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May 11, 2009

Dear Mr. Davis:

Enclosed is the 2009-2011 Action Plan for the Ashokan Watershed Stream Management Program. This plan was developed by Cornell Cooperative Extension of Ulster County, the Ulster County Soil and Water Conservation District and DEP.

In order to ensure that the Action Plan was responsive to recommendations in the Stream Management Plans and the needs of stakeholders in the Watershed, the plan was drafted with the active participation of the Ashokan Watershed Advisory Council, the Flooding and Erosion Working Group, the Riparian and Aquatic Ecosystem Working Group, the Stream-based Recreation and Tourism Working Group and the Education and Outreach Working Group over a period of three months. We convened six meetings, engaged in regular e-mail correspondence with the Advisory Council and Working Group members, and distributed drafts of the plan to all participants by mail for comment. Over 40 people who work or live in the watershed were actively engaged in the development of this plan.

We are looking forward to moving into the implementation phase of this program. This Action Plan will help to guide the project team, and provide accountability to our local stakeholders and our funders.

Sincerely,

A handwritten signature in black ink that reads "Elizabeth Higgins". The signature is fluid and cursive, with a long horizontal line extending to the right.

Elizabeth Higgins, Program Coordinator
Ashokan Watershed Stream Management Program

Action Plan 2009-2011

Ashokan Watershed Stream Management Program



Esopus Creek (Reach 9) depicting several stream management concerns, Ulster County, NY (April, 2009)

Prepared by

**Cornell Cooperative Extension of Ulster County
DEP Stream Management Program
Ulster County Soil and Water Conservation District**

May 15, 2009

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Introduction and Background

The Ashokan Watershed Stream Management Program is a collaborative effort to promote and practice a coordinated approach to multi-objective stream corridor protection and management planning for the streams within the Ashokan Reservoir watershed. This effort is currently primarily funded by New York City Department of Environmental Protection (“DEP”) through contracts with Cornell Cooperative Extension of Ulster County (“CCE”) and Ulster County Soil and Water Conservation District (“UC SWCD”).

The funding for the program is provided by DEP as part of the US Environmental Protection Agency’s (“EPA”) determination to allow New York City to avoid filtration of its Catskill water supply. The filtration avoidance determination (“FAD”) was previously reviewed and determined on a five year basis (1997-2002; 2002 – 2007). The recent approved FAD is for a ten year period 2007-2017.

The DEP Stream Management Program is a watershed management and protection program developed as part of the Memorandum of Agreement (MOA) in 1997. The MOA established a set of watershed partnership protection programs to ensure that the NYC water supply watersheds were adequately protected. 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.

NYC has committed over \$10 million since 1997 for stream management planning in the Ashokan Reservoir watershed. The Ashokan Watershed Stream Management Program is an expansion of an effort that began with the development of the Broadstreet Hollow Stream Management Plan (SMP) in 2003, continued with the Stony Clove SMP in 2004 and most recently the Upper Esopus Creek SMP in 2007. In 2008, DEP and CCE also completed a stream assessment of Woodland Creek which will be incorporated into the watershed-wide program. **Figure 1** on page 2 is a map of the Ashokan Reservoir watershed. Areas that are shaded in pink depict the portions of the watershed that have already been included in the planning process. The non-shaded areas include stream corridors that have not yet been included in the planning process. DEP has committed \$8.11 million in contract funding with CCE and UC SWCD to lead this effort.

Figure 1: Ashokan Reservoir Watershed Stream Management Planning Area



Supporting Documentation

The following Stream Management Planning Documents are used to guide this effort. Hard copies are available for review at the Ashokan Watershed Stream Management Program office in Phoenicia, NY. Digital copies can be accessed via the Catskill Streams website (www.catskillstreams.org).

- UC SWCD, 2003. **The Broadstreet Hollow Stream Management Plan, Volumes I – II**
- GCSWCD, 2004. **The Stony Clove Creek Stream Management Plan, Volumes I - II**
- CCE, 2007. **The Upper Esopus Creek Management Plan, Volumes I – III, Appendices 1 – 3, A – H**

Ashokan Watershed Stream Management Program's Goals

General watershed-level goals are 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:

- Reduce flooding and erosion hazards while improving stream system (overall channel and floodplain) stability in the Ashokan Reservoir watershed;
- Inform stakeholders on water quality issues in the Ashokan Reservoir and advocate for improving and protecting water quality;
- Inform stakeholders on the status of aquatic and riparian (streamside) ecosystem condition and advocate for improving and protecting the condition of the ecologic integrity of the stream corridors in the Ashokan Reservoir watershed;
- Inform stakeholders on the status of recreation and other public uses of the streams within the Ashokan Reservoir watershed and advocate for a viable recreation based local economy that respects the overall goal;
- Work to have a coordinated and consistent approach to stream management activities that optimizes available resources and information;
- Develop and implement an intentional education and outreach program that addresses and informs the successful achievement of the above goals.

Annual Action Plans

The stream management plans are not manuals on how to repair the streams. Given the constantly changing nature of streams and how sensitive they are to human intervention, "repair" is not a practical objective. In addition, the site-specific "problems" identified today are not necessarily the problems that will be present tomorrow. As anyone who lives and works along these mountain streams know, the stream altering floods of 2005 and 2006 have shown how dynamic the streams in the Catskills are. Instead of looking at a stream as a fixed, stationary object, the Ashokan Watershed Stream Management Program will develop an annual Action Plan, which draws from the recommendations of the stream management plans and incorporates new information, to implement strategies dealing with all the streams in the Ashokan Watershed as a dynamic system. While the Action Plan is developed in part as a FAD deliverable for the DEP Stream Management Program, the Action Plan is the process and the product we intend to use to keep the stream management planning process as dynamic as needed to deal with Catskill Mountain streams. The Ashokan Watershed Advisory Council will play a major role in developing the annual action plans for the project.

Project Team, Advisory Council and Working Groups

The Program Team currently consists of DEP, CCE, and UC SWCD. DEP has separate five year Agreements with CCE and UC SWCD to define the Program scope of work and provide the funding. The roles and responsibilities of each of the partnering agencies are described below.

New York City Department of Environmental Protection (DEP)

DEP is responsible for administering federal Safe Drinking Water Act mandates as stipulated in the 2007 Filtration Avoidance Determination; providing financial resources and contract management to CCE and UC SWCD for stream management planning and project implementation; providing expertise in stream management related subjects; directing watershed and stream geomorphic assessments; regulating water quality and quantity in the Ashokan Reservoir watershed; and advocating for drinking water supply needs.

Cornell Cooperative Extension of Ulster County (CCE)

CCE's role in the project is facilitating development of outcomes, strategies and protocols for effective coordination of the partner agencies efforts; coordinating stakeholder organization and involvement in stream management planning and implementation; providing education and outreach expertise; building local knowledge, skills, and capacity; developing targeted programs and training opportunities; managing a funding program to implement SMP recommendations; connecting people to programs for assistance; providing access to Cornell University expertise and USDA Cooperative State Research, Education, and Extension Service funding; and providing a mechanism to contract for other outside expertise. The DEP-CCE Agreement is for \$3.65 million dollars for a five year period (2008-2013).

Specific CCE program responsibilities include:

Facilitation and Capacity Building of Stakeholders in the Ashokan Watershed

- Coordinating the Ashokan Watershed Advisory Council and associated Working Groups
- Co-Development of the Annual Action Plan
- Facilitating SMP Adoption by Towns
- Facilitate coordinated responses to flooding events

Administering the \$2 million dollar SMP Program Fund

- Developing Program Fund grant guidelines
- Administering grant proposal approval and funding disbursement
- Pursuing additional grant opportunities to supplement the Program Fund

Participating in Stream and Community Assessment and Stream Management Plan Development

- Assist and/or facilitate in assessment of invasive species concerns, aquatic habitat, and recreation issues
- Participate in new and/or updated Stream Management Plans

Education and Outreach

- Providing the Education and Outreach component of the Streamside Assistance Program

- Developing/implementing annual Education and Outreach plan and providing education programs, trainings, and information to stakeholders
- Developing/implementing Stream Steward Program
- Developing/implementing Youth Watershed Program

Managing the program office in Shandaken

Ulster County Soil & Water Conservation District (UC SWCD)

The UC SWCD will provide administrative management of technical projects and program support; leading and/or supporting watershed and stream geomorphic assessments; managing and leading stream corridor projects (from stream bank stabilization to large-scale restoration); provide engineering options to address stream management issues; providing access to USDA NRCS, WRDA, and state funding streams; and providing technical assistance to property owners and watershed municipalities in stream and riparian vegetation management. UC SWCD will also provide for lead engineering services to support stream best management practices (BMPs). UC SWCD and NRCS have historically been integral components to the coordinated flood responses both in the NYC Watershed and throughout Ulster County, in coordination with FEMA/SEMO and Ulster County Emergency Management, by providing funding and engineering to stabilize exigency sites. The DEP-UC SWCD Agreement is for \$4.46 million dollars for a five year period.

Specific UC SWCD program responsibilities include:

Participation in the Ashokan Watershed Advisory Council and associated Working Groups

- Lead role in Flooding and Erosion Working group
- Co-Development of Annual Action Plans

Participate in Stream Assessment and Stream Management Plan Development

- Lead assessment of at least 5 streams and associated riparian corridors for input into stream management planning
- Implement long-term monitoring of stream condition in the watershed
- Maintain a GIS database for the Program
- Participate in invasive species assessment and control

Design and Implement Stream BMPs

- Provide technical support to stream corridor projects funded by the Program Fund
- Design and construct at least one large-scale stream restoration project in the watershed (with a water quality improvement emphasis)
- Design and construct at least one project to reduce hydraulic constriction from an under-sized bridge or culvert
- Monitor all stream corridor projects funded by this Agreement

Administer the Streamside Assistance Program

- Develop/implement this NYC watershed-coordinated program to enhance riparian buffers in the Ashokan Watershed
- Technical Assistance – providing support to municipalities and landowners on stream and floodplain related problems.

Ashokan Watershed Advisory Council

The Ashokan Watershed Advisory Council (AWAC) is comprised of 15-20 watershed stakeholders representing local, county, state and federal agencies, watershed towns, and watershed residents. Membership is for a two year, renewable term. The Council meets at least quarterly.

The duties of the Council are to:

- Assist in the development of the Annual Action Plans (plan of work) for the Ashokan Watershed Stream Management Program.
- Incorporate recommendations of working groups into the Action Plan and plan of work.
- Develop process for dissemination of \$2 million dollar local SMP implementation fund based on SMP recommendations, and working group input.
- Review proposals for \$2 million dollar local SMP implementation fund.
- Provide feedback to project staff about other proposed stream enhancement projects.

Working Groups

The Ashokan Watershed Stream Management Program has four standing Working Groups. The purpose of the Working Group is to provide subject matter technical expertise to support the work of the Advisory Council and project staff. Working group membership is open. Each group is led by a project staff member, and the CCE Project Coordinator (Elizabeth Higgins) will participate in all four groups to ensure coordination among the Working Groups. The Working Groups (with the project staff assigned to it) are:

- Flooding and Erosion (UC SWCD Project Manager, to be hired)
- Riparian and Aquatic Ecosystem Enhancement (Walt Keller, CCE)
- Stream-based Recreation and Tourism (Elizabeth Higgins, CCE)
- Education and Outreach (Michael Courtney, CCE)

Other working groups may be formed to work on specific or cross-cutting issues.

Summary of Planned Activities and Outcomes: 2009-2011¹

Action # ²	Description	Lead Agency	Time Frame for Action	Expected Outcome
1.1 (SA)	Phase 1 assessment of two streams in the watershed	SWCD	2009-2010	delineation of the streams into "geomorphic" reaches
1.2 (SA)	Phase 2 assessment of the two streams selected for the Phase 1 study	SWCD	2009-2011	field-based, georeferenced observations of the occurrence of erosion, fine sediment sources, riparian condition, management practices, large woody debris, etc.
1.3 (SA)	Phase 3 assessment of Phase 1 and 2 assessed streams	SWCD	2009-2011	detailed topographic surveys and geomorphic assessments at the sub-reach scale as part of a long term monitoring program and/or evaluation of appropriate BMP solutions for sections of stream
2.1 (SA)	Complete riparian corridor assessments of two streams in the watershed.	SWCD	2009-2011	Mapped vegetation in the stream corridor.
3.1 (SP)	Develop a list of candidate stream corridor projects	SWCD	2009-2011	List of candidate stream corridor projects
3.2 (SP)	Investigation into treatment alternatives for the "Chichester" reach of Stony Clove Creek	SWCD	2009-2011	Project Assessment Report, Project Conceptual Design Report, Project Final Design, Constructed Project with Report
5.1 (FE)	Update topographic data necessary to improve accuracy of terrain for hydraulic modeling required to delineate floodplain.	DEP	Dependant on Contract Registration between DEP-FEMA	Updated digital elevation models used for hydraulic modeling and subsequent hydraulic modeling results to be used in deriving FIRMs.
7.1 (FE)	Work with watershed municipalities on an education and outreach effort to better utilize the NY Alert system for flood emergency preparedness.	CCE	2009-2010	Work with UC Emergency Services to distribution of outreach materials on NY Alert to watershed communities
8.1 (FE)	The Ashokan Watershed SWP Field Office in Shandaken will be a host site for flood prevention/protection information	CCE	Start spring 2009, with continuous updating	Physical and digital library of resources for Ashokan watershed Towns and residents.
8.2 (FE)	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	CCE	April 2010	Workshop on flood emergency preparedness topics at April 2010 Watershed summit
9.1 (FE)	CCE, UCSWCD, and DEP will work with WOH watershed stream management partners to develop documentation of guidelines for post-flood response to stream channel and corridor. <i>This Action Item is contingent upon coordination with WOH watershed Stream Management Program partners, and local, state and federal agencies</i>	All partners	Depends on WOH timing and interest	Convene coordinated inter-basin meeting to strategize content and format of proposed guidance document. Work with partners and consultants, if needed, to publish guidelines.
10.1 (FE)	Work with the Hamlet of Phoenicia to apply flood-proofing measures and relocation as a pilot during the five year project	CCE	2010	Meet with Town of Shandaken to determine interest in this item, and to investigate sources of technical assistance and funding.
12.1 (FE)	Ulster County now has a FEMA-approved Hazard Mitigation Plan. Work with the Town of Shandaken, the only Town in watershed to support the County's HMP effort, to be prepared for use of State mitigation funding following declared State emergencies.	CCE	2009-2011	Work with Town of Shandaken to develop projects and revise project list. Provide technical support. Work with the Town of Olive, Hurley and Woodstock to see if they can participate in the FEMA plan.
13.1 (FE)	Develop a stream corridor project monitoring protocol that can be adapted for specific projects.	SWCD	2009-2010	Review existing protocols and develop a protocol that can be used on multiple projects.
13.2 (FE)	Implement monitoring protocol with the completion of the first project completed with funds from AWSMP contracts.	SWCD	2010-2011	Implement the protocol.
14.1 (FE)	Develop a document that describes appropriate best stream management practices to address stream bank erosion for use in the Ashokan watershed.	Multiple	<i>This Action Item is contingent upon coordination with WOH watershed Stream Management Program partners, and local, state and federal agencies</i>	Convene inter-basin committee to begin developing the document.

¹ Summary of Action Items intended to be completed in the Action Planning Period as presented in the Detailed Recommendations and Action Items from the Stream Management Plans section.

² SA=Stream Assessment, SP=Stream Project, FE=Flooding and Erosion, RA=Riparian and Aquatic Ecosystem, RT=Recreation and Tourism, EO=Education and Outreach

Action # ²	Description	Lead Agency	Time Frame for Action	Expected Outcome
14.2 (FE)	Provide long term access to technical assistance to landowners and municipalities for assessment of their stream-related problems, development of effective management strategies and to supervise stream project implementation.	SWCD	2009-2011	Provide regularly scheduled times in office or for site visits to assist streamside landowners and municipalities with evaluating and addressing stream-related problems. Develop/seek opportunities to demonstrate evaluation techniques and effective management strategies that can be used as part of the education & outreach program. Provide funding, through SAP, CCE implementation funds, or UC SWCD project funds to encourage landowners and municipalities to participate in developing and implementing management plans.
15.1 (FE)	Convene periodic 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.	SWCD	2009-2011	Attend a monthly Ulster County Highway Superintendent meeting to explain the Program. 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 work plans for collaboration.
15.2 (FE)	Provide technical assistance to ensure application of fluvial geomorphic principles and fiscal support to the Town of Shandaken in the Deer Lane bridge replacement.	SWCD	2009-2011	Meet with Shandaken Highway Superintendent and others, as needed to complete geomorphic assessment and design for bridge replacement. Contract to provide funding assistance to help procure materials and implementation service. Seek additional opportunities to establish collaboration with all Highway departments on using applied fluvial geomorphic principles for assessment and design involved with bank stabilization and bridge/culvert replacement.
16.1 (FE)	Meet with all highway departments operating in the Ashokan watershed to identify current roadside ditch and steep slope vegetation management practices and provide support as needed to improve those practices.	SWCD	2009-2011	Convene meetings and make recommendations, as needed. Work with highway departments to secure funding to implement recommendations
17.1 (FE)	Meet with all Towns in the Ashokan watershed to assess whether road abrasive material in current use has high clay/silt content and identify options to improve quality of abrasive if needed.	SWCD	2009-2011	Convene meetings and make recommendations, as needed. Work with highway departments to secure funding to implement recommendations
18.1 (FE)	Meet with Towns, CWC, and UC DOE to identify status of stormwater management planning and formulate recommendations for developing or improving, as needed.	SWCD/CCE	2009-2011	Convene meetings and make recommendations, as needed. Work with involved parties to secure funding to implement recommendations. Documented results of meeting
19.1 (FE)	Town of Shandaken has mapped with GPS, the locations of all culvert outfalls. Work with the Town to identify those culvert outfalls that may contribute pollutants into the stream system and prioritize opportunities for mitigation.	SWCD	2009-2011	Report documenting plan for (1) mitigating point-source pollutant discharges from culvert outfalls; and (2) identification of funding opportunities.
20.1 (FE)	CCE and UCSWCD staff will attend semi-annual public informational meetings required by the Shandaken Tunnel SPDES permit to stay informed on DEP's operations of the Tunnel.	DEP	On-going	Distribute announcements of scheduled meetings to Council and working group members.
20.2 (FE)	The Ashokan SMP Field Office in Shandaken will include hard copies of all pertinent public documents regarding the operations of the Shandaken Tunnel and proposed structural and operational modifications to help reduce turbidity discharged into Esopus Creek (e.g. Catskill Turbidity Control Studies Phases 1-3). [Sub-items a. -d. not needed for this Action Item.]	CCE	On-going	Information is available to the community
21.1 (FE)	Develop and distribute to watershed municipalities maps of potential hazards associated with LWD based on aerial and ground-based reconnaissance imagery	DEP	Depends on interest of towns	Helicopter reconnaissance photos and/or video with maps documenting potential LWD hazard locations.
21.2 (FE)	CCE will research how other areas have handled LWD management issues.	CCE	Will depend on availability and accessibility of information on LWD. Initial research assessment will begin Fall 2009	Brief report documenting research findings and recommendations for actions in the Ashokan watershed.
22.1 (FE)	UC SWCD and DEP intend to initiate a geotechnical assessment of the "Chichester reach" of Stony Clove Creek (Management Units 17 and 18 in the SCSMP) in support of a proposed treatment feasibility study.	SWCD	2009-2011	Work with other partners through inter-governmental agreement to investigate geotechnical and hydrogeologic conditions leading to hill slope failure at the Chichester reach of Stony Clove. Seek to engage researchers to conduct research in the Esopus Creek watershed to investigate these phenomena.

Action #	Description	Lead Agency	Time Frame for Action	Contingent upon MWSGS activities	Expected Outcome
24.1 (FE)	DEP intends to support the NYS Geological Survey effort to update/revise the mapping of the surficial geology of the Upper Esopus Creek watershed.	DEP			Meet with NYSGS staff seasonally to stay apprised as to their efforts and provide additional data as available. Assist NYSGS, if possible with supplemental funding to support effort to characterize distribution of geologic source of Esopus watershed turbidity.
25.1 (RA)	Review local ordinances for municipalities in the watershed in regards to floodplain management (riparian buffer, flood hazard mitigation, stormwater management). Compare local laws to best practices/model regulations. Examine how existing laws/policies are being applied at the local level	CCE	2010		Meet with floodplain managers UC DOE, and UC Planning to identify specific policies of concern to be included in the review. Identify best practices/model regulations. Develop a short report highlighting these findings and disseminate information to towns in the Ashokan Watershed. Public presentations on watershed planning issues to raise awareness in the community and support for policy changes.
26.1 (RA)	Evaluate ecological benefits associated with restoration projects.	Multiple	2009		Coordinate existing monitoring and research programs with proposed stream restoration sites to the extent possible. Starting in the summer 2009, develop outreach materials/reports highlighting the results of research at existing sites
27.1 (RA)	Identify riparian areas of particular environmental benefit or concern and create a database of targeted properties for riparian zone improvement programs.	SWCD	2009 – 2010		Develop a map and database of targeted properties
27.2 (RA)	Identify existing incentive programs that are applicable to landowners in the watershed and develop outreach materials for landowners regarding these programs. Directly contact landowners with targeted properties.	SWCD	2009-2011		Outreach materials for SAP are identified and/or developed. SAP Coordinator and CCE Staff trained on existing incentive programs. Intake and assessment forms for landowners are developed that triage available programs. Targeted landowners are contacted about the availability of SAP
27.3 (RA)	Initiate a riparian buffer program on lands currently not covered by DEP watershed programs.	DEP/SWCD	2009		Coordination of SAP and Riparian Buffer Enhancement Program. Work with Riparian Buffer Working Group to refine SAP program rules as needed. As soon as the SAP Coordinator is hired and materials are in place, documented outreach to local landowners on availability of incentive programs, particularly SAP. Informational materials and enrollment forms will be made available in Project Office and with Town and Village Planning and Zoning staff. Outreach to planning and zoning staff and code enforcement officers about the programs. Landowners in the watershed are referred to, and utilize the Trees for Tribes program, as appropriate.
27.4 (RA)	Provide long term riparian buffer protection through permanent conservation easements for both currently degraded and intact buffer areas.	DEP	2009-2011		CCE will provide outreach through their website, newsletters and other methods to local landowners on availability of easement programs. Informational materials and enrollment forms available on easement programs in Project office and with Town and Village Planning and Zoning staff.
28.1 (RA)	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.	CCE	2009-2011		The project website will be updated Summer 2009. Develop a publication for the public on establishing and maintaining riparian buffers This project will begin Summer 2009. Offer 1 training per year on riparian buffers and native plants
28.2 (RA)	Develop a pool of CCE Master Gardeners and other qualified volunteers to provide advice and recommendations for material riparian buffers.	CCE	2009-2011		Master Gardeners available at least 1 day per month at the Shandaken Office to answer questions (during growing season). Determine if there are individuals who are interested in volunteering to provide information to the public on using native plants in riparian areas. Identify appropriate training programs for possible volunteers
28.3 (RA)	Develop pool of local volunteers to assist with outreach and with planting projects	CCE			Staff will have attended training on volunteer management. Continue Youth Program and Stream Steward Program as a primary source of committed and trained volunteers for community stewardship projects. Enhance outreach to volunteers through better use of website, local media, and other outreach.
28.4 (RA)	Develop youth program to teach youth about the value of riparian habitats, with goal of reaching adults and for general outreach about programs	CCE	2009-2011		Continue Youth Steward Program. Offer at least one family-oriented program per year. Develop webpage or publication (newsletter) targeted to families and youth. Work with outreach staff to ensure media follow-up from youth events/projects. Coordinate with other DEP-led youth efforts, when feasible.

Action # ²	Description	Lead Agency	Time Frame for Action	Expected Outcome
28.5 (RA)	Offer general education programs on the value of riparian buffers in the watershed	CCE	2009-2010	Offer regular programs for the public.
28.6 (RA)	Write articles for newspapers, newsletters, radio and television on the value of riparian buffers to reach wide audience	CCE	2009-2010	One of the three issues of Esopus Creek newsletter will feature riparian buffers. Develop a media outreach plan around riparian buffers and other BMPs by the fall 2009
29.1 (RA)	Work in cooperation with highway departments, utility companies, and Catskill Scenic Railroad, to identify and prescribe specific sites for action or improved management.	SWCD	2009-2011	Identify high priority sites and opportunities for collaboration.
29.2 (RA)	Provide funding for plantings either as buffers or as bioengineering/biotechnical stabilization projects.	DEP/SWCD	2009-2010	Provide funding as appropriate through SAP or CCE funds. Continue to work with Trees for Tribes program
29.6 (RA)	Encourage development and implementation of alternative management practices at US Army Corp flood control projects that enhance in-stream and streamside habitat conditions.	CCE	2010	Meet with DEC to investigate alternative practices for Japanese knotweed control.
30.1 (RA)	NYC DEP and the Soil and Water Conservation Districts in the Catskill region should establish a program researching the ecology of Knotweed and testing various management prescriptions. The findings of this research would be applied to management programs in the watersheds.	DEP/CCE	2009-2010	Stream Stewards will develop citizen science project to test eradication methods and demonstrate results to community
30.3 (RA)	Continue mapping and monitoring the presence of Japanese knotweed in the Upper Esopus Creek watershed through multi-agency and public collaboration.	SWCD/CCE	2009-2011	Map knotweed as a part of the two new stream assessments. Use stream stewards or youth to map knotweed as a community service project
30.5 (RA)	Provide education to landowners through publications, website, and public programs on identification, proper disposal and eradication of Japanese Knotweed	CCE	2009-2011	Two public programs on knotweed. Two newsletter articles on knotweed. Develop website information on knotweed. Develop brochure/factsheet on knotweed
31.1 (RA)	Work with TU and DEC to disseminate information about Didymo and how to prevent its spread	CCE	2009-2010	Place factsheets on kiosks about didymo, Develop public information strategy in collaboration with DEC
31.2 (RA)	Assess the feasibility of possible management strategies for the watershed (i.e. wader cleaning stations)	CCE	2009-2010	Disseminate information about effective prevention strategies. Attend meetings of agencies working on this issue to develop appropriate response
32.1 (RA)	Attend CRISP meetings	CCE	On-going	Continue to designate a staff person to attend CRISP meetings and participate in CRISP
32.2 (RA)	Work with West of Hudson DEP education and outreach group to develop and disseminate outreach materials and offer public programs on Invasive Species for the West of Hudson Watersheds	CCE	On-going	Participate in WOH group
33.1 (RA)	Explore opportunities for operational adjustments of the Shandaken Tunnel to accommodate the needs of biota along with other stakeholders	CCE	2009-2010	Coordinate with USGS/DEC grant that is assessing impact of tunnel on aquatic ecosystems.
33.2 (RA)	Further inventory and characterize wetlands along the main-stem Esopus Creek.	DEP	2009-2011	Coordinate with DEP/UCCC research team to share information as it is available
33.3 (RA)	Support further aquatic bio-monitoring and studies of other wildlife, their habitats, and interactions in the watershed by the multitude of public agencies and interest groups	CCE	2009-2011	Coordinate with DEC/USGS research grant. Hold regular working group meetings. Hold an annual research conference for researchers working in the Ashokan Watershed, or coordinate panel at existing conferences
33.4 (RA)	Assist with coordination to make the sampling consistent and data reporting consistent, organized and accessible	CCE	2009-2011	Hold regular working group meetings. Hold an annual research conference for researchers working in the Ashokan Watershed, or coordinate panel at existing conferences
34.1 (RT)	Improve the timing and reliability of requested recreational releases, particularly in July and August as they are critical to the economic viability and sustainability of the whitewater boating economy	CCE	2009-2010	Investigate actual release dates related to requested dates.
35.1 (RT)	Research policy/regulations around liability for large woody debris	CCE	2009-2011	Literature/Policy review on LWD with best practices from other states. Meeting with stakeholders to review the document and to make local recommendations for policy change where needed.
36.1 (RT)	Identify potential stream access sites in the watershed	CCE	2009-2011	Include a representative from whitewater boating community as a stakeholder for the review panel for Stream Management Projects
39.1 (RT)	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	CCE	2009-2011	Finish and enhance Woodland Valley kiosk with additional informational materials (Summer 2009). Offer mini-grants to develop or enhance kiosks along the streams in the watershed.

Education and Outreach

In the Agreement between CCE and DEP, CCE Ulster County has been charged with the task of working with stakeholders, DEP and SWCD, to develop and deliver education programs and materials that support Action Plan recommendations and meet identified needs in the watershed. CCE has hired two full-time staff to coordinate education and outreach tasks for the watershed. CCE also participates in the DEP-led NYC West-of-Hudson (WOH) education and outreach strategy and in the Riparian Buffer Working Group's education and outreach efforts.

CCE has developed and facilitates a subcommittee of Stakeholders, the Education and Outreach Working Group, to advise the participating agencies on the development of education and outreach programming and materials. The Ashokan Watershed education and outreach strategy has been developed in close coordination with the Ashokan Watershed Advisory Council to ensure that education and outreach efforts are focused on broad goals for the watershed (such as increasing riparian buffer) identified in the Ashokan Basin Action Plan.

In this two year action plan there are 2 primary education and outreach messages that need to be conveyed:

1. The role that riparian buffers play in maintaining a stable stream corridor and protecting water quality.
2. Best Management Practices for streamside landowners and municipalities to protect their property while maintaining the array of ecological functions and stability of the stream and riparian corridor.

The majority of our publications, education efforts and outreach activities will be targeted to reinforce these messages.

Educational Workshops and Summit

A series of workshops and a watershed summit will be held to support specific recommendations listed in this action plan. Planned workshops to date include:

- Field Trip Workshop to Stream Management Sites for Contractors and Highway Departments
- Watershed Summit – a multi-track conference for a broad set of watershed stakeholders
- Research Symposium for the ongoing, multiple research projects in the Ashokan Basin
- Post Flood Response and Mitigation Workshop for Contractors and Highway Departments
- Workshop at Watershed Summit for town planning boards and floodplain officers

- Semi-monthly workshops for landowners and the general community on topics such as riparian buffers and native plants, backyard storm water practices, invasive plants and stream bank protection

Educational Materials

Educational materials will be developed to support other activities across multiple audiences. Whenever possible, materials will be utilized in conjunction with other activities rather than stand alone education tools.

Materials that will be developed or enhanced include:

- Watershed Newsletter –“Esopus Creek News:”
Sent to approximately 1,300 streamside landowners and other stakeholders in the project database will cover annual themes including riparian buffers, best practices and project updates.
- Four-page mini-guides covering: stream disturbance permits/ best practices in stream bank protection and maintaining riparian buffers.
- Brochures - covering: Project overview, Japanese Knotweed Control
- Updating Project website to be more accessible and useful for downloading educational documents.
- Table top Displays covering: Program overview, riparian buffers.
- Media coverage through newspapers, radio and local television.

Stream Stewards Volunteer Program

CCE has developed a local group of volunteers committed to ongoing stewardship efforts in the watershed. Specifically, the stewards have opted to address the recommendation to address Japanese knotweed infestations in the tributaries to create “knotweed free zones.” Activities by this group include:

- Providing outreach to landowners in tributaries with knotweed
- Conducting “knotweed-pull” days and classes
- Mapping knotweed in tributaries

Youth Stewards Program

CCE is leading a youth stewards program at Onteora High School as an afterschool and summer program. The program will educate and develop leadership skills of participating youth, culminating in a watershed service project addressing one of the stream management recommendations. Youth will reach adults in the community as a secondary audience through media publication of service projects. Project examples may include wetland mapping, invasive plant mapping.

Education and Outreach to Streamside Landowners and Community Members

Streamside landowners are a priority audience for education and outreach activities. In addition to materials development above, specific activities for this audience will include:

- Outreach for the Streamside Assistance Program (SAP): CCE and SWCD will work together to identify, organize in a database and provide outreach to streamside landowners who are candidates for riparian enhancement through the SAP.
- Direct outreach through site visits to develop site management plans for the SAP.
- Semi-monthly evening and weekend community workshops. Topics may include: native plants and riparian buffers, bridges and culverts for landowners, backyard stormwater practices, erosion and flooding protection and community watershed art projects.

Municipal Adoption of Stream Management Plans

According to the agreement between Cornell Cooperative Extension of Ulster County and DEP, “CCE shall consult with DEP and UC SWCD, the Steering Committee, and local municipalities to facilitate the adoption of stream management plans, stream stewardship principles, and/or related memorandums of understanding by local municipalities. CCE understands that implementation of projects funded through this Agreement are limited to municipalities in which stream management plans have been adopted. CCE shall prepare and make a formal presentation to the appropriate Town Board(s).”

There are 6 Towns that are affected by this requirement in the Ashokan Watershed:

	Town	SEQRA forms completed	Presentation to Supervisor and/or Town Board	Passed Resolution Adopting SMP
Ulster County				
	Hurley	Yes	No	No
	Olive	Yes	No	No
	Shandaken	Yes	Yes	Yes
	Woodstock	Yes	No	No
Greene County				
	Hunter	Yes	Yes	Yes
	Lexington	Unknown	Unknown	Unknown

To date, Hunter and Shandaken have passed resolutions adopting one or more Stream Management Plans. SEQRA forms have been completed for Hurley, Olive and Woodstock. CCE is scheduling meetings with those three towns and hopes to have their resolutions adopted by this summer.

Principals of Stream Stewardship for Catskill Streams

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 plan form, cross-section and profile— are matched to the landscape forms through which they flow, the hydrologic regime, the geology, and the vegetation on the banks and floodplain. Streams must move sediment as well as water, and the shape of the stream 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.

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.

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. Minimally, for the health and stability of the stream, this streamside, or riparian, buffer should be no narrower than the height of mature trees in the buffer. 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 streambank 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

The Fund to Implement Recommendations from the Stream Management Plans

The 2007 FAD requires that DEP provide at least \$2 million for the implementation of recommendations set forth in Ashokan Basin stream management plans with priority given to local implementation. DEP is required to commit this money to contract by May 15, 2012 as per the 2007 FAD. DEP registered a contract Cornell Cooperative Extension of Ulster County to administer the grant program subject to DEP review and approval.

As part of that administration, CCE is in the process of developing the criteria for selecting projects/programs to receive funding. These projects shall be representative of the multiple-objectives outlined in the Stream Management Plans (water quality improvement, flooding and erosion mitigation, ecosystem protection, recreation enhancement, and management coordination).

CCE has facilitated stakeholder discussions to develop the decision-criteria framework. This implementation fund was discussed by the Ashokan Watershed Stream Management Program Advisory Council at their February 24th meeting and their April 30th meeting. Almost 20 individuals, representing a diverse set of agencies in the watershed, attended each meeting. In addition, the draft guidelines were sent to other key stakeholders for comment. Draft policies for the implementation funds have been created. The draft policies are being reviewed by DEP and CCE's risk management office and will be posted for public comment in a draft notice of funding availability. The planned timeframe for the dissemination of the implementation funds are as follows:

- Spring 2009: CCE to draft policies for funding program, review by DEP and CCE risk management office, CCE to issue draft notice of funding availability for comment
- **Summer 2009: issue the notice of funding availability**
- Fall 2009: fund first round of grants (municipal grants, local landowner grants, mini grants)
- Winter 2009: fund second round of grants (mini grants, research/monitoring grants)
- Spring 2010: fund third round of grants (mini grants), issue draft notice of funding availability
- **Summer 2010: issue notice of funding availability**
- Fall 2010: fund first round of grants (municipal grants, local landowner grants, mini grants)
- Winter 2010: fund second round of grants (mini grants, research/monitoring grants)
- Spring 2011: fund third round of grants (mini grants)

Detailed Recommendations and Action Items from the Stream Management Plans (SMPs)

Included in this section are detailed recommendations developed from the Stream Management Plans (SMPs) and the proposed actions (Action Items) that would move the program towards achieving the recommendations. Each Action Item is followed by the following information:

- a. Lead Agency: *This is the Project Team member or other agency that has the lead responsibility in completing the Action Item.*
- b. Other Partners: *This is the list of other Project Team members or stream management planning participants that will have a key role in implementing the Action Item.*
- c. Existing Activities: *This is a list of current or completed activities that address this Action Item.*
- d. Possible Activities to Address Action Items: *This is a list of recommended activities to address the Action Item. In many instances not all or in some cases none, of the activities can be completed during the two year planning period. These activities are identified for two purposes: (1) for inclusion in subsequent Action Plans and (2) To provide options for local stakeholders to pursue with the Stream Management Plan Fund or other funds.*
- e. Planned Activities/Outcome(s) for 2009 – 2011 Ashokan Action Plan: *This is the list of possible activities and where applicable, related outcomes that are intended to be completed during the Action Plan period.*

The actions were developed based on information culled during the stream management planning processes, as well as meetings with the Watershed Advisory Council, each of the working groups, and discussions with key informants.

This list of recommendations and action items will evolve during the five years of this program as additional stream assessments are completed, as the program staff gain information from research and evaluations of the program and feedback from stakeholders, and as new needs or opportunities arise in the communities. It is not meant to be a static document, but reflects the best information that we have at this time.

This section is organized as follows:

- Planned Stream and Riparian Corridor Assessments
- Planned Stream Corridor Projects
- Flooding and Erosion Recommendations
- Aquatic and Riparian Ecosystem Recommendations
- Stream-based Recreation and Tourism Recommendations

Planned Stream and Riparian Corridor Assessments (2009-2011)¹

Recommendation 1: 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 to help identify stream erosion hazards that may require some treatment.

The Ashokan watershed SMP Program Team utilizes a three phased approach to watershed and stream assessment. Phase 1 is a watershed and corridor scale assessment that utilizes readily available information to assess stream channel and corridor condition. One of the results of a Phase 1 assessment is the delineation of the stream into “geomorphic” reaches or management units. Phase 2 includes (1) a stream reconnaissance to conduct a feature inventory to further assess the stream at the geomorphic reach scale; and (2) supplemental investigations that support characterizing the stream geomorphic condition, flooding conditions, and sediment loading. Minimally, Phase 2 provides field-based, georeferenced observations of the occurrence of erosion, fine sediment sources, riparian condition, management practices, large woody debris, etc. Phase 3 consists of detailed topographic surveys and geomorphic assessments at the sub-reach scale as part of a long term monitoring program and/or evaluation of appropriate BMP solutions for sections of stream. The table below summarizes the assessment status for streams currently included as part of the Ashokan watershed SMP program.

- Action Item 1.1** The Project Team will complete Phase 1 assessments for two streams during the two year planning period (2009 – 2011). Candidate streams include Birch Creek and Beaver Kill in the Esopus watershed and Bush Kill in the Town of Olive. A Phase 1 assessment was completed for Woodland Valley in 2008 and documentation will be completed in 2009.
- a. Lead Agency: UC SWCD
 - b. Other Partners: DEP, CCE, NRCS, Volunteers
 - c. Existing Activities:
 - i. Woodland Valley Phase 1 assessment (2007 – 2008)
 - d. Possible Activities to Address Action Items:
 - i. Phase 1 assessment and documentation using Program protocol for Beaver Kill, Birch Creek, and/or Bush Kill streams.
 - e. **Planned Activities/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Assessment and brief report (with maps) documenting Phase 1 results and Phase 2 recommendations for each assessed stream**
 - ii. **Geodatabase and associated ArcGIS files**

- Action Item 1.2** The Project Team will complete Phase 2 assessments for the same two streams selected for Phase 1 during the two year planning period (2009 – 2011). A Phase 2 assessment was completed for Woodland Valley in 2008 and documentation will be completed in 2009.
- a. Lead Agency: UC SWCD
 - b. Other Partners: DEP, CCE, NRCS, Volunteers
 - c. Existing Activities:
 - i. Woodland Valley Phase 2 assessment (2007 – 2008)
 - d. Possible Activities to Address Action Item:
 - i. Phase 2 assessment and documentation using Program protocol for Beaver Kill, Birch Creek, and/or Bush Kill streams.

¹ Recommendations come from the Esopus Creek Stream Management Plan, Broadstreet Hollow Stream Management Plan, and Stony Clove Stream Management Plans. Updated 4-09 by Flooding and Erosion Working Group

- e. **Planned Activities/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Assessment and brief report (with maps and photos) documenting Phase 2 results and Phase 3 recommendations for each assessed stream**
 - ii. **Geodatabase and associated ArcGIS files**

Action Item 1.3 The Project Team will complete Phase 3 activities at select sites throughout the previously assessed streams during the two year planning period (2009 – 2011) and on through 2013. Site selection and specific activities (e.g. Rosgen Level III assessment, topographic surveys, sediment sampling) will be based on Phase 2 findings and program resources.

- a. Lead Agency: UC SWCD
- b. Other Partners: DEP, CCE, NRCS, Volunteers
- c. Existing Activities:
 - i. Monumented geomorphic survey sites in Stony Clove, Broadstreet Hollow, Esopus Creek and Woodland Creek.
- d. Possible Activities to Address Action Item:
 - i. Resurvey set of monumented cross sections in previously assessed streams to monitor changes in channel morphology and condition.
 - ii. Redo Rosgen Level III Assessments (e.g. BEHI and NBS) at previously assessed sites to reestablish an annual monitoring program.
 - iii. Establish new Rosgen Level III Assessment sites in the Ashokan watershed.
 - iv. Develop bank erodibility curves based on Rosgen Level III monitoring after two years of data collection.
- e. **Planned Activities/Outcome(s) for 2009 – 2011 Ashokan Action Plans:**
 - i. **Assessment and brief annual reports documenting Phase 3 results and recommendations for each assessed stream reach. Minimum effort will be to establish a Rosgen Level III reach assessment and monitoring program for the Ashokan watershed with the initial assessment of at least three reaches per assessed stream.**
 - ii. **Geodatabase and associated ArcGIS files**
 - iii. **Survey data in RiverMorph and/or AutoCAD files**

Watershed and Stream Geomorphic Assessment Summary Status

STREAM	PHASE 1	PHASE 2	PHASE 3
ESOPUS CREEK WATERSHED			
Esopus Creek Mainstem	DEP completed Phase 1 in 2005	DEP-ERDC completed stream feature inventory in 2005 – 2007.	DEP-ERDC initiated monitoring stations in 2006 – 2007; See the ECMP for locations and details.
Little Beaver Kill	TBD	TBD	TBD
Beaver Kill	UC SWCD to complete	UC SWCD to complete by	UC SWCD to initiate in

STREAM	PHASE 1	PHASE 2	PHASE 3
	by 2010	2010	2010 – 2011
Stony Clove	DEP-GCSWCD completed in 2003	DEP-GCSWCD completed in 2003	UC SWCD to resume monitoring in 2009 – 2010
Woodland Valley	DEP/CCE initiated in 2007; completed in 2008	DEP/CCE initiated in 2007; completed in 2008	UC SWCD to initiate in 2009
Broadstreet Hollow	DEP-UC SWCD completed in 2001-2002	DEP-UC SWCD completed in 2001-2002	UC SWCD to resume monitoring in 2009 – 2010
Peck Hollow	TBD	TBD	TBD
Fox Hollow	TBD	TBD	TBD
Bushnellville Creek	TBD	TBD	TBD
Birch Creek	UC SWCD to complete in 2009 – 2010	UC SWCD to complete in 2009 – 2010	UC SWCD to initiate in 2010 - 2011
Big Indian Hollow Tributaries	TBD	TBD	TBD
OTHER STREAMS			
Bush Kill	UC SWCD to complete in 2010 - 2011	UC SWCD to complete in 2010 – 2011	UC SWCD to initiate in 2011 – 2012
Traver Hollow	TBD	TBD	TBD

Recommendation 2: Support further riparian corridor assessment for the tributaries to Upper Esopus Creek not previously investigated.

- Action Item 2.1** Complete riparian corridor assessments for the streams to be assessed in Action Item 1.1. using the Program established protocol.
- a. Lead Agency: UC SWCD
 - b. Other Partners: DEP, SCA Intern, CCE, External Contracts
 - c. Existing Activities:
 - i. Woodland Valley Assessment
 - d. Possible Activities to Address Action Item:
 - i. 2009 Assessment and documentation
 - ii. 2010 Assessment and documentation
 - iii. Disseminate findings to landowners and communities in the watershed and to entities working in the watershed

- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **All possible activities listed above**

Planned Stream Corridor Projects (2009-2011)²

Recommendation 3: Annually update and prioritize stream restoration and/or channel stabilization projects identified in each management plan and support efforts to obtain funding to design and implement them.

Action Item 3.1 Develop a list of candidate stream corridor projects (includes reach scale restoration, hydraulic constriction mitigation, water quality improvement projects; does not include site scale bank stabilization) through review of existing Stream Management Plans, current stream assessments, recommendations from Highway departments and municipalities.

- a. Lead Agency: UC SWCD
- b. Other Partners: DEP, NRCS
- c. Existing Activities:
 - i. Stream management plans and stream assessments for Esopus Creek, Stony Clove Creek, Broadstreet Hollow Creek, and Woodland Valley Creek.
- d. Possible Activities to Address Action Item:
 - i. Review of available planning and assessment documentation
 - ii. Solicitation for candidate sites from municipalities
 - iii. Compilation and review of candidate sites with Flooding and Erosion working group.
- e. **Planned Activities/Outcomes(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **All possible activities listed above.**

Action Item 3.2 Work on assessment, and if project is determined to be feasible, design and construction of prioritized candidate stream corridor project. *If a feasible project is not identified then an additional site from the candidate list developed in Action Item 1 above will be investigated.* The first priority project is an investigation into treatment alternatives for the “Chichester” reach of Stony Clove Creek (Management Units 17 and 18 in the Stony Clove SMP). This is a reach of Stony Clove Creek between Silver Hollow bridge and the Route 214 bridge in Chichester. This reach is a chronic source of turbidity in Stony Clove Creek from stream bank erosion and adjacent hill slope failure.

- a. Lead Agency: UC SWCD
- b. Other Partners: DEP, NRCS
- c. Existing Activities:
 - i. Assessment in support of the Stony Clove Stream Management Plan evaluated this site and identified it as a priority treatment site.
 - ii. DEP has photo-documented this site with aerial and ground reconnaissance since 2008
- d. Possible Activities to Address Action Item:
 - i. Detailed stream geomorphic surveys (topographic and sediment sampling) to assess stream channel geomorphic condition and parameters

² Recommendations come from the Esopus Creek Stream Management Plan, Broadstreet Hollow Stream Management Plan, and Stony Clove Stream Management Plans. Updated 4-09 by Flooding and Erosion Working Group

- ii. Geotechnical and hydrogeologic investigation of hillslope failure that is key contributor to suspended sediment loading.
 - iii. Investigation into engineering alternatives to treat channel and hillslope instabilities
 - iv. If treatment is feasible, conceptual and final design of preferred treatment alternative
 - v. Construction of engineering solution to treat channel and hillslope instability.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
- i. **Assessment and Project Assessment Report**
 - ii. **Engineering design and Project Conceptual Design Report**
 - iii. **Project Final Design**
 - iv. **Constructed Project with Report**

Flooding and Erosion³

The mountain streams in the Ashokan Watershed are subject to a wide range of flood conditions – from annual high water associated with spring runoff to the less frequent and quite damaging floods that have occurred at anytime during the year. Inundation from flooding is a known problem for Phoenicia and in other low-lying developed properties throughout the watershed. The more common problem associated with flooding hazards is streambank erosion. Stream erosion is a natural process, but when the stream erodes into road embankments and bridge abutments or developed property, this natural process needs to be addressed by appropriate management. In some places, deposition of the eroded sediment occurs in sections of stream with insufficient capacity to transport the sediment. When this occurs at stream crossings, bridge flood conveyance capacity is significantly diminished. In addition to the hazards of flooding and associated erosion, water quality is significantly impaired by the erosion and entrainment of fine sediment (silt and clay) leading to excessive turbidity.

The specific findings for each stream evaluated so far can be found in the three SMPs developed to date. In general, the following findings adapted from the Esopus Creek plan can be stated:

- Large flood events have high economic costs
- Flood planning and response needs improvement
- No evident trend in flood frequency
- Erosion of stream banks seems to be localized, not systemic
- Large woody debris influences stream channel morphology, particularly in the Big Indian Hollow and headwater reaches
- Impacts from Shandaken Tunnel discharges on Esopus Creek vary by stream flow

The following recommendations are a compilation and adaption of recommendations from the three existing SMPs in the Ashokan watershed, recent stream assessments, and input from the Flooding and Erosion working group.

Flooding and Erosion Recommendations, Last Updated 5-09

Flood Protection, Response and Mitigation

Recommendation 4: Watershed municipalities should facilitate development of a flood damage reporting system to track types of flooding, their location and the costs associated with flood damage.

- Action Item 4.1** Research use of flood damage tracking systems elsewhere, and if deemed useful, work with watershed municipalities to develop such systems.
- a. Lead agency: CCE
 - b. Other Partners: Municipalities, UC SWCD, USDA-NRCS
 - c. Existing Activities: none

³ Recommendations come from the Esopus Creek Stream Management Plan, Broadstreet Hollow Stream Management Plan, and Stony Clove Stream Management Plans. Updated 4-09 by Flooding and Erosion Working Group

- d. Possible Activities to Address Action Items:
 - i. Investigation into the use and usefulness of flood damage tracking systems
 - ii. Identify how Towns currently track flood damage and evaluate whether this can be improved through a coordinated flood damage tracking system
 - iii. Brief report to municipalities on potential value of developing a flood tracking system with recommendations for next steps.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **none**

Recommendation 5: Support the completion of Flood Studies by FEMA to produce necessary revisions to the existing Flood Insurance Rate Maps (FIRMs) and support adoption of the maps and training for local floodplain managers.

- Action Item 5.1** Update topographic data necessary to improve accuracy of terrain for hydraulic modeling required to delineate floodplains.
- a. Lead Agency: DEP, FEMA
 - b. Other Partners: DEC
 - c. Existing Activities:
 - i. DEP has procured recent LIDAR topographic data (April, 2009) necessary for FIRM development
 - d. Possible Activities to Address Action Item:
 - i. DEP and contractors will update digital elevation models based on LIDAR data
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Updated digital elevation models will be used for hydraulic modeling and subsequent hydraulic modeling results to be used in deriving FIRMs. Timing is contingent upon pending DEP-FEMA contract registration.**
- Action Item 5.2** Revise FIRMs for Ashokan Reservoir watershed via an Agreement between DEP and FEMA.
- a. Lead Agency: FEMA
 - b. Other Partners: DEP, DEC
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Item:
 - i. FEMA will revise FIRMs based on updated terrain and modeling information and will provide to municipalities for review/comment (contingent upon pending DEP-FEMA contract registration)
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **none – since the work for this Action Item is contingent upon contract registration.**
- Action Item 5.3** Provide training for local floodplain managers in use of revised maps
- a. Lead Agency: CCE
 - b. Other Partners: DEC, FEMA
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Item:
 - i. FEMA-sanctioned training to be offered to municipalities

- e. **Planned Activity/Outcome(s) for – 2011 Ashokan Action Plan:**
 - i. **None – since the work for this Action Item is contingent upon contract registration.**

Recommendation 6: Watershed municipalities should facilitate periodic notification to landowners who have stream erosion hazard areas (SEHA) located on their property.

- Action Item 6.1** Continue effort started in Upper Esopus Creek Management Plan to delineate stream erosion hazard areas. Continue to pilot this effort on Esopus Creek to determine its feasibility as a planning tool.
- a. Lead Agency: DEP
 - b. Other Partners: US Army ERDC, Consultants, UC SWCD, USDA-NRCS
 - c. Existing Activities:
 - i. Stream Erosion Hazard Assessment documented in the Upper Esopus Creek Management Plan Volume III, Section 3.1.2
 - d. Possible Activities to Address Action Item:
 - i. Implement recommendations for further model development listed in Section 3.1.2.
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **The Project Team believes this is an important activity and will investigate opportunities to contract for this work**

Recommendation 7: Support development of preliminary recommendations for an emergency early flood warning system, and assist interested communities in obtaining funding for system implementation.

- Action Item 7.1** Work with watershed municipalities on an education and outreach effort to better utilize the NY Alert system for flood emergency preparedness.
- a. Lead Agency: CCE
 - b. Other Partners: UC Emergency Services
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Item:
 - i. Investigate options with the UC Emergency Services
 - ii. Distribution of outreach materials specific to watershed communities
 - e. **Planned Activity/Outcomes for 2009 – 2011 Ashokan Action Plan:**
 - i. **All possible activities identified above.**

Recommendation 8: Increase access to flood prevention/protection information in the watershed.

- Action Item 8.1** The Ashokan Watershed SMP Field Office in Shandaken will be a host site for flood prevention/protection information.
- a. Lead Agency: CCE
 - b. Other Partners: UC SWCD, UC Emergency Services, NRCS
 - c. Existing Activities: none

- d. Possible Activities to Address Action Item:
 - i. CCE will create a physical and digital library of resources for Ashokan watershed Towns and residents.
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **All possible activities identified above.**
- Action Item 8.2** 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
- a. Lead Agency: CCE
 - b. Other Partners: UC SWCD, UCES, NYCDEP, NYSDEC and NYSDOS, NRCS
 - c. Existing Activities:
 - i. CCE hosted a flood response workshop in Ulster County in March 2008.
 - d. Possible Activities to Address Action Item:
 - i. Workshop on flood emergency preparedness topics at April 2010 Watershed summit
 - ii. Investigate the need for further development of a flood emergency preparedness program.⁴
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Workshop on flood emergency preparedness topics at April 2010 Watershed summit.**

Recommendation 9: 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. Guidelines, which integrate stream form and function, should be developed for use during post flood response.

- Action Item 9.1** CCE, UC SWCD, and DEP will work with WOH watershed stream management partners to develop documentation of guidelines for post-flood response to stream channel and corridor. *This Action Item is contingent upon coordination with WOH watershed Stream Management Program partners, and local, state and federal agencies.*
- a. Lead Agency: Multiple
 - b. Other Partners: other local, county, state, and federal agencies
 - c. Existing Activity:
 - i. Contractor training guideline developed by DCSWCD in support of flood response workshops hosted by DCSWCD in 2009.
 - d. Possible Activities to Address Action Item:
 - i. Convene coordinated inter-basin meeting to strategize content and format of proposed guidance document.
 - ii. Work with partners and consultants, if needed, to publish guidelines.

⁴ See Education and Outreach Plan for more details about the Watershed Summit

- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Above Possible Activities if the effort can be coordinated within the two year planning period.**

Recommendation 10: Where existing communities, structures and facilities are in at-risk locations, encourage the application of flood-proofing measures or relocation.

Action Item 10.1 Work with the Town of Shandaken to apply flood-proofing measures in the hamlet of Phoenicia as a pilot during the five year project

- a. Lead Agency: CCE
- b. Other Partners: Town of Shandaken, UC SWCD, Ulster County Emergency Services, FEMA
- c. Existing Activities: none
- d. Possible Activities to Address Action Item:
 - i. Inventory properties and infrastructure that are prone to flood damage
 - ii. Make recommendations for flood-proofing.
 - iii. Work with Town to find funding to implement the recommendations.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Meet with Town of Shandaken to determine interest in this item, and to investigate sources of technical assistance and funding.**

Recommendation 11: Municipalities in the Watershed should conduct a review of current floodplain ordinances and adopt revisions as appropriate. Prevent inappropriate development in areas of high flood or erosion risk and foster uses that are compatible with the anticipated flooding and erosion conditions. Revisions should reflect current building trends, new technologies compliance and integrate broader community plans as appropriate.

Action Item 11.1 Using results of revised FIRMs and the Stream Erosion Hazard Area assessment, work with municipalities to identify how existing ordinances can be improved to limit damaging land use in the floodplain.

- a. Lead Agency: CCE
- b. Other Partners: Municipalities, DEP, UC SWCD, UC Planning
- c. Existing Activities: none
- d. Possible Activities to Address Action item:
 - i. Work with Project Team, Towns, and/or consultants to identify areas of risk and evaluate suitability of existing floodplain ordinances to prevent inappropriate development in these high risk areas.
 - ii. Document and presentation to towns comparing their existing floodplain ordinances with model ordinances designed to address high risk/ high hazard areas.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **None – contingent upon completion of FIRMs and revision of Stream Erosion Hazard Area assessment. Upon completion of both, then this activity can commence.**

Recommendation 12: Support implementation of Ulster County’s Hazard Mitigation Plan in the Town of Shandaken, with emphasis on addressing flooding and stream erosion hazards, and encourage towns in the watershed without Hazard Mitigation Plans to develop plans.

- Action Item 12.1** Ulster County has a FEMA-approved Hazard Mitigation Plan. Work with the Town of Shandaken, the only Town in watershed to support the County’s HMP effort, to be prepared for use of State mitigation funding following declared State emergencies.
- a. Lead Agency: CCE, UC SWCD
 - b. Other Partners: Town of Shandaken, UC Emergency Services, DEP, USDA-NRCS
 - c. Existing Activities:
 - i. Town of Shandaken recently (5/1/09) submitted a list and conceptual designs of proposed projects for FEMA funding.
 - d. Possible Activities to Address Action Item:
 - i. Periodically revise proposed project list and designs to incorporate new information, funding, and technical support.
 - ii. Work with Towns of Olive, Woodstock, and Hurley to see if they can retroactively participate in the FEMA Hazard Mitigation Plan implementation.
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **All possible Activities identified above.**

Stream Erosion Mitigation

Recommendation 13: Annually monitor performance of stream corridor projects funded by the Ashokan Watershed Stream Management Program.

- Action Item 13.1** Develop a stream corridor project monitoring protocol that can be adapted for specific projects.
- a. Lead Agency: UC SWCD
 - b. Other Partners: DEP, NRCS
 - c. Existing Activities:
 - i. There are sample monitoring protocols developed for the demonstration projects constructed in the Esopus Creek watershed that can be used to draft a more uniform protocol.
 - d. Possible Activities to Address Action item:
 - i. Review regionally and nationally available monitoring protocols
 - ii. Develop Program-specific protocol that has adaptive format/content to accommodate the specific types of projects and unique goals/objectives.
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **All Possible Activities identified above.**
- Action Item 13.2** Implement monitoring protocol with the completion of the first project completed with funds from AWSMP contracts.
- a. Lead Agency: UC SWCD
 - b. Other Partners: DEP, other funding agencies
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Item:
 - i. Implement monitoring protocol.

- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Above Possible Activity, if project constructed within the two-year action planning period**

Recommendation 14: Assist local landowners, contractors and others in designing and implementing best management practices to reduce erosion

Action Item 14.1 Develop a document that describes appropriate best stream management practices to address stream bank erosion for use in the Ashokan watershed. CCE, UC SWCD, and DEP will work in conjunction with other watershed partners to develop this document. The final document will be intended to have application beyond the Ashokan watershed. *This Action Item is contingent upon coordination with WOH watershed Stream Management Program partners, and local, state and federal agencies*

- a. Lead Agency: Multiple
- b. Other Partners: local, county, state, and federal agencies
- c. Existing Activities:
 - i. Draft document prepared by US Army ERDC principal investigator, Craig Fischenich, PhD, P.E., titled "Considerations for BMP Implementation in Esopus Creek, NY".
- d. Possible Activities to Address Action Items:
 - i. Convene inter-basin committee to develop a document describing recommended BMPs for use in addressing stream bank erosion in the Catskill Mountains.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Convene inter-basin committee to begin developing the document.**

Action Item 14.2 Provide long term access to technical assistance to landowners and municipalities for assessment of their stream-related problems. Help landowners develop effective management strategies for their property and supervise stream project implementation.

- a. Lead Agency: UC SWCD
- b. Other Partners: CCE, DEP, DEC, NRCS
- c. Existing Activities:
 - i. Currently UC SWCD and NRCS staff provide this assistance outside the Ashokan Watershed SMP effort.
- d. Possible Activities to Address Action Item:
 - i. Provide regularly scheduled times in office or for site visits to assist streamside landowners and municipalities with evaluating and addressing stream-related problems.
 - ii. Develop/seek opportunities to demonstrate evaluation techniques and effective management strategies that can be used as part of the education & outreach program.
 - iii. Provide funding, through SAP, CCE implementation funds, or UC SWCD project funds to encourage landowners and municipalities to participate in developing and implementing management plans.
- e. **Planned Activity/Outcome(s) for the 2009 – 2011 Ashokan Action Plan:**
 - i. **Above Possible Activities**

Infrastructure Protection, Maintenance and Enhancement (Includes Stormwater)

Recommendation 15: Encourage collaboration between state and local highway departments and stream management personnel to develop specifications for applying natural channel design concepts to bridge rehabilitation and replacement, streambank stabilization along roadsides and other routine maintenance activities.

Action Item 15.1 Convene periodic 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.

- a. Lead Agency: UC SWCD
- b. Other Partners: municipal, county and state highway departments, DEP, NRCS, CCE
- c. Existing Activities:
 - i. Ashokan Watershed SMP Flooding and Erosion working group meetings
- d. Possible Activities to Address Action Item:
 - i. Attend a monthly Ulster County Highway Superintendant meeting to explain the Program.
 - ii. 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.
 - iii. Develop annually revised work plans for collaboration.
- e. **Planned Activity/Outcome(s) for the 2009 – 2011 Ashokan Action Plan:**
 - i. **Above Possible Activities**

Action Item 15.2 Provide technical assistance to ensure application of fluvial geomorphic principles and fiscal support to the Town of Shandaken in the Deer Lane bridge replacement as a Program-sponsored demonstration project.

- a. Lead Agency: UC SWCD
- b. Other Partners: Town of Shandaken, NRCS, DEP
- c. Existing Activities: none
- d. Possible Activities to Address Action Item:
 - i. Meet with Shandaken Highway Superintendant and others, as needed to complete geomorphic assessment and design for bridge replacement.
 - ii. Contract to provide funding assistance to help procure materials and implementation service.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Action Plan**
 - i. **Above Possible Activities**
 - ii. **Seek additional opportunities to establish collaboration with all Highway departments on using applied fluvial geomorphic principles for assessment and design involved with bank stabilization and bridge/culvert replacement.**

Recommendation 16: Local municipalities, Greene and Ulster County Highway Departments and NYSDOT, should place a priority on vegetation management on critical areas such as roadside ditches and steep slopes. Develop programs to provide road maintenance crews with additional resources for seeding newly cleaned ditches with native ground-cover appropriate for reclamation.

Action Item 16.1 Meet with all highway departments operating in the Ashokan watershed to identify current roadside ditch and steep slope vegetation management practices and provide support as needed to improve those practices.

- a. Lead Agency: UC SWCD
- b. Other Partners: various highway departments, CCE, CWC
- c. Existing Activities: none
- d. Possible Activities to Address Action Item:
 - i. Convene meetings and make recommendations, as needed.
 - ii. Work with highway departments to secure funding to implement recommendations.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **All above Possible Activities with documented assessment and plan for improving quality of vegetation management practices.**

Recommendation 17: Watershed municipalities should evaluate winter road abrasive procedures to address abrasive quality, application methods and spring sweeping. Winter road abrasive materials containing high silt/clay content can have a direct impact on water quality. Municipalities should be encouraged to use high quality washed sand materials. Cost share funding may be needed to provide incentive to use more highly priced materials.

Action Item 17.1 Meet with all highway departments operating in the Ashokan watershed to assess whether road abrasive material in current use has high clay/silt content and identify options to improve quality of abrasive if needed.

- a. Lead Agency: UC SWCD
- b. Other Partners: Ashokan Watershed municipalities, CCE, CWC
- c. Existing Activities: none
- d. Possible Activities to Address Action Item:
 - i. Convene meetings and make recommendations, as needed.
 - ii. Work with highway departments to secure funding to implement recommendations.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **All above Possible Activities with documented assessment and plan for improving quality of road abrasive used by Towns.**

Recommendation 18: Watershed communities should develop and implement comprehensive stormwater management plans which will protect water quality as well as reduce impacts on stream morphology.

- Action Item 18.1** Meet with Towns, CWC, and UC DOE to identify status of stormwater management planning and formulate recommendations for developing or improving, as needed.
- a. Lead Agency: UC SWCD/CCE
 - b. Other Partners: Towns, CWC, UC Dept of Environment
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Item:
 - i. Convene meetings and make recommendations, as needed.
 - ii. Work with involved parties to secure funding to implement recommendations.
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Documented results of meetings**

Recommendation 19: 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.

- Action Item 19.1** Town of Shandaken has mapped with GPS, the locations of all culvert outfalls. Work with the Town to identify those culvert outfalls that may contribute pollutants into the stream system and prioritize opportunities for mitigation.
- a. Lead Agency: UC SWCD
 - b. Other Partners: Shandaken, UC DOE, CWC
 - c. Existing Activities:
 - i. Ulster County EMC assessment report (2006) for County road culverts.
 - d. Possible Activities to Address Action Item:
 - i. Obtain copy of georeferenced information on culverts from Shandaken and UC DOE.
 - ii. Work with Town to add information relating to whether the culvert is a “critical” point-source discharge of pollutants and identify treatment alternatives that can be used to mitigate the problem.
 - iii. Identify funding sources that can assist the Town (and other highway management agencies) in implementing recommended mitigation practices.
 - e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **All Possible Activities listed above with report documenting plan for (1) mitigating point-source pollutant discharges from culvert outfalls; and (2) identification of funding opportunities.**

- Action Item 19.2** If needed, 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.
- a. Lead Agency: UC SWCD
 - b. Other Partners: Municipal, county, and State Highway Dept, UC DOE, CWC

- c. Existing Activities:
 - i. Ulster County EMC assessment report (2006) for County road culverts
- d. Possible Activities to Address Action Item:
 - i. Obtain available copy of georeferenced information on all culverts in Ashokan watershed
 - ii. Perform assessment to identify whether culverts are critical point-source discharges of contaminants and revise geodatabase to identify these sources.
 - iii. Identify treatment alternatives that can be used to mitigate problem culverts.
 - iv. Identify funding sources that can assist the Town (and other highway management agencies) in implementing recommended mitigation practices.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **none – this would be scheduled after 2011.**

Recommendation 20: Support the development of operational and/or structural modifications at the Shandaken Tunnel intake chamber to reduce turbidity loading to Upper Esopus Creek as outlined in the SPDES permit and Catskill Turbidity Control Study, Phase II. (EC WQ.3)

Action Item 20.1 CCE and UC SWCD staff will attend semi-annual public informational meetings required by the Shandaken Tunnel SPDES permit to stay informed on DEP’s operations of the Tunnel.

- a. Lead Agency: CCE, DEP hosts meetings
- b. Other Partners: none
- c. Existing Activities:
 - i. Semi-annual public meetings hosted by DEP.
- d. Possible Activities to Address Action Item:
 - i. Distribute announcements of scheduled meetings to Council and working group members.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 :**
 - i. **Above Possible Activity**

Action Item 20.2 The Ashokan SMP Field Office in Shandaken will include hard copies of all pertinent public documents regarding the operations of the Shandaken Tunnel and proposed structural and operational modifications to help reduce turbidity discharged into Esopus Creek (e.g. Catskill Turbidity Control Studies Phases 1-3). **[sub-items a. – d. not needed for this Action Item.]**

Recommendation 21: 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.

Action Item 21.1 Develop and distribute to watershed municipalities maps of potential hazards associated with LWD based on aerial and ground-based reconnaissance imagery.

- a. Lead Agency: DEP
- b. Other Partners: CCE, UC SWCD
- c. Existing Activities
 - i. Annual spring aerial reconnaissance of Esopus Creek by helicopter dating back to 2004.

- d. Possible Activities to Address Action Item:
 - i. Review available aerial reconnaissance imagery to map out persistent and/or potentially hazardous LWD sites.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Above Possible Activity provided to Towns and other involved parties, if they want it.**

Action Item 21.2 CCE will research how other areas have handled LWD management issues.

- a. Lead Agency: CCE
- b. Other Partners: UC SWCD
- c. Existing Activities: none
- d. Possible Activities to Address Action Item:
 - i. Conduct nation-wide research into LWD management by agencies and NGOs
 - ii. Prepare brief report documenting research findings with recommendations for LWD management in the Ashokan watershed.
 - iii. Presentation on findings to stakeholders.
- e. **Planned Activity/Outcome(s):**
 - i. **Above Possible Activities. Will depend on availability and accessibility of information on LWD. Initial research assessment will begin Fall 2009.**

Recommendation 22: Support an investigation 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.

Action Item 22.1 UC SWCD and DEP intend to initiate a geomorphic and geotechnical assessment of the “Chichester reach” of Stony Clove Creek (Management Units 17 and 18 in the SCSMP) in support of a proposed treatment feasibility study. This reach of stream is characterized by chronic suspended sediment loading from coupled streambank erosion and hill slope failures.

- a. Lead Agency: UC SWCD
- b. Other Partners: DEP, NRCS, NYS Geological Survey
- c. Existing Activities:
 - i. Geotechnical investigations as part of the Broadstreet Hollow demonstration project and the Batavia Kill at Red Falls study completed by Dan Loucks for GCSWCD.
- d. Possible Activities to Address Action Item:
 - i. Work with other partners through inter-governmental agreement to investigate geotechnical and hydrogeologic conditions leading to hill slope failure at the Chichester reach of Stony Clove.
 - ii. Seek to engage researchers to conduct research in the Esopus Creek watershed to investigate these phenomena.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Possible Activity (i.) listed above.**

Recommendation 23: Support implementation of a stream channel monitoring program. The intent of the monitoring would be to assess and evaluate short-term and long term stream channel system condition at representative sites.

See Action Item 1.3 for the Planned Stream Assessments on page 20. This recommendation will be removed in subsequent Action Plans

Recommendation 24: Support glacial geology mapping in the Upper Esopus Watershed to improve turbidity source characterization.

Action Item 24.1 DEP intends to support the NYS Geological Survey 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. *This Action Item is contingent upon availability of federal funding.*

- a. Lead Agency: DEP NYS Geological Survey
- b. Other Partners: USGS
- c. Existing Activities: none
- d. Possible Activities to Address Action Item:
 - i. Meet with NYSGS staff seasonally to stay apprised as to their efforts and provide additional data as available.
 - ii. Assist NYSGS, if possible with supplemental funding to support effort.
- e. **Planned Activity/Outcome(s) for 2009 – 2011 Ashokan Action Plan:**
 - i. **Contingent upon NYSGS activities, provide support as listed in Possible Activities for this Action Item.**

Riparian and Aquatic Ecosystem Protection and Enhancement

The streams in the Ashokan Watershed and their associated floodplains support an interrelated set of diverse plants and animals. Riparian buffers, in a mountain river setting like the Catskills, are necessary for maintaining a stable stream channel and maintaining ecologic integrity.

Findings from the Stream Management Plans

- The Ashokan Watershed is located entirely within the Catskill Park, in which lies one of the largest expanses of protected land in the United States (the Catskill Forest Preserve) and home to a diverse population of plants and animals.
- The community perceives the health of the stream and associated wildlife as directly related to its sense of community and well-being. The streams support the local economy – which is dependent on tourism related to fishing, whitewater recreation, and other forms of outdoor recreation.
- The Shandaken Tunnel discharges water from Schoharie Reservoir into Esopus Creek that must meet drinking water supply needs while meeting regulatory thresholds for flow, temperature, and turbidity. The effect of the turbidity from the Tunnel on aquatic ecosystems and tourism is a particular concern to residents.
- Attempts to control flooding and erosion, particularly through stream restoration projects, must be balanced with maintaining the integrity of the ecosystem and the wild character of the watershed.

Riparian and Aquatic Ecosystem Recommendations⁵, last updated 4/09

Recommendation 25: 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.

- Action Item 25.1** Review local ordinances for municipalities in the watershed in regards to floodplain management (riparian buffer, flood hazard mitigation, stormwater management). Compare local laws to best practices/model regulations. Examine how existing laws/policies are being applied at the local level.
- a. Lead Agency: CCE
 - b. Other Partners: Ulster County Dept of the Environment, Ulster County Planning, Coalition of Watershed Towns
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Items:
 - i. Determine specific policies of concern and identify best practices/model regulations
 - ii. Collect ordinances for watershed (village, town, county, state, federal) that affect those policies
 - iii. Compare existing policies to each other and to best practices

⁵ Recommendations come from the Esopus Creek Stream Management Plan, Broadstreet Hollow Stream Management Plan, and Stony Clove Stream Management Plans. Updated 4-09 by Riparian and Aquatic Ecosystem Working Group

- iv. Work with elected officials and agency staff to determine how policies are being implemented in the watershed.
- v. Identify and assess impact of possible improvements
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Meet with floodplain managers UC DOE, and UC Planning to identify specific policies of concern to be included in the review. Identify best practices/model regulations. Develop a short report highlighting these findings and disseminate information to towns in the Ashokan Watershed.**
 - ii. **Public presentations on watershed planning issues to raise awareness in the community and support for policy changes.**

Action Item 25.2 Work with towns to refine laws, regulations, or policies as appropriate.

- a. Lead Agency: CCE
- b. Other Partners: Ulster County Dept of the Environment, Coalition of Watershed Towns
- c. Existing Activities: none
- d. Possible Activities to Address Action Items:
 - i. Outreach to municipal officials, assess interest in policy change
 - ii. Develop publications, draft regulations or policies to support proposed changes to policy
 - iii. Offer public education on policies
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Recommendation 26: Recommendation: Assess the impacts of restoration projects on aquatic ecosystems and riparian habitats.

Action Item 26.1 Evaluate ecological impacts associated with restoration projects.

- a. Lead Agency: Multiple
- b. Other Partners: CCE, USGS, DEC, UC SWCD
- c. Existing Activities:
 - i. There are existing aquatic ecosystem monitoring efforts at restoration projects, led by USGS.
- d. Possible Activities to Address Action Items:
 - i. Assess possible restoration sites and collect pre-restoration data
 - ii. Continue monitoring efforts and existing restoration sites
 - iii. Assess impact of restoration efforts
 - iv. Publicize findings of monitoring efforts both to inform other restoration efforts and to inform the public.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Coordinate existing monitoring and research programs with proposed stream restoration sites to the extent possible**
 - ii. **Starting in the summer 2009, develop outreach materials/reports highlighting the results of research at existing sites**

Recommendation 27: Develop and improve landowner incentive programs to encourage voluntary participation in riparian zone protection and enhancement programs.

Action Item 27.1 Identify riparian areas of particular environmental benefit or concern and create a database of targeted properties for riparian zone improvement programs.

- a. Lead Agency: UC SWCD
- b. Other Partners: CCE, DEP
- c. Existing Activities:
 - i. Meetings with other West of Hudson Watershed staff and DEP Riparian Buffer Working Group to identify areas that are critical for SAP program.
- d. Possible Activities to Address Action Items:
 - i. Develop database and GIS layer of targeted properties.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Develop a map and database of targeted properties**

Action Item 27.2 Identify existing incentive programs that are applicable to landowners in the watershed and develop outreach materials for landowners regarding these programs. Directly contact landowners with targeted properties.

- a. Lead Agency: UC SWCD
- b. Other Partners: CCE, DEP
- c. Existing Activities:
 - i. The DEP SAP program staff are working with a consulting firm to develop outreach materials.
- d. Possible Activities to Address Action Items:
 - i. Work with CCE Ulster to refine materials for use in Ashokan Watershed.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Outreach materials for SAP are identified and/or developed**
 - ii. **SAP Coordinator and CCE Staff trained on existing incentive programs**
 - iii. **Intake and assessment forms for landowners are developed that triage available programs**
 - iv. **Targeted landowners are contacted about the availability of SAP**

Action Item 27.3 Initiate riparian buffer programs on lands currently not covered by DEP watershed programs.

- a. Lead Agency DEP/UCSWCD
- b. Other Partners: CCE
- c. Existing Activities:
 - i. Streamside Assistance Program will start in 2009, funded by DEP, this is a new program
 - ii. CCE is assisting landowners in using Trees for Tribes (DEC funding)
 - iii. UC SWCD obtained WRDA funding for a Riparian Buffer Enhancement Program
- d. Possible Activities to Address Action Items:
 - i. Coordination of SAP and Riparian Buffer Enhancement Program
 - ii. Work with Riparian Buffer Working Group to refine SAP program rules as needed
 - iii. As soon as the SAP Coordinator is hired and materials are in place, documented outreach to local landowners on availability of incentive programs, particularly SAP

- iv. Informational materials and enrollment forms will be made available in Project Office and with Town and Village Planning and Zoning staff.
- v. Outreach to planning and zoning staff and code enforcement officers about the programs.
- vi. Landowners in the watershed are referred to, and utilize the Trees for Tribes program, as appropriate

e. Planned Activities for 2009-2011 Ashokan Plan

i. All action items listed above

Action Item 27.4 Provide long term riparian buffer protection through permanent conservation easements for both currently degraded and intact buffer areas.

- a. Lead Agency: DEP, CCE
- b. Other Partners: UC SWCD, NRCS, DEC
- c. Existing Activities:
 - i. NRCS Stimulus funds offered floodplain easements and restoration. CCE and NRCS contacted local towns and landowners to let them know about this program. One landowner submitted an application.
 - ii. Existing DEP Easement Program
 - iii. NRCS CREP program (not generally applicable in this watershed)
- d. Possible Activities to Address Action Items:
 - i. Continue to publicize existing easement programs, and identify properties that are suitable for easements for targeted outreach.

e. Planned Activities for 2009-2011 Ashokan Plan

- i. CCE will provide outreach through their website, newsletters and other methods to local landowners on availability of easement programs**
- ii. Informational materials and enrollment forms available on easement programs in Project office and with Town and Village Planning and Zoning staff.**

Action Item 27.5 Identify barriers to enrolling targeted properties in the programs and work with program managers to improve the programs, to the extent possible.

- a. Lead Agency: CCE
- b. Partner Agencies: UC SWCD
- c. Existing Activities: none
- d. Possible Activities to Address Action Items:
 - i. Survey/interview landowners, environmental non-profits, and municipal officials to identify barriers to participation in buffer enhancement and other ecosystem enhancement programs and solicit recommendations to make programs more accessible
 - ii. Work with DEP, UC SWCD and Ecosystem WG to evaluate recommendations
 - iii. Work with agencies to improve programs where feasible.

e. Planned Activities for 2009-2011 Ashokan Plan

i. none

Action Item 27.6 Develop reliable local sources of native plant material.

- a. Lead Agency: UC SWCD
- b. Other Partners: DEP, CCE, Ulster County Economic Development
- c. Existing Activities:
 - i. DEC is propagating native species from seed at nursery on Long Island
 - ii. Greene County UC SWCD has native plan program

- d. Possible Activities to Address Action Items
 - i. Investigate the feasibility of establishing a source of native plants in Ashokan Watershed
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Recommendation 28: Recommendation: 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 Streamside Assistance Program

Action Item 28.1 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.

- a. Lead Agency: CCE
- b. Other Partners: DEP
- c. Existing Activities:
 - i. CCE website and newsletter
 - ii. Catskill Streams.org (DEP Website)
 - iii. Other publications (e.g. Native Plant Guide)
- d. Possible Activities to Address Action Items:
 - i. Improve CCE website, specifically to promote existing resources.
 - ii. Work with DEP to add content to Catskill Streams.org, where applicable
 - iii. Identify specific publication needs and develop publications tailored to Ashokan Watershed.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **The project website will be updated Summer 2009.**
 - ii. **Develop a publication for the public on establishing and maintaining riparian buffers This project will begin Summer 2009.**
 - iii. **Offer 1 training per year on riparian buffers and native plants**

Action Item 28.2 Develop a pool of CCE Master Gardeners and other qualified volunteers to provide advice and recommendations for material for maintaining and restoration of riparian buffers.

- a. Lead Agency: CCE
- b. Other Partners: none
- c. Existing Activities: none
- d. Possible Activities to Address Action Items:
 - i. CCE Master Gardeners will be working out of the Shandaken Office this summer to provide direct advice to landowners in the watershed.
 - ii. Identify Stream Stewards with a strong gardening background who might be interested in providing information to landowners
 - iii. Provide training to interested volunteers to ensure consistency and accuracy of recommendations
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Master Gardeners available at least 1 day per month at the Shandaken Office to answer questions (during growing season)**

- ii. **Determine if there are individuals who are interested in volunteering to provide information to the public on using native plants in riparian areas**
- iii. **Identify appropriate training programs for possible volunteers**

Action Item 28.3 Develop pool of local volunteers to assist with outreach and with planting projects

- a. Lead Agency: CCE
- b. Other Partners: Trout Unlimited, Homeowner Associations
- c. Existing Activities:
 - i. Stream Stewards Volunteer Program
 - ii. Youth Education Program
 - iii. Ad Hoc requests for volunteers
- d. Possible Activities to Address Action Items
 - i. Enhance outreach to identify and target additional volunteers for projects.
 - ii. Improve database to be able to better track volunteer participation and manage volunteers
 - iii. Staff training on best practices volunteer management
 - iv. Offer regular opportunities for volunteers to participate in the Watershed, with different levels of commitment available.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Staff will have attended training on volunteer management**
 - ii. **Continue Youth Program and Stream Steward Program as a primary source of committed and trained volunteers for community stewardship projects.**
 - iii. **Enhance outreach to volunteers through better use of website, local media, and other outreach.**

Action Item 28.4 Include youth programming to teach youth about the value of riparian habitats, with goal of reaching adults and for general outreach about programs

- a. Lead Agency: CCE
- b. Other Partners: DEP
- c. Existing Activities:
 - i. Youth Program with Onteora High School and Junior High
- d. Possible Activities to Address Action Items:
 - i. Continue Youth Stewards Program
 - ii. Offer public programs targeted to families to reach parents with younger children or those who do not want a regular commitment.
 - iii. Publicize youth activities in the watershed through media, website, and direct outreach to key stakeholders.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Continue Youth Steward Program**
 - ii. **Offer at least one family-oriented program per year**
 - iii. **Develop webpage or publication (newsletter) targeted to families and youth**
 - iv. **Work with outreach staff to ensure media follow-up from youth events/projects**
 - v. **Coordinate with other DEP-led youth efforts, when feasible.**

Action Item 28.5 Offer general education programs on the value of riparian buffers in the watershed.

- a. Lead Agency: CCE
- b. Other Partners: DEP, UC SWCD

- c. Existing Activities:
 - i. Regular general programs for the public
 - ii. Booths at festivals (Shandaken Day, Ulster County Fair)
 - d. Possible Activities to Address Action Items:
 - i. Continue to offer regular public programs some of which feature riparian buffers.
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Feature riparian buffers at one program for the public each year**
- Action Item 28.6** Write articles for newspapers, newsletters, radio and television on the value of riparian buffers to reach wide audience
- a. Lead Agency: CCE
 - b. Other Partners: none
 - c. Existing Activities:
 - i. Esopus Creek Newsletter
 - d. Possible Activities to Address Action Items
 - i. Increase number of contacts with media in watershed
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **One of the three issues of Esopus Creek newsletter will feature riparian buffers.**
 - ii. **Develop a media outreach plan around riparian buffers and other BMPs by the fall 2009**

Recommendation 29: 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.

- Action Item 29.1** Work in cooperation with highway departments, utility companies, and Catskill Scenic Railroad, to identify and prescribe specific sites for planting or improved management
- a. Lead Agency: UC SWCD
 - b. Other Partners: DEP, CCE
 - c. Existing Activities:
 - i. Outreach to highway departments
 - d. Possible Activities to Address Action Items
 - i. Identify high priority sites for mitigation work.
 - ii. Adapt Delaware County's contractor and municipal employee training in Ulster County
 - iii. Workshops
 - iv. Field tours
 - v. Offer grants for improved management
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Identify high priority sites and opportunities for collaboration**
- Action Item 29.2** Provide funding for plantings either as buffers or as bioengineering/biotechnical stabilization projects.
- a. Lead Agency: UC SWCD
 - b. Other Partners: CCE

- c. Existing Activities:
 - i. Trees for Tribes program
 - ii. Riparian Buffer Enhancement Program through UC SWCD
- d. Possible Activities to Address Action Items
 - i. CCE or UC SWCD provide funding, depending on project
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Provide funding as appropriate through SAP or CCE funds**
 - ii. **Continue to work with Trees for Tribes program**

Action Item 29.3 Identify critical road embankment/streambank locations where side cast snow is likely to affect riparian vegetation and develop strategies to strengthen the riparian vegetation through planting of native species combinations that are both hardy to having their “feet” buried, and which can serve to trap fine sediment.

- a. Lead Agency: UC SWCD
- b. Other Partners: CCE
- c. Existing Activities: none
- d. Possible Activities to Address Action Items
 - i. Identify suitable plants based on hardiness, cost, suitability for roadside planting, and availability
 - ii. Work with highway departments to identify appropriate planting locations
 - iii. Provide funding to pilot the effectiveness of the plantings over several years
 - iv. Monitor plantings relative to similar untreated locations.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Action Item 29.4 Identify locations where utility line right-of-ways pass through vegetation that is critical to bank stability. Work with utility companies to improve management practices to reduce loss of riparian buffer during routine maintenance or replacement of utility lines.

- a. Lead Agency: CCE
- b. Other Partners: UC SWCD
- c. Existing Activities: none
- d. Possible Activities to Address Action Items
 - i. Identify right of way locations that are of concern.
 - ii. Research and assess feasibility in Ashokan Watershed of best practices used by utility companies, nationally
 - iii. Work with utilities to test best practices that are likely to be effective
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Action Item 29.5 Develop management prescriptions for minimizing stress to trees resulting from trimming stream and roadside vegetation. Develop strategies and programs to replant these areas with tree and shrub species which require less maintenance, and seek resources to implement these strategies and programs.

- a. Lead Agency: UC SWCD
- b. Other Partners: CCE, CWC
- c. Existing Activities: none
- d. Possible Activities to Address Action Items
 - i. Identify best management practices that are appropriate to Ashokan Watershed

- ii. Identify barriers to implementing best management practices
- iii. Offer trainings to municipal employees and utility company workers on tree trimming
- iv. Identify areas where replanting with more appropriate species would be more effective
- v. Assist municipalities in replanting

e. Planned Activities for 2009-2011 Ashokan Plan

- i. **None**

Action Item 29.6 Encourage development and implementation of alternative management practices at US Army Corp flood control projects that enhance in-stream and streamside habitat conditions.

- a. Lead Agency: CCE
- b. Other Partners: UC SWCD, DEP
- c. Existing Activities: none
- d. Possible Activities to Address Action Items:
 - i. Meet with DEC to investigate alternative practices for Japanese knotweed control

e. Planned Activities for 2009-2011 Ashokan Plan

- i. **Meet with DEC to investigate alternative practices for Japanese knotweed control.**

Recommendation 30: Work with landowners and other partners to develop a Japanese knotweed eradication program for the Watershed that emphasizes starting in the headwaters and main tributary streams.

Action Item 30.1 NYC DEP and the Soil and Water Conservation Districts in the Catskill region should establish a program researching the ecology of Knotweed and testing various management prescriptions. The findings of this research would be applied to management programs in the watersheds.

- a. Lead Agency: DEP
- b. Other Partners: CCE, UC SWCD
- c. Existing Activities:
 - i. Outreach by DEP (Jenn Greiser) on research on management of knotweed
 - ii. UC SWCD Japanese knotweed demonstration study
- d. Possible Activities to Address Action Items:
 - i. Volunteer Stream Stewards test eradication methods in watershed based on research findings presented by DEP and UC SWCD
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Stream Stewards will develop citizen science project to test eradication methods and demonstrate results to community**

Action Item 30.2 Encourage and assist watershed municipalities to manage knotweed areas in a manner that will prevent the spread and further infestation of the watershed stream corridor. In particular work with local and county highway departments

- a. Lead Agency: UC SWCD
- b. Other Partners: CCE, DEP
- c. Existing Activities: none

- d. Possible Activities to Address Action Items:
 - i. Encourage highway departments to reduce spread of knotweed
 - ii. Develop a program for highway maintenance staff on managing knotweed
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Action Item 30.3 Continue mapping and monitoring the presence of Japanese knotweed in the Upper Esopus Creek watershed through multi-agency and public collaboration.

- a. Lead Agency: UC SWCD
- b. Other Partners: CCE, DEP
- c. Existing Activities:
 - i. Stream Stewards have mapped knotweed
 - ii. Mapping knotweed is a part of the Phase 2 stream assessments.
- d. Possible Activities to Address Action Items
 - i. Continue to map knotweed as a part of the assessment process
 - ii. Develop protocol for citizens to map and monitor knotweed and to provide information to the project staff
 - iii. Provide training to citizens/volunteers to map knotweed
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Map knotweed as a part of the two new stream assessments**
 - ii. **Use stream stewards or youth to map knotweed as a community service project**

Action Item 30.4 Continue use of the Upper Esopus Creek at Woodland Valley Restoration Project site as a Japanese knotweed control demonstration site.

- a. Lead Agency: UC SWCD
- b. Other Partners: CCE, DEP
- c. Existing Activities:
 - i. UC SWCD demonstration site
- d. Possible Activities to Address Action Items: none
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Action Item 30.5 Provide education to landowners through publications, website, and public programs on identification, proper disposal and eradication of Japanese Knotweed

- a. Lead Agency: CCE
- b. Other Partners: UC SWCD, DEP
- c. Existing Activities:
 - i. Public programs
 - ii. Newsletter articles
- d. Possible Activities to Address Action Items
 - i. Continue public programs (one per year on knotweed)
 - ii. At least one article per year on knotweed
 - iii. Website information on knotweed
 - iv. Develop brochure/factsheet on Knotweed
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **One public program on knotweed**
 - ii. **Two newsletter articles on knotweed**

- iii. **Develop website information on knotweed**
- iv. **Develop brochure/factsheet on knotweed**

Recommendation 31: Work with Trout Unlimited, fishing guides, whitewater recreation, and other partners to develop a Didymo awareness program for the Watershed that emphasizes prevention of further infestation.

Action Item 31.1 Work with TU and DEC to disseminate information about Didymo and how to prevent it

- a. Lead Agency: CCE
- b. Other Partners: Trout Unlimited, DEC
- c. Existing Activities: none
- d. Possible Activities to Address Action Items:
 - i. Develop factsheets for kiosks on didymo
 - ii. Develop public information campaign on didymo
 - iii. Develop signage for fishing access spots
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Place factsheets on kiosks about didymo**
 - ii. **Develop public information strategy in collaboration with DEC**

Action Item 31.2 Assess the feasibility of possible management strategies for preventing the spread of didymo in the watershed (i.e. wader cleaning stations)

- a. Lead Agency: CCE
- b. Other Partners: Trout Unlimited, DEC
- c. Existing Activities: none
- d. Possible Activities to Address Action Items:
 - i. Investigate success of other prevention strategies in areas with Didymo
 - ii. Work with DEC and TU to implement prevention strategies with a likelihood of success
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Disseminate information about effective prevention strategies**
 - ii. **Attend meetings of agencies working on this issue to develop appropriate response**

Action Item 31.3 Provide financial assistance for outreach activities and to help implement feasible management strategies.

- a. Lead Agency: CCE
- b. Other Partners: Trout Unlimited, DEC
- c. Existing Activities: none
- d. Possible Activities to Address Action Items: none
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **none**

Recommendation 32: Work with the Catskill Region Invasive Species Partnership (CRISP) to address locations of early detection species in the Ashokan Basin.

Action Item 32.1 Attend CRISP meetings

- a. Lead Agency: CCE
- b. Other Partners: UC SWCD, DEP

- c. Existing Activities:
 - i. CCE Participates in CRISP
 - d. Possible Activities to Address Action Items:
 - i. Continue to designate a staff person to attend CRISP meetings and participate in CRISP
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Designate a staff person to attend CRISP meetings and participate in group**
- Action Item 32.2** Work with West of Hudson DEP education and outreach group to develop and disseminate outreach materials and offer public programs on Invasive Species for the West of Hudson Watersheds
- a. Lead Agency: CCE
 - b. Other Partners: UC SWCD, DEP
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Items
 - i. Participate in WOH group
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Designate staff to participated in WOH education group**
- Action Item 32.3** Provide resources to support efforts to address early detection species
- a. Lead Agency: CCE
 - b. Other Partners: UC SWCD, DEP
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Items: none
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **none**

Recommendation 33: Continue research, evaluation, and monitoring efforts on Aquatic Ecosystems in the Watershed to improve best management practices.

- Action Item 33.1** Explore opportunities for operational adjustments of the Shandaken Tunnel to accommodate the needs of biota along with other stakeholders.
- a. Lead Agency: CCE
 - b. Other Partners: USGS, DEC, DEP
 - c. Existing Activities: none
 - d. Possible Activities to Address Action Items:
 - i. “Quantitative Assessment of Water Quality in the Upper Esopus Creek: fish, macro invertebrates, periphyton, turbidity and nutrients” NY DEC and USGS Grant to: “provide a comprehensive assessment of biological condition (fish, invertebrates and algae); quantify areas of high sediment and turbidity, and possible sources nutrient enrichment in the Upper Esopus Creek. In addition, provide recommendations on management strategies to improve biological condition and water quality based on the data collected”
 - ii. Provide outreach materials on findings
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Coordinate with USGS/DEC grant listed above**

Action Item 33.2 Further inventory and characterize wetlands along the main-stem Esopus Creek.

- a. Lead Agency: DEP
- b. Other Partners: DEC, CCE, UC SWCD, UCCC
- c. Existing Activities:
 - i. DEP wetlands assessment contract with Ulster County Community College
- d. Possible Activities to Address Action Items: none
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Coordinate with DEP/UCCC research team to share information as it is available**

Action Item 33.3 Support further aquatic bio-monitoring and studies of other wildlife, their habitats, and interactions in the watershed by the multitude of public agencies and interest groups.

- a. Lead Agency: CCE
- b. Other Partners: USGS, DEC, DEP
- c. Existing Activities: none
- d. Possible Activities to Address Action Items
 - i. "Quantitative Assessment of Water Quality in the Upper Esopus Creek: fish, macro invertebrates, periphyton, turbidity and nutrients" NY DEC and USGS Grant to: "provide a comprehensive assessment of biological condition (fish, invertebrates and algae); quantify areas of high sediment and turbidity, and possible sources nutrient enrichment in the Upper Esopus Creek. In addition, provide recommendations on management strategies to improve biological condition and water quality based on the data collected"
 - ii. Hold regular working group meetings
 - iii. Hold an annual research conference for researchers working in the Ashokan Watershed, or coordinate panel at existing conferences
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Coordinate with DEC/USGS research grant**
 - ii. **Hold regular working group meetings**
 - iii. **Hold an annual research conference for researchers working in the Ashokan Watershed, or coordinate panel at existing conferences**

Action Item 33.4 Assist with coordination to make the sampling consistent and data reporting consistent, organized and accessible.

- a. Lead Agency: CCE
- b. Other Partners: Aquatic and Ecosystem Working Group, USGS, DEC, DEP
- c. Existing Activities:
 - i. Working Group Meetings
- d. Possible Activities to Address Action Items
 - i. Regular meetings of researchers working in the watershed
 - ii. Annual research conference
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Hold regular working group meetings**
 - ii. **Hold an annual research conference for researchers working in the Ashokan Watershed, or coordinate panel at existing conferences**

Action Item 33.5 Support identification and characterization of spring seeps that provide critical cold-water habitat to trout and other biota.

- a. Lead Agency: CCE
- b. Other Partners: USGS, DEC, DEP
- c. Existing Activities: Initial study of seeps
- d. Possible Activities to Address Action Items
 - i. Factsheet on importance of seeps to trout
 - ii. Coordinate with related research monitoring activities in the watershed
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **none**

Stream-based Recreation and Tourism⁶

Historically, the Catskills have been a draw for the wide range of recreational activities they provide. Hiking, camping, fishing and family vacations at the former great resorts have all drawn people from the surrounding metropolitan areas. Tourism has changed since the hay days of the grand resorts in the Catskills, and there is hope in the new emphasis on “eco-tourism.” Some of the findings and concerns raised in the Stream Management Plans included:

- Trails for hiking, biking, cross country skiing and snowshoeing can provide multiple benefits, including drawing visitors to local resorts and increasing user awareness of stream management issues.
- Turbid water sometimes discharged from the Shandaken Tunnel impacts aesthetics and recreational use of the stream.
- Flows from normal operation of the Shandaken Tunnel sustain the tubing industry, while the kayaking and canoeing community require recreational releases as allowed in Part 670.
- Large Woody Debris and unnatural debris like appliances and metal provide habitat for trout and other biota but may present a navigational hazard to recreational boaters and tubers.
- Stream projects have the potential to impact user- opportunities for angling and water-based recreation.
- Esopus Creek access, information, and services (or lack thereof) could be enhanced.

Stream-based Recreation and Tourism Recommendations (last updated 4/09)

Recommendation 34: Support the use of newly developed models to optimize operation of the Shandaken Tunnel to meet the flow requirements in Part 670, including recreational releases when requested, in balance

- Action Item 34.1** Improve the timing and reliability of requested recreational releases, particularly in July and August as they are critical to the economic viability and sustainability of the whitewater boating economy
- a. Lead Agency: CCE
 - b. Other Partners: DEP, DEC, KCCNY
 - c. Existing Activities:
 - i. KCCNY coordinates requested releases for whitewater boating community to DEC.
 - d. Possible Activities to Implement the Action Items:
 - i. Research reliability of release dates related to requests
 - ii. Improve communication between DEC and whitewater clubs and businesses that are dependent on knowing dates of releases.

⁶ Recommendations come from the Esopus Creek Stream Management Plan, Broadstreet Hollow Stream Management Plan, and Stony Clove Stream Management Plans. Updated 4-09 by Recreation and Tourism Working Group

- iii. Make the notification process earlier, if possible. May is too late to plan events and past the date many people plan for vacations.
- iv. Do not cancel the summer releases unless there is a significant environmental impact that would outweigh the economic benefit of the planned releases or the loss from cancelled events.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Investigate actual release dates related to requested dates.**

Recommendation 35: Support continued exploration of stakeholder liability issues for large woody debris (LWD), as well as jurisdictional responsibility for removal of LWD.

- Action Item 35.1** Research policy/regulations around liability for large woody debris
- a. Lead Agency: CCE
 - b. Other Partners: DEC
 - c. Existing Activities: none
 - d. Possible Activities to Implement the Action Items:
 - i. Coordinate with Ecosystem Working Group Members also interested in LWD
 - ii. Initial literature review on large woody debris management and policy
 - iii. Look into possibility of designating the Upper Esopus below the Portal as a High Intensive Use Area, to allow DEC to provide assistance with LWD removal, without setting a precedent that they will do this for all streams.
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Literature/Policy review on LWD with best practices from other states**
 - ii. **Meeting with stakeholders to review the document and to make local recommendations for policy change where needed.**

Recommendation 36: Public access to the streams should be enhanced in the watershed.

- Action Item 36.1** Identify potential stream access sites in the watershed.
- a. Lead Agency: CCE
 - b. Other Partners: DEP, DEC, Trout Unlimited, KCCNY, DOT
 - c. Existing Activities: none
 - d. Possible Activities to Implement the Action Items:
 - i. Develop criteria for additional access sites
 - ii. Identify potential access sites that meet criteria
 - iii. Solicit feedback from user communities as to which sites would be the highest priority for development
 - iv. Coordinate with UC SWCD Stream Projects to include or consider public access, where feasible
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Include a representative from whitewater boating community as a stakeholder for the review panel for Stream Management Projects**

- Action Item 36.2** Make improvements to existing stream access sites
- a. Lead Agency: CCE
 - b. Other Partners: DEC, DEP
 - c. Existing Activities: none
 - d. Possible Activities to Implement the Action Items:
 - i. Rename “Fishing Access Sites” to “Public Access Sites” to recognize that the stream has multiple users.
 - ii. Develop assessment tool for reviewing condition and use of existing access sites
 - iii. Assess existing sites
 - iv. Rank needed improvements
 - v. Identify possible funding sources to make improvements
 - vi. Recruit volunteers to assist with repairs/enhancements/maintenance
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Recommendation 37: Investigate opportunities to develop multi-use, low impact trail systems along the stream corridor. Trails for hiking, biking, cross country skiing and snowshoeing can provide multiple benefits, including drawing visitors to local resorts and increasing user awareness of stream management issues.

- Action Item 37.1** Develop access trails to rivers and connect trails to existing trail networks as feasible
- a. Lead Agency: CCE
 - b. Other Partners: Ulster County Planning
 - c. Existing Activities: none
 - d. Possible Activities to Implement the Action Items:
 - i. Work with Ulster County trails and open space committees to assess feasible locations for trails.
 - ii. Seek funding for trails
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

- Action Item 37.2** Trails should be integrated with interpretive signage.
- a. Lead Agency: CCE
 - b. Other Partners:
 - c. Existing Activities: none
 - d. Possible Activities to Implement the Action Items:
 - i. Mini grants to develop interpretive signage
 - e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

- Action Item 37.3** Develop better maps of trail networks, parking, and river access locations to encourage and enhance the recreational experience that visitors and locals have.
- a. Lead Agency: CCE
 - b. Other Partners: DEP, DEC
 - c. Existing Activities: none

- d. Possible Activities to Implement the Action Items:
 - i. Mini grants to assist with map development
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Recommendation 38: Study the economic impacts of stream-based recreation and tourism related activities on the local economy.

Action Item 38.1 Economic impact assessment of fishing based tourism, including an economic analysis and review of resource limitations/needs. A study should address stream conditions, resource limitations and the status of support industries such as tackle shops.

- a. Lead Agency: CCE
- b. Other Partners: UC Department of Economic Development, UC Tourism, Trout Unlimited
- c. Existing Activities: none
- d. Possible Activities to Address Action Item:
 - i. Lit review on economic impact of fishing based tourism
 - ii. Estimates of multiplier effect of fishing-based businesses on local economy
 - iii. Estimate current impact and feasibility of expansion. Work with UC Tourism and UC Economic Development
 - iv. Disseminate information to stakeholders
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Action Item 38.2 Conduct an economic impact analysis of whitewater boating on the Esopus to the region, including an economic analysis and review of resource limitations/needs. The study should address stream conditions, resource limitations and the status of support businesses such as campgrounds.

- a. Lead Agency: CCE
- b. Other Partners: UC Department of Economic Development, UC Tourism
- c. Existing Activities: none
- d. Planned Activities:
 - i. Lit review on economic impact of whitewater boating in region
 - ii. Estimates of multiplier effect of whitewater-based businesses on local economy
 - iii. Estimate current impact and feasibility of expansion. Work with UC Tourism and Economic Development
 - iv. Disseminate information to stakeholders, including to managers of Shandaken Tunnel releases.
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **None**

Recommendation 39: Provide a community education campaign for recreational safety on the Esopus Creek.

Action Item 39.1 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.

- a. Lead Agency: CCE
- b. Other Partners: TU, KCCNY, Stream Stewards, Youth Stewards
- c. Existing Activities:
 - i. Kiosk at Esopus Creek at Woodland Valley Demonstration Site
- d. Possible Activities to Implement the Action Items:
 - i. Finish existing Woodland Valley Kiosk
 - ii. Develop/identify informational materials
 - iii. Four additional kiosks were recommended
 - iv. Offer minigrants to develop kiosks
 - v. Update information/maintain kiosks
- e. **Planned Activities for 2009-2011 Ashokan Plan**
 - i. **Finish and enhance Woodland Valley kiosk with additional informational materials (Summer 2009)**
 - ii. **Offer mini-grants to develop or enhance kiosks along the streams in the watershed.**

Staff Development to Support Action Plan Implementation

Audience: Program Staff and Agency Partners

1. Willow Identification Training

Description: Training for internal project staff to learn to identify and tag native species of willow for possible future harvesting for bioengineering and planting projects.

Lead Agency: DEP

Other Partners: CCEUC, SWCD, DEC, and others

Timeframe: June, 2009

2. Staff will attend training on volunteer management

Description: staff will learn volunteer management and tracking techniques.

Lead Agency: CCE - Ulster

Timeframe: by June, 2010

3. Rosgen Fluvial Geomorphology Trainings

Description: Five day training on Rosgen's methods of natural channel stream restoration.

Lead Agency: DEP

Partner Agencies: CCEUC, SWCD, contractors, regional agencies, DEC, others

Timeframe: 2009-2011

4. Train staff on requirements and benefits of existing incentive programs for landowners including but not limited to: public and private easements, CWC programs, CREP, forestry programs, and the Streamside Assistance Program.

Lead Agency: UC SWCD

Partner Agencies: CCEUC, DEP

5. Bioengineering Training

Description: Three day "beginner to intermediate" workshop on bioengineering for internal staff, highway departments, SWCD and others. Classroom and field installation component. Includes review of stream dynamics, hydrology, hydraulics, sediment transport, riparian vegetation concepts, principles behind using bioengineering treatments, riparian plant propagation and plant identification, streambank soil bioengineering practices.

Lead Agency: DEP

Other Partners: CCEUC, UCSWCD, Contractors, Highway Departments, and others

Timeframe: Spring, 2010