 2009-2014

STREAM ASSESSMENTS

Streams	Location	Status
Broadstreet Hollow	Towns of Shandaken and Lexington	Completed 2001
Stony Clove	Towns of Shandaken, Woodstock, Hunter, and Lexington	Completed 2003
Esopus Creek	Towns of Shandaken and Olive	Completed 2007
Woodland Valley	Town of Shandaken	Completed 2008
Beaver Kill	Towns of Shandaken and Woodstock	Completed 2010
Warner Creek	Town of Shandaken and Woodstock	Completed 2010
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	Completed mainstem reassessment 2013

STREAM RESTORATION/STABILIZATION PROJECTS

Town	Project	Goal	Construction Cost	Status
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

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.

Project	Town	Goal
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.

EDUCATION AND OUTREACH PROJECTS

Publications			
Type	Title(s)	Audience	Status
Stream Management Plans	Upper Esopus Creek Management Plan (2007)	Watershed residents, stream managers, municipal officials, project partners	Completed for mainstem of Esopus Creek and several tributaries; a combined Ashokan Watershed SMP is planned for the future
Newsletter	Esopus News	Streamside landowners and project partners	2009 (3 issues) 2010 (2 issues) 2011 (3 issues) 2012 (3 issues) 2013 (2 issues) 2014 (3 issues)
Fact Sheets	Large Woody Debris Stream Guide (2012) Flood Preparedness Stream Guide (2012) Native Plant Stream Guide (2012)	General public, municipal employees, and streamside landowners	3 fact sheets completed (2009-2013)
Videos	Ashokan Conf – Speaker Presentations Ashokan Conf - Why We Are Here Ashokan Conf – Bark Peeling Ashokan Conf – Climate Change Ashokan Conf – Rivers are Dynamic Ashokan Conf – Stable Rivers Need Room Ashokan Conf - Dredging		2014
Program Brochure	Guide to the Ashokan Watershed Stream Management Program	General public	Brochure completed 2011 Updated annually 2012-2014
Displays and Kiosks	AWSMP Program Esopus Creek Demo Project	General public	Updated annually Updated 2013
Action Plan	2009-2011 Action Plan 2010 Update 2011-2013 Action Plan 2012 Update 2013-2015 Action Plan 2014-2016 Action Plan 2015-2017 Action Plan	Project partners, municipal officials, applicants for funding, interested members of the public, FAD regulators	Updated annually

Social Media	www.ashokanstreams.org www.facebook.com/AWSMPULster Twitter@AshokanStreams	General public	2011 Website published 2013 Website redesign Updated weekly
Press Releases	Projects and Events	General public	2011 (6) 2012 (15) 2013 (10) 2014 (16)
Email News Alerts	Various	Streamside landowners, municipal officials and project partners	Annually 2011-2014
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
Research Symposium	Catskill Environmental Research and Monitoring (CERM)	Researchers, resource managers, project partners, interested members of the public	CERM 2010, 2012, 2014
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)	Highway and DPW staff, stream managers, contractors, and program staff	2009-2013
Floodplain Management Trainings	NYS Floodplain and Stormwater Manager's Conference and Certified Floodplain Manager Training (2010-2014) NFIP Educational Session (2013) CFM Exam Review (2014) Floodplain Mapping Fundamentals (2014) Benefit-Cost Analysis (2014) Using Depth Grids (2014)	Code enforcement officers, planning board members, town board members, and program staff	2010-2014
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)	Streamside landowners	2009-2011
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)	General public, streamside landowners	2009-2014
Volunteer Buffer Plantings	Various locations	General public, streamside landowners, students/interns	Annually 2010-2013
Booths and Displays	Shandaken Day Big Indian Spring Festival Olive Day Woodstock Library Day Ulster County Creek Week Ashokan Hoots Ulster County Fair	General public, streamside landowners	Annually 2009-2014

	Ashokan Watershed Conference Emerson Festival Mountain Valley Little League Day		
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	Grant Outreach Meetings Stream Project Meetings NYC Watershed Education & Outreach Meetings Riparian Buffer Working Group Meetings CRISP Meetings FEMA Meetings NYC Watershed Partner Meetings CWT and CWC Meetings	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) Rochester Hollow Stream Walk (2013) Kanape Brook Stream Walk (2013) Trout Unlimited Meetings (2009-2013) Little Beaver Kill Stream Walk (2014) Warner Creek Stream Walk (2014)	General public	Annually, as available
Youth Education			
Type	Title	Audience	Status
Presentations and Trainings	4-H Stream Team Stream Table Demo (2013) CCE Centennial Stream Table Demo (2013) UC Fair Floodplain Model Demo (2013) UC Fair Stream Table Demo (2014) Bennett Elementary Earth Day Macroinvertebrate Table (2011-2014)	Youth multiple ages	Annually, as available
After-School Activities and Classroom Enrichment	Watershed Detectives Club, Grades 4-6 Classroom Enrichment, Grades 4-6	Bennett Intermediate School	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 3-4x 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 4x per year
Stream Access & Recreation Working Group	To make recommendations for stream access/recreation improvements in the Ashokan Watershed	Project partners, recreation groups, municipal officials, local business owners	Meet 3-4x per year
Highway Managers Working Group	To exchange information and identify opportunities for technical or financial assistance to improve stream management	Highway managers, project partners	Meet 4-6x 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	Met 2x per year through 2011; Committee inactive 2012-2013

Aquatic Ecosystem Working Group	To advise on development of a program research, assessment and monitoring agenda	Researchers, resource managers, project partners	Meet 1-2x 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	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 as a way 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 general 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.
Infrastructure					
Organization	Proposal Title	Proposal Number	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.

Appendix A: Completed Projects | 2015-2017

Ulster County Dept. of Public Works	Woodland Valley at Fawn Hill	AWSMP-2010-41	\$35,075	Complete	Stabilize a failing hill slope 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 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.
Planning					
Organization	Proposal Title	Proposal Number	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.
Research and Monitoring					
Organization	Proposal Title	Proposal Number	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." In particular 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

Appendix A: Completed Projects | 2015-2017

					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).
SUNY New Paltz	Rock Snot in Sick Rivers	AWSMP-2010-8	\$4,984	Complete	Investigate the causes of the invasive didymosphenia geminate, "didymo" algae blooms in streams and whether 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.
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.
Restoration					
Organization	Proposal Title	Proposal Number	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 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.

Appendix A: Completed Projects | 2015-2017

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. In order 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.
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