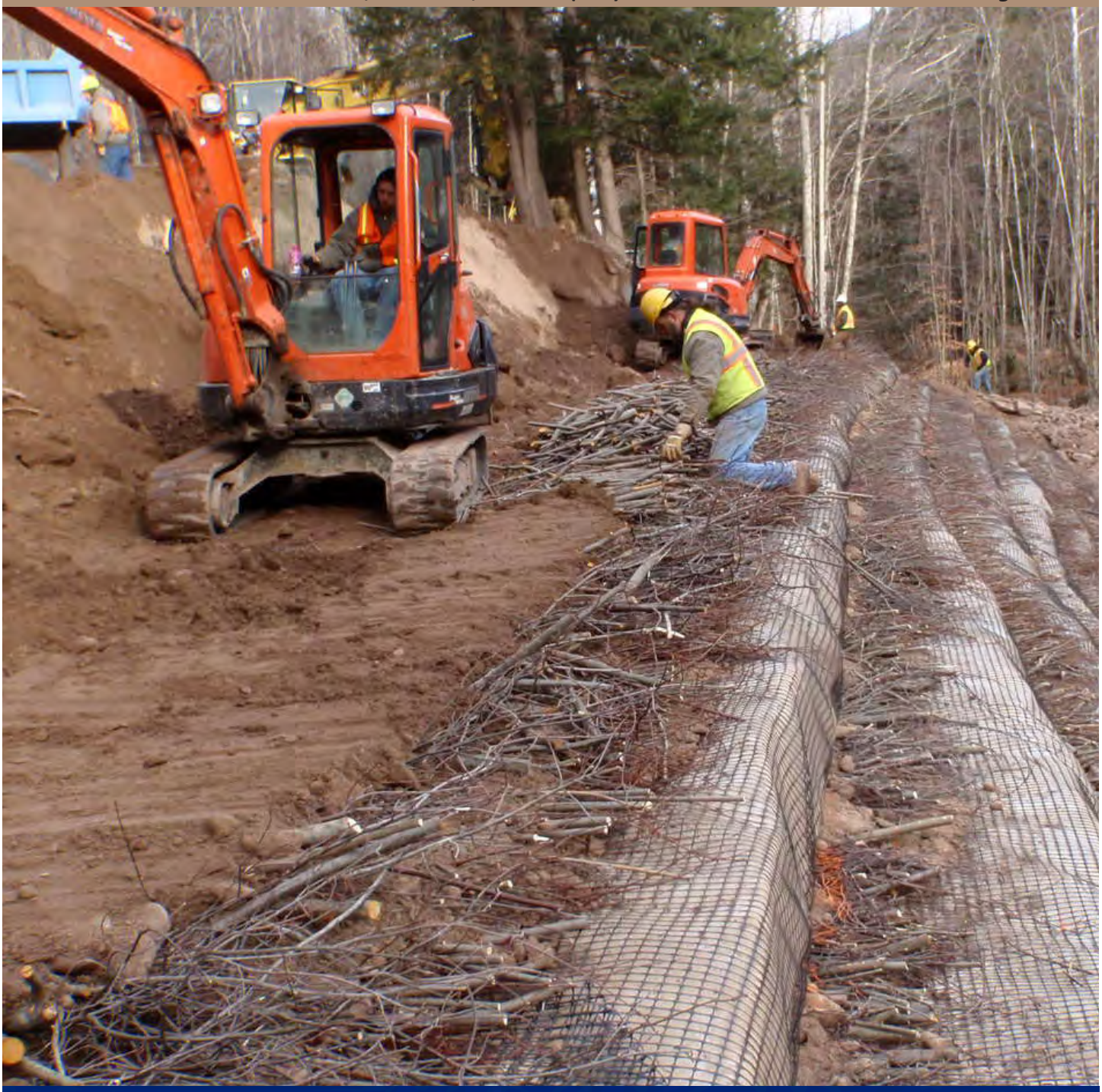
2011-2013 Action Plan

*6375 State Rt. 28 Phoenicia, New York, 12464 * (845) 688-3047 * www.ashokanstreams.org*



ASHOKAN WATERSHED STREAM MANAGEMENT PROGRAM

Cornell University Cooperative Extension Ulster County

ULSTER COUNTY SOIL & WATER Conservation District

NYC Environmental Protection

Ashokan Watershed Stream Management Program 2011-2013 Action Plan

Purpose

The purpose of the 2011-2013 Action Plan is to identify the planned activities, in support of the needs identified by stream assessments and stakeholders in the Ashokan Reservoir Watershed. These activities will be undertaken by the Ashokan Watershed Stream Management Program team[1] for the next two years. The Action Plan also provides the framework for reporting progress on those planned activities to the public.

The plan is organized around the key programmatic areas. The recommendations, are the basis for the plan of work, are in ***italicized blue text***. They are followed by the accomplishments to date and the planned activities for the next two years (if any). Summary tables of key planned activities and projects have been included to assist the reader in quickly identifying the key outcomes for the program.

Background

In 1997 New York City negotiated a Memorandum of Agreement (MOA) to avoid filtration of the NYC West-of-Hudson water supply. The MOA included establishing a set of watershed partnership programs to help ensure that the NYC water supply watersheds were adequately protected.

The DEP Stream Management Program was one of several watershed partnership programs developed as part of the Memorandum of Agreement. The Stream Management Program was established to work with all Catskill Mountain stream stakeholders to devise strategies and best management practices to protect and enhance the integrity of the stream system. In each water supply watershed, DEP stream management program staff collaborates with local education and resource management agencies. In the Ashokan Watershed those agencies are Ulster County Soil and Water Conservation District and Cornell Cooperative Extension of Ulster County.

Stream assessment efforts in the Ashokan watershed began with the development of the Broadstreet Hollow Stream Management Plan (SMP) in 2003. Stream Management Plans were developed for the Stony Clove (2004) and the Upper Esopus Creek (2007). In 2008, DEP and Cornell Cooperative Extension

[1] NYC DEP, Cornell Cooperative Extension of Ulster County, Ulster County Soil and Water Conservation District, and USDA Natural Resources Conservation Service

of Ulster County (CCE) completed a stream assessment of Woodland Creek, and an assessment of the Beaverkill by Ulster County Soil and Water Conservation District (UCSWCD) is underway. Copies of the Stream Management Plans are available on the Ashokan Watershed Stream Management Program's website WWW.ASHOKANSTREAMS.ORG . Information about the overall stream management program in the New York City drinking water watersheds that are west of the Hudson River at WWW.CATSKILLSTREAMS.ORG

General watershed-level goals were developed in the stream management planning process to further the overall program goal of restoring stream system stability and ecologic integrity while sustaining viable communities in the Catskill watersheds. The goals are formed around the basic categories of issues associated with managing streams: stream system integrity, floodplain management, highway and infrastructure management (related to streams), educating and assisting streamside landowners, protecting aquatic and riparian ecosystems, and enhancing public use and access to the streams in the watershed.

After stream management plans are developed, the MOA requires DEP and its partners to develop an action plan every two years to show how the findings and recommendations of the stream management plans will be implemented. The first post-implementation phase Action Plan was developed in 2009 for June 1, 2009- May 31, 2011 - with an update in 2010.[2] The current plan will run from June 1, 2011-May 31, 2013. The Ashokan Watershed Stream Management Program moved into the implementation phase of the program in 2008. During that year the program staff, with input from local stakeholders, developed a process for distributing funding provided in the FAD to the watershed communities to help implement stream management plan recommendations (the Ashokan Watershed SMP Implementation Program, or "SMIP"). To date, over $700,000 has been allocated to implementation projects and they are highlighted in red text at the end of each section of this plan.

[2] In the Ashokan Watershed, the plans run from June 1-May 31.

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Summary Tables of Key Planned Activities and Projects 2011-2013 and Progress, to Date

Stream Assessments

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
Woodland Valley	Town of Shandaken	Completed 2008
Beaverkill	Towns of Shandaken and Woodstock	Completed 2010
Warner Creek	Town of Shandaken and Woodstock	Completed 2010
Birch Creek	Town of Shandaken	Summer 2011
Bush Kill	Towns of Shandaken and Olive	Summer 2011
Bushnellsville Creek	Towns of Shandaken and Lexington	Summer 2012
Fox Hollow Creek	Town of Shandaken	Summer 2012
Peck Hollow	Towns of Shandaken and Lexington	Summer 2013
Little Beaverkill	Town of Woodstock	Summer2013
Ashokan Reservoir Tributaries	Town of Olive and Town of Hurley	TBD

Stream Project List

Project	Town	Priority	Goal	Current Status
Beaverkill Creek at Mink Hollow Road LWD	Woodstock	High	Removal of large woody debris jam on DEP property threatening road and private residence	Possible (de)construction of Large Woody Debris Jam in 2011
Beaverkill Creek at Van Hoagland Road Bridge	Woodstock	High	Bridge extension for possible hydraulic constriction mitigation	Funds provided to town for hydraulic analysis of bridge. To be completed spring 2011.
Bush Kill Creek at Every Road	Olive	High	Stormwater project near a small tributary of the Bush Kill resulting in sediment loading in stream	Conceptual design in progress, possible construction project in 2011
Little Beaverkill (tributary), Cross Patch Road Stormwater Project	Woodstock	High	Stormwater improvement project to reduce sediment loading into trib.	Engineering design completed, construction planned for 2011
Stony Clove Creek at Chichester #1	Shandaken	High	Stabilize large eroding hill slope. Very significant point source of turbidity in Ashokan Watershed	60% design completed, permit application submitted 4/11, construction planned summer 2011
Stony Clove Creek at Chichester #2	Shandaken	High	Stabilize large eroding hill slope. Very significant point source of turbidity in Ashokan Watershed	Conceptual plans in progress, potential construction summer 2012
Stony Clove Creek at Chichester #3	Shandaken	High	Stabilize large eroding hill slope possibly using bio-engineering techniques. Very significant point source of turbidity in Ashokan Watershed	Conceptual plans in progress, potential construction 2012
Stony Clove Creek at Chichester #4	Shandaken	High	Stabilize eroding streambank adjacent to multiple homes. Area adjacent to Chichester sites 1-3.	60% design completed, construction status undetermined
Stony Clove Creek at Phoenicia	Shandaken	High	Post flood emergency assistance. Largest concentration of flood-impacted homes and businesses in the watershed.	Engineering and construction planned for 2011. Funds provided to town for engineering and design work.
Traver Hollow Creek at Bradkin Road Culvert	Olive	High	Replacement of stream crossing culvert	Design completed, construction planned 2011. Funds provided to town for culvert.

Project	Town	Priority	Goal	Current Status
Warner Creek #1	Shandaken	High	Stabilize forest cut streambank. Very significant point source of turbidity in Ashokan Watershed	Engineering design in progress, possible construction planned 2011
Warner Creek #2	Shandaken	High	Realignment of creek into former channel to reduce bridge and road flooding. Very significant point source of turbidity in Ashokan Watershed	Conceptual designs complete in 4/11. Construction planned in 2012
Warner Creek #3	Shandaken	High	Mitigate large eroding hill slope in clay sediment source. Very significant point source of turbidity in Ashokan Watershed	Conceptual designs complete 4/11. Construction date TBD
Warner Creek #4	Shandaken	High	Streambank stabilization near road. Very significant point source of turbidity in Ashokan Watershed	Conceptual designs complete in 4/11. Construction date TBD
Beaverkill Creek at Miller Road	Shandaken	Medium	Large eroding hill slope streambank stab and potential NCD threatens road	Application to FEMA for mitigation funding has been completed by town, possible survey by UCSWCD in 2011, UCSWCD will provide design consultation to town
Beaverkill Creek at Van Hoagland Road	Woodstock	Medium	Streambank stabilization using channel realignment and natural channel design techniques	Survey planned for summer 2011. Possible project in 2012 or 2013 using NCD techniques
Bush Kill Creek at Watson Hollow Road	Ulster County (Olive)	Medium	Streambank stabilization along road and culvert replacement. County road threatened.	Survey completed 4/11. Possible construction project in 2011 or 2012
Esopus Creek at Brown Road	Shandaken	Medium	Stabilize reach of stream threatening homes and public infrastructure	DEP provided engineering support for emergency stream work by town after October flood in 11/10. Letter of Intent submitted to FEMA by UCSWCD for Mitigation Grant funding for a more permanent solution 3/11, updated survey on 4/11.
Little Peck Hollow Creek Culvert	Shandaken	Low	Stream crossing culvert replacement	Survey to be completed 2011, construction status undetermined
McKinley Hollow Creek at Cemetery	Shandaken	Low	Stream crossing culvert and streambank stabilization	On-going monitoring
Woodland Valley Creek at Fawn Hill	Shandaken	Completed	Streambank stabilization to protect road	Completed in 2010

CSBI Projects

Project	Town	Goal
Flynn 2010	Shandaken	The project site comprises the western portion of the property and extends approximately 20 feet east of the stream bank. The primary concern of the landowner is stabilization of eroding banks found on the property. To accomplish this, the landowner is willing to allow a section of lawn be converted to native vegetation.
Mitchelotti 2010	Shandaken	The project site is located within the main parcel West of Oliverea Road and adjacent to the right bank (facing downstream) of the Esopus Creek. The Michelotti's primary concern is stabilization of their eroding bank through the use of vegetation native to the Catskill region of New York State. The landowners have also expressed an interest in utilizing vegetation that has a high wildlife value. Visual access to the stream is not required, though it is strongly suggested that any plan incorporate some form of physical access to the stream.
Smith 2010	Shandaken	The project site is located within the east parcel and adjacent to the left bank (facing downstream) of Fox Hollow. The property owners' primary concern is the presence of established stands of Japanese knotweed. They are hoping once the invasive plants have been removed, plants native to the Catskill region can be established.
2011	Multiple	Planned installation of seven (7) CSBI projects
2012	Multiple	Planned installation of seven to ten (7-10) CSBI projects

Program Coordination

Advisory Council and Working Groups				
Type	Purpose	Audience	2011-2013 Goal	2009-Present Status
Advisory Council	To provide overall guidance and oversight to the program	Project partners, municipal officials	Meet quarterly	Meeting Quarterly
Education and Outreach Working Group	To incorporate stakeholders into decision making for education and outreach programs	Project partners, watershed educators	Meet quarterly	Met about 2x per year
Technical Advisory Committee	To provide technical review of AWSMP information and data	Researchers, resource managers, project partners	Meet annually	In development
Recreational Access Committee	To make recommendations for stream access/recreation improvements in the Ashokan Watershed.	Resource managers, recreation groups, planning board or recreation departments managers, economic development groups, interested members of the public	Meet twice in 2011, annually thereafter	In development
Project Review Committee	To review and comment on proposed stream projects	Resource managers, project partners	Meet quarterly	Established group and held several meetings
Highway Managers Group	To exchange information and identify opportunities for technical or financial assistance to improve stream management	Highway managers, project partners	Meet every other month	Established group and began regular meetings
Shandaken Area Flood Advisory and Remediation Initiative (SAFARI) and other floodplain management groups	To exchange information and identify opportunities to improve floodplain management	Representatives from Shandaken, project partners	Meet every other month	Began meeting in December 2010 in Shandaken.
Mapping Committee	To share information about FEMA/DEP flood study and FIRM development	DEP, DEC, municipal representatives	Meet at a schedule to be determined by DEP	Initial meeting 4/10.

Education and Outreach - Publications

Publications				
Type	Purpose	Audience	2011-2013 Goal	2009-Present Status
Newsletter (Esopus Creek News)	Program information and updates written for a general audience.	Streamside landowners and project partners	3 issues per year in 2011-2013	2009 (3 issues) 2010 (3 issues)
Fact Sheets	General information on key topics related to the program, written for a lay-audience.	General public, municipal employees, and streamside landowners	10 factsheets 2011-2013	2 fact sheets completed (2009-2011) Updated design template for fact sheets developed in 2010
Program Brochure	Provides a summary of the program, to be used for outreach with municipalities, other agencies and landowners.	General public.	n/a – update brochure as needed.	Brochure completed (2011)
Action Plan	Outlines the prioritized activities for the program based on Stream Management Plan recommendations and input from stakeholders.	Project partners, municipal officials, applicants for funding, interested members of the public.	Update plan in 2012 2013-2015 plan	2009-2011 plan 2010 update 2011-2013 plan
Combined Ashokan Watershed SMP	Combines information from prior stream assessments, management plans and input from stakeholders into a single plan document. Improves the accessibility of information.	Project partners, municipal officials, agencies, interested members of the public.	Single plan document by 2012	Plan outline and draft introductory section completed. Content for the plan is currently distributed among 3 plans.

Publications				
Type	Purpose	Audience	2011-2013 Goal	2009-Present Status
Website	Distribute information to the public and provide program updates. To make materials and documents available.	General public	Maintain website and improve content.	Website has been developed: www.ashokanstreams.org Site currently receives over 450 unique views per month.
Technical Documents	Provide access to the detailed research, analysis and information that is the basis for the watershed plan and action plans	Project partners, researchers, interested members of the public.	Organize existing program information into technical documents to improve accessibility of information.	Content is currently scattered in many places and formats. A draft outline of plan for documents was developed in 2010.
Project Reports	Share information about projects. Document project history	Project partners, municipal officials, researchers	Complete a project report for each AWSMP project; make reports available to the public on-line.	Project reports are being developed for existing projects.
Press Releases and Media	Disseminate information about programs and encourage participation in events and trainings.	General public, municipal officials.	Disseminate a press release for all events and programs.	Press releases currently disseminated for all events and programs.

Education and Outreach – Conferences and Training Programs

Conferences and Training Programs				
Type	Purpose	Audience	2011-2013 Goal	2009-Present Status
Annual Watershed Conference	Provide a day of information and training for landowners and municipal officials on key watershed program concepts (flooding, stream management, regulations)	Streamside landowners, municipal officials	1 conference per year in 2012 and 2013.	Conferences held in 2010 and 2011.
Research Symposium	Sharing information on data and research being conducted in the Watershed. Goal is to improve management decisions based on research.	Researchers, resource managers, project partners, interested members of the public	1 additional symposia	1 research symposia offered in 2010. Next symposia scheduled for 2012.
Trainings for Hwy Dept. Staff	Improve staff management practices and knowledge	Highway and DPW staff, contractors	2 trainings per year on topics of interest to highway managers	Rosgen 5-day training 10-09 Rosgen public presentation 10/09 Sweeper vac demonstration 9/10 Cornell Local Roads Training 1 day training on roadside drainage best practices 10/10 Delaware County Flood Lessons Presentation 2/11

Conferences and Training Programs				
Type	Purpose	Audience	2011-2013 Goal	2009-Present Status
Trainings for Floodplain Managers	Improve management and knowledge of floodplain managers. Encourage adoption of best management practices and improved policies at the local level.	Code enforcement officers, planning board members, town board members, highway managers, contractors	At least one session at Annual Conference to provide municipal credit opportunities. 1 additional training will be offered within the west of Hudson watershed region. DEC will be sponsoring education in watershed in 2011-2012 in conjunction with revision of FIRMs.	Floodplain Management credit courses offered at 2010 and 2011 annual conferences. Delaware County sponsored credit course in 2010 in Oneonta attended by Shandaken CFO and AWSMP staff. Shandaken CFO attended CRS training in Montour Falls, NY in 2010 with AWSMP staff.
Trainings for contractors (and hwy. dept. staff) on stream restoration practices.	Improve knowledge and skills of local contractors who engage in stream work	Local contractors, highway department staff.	3 short trainings in 2011 on key topics, review program for continuation or expansion. If successful, expand the trainings based on feedback from participants. Work with contractors and highway managers to identify areas where professional development is needed.	Project in development, scheduled for summer 2011.
Classes for Landowners	Improve management	Streamside landowners	At least one class per year beyond Watershed Conference	Native plant trainings 2009 and 2010 Raingarden training in 2011 Streambank erosion class scheduled for 2011

Education and Outreach – Public Programs

Public Programs				
Type	Purpose	Audience	2011-2013 Goal	2009-Present Status
Volunteer Events	Increase knowledge of resource and program	General public, streamside landowners	At least 2 non-planting project opportunities per year	Knotweed Pulls 2009 and 2010 Stream clean-up 6/10 Native seed collection 9/1-
Volunteer Plantings	Increase knowledge of program. Assist landowners	General public, streamside landowners	Offer volunteer planting opportunities in conjunction with CSBI projects	2 plantings in 2010

Public Programs				
Type	Purpose	Audience	2011-2013 Goal	2009-Present Status
General Public Talks and Events	Increase knowledge	General public, streamside landowners	Provide at least 6 general talks per year	Culvert presentation to TU Lower/Upper Esopus presentation to TU Catskill Cabiradio presentation Flood Insurance presentation Invasive Species

Education and Outreach – Booths and Displays

Booths and Displays				
Type	Purpose	Audience	2011-2013 Goal	2009-Present Status
Local events	Disseminate information, support local events	General public, streamside landowners	Attend at least 1 local festival in Shandaken, Olive and Woodstock per year.	Shandaken Day 2009, 2010 Olive Day 2010 Ashokan Festival 2010
UC Fair	Disseminate information to large numbers of people	General public	Offer one day at the fair focused on watershed information and activities	Ashokan Day at UC Fair in 2010 Stream table display at UC Fair in 2009
Other events	Disseminate information	General public, project partners	At least 1 per year	Catskill Local government day display 2009 Catskill Research Festival Display 2010 Legislative Breakfast Display 2010 and 2011

Education and Outreach – Public Meetings

Public Meetings				
Type	Purpose	Audience	Goal	Current Status
Public Programs	Provide information specifically about the program or planned project(s)	General Public, landowners, municipal officials	At least three per year	Grant outreach meetings Stream access project meetings
Town Board Meetings/Planning Board Meetings other meetings with elected officials	Increase awareness of the program	Municipal elected officials	Attend at least one board meeting per year in each town	Have attended board meetings in Hurley, Olive and Shandaken. Have met with board members in Woodstock and Hunter

Protecting and Enhancing the Integrity and Water Quality of the Stream System

Stream Corridor Assessments

Support continued stream feature inventories (SFI) in the tributary streams to the Esopus that have not been previously assessed. The SFI's are used to help diagnose stream corridor condition and identify stream erosion hazards and/or water quality impairment that may require some treatment. Complete riparian corridor assessments for the assessed streams using the program-established protocol. Support stream investigations by other organizations in Ashokan Watershed, with an emphasis on turbidity reduction.

Accomplishments (2009-2011)

Two streams were assessed. UC SWCD staff completed the assessment of the Beaverkill in 2010. This was the first stream to be assessed by the current AWSMP team, and the first stream assessed in the Towns of Woodstock and Shandaken.

An assessment of Warner Creek was also undertaken in 2010 by DEP and SUNY New Paltz summer undergraduate researchers. Warner Creek was identified in 2009/2010 as one of the most significant sources of turbidity during low to moderate flows in the Ashokan watershed. A further investigation of Warner Creek was conducted by a consultant under contract to UCSWCD (Clear Creeks Consulting) to identify specific areas of Warner Creek requiring treatment and to assess feasible treatment options.

In 2010 the AWSMP provided a grant to USGS to support monitoring water quality and turbidity at 13 sites in the watershed. Turbidity probes were installed at the base of tributaries entering into the Esopus Creek.

Plan of Work (2011-2013)

The project team will complete assessments for four streams during the two year planning period (2011-2013). This includes an assessment and brief report (with maps) documenting Phase 1 results and Phase 2 recommendations for each assessed stream and an assessment and brief annual reports documenting Phase 3 results and recommendations for selected sites at each assessed stream reach. The minimum effort will be to establish a Rosgen Level III reach assessment and monitoring program for the Ashokan watershed with the initial assessment per assessed stream. A complete riparian corridor assessment for the assessed streams using the program-established protocol will also be completed.

The Ashokan Watershed Stream Management Program staff will support work undertaken by other organizations to assess streams in the watershed. In particular, staff will monitor the progress of the USGS grant related to turbidity and support dissemination of information about USGS research findings

to the public. AWSMP staff will also participate with SUNY New Paltz REU summer research projects in the Ashokan Watershed.

Support investigations of the geotechnical processes controlling coupled hill slope and stream bank erosion in order to evaluate management feasibility. These erosion sites are typically long-lasting and chronic sources of turbidity to Esopus watershed streams.

Accomplishments (2009-2011)

UC SWCD and DEP initiated a geomorphic and geotechnical assessment of the Chichester reach of Stony Clove Creek (Management Units 17 and 18 in the Stony Clove Stream Management Plan) and in Warner Creek in support of treatment feasibility studies, Warner Creek was not reflected in the 2009-2011 Action Plan, but emerged as an issue in 2010.These reaches of stream are characterized by chronic suspended sediment loading from coupled streambank erosion and hill slope failures. Consultants were hired for both streams to conduct these investigations. Milone and MacBroom completed their investigation of the Chichester and issued a report on the four proposed stream remediation sites in the Chichester area of the Stony Clove in 2010. Clear Creeks Consulting was hired to investigate a turbidity-prone section of Warner Creek. Their report was completed in May 2011.

Plan of Work (2010-2013)

AWSMP team will evaluate the results of the investigations in Chichester and Warner Creek and use the information to inform further management decisions in the Watershed. Information on the findings will be shared with agency and municipal partners and the public.

Support the NYS Geological Survey's efforts to update/revise the mapping of the surficial geology of the Upper Esopus Creek watershed. The results of this mapping can be used to help (1) improve our understanding of where potential stream channel and hill slope sources of suspended sediment are likely to occur; and (2) aid in development of spatially distributed models of suspended sediment entrainment and transport in the stream network.

Accomplishments (2009-2011)

NYSGS submitted a request for AWSMP Implementation Funds and the project was approved for funding in 2010 by the Advisory Council. NYS Geological Survey commenced drilling summer 2010. AWSMP staff helped to provide outreach to the community about the drilling project.

Using this information, NYSGS updated the surficial geologic maps for the Phoenicia USGS quadrangle. Revised maps for the Bearsville and Shandaken quadrangles are under review. NYSGS will submit a report describing the investigation findings in the spring/summer 2011.

Plan of Work (2011-2013)

AWSMP staff will continue to meet with NYSGS staff seasonally to stay apprised as to their efforts and provide additional data as available. AWSMP staff will support dissemination of information about this project to the public.

Advocate an active monitoring program for large woody debris (LWD) that focuses upon (1) the identification and removal of debris that poses a flood hazard to infrastructure and a threat to human welfare and (2) identifies LWD key to ecologic health.

Accomplishments (2009-2011)

From 2008-2010, two interns worked with CCE and SWCD on LWD monitoring projects. Both interns undertook a literature review to determine conditions likely leading to LWD persistence in Catskill Mountain streams. The first intern developed a DEP data dictionary for documenting LWD in the field – especially during the stream feature inventories based on his review of literature. He then initiated a LWD photo monitoring project at key locations. He used aerial imagery to identify persistent LWD sites. He presented his findings to the Advisory Council at the August 2009 meeting.

The second intern helped to make recommendations to refine the DEP data dictionary, based on attempts to use the documentation protocol in the field. She focused her assessment efforts on Woodland Valley as a demonstration site because of data availability as the 2008 assessment also included data on LWD. She identified all of the sites that had LWD in 2008 and assessed them in the summer of 2010 and again after a flood in October 2010. A report and a website for the public documenting the changes over time (from 2008-2011) was developed demonstrating the persistence of LWD on Woodland Creek. One permanent LWD monitoring site in Woodland Valley, with cross sections, to monitor the geomorphic effect that LWD is having on the stream was established. She also presented a poster for the Catskill Monitoring and Research Conference in November 2010.

Plan of Work (2011-2013)

AWSMP staff will continue to support the ongoing LWD monitoring project in Woodland Valley and elsewhere throughout the watershed.

Ashokan Watershed SMIP Projects Supporting Stream Corridor Assessments

NYS Geological Survey	**An Investigation of Glacial Geology and Applied Three Dimensional Geologic Mapping in Ulster County, NY** ***To develop new geologic maps of the Ashokan Watershed***	**$38,037**	**In Process**
USGS	**Quantitative Assessment of Water Quality in the Upper Esopus Creek** ***To measure turbidity at 20 sites in the watershed.***	**$90,990**	**In Process**

Stream Restoration/Stabilization Projects

Identify locations in the Ashokan Watershed that are long-term, chronic fine sediment sources and evaluate the potential efficacy of restoration practices. AWSMP staff will annually update and prioritize the stream restoration and/or channel stabilization projects identified in each management plan and support efforts to obtain funding to design and implement them.

Accomplishments (2009-2011)

In 2009, AWSMP staff reviewed available assessment documentation from the completed Stream Management Plans[3] and developed an initial project list. The project staff met with multiple municipal officials, highway department staff and local and state agency staff and included projects they identified, that also met AWSMP objectives, as concerns onto AWSMP project list. This list currently includes projects in the towns of Shandaken, Woodstock and Olive. The staff continues to reach out to municipal officials through meetings held at AWSMP office, attendance at town meetings and one on one discussion with area leaders.

Town of Shandaken has endorsed the Chichester and Warner Creek projects by a town resolution.

Stony Clove Creek at Chichester
This 1 km of unstable stream has been a chronic source of turbidity in Stony Clove Creek from stream bank erosion and adjacent hill slope failure for over 10 years. MMI submitted a river assessment report in late 2010 and completed 60% of the design for Sites 1 and 4 in March, 2011. Six groundwater observation wells were installed in March 2011 to inform assessment and design on the role of groundwater in the hill slope failure process.

Warner Creek Restoration Plan
This reach of stream is characterized by chronic suspended sediment loading from coupled streambank erosion and hill slope failures. The UC SWCD-commissioned, initial investigation by Clear Creeks Consulting of Warner Creek turbidity sites is underway. The final design and construction will take place during the 2011-2013 Action Plan.

Plan of Work (2011-2013)

Restoration projects in the Chichester Reach and Warner Creek are planned to address fine sediment sources. For Chichester, 4 stabilization projects along distinct segments of stream are planned during this period. Design and construction of Site 1 is planned for 2011. Sites 2 and 3 are planned for completion in 2012. Site 4 is an optional project that may be installed in 2011. This project is a combined effort of DEP and MMI to complete the design and UCSWCD and MMI to install the project. For Warner Creek there are also 4 sites under consideration for construction starting in 2012.

AWSMP staff will continue to utilize past and current documentation and assessments and field visits to incorporate potential projects onto the project list. Reach-level projects that are being considered

[3] Broadstreet Hollow SMP, Stony Clove SMP and Esopus Creek SMP

include sections of the Beaverkill above Van Hoagland Bridge, the Esopus Creek at Brown Road. The smaller site projects that have a primary objective of road or public infrastructure protection are described in the Highway Management Section of the Action Plan.

Monitoring Stream Projects

Annually monitor performance of stream corridor projects funded by the Ashokan Watershed Stream Management Program.

Plan of Work (2011-2013)

A general project monitoring protocol will be developed prior to the construction of any more AWSMP-sponsored projects to be adapted and implemented during this period as projects are completed.

Outreach, Education and Technical Assistance to Encourage Stream Stewardship

Develop a set of Stream Stewardship Principles and promote the principles to relevant entities.

Accomplishments (2009-2010)

The Ashokan Watershed Stream Management Program uses the Catskill Streams Principles of Stream Stewardship. These principles are used by all of the DEP West of Hudson Watershed Stream Management Programs. The principles are located in the Appendix.

AWSMP staff attended trainings to increase their knowledge and ability to support stream restoration practices that are consistent with the Principles of Stream Stewardship. All staff has had Rosgen level 1 training. Higher levels of training have been achieved by UCSWCD and DEP staff. AWSMP Implementation funds supported Rosgen level II-IV training for an additional UCSWCD staff person to increase the capacity of the office. Many of the AWSMP staff also attended the bio-engineering class taught by USDA offered by DEP in 2010.

Plan of Work (2011-2013)

The AWSMP staff will continue to promote the Principles of Stream Stewardship in education and outreach materials

Staff will continue to build their own knowledge about stream restoration practices and will encourage and support training for partners in the watershed. UCSWCD/NRCS stream restoration design staff will take Rosgen Level IV training in the fall.

Facilitate a watershed wide Technical Advisory Committee to provide for routine networking between stream managers and agencies, researchers, and other experts. The Technical Advisory Committee would work with AWSMP staff and the Watershed Advisory Council

Accomplishments (2009-2010)

AWSMP staff developed a process for the Committee and a list of potential members in 2010. Although it was intended that this group would meet in early January 2011, the departure of key staff delayed the start of this committee.

Plan of Work (2011-2013)

Staff will develop a Technical Advisory Committee in 2011 to meet the above objectives. The committee will meet at least once annually.

Provide outreach to municipal officials, agencies, affected landowners, and the public about findings from stream assessments and planned stream restoration projects.

Accomplishments (2009-2010)

UC Soil and Water Conservation District established the AWSMP sub-committee for project review in 2009 to provide a forum for outreach and comment on proposed projects with key agency, non-profit, and municipal stakeholders. Three meetings of the committee were held. Projects are also vetted through the Highway Managers working group and the Advisory Council. In addition, UC SWCD staff met with NYS DEC permit representatives to review projects prior to permit application submittals. The newsletter is also used as a forum for disseminating information about projects.

Staff also provided outreach to landowners whose properties are adjacent to proposed stream restoration projects. In Chichester an informational meeting was held about the proposed project in 2010 and multiple meetings were held on a one on one basis with residents. Staff also met and communicated frequently with Brown Road landowners during the emergency project on Esopus in November 2010.

Staff also met with and communicated with landowners prior to planned construction for smaller projects – during the Woodland Valley project, information was disseminated to landowner association blog; AWSMP staff met with Bradkin Road residents about the planned stream crossing culvert replacement and presented the project to the Olive Town Board; AWSMP staff have met with the landowners affected by the proposed project on Cross Patch Road in Woodstock.

Plan of Work (2011-2013)

Staff will provide public presentations on findings from stream corridor assessments as they are completed.

Staff will use the sub-committee for project review, composed of representatives from stakeholding organizations, to inform municipal officials and agencies about planned projects. Staff will also inform and solicit feedback from municipal officials and agencies about possible stream restoration projects through meetings and other contacts. Staff will continue to reach out to municipal officials through meetings held at AWSMP office, attendance at town meetings and one on one discussion with area leaders

Staff will contact and provide specific information to landowners, in areas that have long-term, chronic fine sediment sources where restoration practices are planned, about possible remediation options.

Solicit participation of local community members and education-related organizations in overall education and outreach activities. Organize quarterly Education and Outreach Working Group meetings. Fund public education and outreach activities regarding stream and watershed management through the AWSMP Implementation Fund.

Accomplishments (2009-2010)

The Education and Outreach Working Group met three times in 2009 and three times in 2010 to review proposed education and outreach activities and to make recommendations for improvement. A conference planning committee of stakeholders was established and used for planning the 2010 and the 2011 Ashokan Watershed Conferences. A working group was also convened in 2009 to plan the Watershed Stewards Volunteer Program.

Two grant projects supporting general public education and awareness about water resources were funded in 2010. One was for the town of Woodstock to develop an education program around their Wetlands and Watercourse Law and the other was to Trout Unlimited to include information about the benefits of water quality protection on literature disseminated through their ”Leaping Trout” project.

Plan of Work (2011-2013)

Staff will continue to organize quarterly Education and Outreach Working Group meetings. They will also organize committees of stakeholders for conferences and large trainings

Local partnerships will be supported by soliciting and funding education and outreach activities through the Ashokan Implementation Fund Grant Programs

Develop general written education and outreach materials for streamside landowners and other stakeholders in the communities of the Ashokan Watershed. Use a variety of media (newsletters, fact-sheets, press, and website) to disseminate information about the program and to encourage stewardship.

Accomplishments (2009-2011)

Six issues of the project newsletter Esopus Creek News were published in 2009 and 2010. The newsletter is distributed by mail to over 2500 watershed residents and agencies. It is also available on-line.

Two factsheets were developed, Stream Project Permit Guide and Flood Emergency Preparedness Guide. The Flood Emergency Preparedness Guide was revised after the October 2010 flood and sent out to the program mailing list of watershed residents. It was also shared with, and used by the other West of Hudson watersheds after the October 2010 flood. A draft fact-sheet for landowners living in specific sub-basins was developed ("Guide to Living on Woodland Valley Creek"). These will be finalized in 2011. A graphic design template was developed for a future set of factsheets. Staff also prepared outreach materials on Didymo, culverts, native plants and large woody debris.

A two page and a four-page program brochure for the AWSMP were developed to describe program projects and services for all audiences. Packets of information were collated for streamside landowners including the above factsheets and other existing stream stewardship handouts from Cornell University and other conservation programs

The program provided ongoing media exposure through press releases, purchase of advertising and articles in local and county newspapers. Press releases were distributed for each event in 2009-2011.

A new program website was developed in 2010 (www.ashokanstreams.org) and collaboration with catskillstreams.org site was improved. The ashokanstreams.org website reported 3216 unique visitors in 2010, visitors to the site increased from 33 in January 2010 to 423 in November. The site is currently averaging about 400 unique visitors per month. In addition, a Facebook site was developed, HTML-mail newsletters were developed, and improved e-mail communications were developed with volunteers, increasing volunteer participation in the program.

Plan of Work (2011-2013)

Staff will continue to publish the program newsletter, Esopus Creek News, three times per year. Staff will develop and produce at least 10 additional factsheets that address common stream management issues for the general public. Fact sheets will be distributed to mailing list and made available on-line. AWSMP will collaborate with the other watershed programs in the West of Hudson Watershed on development of outreach materials to reduce duplication of efforts.

Staff will provide ongoing media exposure through press releases, purchase of advertising and articles in local and county newspapers.

Staff will continue development of website content for www.ashokanstreams.org, Facebook page, and www.catskillstreams.org and include more information of program successes and progress on website.

Host an annual conference and other workshops that promote an understanding of effective stream management strategies for local stakeholders. Hold at least three public educational events per year on stewardship topics relevant to the Ashokan Watershed.

Accomplishments (2009-2011)

The AWSMP organized two Annual Watershed Conferences to provide training and information to landowners and municipal officials. The first was held in May, 2010 and the second was April, 2011.

AWSMP staff held the following stewardship-related public events in 2009-2011:

- Streamside stewardship tour, July, 2009
- USGS Presentation – the Shocking Truth, August, 2009
- Native Plant Workshops 2009 and 2010
- Open House and BBQ, Aug, 2009
- Dave Rosgen Public Presentation, Oct, 2009
- Presentation on Invasive Species by Leslie Suprenaut of DEC
- Ashokan Watershed Creek Week Events, Sept, 2010
    - Rain Barrel Class, Environmental Film Night, Youth Fishing Day, Crummy Culvert Contest, Native Plant Walk, Streamside Restoration Planting, Photo Contest & Opening

Plan of Work (2011-2013)

The program will continue to host an Annual Conference with workshops that promote an understanding of effective stream management strategies for local stakeholders in 2012 and 2013.

The program staff will continue to hold at least three public educational events per year on stewardship topics relevant to the Ashokan Watershed.

Participate in local events to promote the goals of the Ashokan Watershed Stream Management Program

Accomplishments (2009-2010)

AWSMP provided informational displays and streamtable demonstrations at Shandaken Day 2009 and 2010, Olive Day 2010, Ashokan Center Fall Festival 2010, and Phoenicia Rotary Duck Race 2009, Ulster County Fair 2009 and 2010, Catskill Local Government Day 2009. Program displays were also developed for the CCE Legislative breakfasts in 2009 and 2010, and the Catskill Environmental Monitoring and Research Conference, 2010.

Staff gave presentations to the Ashokan-Pepacton and Catskill Trout Unlimited Chapters, Ulster County Environmental Management Council, Kiwanis Club, Rotary Club, Main Street Program (Phoenicia), Rt. 28 Scenic Byway committee and other community organizations. AWSMP staff was interviewed on local radio stations and cable TV stations.

Plan of Work (2011-2013)

AWSMP staff will participate in at least one community event per watershed town (Olive Day, Shandaken Day and other local events). Staff will provide a display or booth for at least one other event per year (Catskill Local Government Day, Ashokan Center Fall Festival) and offer one day at the Ulster County Fair that emphasizes stream management and the NYC watersheds.

Staff will also speak to outside groups and organizations, as requested and time permits.

Develop a local group of volunteers committed to ongoing stewardship efforts in the watershed.

Accomplishments (2009-2011)

The AWSMP program staff provided a one day training in basic stream stewardship concepts to give volunteers a common background in July 2010. Several evening meetings for volunteers were also held in 2009 and 2010.

Program staff offered weekend and evening core volunteer activities that integrated mini trainings as part of the volunteer activities. These included:

- Volunteer Knotweed Pulls, May 2009 and 2010
- Volunteer Stream Clean-up, June 2010
- Training on using GPS for data collection
- Native Seed Collection Training
- Volunteer Riparian Plantings, two in 2010

Staff reached volunteers through use of website, local media, speaking to local community groups, and other outreach efforts. Volunteer applications, job descriptions are available on the program website. Press releases announcing program and events were covered in local papers.

Staff began to partner with existing volunteer and community organizations including Trout Unlimited and Bruderhof on volunteer activities. Bruderhof has provided members for stream plantings. Trout Unlimited, Catskill Chapter will be co-sponsoring a stream clean-up with our program in 2011.

Plan of Work (2011-2013)

Staff will provide a regular schedule of weekend and evening core volunteer activities that integrate mini trainings as part of the activities and will continue to recruit volunteers to participate in CSBI planting projects. At least three volunteer events will be organized each year.

Staff will work with local volunteer and community organizations to engage their members in volunteer efforts in collaboration with the Ashokan Watershed Stream Management Program.

Staff will continue to recruit and reach volunteers through use of website, local media, and other outreach efforts. Staff will put volunteer applications and job descriptions on the website.

Ashokan Watershed SMIP Projects Supporting Education, Outreach and Technical Assistance about Stream Systems

Ulster County SWCD	**Rosgen Level II-IV trainings** ***To increase the capacity of Ulster County SWCD staff in stream projects***	**$11,586**	**In Process**
Trout Unlimited, Ashokan-Pepacton Chapter	**Leaping Trout Art Project** ***Support local Trout Unlimited Chapter outreach activity, stewardship information included in outreach materials***	**$925**	**Completed**
Watershed Towns	**Training Grants** ***Provide grants to municipalities to provide training and education to employees and elected officials related to stream and floodplain management***	**$25,000**	**Approved**

Floodplain Management and Planning

Floodplain Assessment

Support the completion of Flood Studies by FEMA to produce necessary revisions to the existing Flood Insurance Rate Maps (FIRMs). Revise FIRMs for Ashokan Reservoir watershed via an Agreement between DEP and FEMA.

Accomplishments (2009-2011)

The DEP/FEMA contract for the flood studies has been registered and the project is underway. In 2009 DEP procured recent LIDAR topographic data necessary for FIRM development. DEP and contractors updated digital elevation models based on LIDAR data. Updated digital elevation models will be used for hydraulic modeling and subsequent hydraulic modeling results to be used in deriving FIRMs.

NYS DEC, DEP and CCE sponsored an initial meeting with towns (4/10) to identify priority areas for detailed FIRM mapping.

Plan of Work (2011-2013)

FEMA will revise FIRMs based on updated terrain and modeling information and will provide opportunities to municipalities for review/comment.

DEC has received a grant from FEMA to lead education efforts in the watershed around the map revisions. CCE will participate in mapping committee and support work of DEP and DEC in outreach and education. AWSMP staff will support town adoption of revised FIRMs when completed.

Coordination with Floodplain Management Efforts in the Watershed

Assist municipalities in the Watershed to review their current floodplain ordinances and adopt revisions as appropriate. 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. Revisions in ordinances should reflect current building trends, new technologies, compliance and integrate broader community plans as appropriate. Where existing communities, structures and facilities are in at-risk locations, encourage the application of flood-proofing measures or relocation.

Accomplishments (2009-2011)

In 2009 AWSMP staff met with Town of Shandaken Supervisor to assess interest in applying for NYS DOS funds flood hazard mitigation in Phoenicia. At that point in time, Shandaken was not ready to submit an application for this. After the 2010 floods, a flood hazard mitigation committee, the Shandaken Area Flood Advisory and Remediation Initiative (SAFARI), was formed in Shandaken and the town applied for funding to hire a consultant to assist them with flood hazard mitigation, including flood-proofing, in the hamlet of Phoenicia. Assisted in coordinating agency response to 2010 floods and helped develop Flood Mitigation Planning group in Shandaken (SAFARI). AWSMP staff assisted the town with a grant to hire a consultant to develop a flood-mitigation plan and to help the town apply for the FEMA Community Rating System.

CCE submitted a letter of intent to SEMO in March, 2011, for funds to mitigate repetitive loss structures in Phoenicia. UCSWCD also submitted a letter of intent to SEMO at that time for a project on Brown Road, which includes mitigation or relocation of flood-prone structures.

Plan of Work (2011-2013)

AWSMP staff will monitor grant to Shandaken for flood mitigation planning and participate in the SAFARI group. Staff will provide support to Shandaken as they proceed with Community Rating System application. Work with the town of Shandaken, through their grant from the AWSMP program, to identify and implement flood-proofing measures in Phoenicia and seek sources of funding for mitigation efforts. Work with the town of Shandaken on other locations where structures are particularly prone to flood damage (Brown Road, Mt. Tremper) to identify options for remediation.

Based on the experience of Shandaken, AWSMP will encourage other towns to participate in Community Rating System through National Flood Insurance Program. Towns who are interested may be encouraged to apply for support through AWSMP Implementation Fund. Work with the towns to discourage inappropriate construction practices in flood-prone areas.

Encourage towns in the watershed without All-Hazard Mitigation Plans to develop plans. Work with the towns who adopted the County's all-Hazard Mitigation Plan, to be prepared for use of state mitigation funding following declared state emergencies and to utilize the information in the plan.

Accomplishments (2009-2011)

CCE/SWCD worked with Town of Shandaken to develop project plans for their grant proposal to receive mitigation funding (Fawn Hill Project in Woodland Valley). CCE and SWCD submitted letters of intent for two additional Mitigation projects in Shandaken. Staff highlighted the fact that Shandaken is eligible for funding because of its participation in the County All-Hazard Plan in media outreach and to other communities.

Staff worked with the Towns of Olive and Woodstock to see if they could retroactively participate in the FEMA Hazard Mitigation Plan - the option is not available to them until the County renews its plan in 2014.

Plan of Work (2011-2013)

Staff will work with towns who have not signed on to the County All-Hazard Mitigation Plan (Olive, Woodstock) to prepare them to participate in the revised county All-Hazard Mitigation plan in 2014.

Staff will coordinate with SEMO and Emergency Management to track availability of Hazard Mitigation funds, assist in the development of proposals and support, through the AWSMP Implementation Fund, match for projects that are consistent with the stream management program

Watershed communities should develop and implement comprehensive stormwater management plans which will protect water quality as well as reduce impacts on stream morphology.

Accomplishments (2009-2011)

AWSMP staff met with UC Department of the Environment regarding stormwater planning requirements in Ashokan Watershed (2009).

The Annual Watershed Conferences in 2010 and 2011 focused on flooding and offered sessions on reducing erosion. Stormwater was particularly emphasized at the 2010 conference.

The AWSMP Implementation Fund paid for a training for municipal highway employees, taught by Cornell Local Roads, on best management practices for installation of runoff drainage systems on roads and driveways.

Plan of Work (2011-2013)

Continue to work with Towns, CWC, and UC Department of the Environment to identify status of stormwater management planning and formulate recommendations for developing or improving, as needed.

Provide training to area stakeholders (mainly focused on municipal employees) from Cornell Local Roads, or other sources, for BMP installation of runoff drainage on roads and driveways

Use results of FEMA flood study to identify areas where existing stormwater infrastructure may be undersized.

Ashokan Watershed SMIP Projects Supporting Coordination with Floodplain Management Efforts in the Watershed

Cornell Cooperative Extension of Ulster County – Master Gardeners	**Raingarden Training and Installation**	**$5,000**	**In Process**
	To design and construct a raingarden at a public site in the Ashokan Watershed and offer a training to the public on raingardens.		
Town of Shandaken	**Phoenicia Flood Mitigation Phase 1**	**$47,000**	**In Process**
	To hire an consultant to analyze Stony Clove reach at bridge and develop design for mitigation project		
Town of Shandaken	**Shandaken Flood Planning**	**$102,500**	**In Process**
	To hire a consultant to develop a long-term mitigation strategy for Shandaken, with an emphasis on Phoenicia, and to assist the town in applying to the FEMA Community Rating System program.		

Outreach, Education and Technical Assistance for Floodplain Management in the Ashokan Watershed

Provide training and assistance for local floodplain managers and municipal officials in using revised FIRMs (Flood Insurance Rate Maps)

Accomplishments (2009-2011)

CCE coordinated with DEP and DEC on meeting for Watershed Towns to review FIRM maps and make recommendations for priority study areas for new FIRMs 4/2010.

AWSMP staff have participated in trainings sponsored by DEP and DEC to increase their knowledge of floodplain management AWSMP staff have encouraged municipal officials in the watershed communities to take advantage of these training opportunities. The Town of Shandaken floodplain manager, in particular, has participated actively in training opportunities. CCE staff attended floodplain

manager training in Oneonta to prepare to assist watershed towns with outreach on new FIRMs 5/2010, Shandaken Code enforcement officer attended Floodplain management training in Oneonta in early May. Higgins gained CFM certification (certified floodplain manager) with support from DEP and SWCD Delaware County.

CCE sponsored NYS DEC training on National Flood Insurance Program at 2010 and 2011 Watershed Conferences that offered municipal training credits.

Plan of Work (2011-2013)

Provide assistance to NYS DEC/DEP as needed for FIRM map trainings. CCE will continue to sponsor NYS DEC training on National Flood Insurance Program at Ashokan Watershed Conference

Encourage municipalities to use grants provided by the AWSMP to send employees to trainings and provide additional workshops or presentations as needed.

Staff will participate in continuing educational opportunities to increase their capacity to assist watershed communities and residents.

Increase access to flood prevention/protection information in the watershed. The Ashokan Watershed SMP Field Office in Shandaken will be a host site for flood prevention/protection information.

Accomplishments (2009-2011)

Resources have been identified and a library of Flood and National Flood Insurance Program related resources is in process. Ulster County Emergency Management and FEMA offer many of the resources on-line.

Flood warning information was posted to front page of AWSMP website, with link to National Weather Service flood prediction website.

Plan of Work (2011-2013)

Continue to develop a physical and digital library of resources for Ashokan watershed towns and residents. Use the www.ashokanstreams.org website to guide people to Ulster County Emergency Management and FEMA on-line resources. Provide assistance by phone and in person to residents who have questions about flood insurance or flood risk.

Continue to distribute the AWSMP Flood Emergency Preparedness Fact Sheet and Include flood emergency preparedness articles in Esopus Creek Newsletter. Update the website to include better information on flood related topics targeted to the watershed.

Offer continuing education credit opportunities for floodplain managers and other municipal officials.

Develop a flood emergency preparedness program for stream management stakeholders. Watershed municipalities, working with local and state agencies, should support periodic training sessions on flood related issues. Audience should include municipal leaders, code enforcement staff, planning boards, landowners, realtors, lending institutions and others

Accomplishments (2009-2011)

AWSMP staff offered workshop on flood emergency preparedness topics at May 2010 and 2011 Watershed conferences. Multiple speakers at the 2010 Watershed Conference covered topics on floodplain planning and development including Art Snyder, Director of Ulster County Emergency Management and regional SEMO representative.

CCE staff worked with the County Department of Economic Development and Planning to coordinate a workshop for flood-affected businesses/residents in Shandaken in January 2011 and offered a presentation on the basics of flood insurance at the workshop.

Produced and distributed Flood Emergency Preparedness Fact Sheet. The fact sheet was provided to all 2010 conference participants, mailed to mailing list and revised and resent to mailing list after October 2010 flood. Included flood emergency preparedness articles in Spring, 2010 newsletter.

Plan of Work (2011-2013)

Continue to offer workshops on flood emergency preparedness topics at Ashokan Watershed conference and work with watershed towns, DEP, and DEC to offer other training programs.

Work with the Town of Shandaken's flood mitigation group (SAFARI) to develop improved flood preparedness. Share information/processes developed by Shandaken with other watershed towns. Assist with programs in other towns as requested and time permits.

Highway and Infrastructure Management in Conjunction with Streams

Application of Highway Best Management Practices to Reduce Water Pollution

Winter road abrasives, mined locally in the Ashokan Watershed, have a high clay and silt content and are a likely source of turbidity in the streams in the Ashokan Watershed. There may be opportunities to reduce loadings through application of BMPs.

Accomplishments (2009-2011)

Assessed town needs for street cleaning and vacuuming. Evaluated denied County grant application for vacuum /sweeper truck. Contacted CWC, UC DOE, USDA NRCS and DEP for feedback on reasons for denial and provided feedback to Town of Shandaken Highway Department. Sponsored a demonstration for highway personnel in September 2010 at the Ulster County Highway Garage in Boiceville of the recommended sweeper/vac truck. Highway managers and AWSMP staff evaluated the effectiveness of the vac truck in picking up the clay mixed in with locally-mined sand.

Plan of Work (2011-2013)

Continue investigation with Towns, County, CWC and DEP into the benefits of acquiring sweeper/vac truck and investigate other viable management options, from a water quality perspective, to reduce turbidity loading in streams from road sand and salt.

Culvert outfalls create point sources of discharge, collected from the diffuse sources of road runoff. These outfalls can discharge significant amounts of concentrated pollutants into the stream. Identify the most critical outfalls with regard to point-source discharges and substrate stability, and which offer opportunities for mitigation.

Accomplishments (2009-2011)

Town of Shandaken has mapped with GPS, the locations of all culvert outfalls. Received report from Ulster County DOE on prior work done on mapping culverts in Ulster County. CCE and SWCD researched culvert assessment and monitoring protocol in other states.

Plan of Work (2011-2013)

The Cross Patch Road Demonstration Project (Town of Woodstock) funded by AWSMP Implementation Fund will be implemented. The project will reduce turbidity loading from ditch/culvert system on un-paved road into tributary of the Beaverkill. The project team hopes to complete Cross Patch Road installation by Summer 2011. For this project, landowner support has been somewhat uncertain. The timeline may change to accommodate a design change. Supporting publications and outreach materials will be developed.

Work with the other Ashokan watershed municipalities, County DPW and NYSDOT to map culvert outfalls and identify those culvert outfalls that may contribute pollutants into the stream system and prioritize opportunities for mitigation. Use AWSMP Implementation Fund to help address problems.

Local municipalities, highway departments and NYSDOT, should place a priority on 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.

Accomplishments (2009-2011)

Met with town highway supervisors to discuss needs for hydro-seeding and current practices Group recommended continued training for town personnel. Offered a Cornel Local Roads led training on roadside drainage and ditch maintenance for area highway personnel. Held multiple highway manager meetings at AWSMP office

Plan of Work (2011-2013)

Continue to identify current roadside ditch and steep slope vegetation management practices and provide support as needed to improve those practices. Use survey developed by Cornell University to establish baseline of current practices.

Organize town requirements into strategy for acquiring hydro-seeding opportunities and training. Apply AWSMP Implementation Funding as appropriate. Coordinate SWCD access to multi-county hydro-seeder for larger projects.

Ashokan Watershed SMIP Projects Supporting Highway BMPs to Reduce Pollution

Town of Woodstock	**Cross-Patch Road Stormwater Project** ***Implement a roadside drainage BMP project to reduce sediment loading into a tributary of the Little Beaverkill***	**$100,000**	**Approved**

Reducing Hydraulic Constrictions in Streams: Bridges and Culverts

Encourage collaboration between 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.

Accomplishments (2009-2011)

Established a regular meeting with all relevant local, county, and State highway personnel to identify shared stream/road concerns and evaluate opportunities to support coordinated effort to use BMPs. As a result of these meetings, identified several bridge projects Staff met with Ulster County bridge engineer to discuss plans for bridge replacement in McKinley Hollow. Met with Town of Woodstock highway manager and identified need for geomorphic assessment on Van Hoagland Bridge in Woodstock. Offered support to Woodstock for hydraulic analysis of bridge.

Plan of Work (2011-2013)

Continue to use highway managers' meetings with the highway superintendents for each of the Ashokan Watershed municipalities, Ulster and Greene County DPW staff, and NYS DOT representatives to discuss opportunities for collaboration and technical support.

Use results of FEMA Flood Study to help identify bridges and culverts that are likely to be hydraulic constrictions. Provide technical assistance to ensure application of fluvial geomorphic principles and fiscal support for bridge replacements in the Watershed as a Program-sponsored demonstration project.

Use AWSMP Implementation Fund to support projects where hydraulic constrictions contribute to stream instability, flooding hazard, habitat degradation, or erosion.

Ashokan Watershed SMIP Projects Supporting Reducing Hydraulic Constrictions in Streams (Bridges and Culverts)

Town of Olive	**Bradkin Road Culvert Replacement** ***To replace stream crossing culvert that was washed out during the October 2010 flood with a culvert that is sized appropriately for the stream channel.***	**$90,046**	**In Process**
Town of Woodstock	**Van Hoagland Road Hydrology Study** ***To help fund a hydraulic analysis for the replacement of the Van Hoagland Road bridge to help size the structure appropriately.***	**$5,000**	**In Process**

Stream/Road Stabilization Projects and Implementation of Best Management Practices on Right of Ways

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

Accomplishments (2009-2011)

Used the highway manager working group meetings to discuss opportunities for collaboration and technical support. Met with highway department staff in the field post flood response to discuss possible projects.

Assessed and designed a project on Woodland Valley Road to stabilize large/steep failing stream bank adjacent to stream. Met with FEMA representatives and assisted in the Town of Shandaken's application for hazard mitigation funding for the project. Assisted the town with post-flood projects on the Esopus, Woodland Valley Creek and Warner Creek.

Started assessment of BMPs for ditch management on Cross Patch Road in Woodstock.

Plan of Work (2011-2013)

Assist with design and construction supervision of stream projects. Provide financial support to high priority projects through the Ashokan Watershed SMIP. Assist towns with securing funding from other sources for priority projects

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.

Accomplishments (2009-2011)

AWSMP staff had multiple site visits with landowners in close proximity to streams and roads. Recommended best practices for maintaining riparian vegetation and offered funding to 11 landowners through the CSBI program.

Worked with Ulster County Dept of the Environment to make recommendations to Catskill Scenic Rail Road for railroad corridor weed management on County-owned right of way.

Plan of Work (2011-2013)

As opportunities arise, work in cooperation with highway departments, utility companies, and Catskill Scenic Railroad, to identify and prescribe specific sites for planting or improved management of

vegetation in right of ways. Provide funding through the program for plantings either as buffers or as bioengineering/biotechnical stabilization projects.

Ashokan Watershed SMIP Projects Supporting Improved Stream/Road Stabilization and Improved Right of Way

Town of Shandaken	**Woodland Valley at Fawn Hill**	**$35,075**	**Completed**
	Stabilize streambank and hillslope where road was threatened by stream erosion.		

Outreach, Education and Technical Assistance to Highway Managers and Excavation Contractors

Establish a quarterly or semi-annual meeting with all relevant local, county, and state highway personnel to identify shared stream/road concerns and evaluate opportunities to support coordinated effort to use BMPs. Develop annually revised Plan of Works for collaboration.

Accomplishments (2009-2011)

Organized regular meetings of Highway managers. Meetings were used to identify possible projects, network, and provide technical assistance and information.

Plan of Work (2011-2013)

Continue bi-monthly highway managers' meetings. Increase training opportunities for highway department staff in stream management concepts.

During periods of post -flood response, municipalities need information and technical support to minimize impacts on stream system stability. Documented guidelines for "repairs" of flood damaged streams and drainage systems with best management practices advocated by the AWSMP would greatly reduce risk of further instability. Develop guidelines, which integrate stream form and function, for use during post flood response.

Accomplishments (2009-2011)

CCE participated in review and comment on Delaware County SWCD training program. One contractor from Ulster County participated in first training session.

Offered a presentation by the Delaware County DPW commissioner to Ulster County and municipal highway department staff on Delaware County's process for post-flood response, based on lessons learned from recent significant flood events.

Plan of Work (2011-2013)

CCE, UC SWCD, and DEP will work with West of Hudson NYC DEP Watershed Stream Management Program partners to develop documentation of guidelines for post-flood response to stream channel and corridor.

CCE, UC SWCD and DEP will publicize documents, trainings and other resources on this topic developed by other West of Hudson NYC DEP Watershed Partners. CCE, UCSWCD, and DEP will collaborate on development of a series of three short trainings in 2011 on key topics, review program for continuation or expansion. If successful, expand the trainings based on feedback from participants.

Ashokan Watershed SMIP Projects Supporting Outreach, Education and Training for Highway Managers

Cornell Cooperative Extension of Ulster County	**Cornell Local Roads Ditch and Culvert Class**	**$5,000**	**Completed**
	Provide training on roadside drainage and ditch management to staff from watershed highway departments and Ulster County DPW		

Assistance to Streamside Landowners (public and private)

Assessment of Streamside Property Issues

Work with towns 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.

Accomplishments (2009-2011)

Using the highway managers group, other meetings with agency and municipal officials and over 55 landowner site visits in 2010, Ashokan Watershed staff have been working with the towns and landowners to identify and document streamside property where there are stream stability concerns. Tracking process for documenting concerns was developed.

Plan of Work (2011-2013)

Site visits with town and agency staff, helicopter reconnaissance, aerial imagery will be used to provide assistance. Program staff can provide GIS, engineering consultation and data support to this effort. Continue to refine and enhance tracking systems for areas of concern.

Streamside Landowner Financial Assistance

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

Accomplishments (2009-2011)

CSBI Coordinator and CCE Staff were trained on existing incentive programs. AWSMP staff attended in-service in Delaware County on existing incentive programs for private landowners. Ashokan Program developed landowner intake form to help assess landowner needs.

CCE advertised NRCS floodplain easement program in fall 2009 on their website, contacted town supervisors in the watershed about the program and contacted targeted landowners directly. Landowners have also been referred to flood insurance programs, CWC septic replacement program and post-flood low interest loans offered by various agencies.

CSBI program has developed program outreach materials. The informational materials and enrollment forms have been made available in the AWSMP office and have been distributed to landowners and municipal officials. Three CSBI projects were approved for funding in 2010.

Plan of Work (2011-2013)

Continue to provide outreach on Catskill Stream Buffer Initiative and using assessment information, target applicable landowners.

Continue to identify other existing incentive programs that are applicable to streamside landowners in the watershed and develop outreach materials for landowners regarding these programs. Directly contact landowners (public and private) with targeted properties. Continue support of watershed landowners with site visits, informational packets and formal site reports. Integrate intake form into database to better track landowner needs.

Outreach, Education and Technical Assistance to Streamside Landowners

Assist local landowners, municipalities, contractors and others in designing and implementing best management practices to reduce erosion.

Accomplishments (2009-2011)

Outreach and Assistance

In 2010, over 55 streamside landowners were directly assisted by staff. Technical assistance, training, and support was provided in all six watershed communities.

Trainings and Education

Introduction to Fluvial Geomorphology, October 8-12, 2009, taught by Dave Rosgen was offered to highway managers and others in the West of Hudson Watersheds. The Ashokan Watershed SMP staff sponsored the training.

Roadway and Roadside Drainage Workshop: A one day training for highway department workers on roadside drainage was held on October 15, 2010. David Orr from Cornell Local Roads Program led the training for 25 participants who were members of highway crews in four of the five towns in the Ashokan Watershed. The main reason for the workshop was to encourage practices for proper culvert installation and limiting runoff pollution from roads and ditches.

Ashokan Watershed Conference: May 1, 2010 Belleayre Mountain, 65 participants attended the first annual Ashokan Watershed Conference was held with the theme of “Floodplain and Stormwater Management for Towns and Landowners.” Highlights included broad representation from each town

board or planning board in the watershed with attendance roughly split between streamside landowners and municipal or other agency officials.

Ashokan Watershed Conference, April 9, 2011, The Emerson Resort, over 80 participants attended about evenly distributed between municipal and agency staff and landowners. Emphasis was on information about flood mitigation and the impact of projected increased precipitation on streams.

Plan of Work (2011-2013)

AWSMP staff will continue to provide technical assistance to landowners and municipalities for assessment of their stream-related problems. Staff will help landowners develop effective management strategies for their property and supervise stream project implementation. Staff will provide regularly scheduled times in office or for site visits to assist streamside landowners and municipalities with evaluating and addressing stream-related problems.

AWSMP staff will continue to offer trainings, including sessions at the annual Ashokan Watershed Conference, on effective stream management strategies for resource managers and landowners.

Develop a riparian enhancement education program that assists landowners in education on the role of riparian buffers in protecting their property and supports landowner incentive programs, in particular the Catskill Streams Buffer Initiative.

Accomplishments (2009-2011)

Offered native plant workshops to landowners in February 2009 and March 2010

Publications

Media and outreach strategy was developed: including initially using newsletter and direct outreach to landowners identified as needing riparian enhancement.

- Spring, 2010 newsletter featured launch of CSBI
- CSBI is featured on both the ashokanstreams.org website and the catskillstreams.org website.
- Streamside landowner guide was included in the spring, 2009 issue of the Esopus Creek News, highlighting the importance of streamside buffers.
- CSBI program announcement covered by local press

Plan of Work (2011-2013)

Provide streamside landowners and others detailed technical information through publications and the project website on the best practices for establishment and maintenance of riparian buffers.

- Riparian buffers and planting projects will be featured in at least one issue of Esopus Creek News annually. Also:
- Feature riparian buffers at one program for the public each year

- Write articles for newspapers, newsletters, radio and television on the value of riparian buffers to reach wide audience
- Provide direct outreach to streamside landowners about importance of riparian buffers on the streams where program staff are actively conducting stream assessments and during landowner visits.

Develop reliable local sources of native plant material for stream and riparian improvement projects.

Accomplishments (2009-2011)

UC SWCD developed a plant materials center at the Ashokan Watershed Office and identified sources of native willows for use as cuttings to establish willow beds. Stream Steward volunteers were trained to collect native seeds for use in future restoration projects.

Plan of Work (2011-2013)

Store additional potted plant materials at office site and establish willow beds for projects. Possible location near Ulster County Fairgrounds have been explored for willow bed development.

Start willows at office site for use as plant material in projects. Investigate additional locations for willow bed plantings for use in restoration projects.

Continue to train volunteer Stream Stewards to collect native seeds for restoration projects.

Protecting and Enhancing Aquatic and Riparian Habitat and Ecosystems

Aquatic and Riparian Ecosystem Assessment

Identify riparian areas of particular environmental benefit or concern and create a database of targeted properties for riparian zone improvement programs.

Accomplishments (2009-2011)

New York Natural Heritage Program began Riparian Reference Reach study for selected streams in Ashokan Watershed. Data to be used to guide restoration plantings.

Plan of Work (2011-2013)

Evaluation of two tributaries utilizing updated imagery to be completed. Complete Ashokan Watershed by Winter 2012.

Assess the impacts of restoration projects on aquatic ecosystems and riparian habitats. Continue research, evaluation, and monitoring efforts on aquatic ecosystems in the Watershed to improve best management practices as they relate to habitat and ecosystems. Support further aquatic bio-monitoring and studies of other wildlife, their habitats, and interactions in the watershed by public agencies and interest groups.

Accomplishments (2009-2011)

Held two Ecosystem Working Group Meetings (2009)

Supported USGS-DEC investigation of aquatic habitat "Quantitative Assessment of Water Quality in the Upper Esopus Creek: fish, macro invertebrates, periphyton, turbidity and nutrients" by providing financial support and allowing USGS, DEP and DEC fishery staff and interns to use Shandaken office for field work during the summer in 2009 and 2010. The purpose of this study is to provide a comprehensive assessment of biological condition (fish, invertebrates and algae). USGS is including data collection near proposed sites in Stony Clove's "Chichester Reach" restoration project.

Provided financial support to SUNY New Paltz REU students engaged in research on Didymo in the Esopus Creek summer 2010.

Organized a Catskill Environmental Monitoring and Research Conference in November 2010 in collaboration with USGS, DEC, Cary Institute, DEP to help support sharing of research related to Catskills Ecosystems. Barry Baldigo (USGS) and TJ Ross (Cornell) presented their preliminary findings at the Watershed Technical Conference in September and the Catskill Environmental Research Conference in November. SUNY New Paltz REU students also presented posters at the Catskill Environmental Research Conference.

Plan of Work (2011-2013)

Continue to support and coordinate with USGS-DEC grants and SUNY REU research projects related to habitat and ecosystems.

Use research to make recommendations on management strategies to improve biological condition and water quality, based on the data collected

Collaborate with other researchers working in the Watershed by: supporting an additional research conference in 2012 for researchers working in the Catskills; coordinating or participating in panels at other conferences; maintaining the e-list for researchers and resource managers in the Catskills

Use Technical Advisory group to help integrate ecosystems information into stream management decisions.

Work with the Catskill Region Invasive Species Partnership (CRISP) and with the West of Hudson (WoH) DEP Education and Outreach group to develop and disseminate outreach materials and offer public programs on critical invasive species for the West of Hudson Watersheds.

Accomplishments (2009-2011)

Michael Courtney and Adam Doan are designated as CRISP representative and attended CRISP meetings. Staff from CCE and SWCD participated in WoH Watershed-wide efforts to disseminate information on key invasive species; Japanese Knotweed, Emerald Ash Borer, Asian Long Horn Beetle, and Didymo were the species of concern during the 2009-2011 plan period.

In 2010 CCE hosted a public presentation by Leslie Suprenaut on invasive species in the Catskills region. CCE also sponsored a county-wide presentation on invasive species, particularly Emerald Ash Borer, at their annual meeting in Stone Ridge. CCE's agriculture program and Master Gardeners are a primary source of information about invasive insects and plants in the County. UCSWCD is a resource for information about invasive in ponds, Cornell University faculty have also been a resource to respond to questions by landowners.

Asian Longhorn Beetle and Emerald Ash Borer: Staff from CCE attended DEP/Nature Conservancy training on identifying outbreaks of Asian Longhorn Beetle and European Emerald Ash Borer in the Catskills. Invasive species displays about these insects were provided at Shandaken Day, Olive Day and Ulster County Fair. CCE's Teresa Rusinek has provided most of the outreach and information on Emerald Ash Borer in Ulster County.

Didymo: In 2009, CCE researched Didymo cleaning protocol used in other states and shared findings with DEP and WoH program staff in other watersheds and developed Didymo Flyer aimed at recreational users (Flyer distributed in Esopus Creek Newsletter) Laminated flyer also provided to CWC and others for inclusion in kiosks and along stream access points. In 2010, ASWMP funded a grant to SUNY New Paltz for a REU Didymo Project. REU (Research Experience for Undergraduate) students from SUNY New Paltz, under the direction of David Richardson of New Paltz and Catherine O'Reilly of Bard conducted research on the factors that lead to Didymo blooms in the Esopus. They presented their findings at the Catskill Environmental Research Conference in November.

Japanese Knotweed: Staff collaborated with DEP for disseminating recommendations about Knotweed removal. A demonstration site has been established at the corner of Bridge and High St. in Phoenicia. Volunteers have been pulling the knotweed at that location each spring since 2009 and monitoring its rate of return.

Plan of Work (2011-2013)

AWSMP staff will continue to participate in DEP West of Hudson Watershed and CRISP efforts to coordinate outreach around key invasive species of concern. Staff will continue to provide outreach to partners about prevention of transmission of aquatic invasive species. AWSMP Implementation funds can be used to provide financial assistance for outreach activities and to help implement feasible management strategies for species that are of concern in the watershed.

Staff will continue to work with TU and DEC to disseminate information about Didymo and how to prevent it.

Staff will assist with and encourage volunteer projects in the watershed that relate to invasive species monitoring or prevention and encourage small grants for other targeted invasive species awareness and prevention projects.

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

Accomplishments (2009-2011)

Ulster County Department of the Environment started a project to review local ordinances for municipalities in the watershed in regard to floodplain management (riparian buffer, flood hazard mitigation, stormwater management).

The AWSMP Implementation Fund provided resources to the Town of Woodstock for ecosystem mapping in Woodstock to help in their municipal landuse planning.

Plan of Work (2011-2013)

Staff will support local projects and efforts as requested and time permits.

Ashokan Watershed SMIP Projects Supporting Aquatic and Riparian Habitat and Ecosystem Assessment

SUNY New Paltz	Rock Snot in Sick Rivers	$5,000	Completed
USGS	Use of telemetry to assess potential effects of Schoharie Reservoir waters on trout populations in the Upper Esopus Creek *Purchase radio transmitter and receiver for telemetry project*	$8,273	Completed
USGS	Quantitative Assessment of Water Quality in the Upper Esopus Creek *Support for summer field technician and senior scientist for data collection, summer 2010*	$27,080	Completed
Town of Woodstock	Habitat Mapping for the Town of Woodstock *Develop an eco-system map for the Town of Woodstock*	$29,000	In Progress
USGS	Quantitative assessment of fish, macroinvertebrate, and periphyton communities in the Upper Esopus Creek *To assess water quality based on biological indicators*	$79,700	In Progress
USGS	Use of telemetry to assess potential effects of Schoharie Reservoir waters on trout populations in the Upper Esopus Creek *To assess the impact of the Shandaken Tunnel on the abundance and health of trout.*	$86,800	In Progress

Enhancing Stream-based Recreation and Public Access

Enhancing Public Access to the Streams

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

Accomplishments (2009-2011)

Attended Rt. 28 Corridor, Main Street Meetings. Public outreach sessions were held in Shandaken, Olive and Woodstock. AWSMP staff distributed information to planning boards, Trout Unlimited chapters, and other stakeholders. A survey and editable Google map was included on the website (www.ashokanstreams.org/streamaccess.html) to encourage additional feedback. A committee to develop the projects has been formed and will begin meeting in spring 2011.

Plan of Work (2011-2013)

In 2011 the AWSMP program allocated $200,000 in implementation funding to improve public stream access. The project development committee will review public input to develop a set of recommended projects for funding. The public will have an opportunity to comment on proposed projects prior to implementation. Staff will work with other partners in the watershed to develop and implement projects including the Rt. 28 Corridor improvement group, and the Pine Hill, Phoenicia and Boiceville Main Street Programs to coordinate efforts.

Explore opportunities for and impacts of operational adjustments of the Shandaken Tunnel to accommodate the needs of biota along with other stakeholders.

Plan of Work (2011-2013)

If specific recommendations for making adjustments to the Tunnel for recreational purposes are included in the public feedback from the stream access/recreation improvement project, these recommendations will be considered in updated management plans.

Education for Recreational Users of Streams

Support the placement of information kiosks at common put-in and take-out locations as a means to share pertinent information about the location of in stream hazards, invasive species, safety tips and other key information.

Accomplishments (2009-2011)

Finished Woodland Valley kiosk with additional informational materials (Summer 2009). Provided grant to Catskill Center for Conservation and Development to develop an informational kiosk on Rt.28. Kiosk constructed in 2010.

Plan of Work (2011-2013)

Continue to offer grants to develop or enhance educational information. Work with stream access committee in 2011 to develop projects in the watershed that may include informational kiosks and signage at stream access locations.

Study the economic impacts of stream-based recreation and tourism related activities on the local economy.

Accomplishments (2009-2011)

CCE researched prior similar studies done in the Ashokan Watershed or WoH watersheds. Identified study done by CWC. Contacted UC Planning, Catskill Center, and UC Economic Development to determine what type of project would be useful for other efforts in the region.

Plan of Work (2011-2013)

Support relevant projects through the AWSMP Implementation Fund.

Ashokan Watershed SMIP Projects Supporting Education and Outreach for Recreational Users of Streams

Catskill Center for Conservation and Development	**Catskill Kiosk Panel Project** ***To help support an informational Kiosk on Rt. 28 in Boiceville***	**$5,000**	**Completed**

Appendix

Principles of Stream Stewardship in Catskills Streams

Management of natural stream systems often results in the perception of competing or inconsistent goals and objectives. Using sound, science-based principles, stream managers will find it easier to guide their work, and achieve a common ground between landowners, municipalities, regulatory agencies and others that play an important role in the health of our Catskill stream systems. These guiding principles set a common framework upon which stream managers may carry out their important activities.

1. We celebrate the role streams play in the natural heritage of our communities.

The creeks, streams and rivers that run through our neighborhoods play a subtle but profound role in the identity of our communities, and also in the larger landscape: they are the "kills" in "Catskills." Our streams are intimately tied to our culture and history.

2. We will work to protect and restore the environmental services provided by our streams and floodplains.

Streams and their floodplains provide many essential environmental services: they are the major conduits of our stormwater system, convey sediment eroded from upland areas, process a large portion of the human waste stream --both in the stream and through the floodplain "filter"-- and for many anglers, provide significant food resources. Streams and floodplains also provide highly valued recreational and economic benefits, and their natural beauty is an invaluable collective asset of the community.

3. We will work to protect and restore the health of our stream and floodplain ecosystems.

Stream and floodplain ecosystems are complex. They are key components of the larger ecosystem, interconnected with upland biological diversity and integrity. The health of our ecosystem is dependent on the health of our streams, and vice versa. The health of the environment is likewise connected to human health—both individuals and communities.

4. Wherever possible, we will manage streams so as to maintain their naturally effective channel form and function.

The shape of the stream –its characteristic planform, cross-section and profile— are matched to the hydrologic regime, the geology, the vegetation on the banks and floodplain, and the landscape forms through which they flow. Streams must move sediment as well as water, and the shape of the channel determines how effectively it can perform that function. When we disturb the shape of the stream --widening, narrowing, deepening, straightening, removing gravel bars, or berming-- we alter its effectiveness. Streams evolve over time, and need to be able to shift somewhat within the constraints of their floodplain. Generally speaking, however, in the Catskills, healthy streams are more stable and resilient than disturbed streams, and maintain their characteristic form after even large flood events.

5. Wherever possible, we will manage floodplains as part of the natural stream system.

Floodplains play a critical role in the stream system, and in the environmental services streams provide: floodplains should be considered part of the stream. When streams and their natural floodplains are well-connected, the risk of flood hazards downstream are reduced and water quality is improved. The most appropriate land use for floodplains will allow natural stream processes to occur.

6. Wherever possible, we will protect and restore mature forest in the riparian buffer.

If we want to prevent bank erosion, the most critical concern should be maintaining a healthy buffer of mature, native vegetation along the stream bank. Ideally, the wider the buffer, the better. The root system of natural, dense vegetation in the streamside, or riparian, buffer holds the soil together, and makes it more resistant to the erosive force of fast moving floodwaters. Mowing down to the edge of the stream bank puts the bank at higher risk of erosion. Natural streamside vegetation also supports healthy communities of organisms in the stream and floodplains and moderates water and soil temperatures, protecting fish and amphibians.

7. As we manage streams to protect public safety and investments in infrastructure, our actions in one location shouldn't compromise the health of the stream upstream or downstream, or threaten the adjacent upland ecosystem through which the stream runs.

Even small disturbances at one location on a stream can propagate upstream or downstream, or laterally into floodplains and upland areas. When we engage in management practices in response to flooding or bank erosion, we need to anticipate these off-site impacts, and apply the principle of "do no harm."

8. We will strive to keep abreast of the state-of-the-science and best management practices related to streams and floodplains.

Our understanding of how healthy streams function is still growing. As the science of stream ecosystems and the best management practices to protect and restore them continue to evolve, this improved understanding needs to be incorporated into our day-to-day management activities.
