

Completed Action Plan Items May 2007 through May 1, 2015

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Schoharie Basin Stream Management Program Action Plan - Completed Action Items May 2007 through May 1, 2015

The *Schoharie Basin Stream Management Program Action Plan* summarizes the programs and projects of the GCSWCD, NYCDEP and Schoharie Watershed Advisory Committee. Completion of these programs and projects leads to successful implementation of Schoharie Basin stream management plans. The first Action Plan was completed in May of 2007, and is updated annually. This document summarizes **completed** action items from the previous action plans (May, 2007 through May 1, 2015).

I. Program Administration

1. **General Contracting Specification (2009):** The GCSWCD went through an RFP process to develop a list of “pre-qualified” contractors for miscellaneous contract work, including installing stormwater management practices, drainage improvements, and stream projects. Having the four pre-qualified contractors will shorten the contracting process in times of emergency, such as following floods.
2. **Inter-Agency Coordination:** Further coordination between the agencies with stream management responsibilities is a key component of SMP implementation. Although this is an ongoing activity in Schoharie basin action plans, and everyday interactions among agencies are difficult to account for, the following measurable items have been completed:
 - a. **Riparian Buffer General Permit (2009):** To successfully implement a multi-year riparian buffer program it was necessary to work with NYSDEC, USACOE and NYCDEP to develop a general permit to allow for rapid planning and installation of riparian buffers. The general permit applies to minor (less than 300-ft), short-term impacts such as bank preparation and planting. For more information on the general permit contact GCSWCD.
 - b. **Restoration Project Permits (turbidity controls) (2007):** The GCSWCD and NYCDEP worked with NYSDEC to evaluate alternatives and to offer training to address the complexity of achieving turbidity control during construction. The GCSWCD had two staff members trained as Certified Professional Erosion and Sediment Control specialists, one trained as a Certified Professional in Stormwater Quality and the majority of staff were trained as part of the NYSDEC 4-hour erosion and sediment control certification. In addition, the GCSWCD is qualified to teach the 4-hour E/S control certification. Finally, through DEP, GCSWCD purchased dewatering equipment for stream projects and routinely prepares stormwater pollution prevention plans for all size projects.
3. **Local Adoption of SMPs (April 2009) -** All Greene County municipalities within the Schoharie Basin and sub-basins (Batavia Kill, East Kill, and West Kill watersheds) and the Town of Conesville (Manor Kill) have adopted the relevant SMPs and signed Memoranda of Understanding (MOU) with GCSWCD and SCSWCD, respectively. Annual reviews occur with the municipalities per the MOU and provide an update on current action items within the municipality as well as seek input from municipal officials in identifying potential future projects based on local needs.
4. **Schoharie Watershed Advisory Committee (Organized, May 2008):** The organizational structure of the Schoharie Watershed Advisory Committee (SWAC) was developed in early 2008. After the kick off meeting in May 2008, the SWAC has met regularly throughout the year, developed program materials to initiate a stream management plan implementation funding application process, and identified initial projects for implementation. Although administrative support for the SWAC remains on ongoing activity, the effort to establish local representation and implementation of the SMP, coupled with technical agency support, has been accomplished. For more information: <http://www.catskillstreams.org/SWAC.html>.

5. **Program Office (April 2008):** The GCSWCD and NYCDEP collaborated to establish a project office within the Schoharie watershed. The GCSWCD and WAP identified and secured a Mountaintop project office in Tannersville which is being used by various local, regional, and state committees working on watershed protection (e.g., Schoharie Watershed Advisory Committee, subcommittees of the SWAC, Mountaintop Supervisor & Mayors Association, WOH Education & Outreach committee, Stream Restoration Committee for NJ Chapter of AWRA, to name a few). For directions to the office contact Michelle Yost at michelle@gcswcd.com or 518.589.6871.

6. **Program Administration, Staffing Plan (2007):** To manage the many projects and priorities in the action plan, the GCSWCD needs staffing and resources to provide overall project administration. In 2007, a staffing plan was developed along with a new intergovernmental agreement between the GCSWCD and NYCDEP that began in January of 2009 and will fund watershed activities through January, 2014.

II. Education on Watershed Protection

The GCSWCD continues to work with a wide network of partners to enhance its education and outreach efforts related to stream management, floodplain management, sediment and erosion control and other topics critical to sound watershed management. A number of successful educational projects were completed between May 2007 and May 2013:

1. **Post Flood Stream Intervention Training (2012 & 2013):** GCSWCD presented and/or contributed to five Post Flood Stream Intervention Trainings, held in Ulster, Greene, and Dutchess counties. The training was tailored to local highway departments, excavation contractors, and other involved in stabilizing streams following flood events. The training focused on the basics of stream process and the limits of what should be targeted for repair in the immediate days following destructive flooding.

2. **CD Lane Family Day (2011):** The Community of Windham Foundation (COWF) sponsored a Family Day as part of the 2011 Schoharie Watershed Month (May 2011). The Family Day activities included Trout Unlimited fly fishing demonstrations, water quality testing activities with the Schoharie River Center, nature hikes, kayak demonstrations, and a water-focused craft activity. The Family Day activities were intended to encourage responsible use of water and nearby land areas. Approximately 60 individuals participated in the 2011 Family Day, which was held along Main Street in Windham. This location was chosen (instead of CD Lane Park) in order to increase attendance at, and public participation in, Family Day.

3. **Manor Kill Information Kiosk (2011):** GCSWCD provided a Kiosk for Conesville, and a general Schoharie Watershed/ Schoharie Soil and Water Conservation District educational panel was produced in conjunction with GCSWCD's kiosk series. The kiosk was installed in December 2011.

4. **Identify Existing Resources (2011):** GCSWCD identified and cataloged existing resources that are currently available. The website was revamped in 2011, to provide web-based documentation of existing resources and links to additional resources.

5. **Environmental Film Series (2011 & 2012):** The film series was held at the Doctorow Center in Hunter during the Schoharie Watershed Month. The films highlighted watershed issues, pollution mitigation, and watershed, foodshed, and viewshed topics.

6. **Mountain Top Arboretum Outdoor Classroom Construction (2011):** An outdoor classroom was designed and constructed at the arboretum. The classroom accommodates approximately

45 people for year-round outdoor programming on a range of ecological and natural history topics relating to the watershed.

7. **Schoharie Watershed Months (2011 & 2012):** Schoharie Watershed Week was expanded to one month in 2011. The 2011 Schoharie Watershed Month involved hands-on workshops, stream clean ups, riparian buffer plantings, an Environmental Film Series, and other fun, educational, hands-on activities.
8. **Schoharie Watershed Week (2010):** The first Annual Schoharie Watershed Week was held May 17-23rd, 2010. A number of events were scheduled during the week to educate and engage local community members in watershed programs and stewardship activities.
9. **Batavia Kill Stream Celebration (Aug. 2007, 2008, 2009, 2010 & 2011):** recommended in the BK SMP and organized through a strong partnership of local communities, watershed agencies, non-profit organizations, educators and businesses, the BKSC has become a premier annual environmental event. At its core, the BKSC is about celebrating and promoting the wise use of our natural resources as they relate to water quality and ecosystem functions. Designed to engage people of all ages, especially children, the Celebration offers interactive exhibits, educational displays, and activities promoting understanding of the environment. For more information: <http://gcswwcd.com/swp/eo/bksc.html>.
10. **Manor Kill Environmental Study Team/Stream Management Implementation (August 2009 – June 2011):** The Manor Kill Environmental Study Team (EST) Program was an experientially based, hands on environmental education and stream monitoring program. Through this program, youth EST members (ages 13 - 18) learn specific skills, and develop and master abilities in environmental assessments, field research projects and community education activities. The EST also participated in a riparian planting along the Manor Kill in 2011. The program served 20 youth from the Gilboa-Conesville School District and an additional 40 youth from Schoharie, Montgomery and Schenectady Counties.
11. **Watershed Summits (January 2007, 2008, 2009, 2010, 2011, 2012 & 2013):** initiated under the Schoharie Watershed Strategy noted below, watershed conferences were held in January '07, '08, '09, '10 and '11 to provide local decision makers and officials educational classes and networking opportunities around watershed protection. Interest in the Summits is evident by the number and diversity of attendees, with all eleven communities in the basin being represented.
12. **Watershed Tours (2007 through 2010):** Watershed tours were organized in June '07, '08, '09 and '10 as a follow up to the successful Watershed Summits. Recommended by local officials to continue educational outreach on a basin-scale, the tours are designed to demonstrate best management practices to foster an improved understanding of stewardship practices.
13. **Educational Workshops (2007 through May 2013):** although listed as a separate category, educational workshops are built into the Summits and Tours. Targeted audiences included elected and appointed officials, planning boards, code enforcement officers, highway department staff and streamside property owners.
 - a. **Post Flood Emergency Stream Work Training (2012):** The flooding and damage caused by Tropical Storms Irene and Lee led to the coordination and presentation of the emergency stream work training. The training content was developed by a team of contributors from DEP, UCSWCD, GCSWCD, CCE Ulster, Trout Unlimited, and Shandaken Highway Department In the first quarter of 2012. One session of the training was presented in Ulster County on March 20, 2012. Two sessions of the training were presented in Greene County on March 26 and 27, 2012. Over 200 attendees were trained in the basic considerations that should be addressed when planning an emergency intervention in a stream system.

- b. Water Quality at Home Workshops (2011): Two action-based educational workshops were held during Schoharie Watershed Month to help raise awareness about stewardship of water quality. The Holistic Pond Management Workshop provided tools and strategies to address pond problems without the use of chemical treatments. The rain barrel workshop discussed the impacts of stormwater runoff on water quality and taught participants how to build a rain barrel.
- c. Roadside Ditch Maintenance Workshop (2011): NYSDOT, Greene County Highway and most municipalities in Greene County and the Schoharie Watershed attended the Workshop which covered 1) Impacts from roadside ditches on water quality and municipal budgets, 2) General ditch maintenance and importance of proper erosion control, 3) Distinctions with topography, soils, slopes, and drainage; 4) Cost factors, different applications and lifespan; and 5) Selective ditching, how to prioritize to save money and minimize water quality impacts.
- d. State and City Stormwater Regulations (2011): Workshop participants were informed about what triggers a permit and what are permit requirements of NYSDEC, NYCDEP.
- e. What to do After the Flood (2011): Floodplain administrators' and community officials' guide to surviving a flood. NYSDEC.
- f. Mountaintop Mapping (2011): workshop participants learned how environmental mapping software can assist local communities in site planning and subdivision reviews.
- g. Low Impact Development Made Local (2010): how improved site planning can achieve multi objectives for Schoharie basin communities
- h. Implementing SEQRA, basics and determinations (2008, 2009, 2010)
- i. DEP and DEC Stormwater Regulations & Updates (2008, 2009, 2010): Presentation of NYSDEC and NYCDEP stormwater regulations.
- j. Basics of implementing low impact development practices, what communities need
- k. National Flood Insurance Program (2009, 2010): Introductory course on floodplain management NYSDEC
- l. National Flood Insurance Program: Intermediate Course (2009): NYSDEC, course focused on flood insurance maps and elevation certificates; DOS accredited course
- m. Low-Impact Development (2009): an overview of an alternative approach to site planning, design and building that minimizes landscape impacts and preserves the natural hydrological cycle.
- n. Dream Homes & Ditch Nightmares (2009) A skit involving landowners learning about permit requirements when building their dream home - volunteer role playing by audience NYSDEC, DOS approved course
- o. Where Infrastructure & Streams Collide: How to Manage Both Responsibly (2008): how infrastructure and streams are influenced by each and what potential strategies exist for prevention and mitigation of problems where stream instability has impacted infrastructure and vice-versa.
- p. Federal & NYS Wetland Protection & Regulation (2008)
- q. 2008 FEMA Flood Maps: What Every Planner Needs to Know (2008)

- r. What is Turbidity & Why is it Important (2007): an overview of what turbidity is, and the impact it has in the Schoharie Basin.
 - s. Impacts from Road Ditch Erosion (2007): results of a field study on the impact of road ditch instability on erosion and sedimentation.
14. **Japanese Knotweed Mailing (2010):** GCSWCD printed 1000 copies of a revised JKW prevention brochure for distribution to landowners in knotweed prevention areas identified by stream feature inventories. The brochures were mailed to 286 streamside landowners and distributed to 11 municipal town halls (15 copies each).
 15. **Riparian Buffer Workshop (2010):** GCSWCD CSBI sponsored Healthy Buffers, Healthy Streams: A Landowner Workshop July 10, 2010. The interactive workshop was held at the Spruceton Community Center in West Kill and showed participants the characteristics of healthy vs. degraded buffers and different management practices to maintain healthy buffers.
 16. **ESC Workshops (2008 through 2010):** sponsored three Construction Erosion and Sediment Control Training Courses that were attended by approximately 230 people from the Schoharie basin. Participants included watershed developers, planners, code enforcement officers, regulators and contractors. This course focused on the review of new state construction permit, the requirements of stormwater pollution prevention plans, and the proper installation of erosion and sediment control practices.
 17. **Mountain Top Arboretum Outdoor Classroom Design (2010):** Design plans and bid specifications for an accessible outdoor classroom were completed in 2010. Visit <http://www.catskillstreams.org/grants> for project materials.
 18. **Rain Barrel Workshop (2010):** Workshop took place during Schoharie Watershed Week May, 2010. Fifteen people took part in building their own rain barrels.
 19. **Mountaintop Arboretum Wet Meadow – Interpretive Kiosk, Brochures, & Historic Pump House Repair (2010):** A kiosk was installed and brochures were developed to describe the wet meadow including the historical background of the historic pump house, an explanation of the site's hydrology, and other information about wetland plants and wildlife. Visit <http://www.catskillstreams.org/grants> for project materials.
 20. **SWAC and Schoharie Watershed Week Logos (2010):** Logos were developed for the Schoharie Advisory Committee and Watershed Week. Visit <http://www.catskillstreams.org/grants> for project materials.
 21. **Conduct Watershed Survey (2009):** It was decided by the SWAC E/O subcommittee to focus surveys on events; that enough watershed surveys have already been done. No larger survey is expected.
 22. **Websites (2007 & 2010):** although websites require continuous updating, the www.catskillstreams.org and www.gcswcd.com are established sites that are used to promote project updates and share information on watershed protection issues.

III. Landowner Stream Assistance

The GCSWCD and NYCDEP recognize the importance of providing assistance to local landowners. The NYCDEP, GCSWCD and SCSWCD have provided necessary training for project staff to be able to provide state-of-the-art technical assistance throughout the watershed. Technical assistance from staff

members guide restoration of stream system stability and help to maintain ecological integrity. The technical assistance can range from a landowner consultation to activities that will help to meet the priorities of protecting water quality and establishing riparian buffers. Protection and enhancement of water quality can benefit both the City of New York's water supply and the residents of the Schoharie basin. Completed Landowner Stream Assistance action items include:

1. **Catskill Streams Buffer Initiative Educational Materials (2009):** CRSR, Inc. was awarded a contract in February 2009 to conduct a needs assessment, develop a marketing strategy, and develop initial program roll-out with above mentioned educational materials. Based on a needs assessment conducted by CRSR, the Streamside Assistance Program has been renamed the Catskill Streams Buffer Initiative (CSBI). The Marketing Strategy, Program Slogan, Program Logo, Introduction Language, Program Brochure and Application for funding have all been developed.
2. **Riparian Program Development (2008):** In 2007-08, the Catskill Streams Buffer Initiative (CSBI) was developed to educate and assist streamside landowners in order to provide for improved stewardship of riparian areas. The GCSWCD worked closely with NYCDEP and others to establish program guidelines, policies, protocols and other items required to offer a riparian buffer program to watershed landowners. GCSWCD developed a protocol that utilizes stream feature inventory and vegetation mapping to identify potential riparian planting sites. In addition, GCSWCD, NYCDEP and other agencies and organizations worked together to guide development of the CSBI, develop CSBI Guidelines and GCSWCD hired a program coordinator to guide riparian projects. For more information visit: <http://www.catskillstreams.org/CSBI/>
3. **Plant Materials Program (Progress – 2007 through 2014):** GCSWCD and NYCDEP staff planted RPM trees at the majority of stream restoration projects and are monitoring 10% of the trees at each site. During the fall of 2007, 202 RPM trees were planted on 8 different sites. Sedges were planted in beds during the spring of 2007 and were over-wintered to establish better root growth. The project team also potted 7950 trees during the spring of 2007 and planted the following project sites: 3200 trees at Conine, Prattsville; 124 trees on the two sites of Shadow Mt. Bridge, Jewett and Holden, Ashland; 1000 trees at Accardi, Jewett; and 400 trees at Ashland Connector, Ashland. The GCSWCD over wintered approximately 3000 trees each year for spring plantings. In addition, the project team utilized balled and burlaped trees that were obtained from the Plant Materials Center. The native seed program was initiated in 2008. GCSWCD arranged delivery of 20,000 herbaceous plugs grown from locally collected seeds by Staten Island Greenbelt Center in October 2009. In 2009, approximately 9,000 trees and shrubs were over-wintered, and 13 planting sites were planted with 4,135 trees and shrubs. Over 1,500 trees were ordered in the spring of 2010. The GCSWCD Plant Material Center received another 10,000 herbaceous plugs and 5,000 Greenbelt tubelings in June 2010, 1,250 RPM trees and shrubs in September 2010, 2,256 Greenbelt tubelings and 1,212 gallon pots from the Greenbelt Center in October 2010. In 2011, GCSWCD received 5,000 2-gallon trees and shrubs, 10,000 herbaceous plugs, and 1,500 1-gallon trees and shrubs. In 2012, GCSWCD received 632 Greenbelt plants in the spring and 1,462 in the fall. In 2013, GCSWCD received 1,811 Greenbelt plants. In 2014, approximately 20,000 Greenbelt plants were delivered; GCSWCD repotted 14,571 out of 20,401 Greenbelt plants.
4. **Catskill Stream Buffer Initiative Projects:** For additional information and project reports visit <http://www.catskillstreams.org/projectmaps/>
 - a. Manor Kill Dahlberg Property Planting (2014): GCSWCD has a 5 year landowner agreement for this property. GCSWCD installed 50 native trees and shrubs and willow stakes along 150 feet of stream in 2014.
 - b. Dodson/McCloskey Property Planting Phase 2 (2013): GCSWCD re-installed a 100 ft. wide riparian buffer along 300 feet of stream including, 250 native trees and shrubs and 25 willow stakes, in the fall of 2013.

- c. Wilkie Riparian Project (2013): GCSWCD has a 5 year landowner agreement for this property. GCSWCD installed 75 willow stakes and 15 native trees and shrubs along 150 feet of stream in the fall of 2013.
- d. Donnelly Riparian Project (2013): GCSWCD has a 5 year landowner agreement for this property. GCSWCD installed 125 willow stakes and 117 native trees and shrubs along 250 feet of stream in the fall of 2013.
- e. Enochty Property Planting (2013): GCSWCD has a 5 year landowner agreement for this property. GCSWCD installed 30 willow stakes and 25 native trees and shrubs along 100 feet of stream in the fall of 2013.
- f. Mayo Property Planting (2013): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 300 willow stakes were installed along 200 ft. of streambank; 94 native trees and shrubs were installed; 0.23 acres of streamside habitat was seeded.
- g. Higgins Property Planting (2013): GCSWCD has completed a Riparian Corridor Management Plan for this property and obtained a 10 year landowner agreement for this property. 60 willow stakes and 49 trees and shrubs were installed in the fall of 2013.
- h. Cole Property Planting (2012): GCSWCD has a 5 year landowner agreement for this property. The Riparian Corridor Management Plan is complete. A subcontractor was hired to grade 300 ft. of streambank along the West Kill prior to planting. GCSWCD planted 225 trees and shrubs and, 200 willow stakes and 300ft of fascines were installed along 350 ft of the right streambank.
- i. Bardfield Property Planting (2011): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. Project planned for the installation of 465 trees, shrubs and willow stakes to create a 35ft. wide riparian buffer along approximately 850 feet of the East Kill in the spring of 2011. Installed 432 trees and shrubs with 20 NYC students on May 5th, 2011. Planting area was 700 feet long and 35 feet wide. Many of the trees were lost to post-flood management activities in the fall of 2011.
- j. Rivera Property Planting (2011): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. Project planned for the installation of 514 trees and shrubs in the spring of 2011 in two separate planting areas along the East Kill. One planting area is 200ft by 50ft. The other is 250ft by 90 ft. In addition, another 500 feet of streambank will be seeded with a riparian buffer mix and staked with willows. GCSWCD installed 506 trees and shrubs, 500 willow stakes, and 50 lbs. of seed. Most trees were lost to post-flood management activities in the fall of 2011.
- k. Slutzky Property Planting (2011): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. Project planned for the installation of 1,484 trees and shrubs in the spring of 2011 next to a parcel that was planted by GCSWCD in 2009. Installed 793 trees and shrubs on May 13th, 2011 with 15 high school students from Gilboa-Conesville CSD. Planting area was 950 ft. long and 50 ft. wide.
- l. Kelly Property Planting (2011): GCSWCD has a 10 year landowner agreement for this property. Riparian Corridor Management Plan is complete. Project planned for the installation of 97 trees and shrubs along 250 ft. to create a 25 ft. riparian buffer in the spring of 2011. Installed 94 trees and shrubs.

- m. Cervini Property Planting (2011): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. Installed 275 trees and shrubs.
- n. Torsiello Property Planting (2011): Flooding, due to Tropical Storm Irene, caused woody debris jam on property. Stream channel was repaired by town highway department. GCSWCD has a 5 year landowner agreement for this property. CSBI installed 275 trees and shrubs.
- o. Hegner Property Planting (2011): This property is adjacent to Torsiello, where stream channel was repaired by the town highway department. GCSWCD has a 5 year landowner agreement for this property. Installed 175 trees and shrubs.
- p. Manor Kill Gentile Property Planting (2010): Catskill Streams Buffer Initiative Pilot. SCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 292 trees, 50 willow stakes, and 500 sedge plugs were installed in November 2009. 100 additional willow stakes were installed spring (2010).
- q. Manor Kill Brandow Property Planting (2010): SCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 50 trees, 100 willow stakes/tubes, and sedge plugs were installed spring (2010).
- r. Manor Kill Quinn Property Planting (2010): SCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 100 trees, 80 willow stakes/tubes, and 100 sedge plugs were installed spring (2010). Approximately 50 – 100 Japanese knotweed plants were removed from the site.
- s. Dodson/McCloskey Property Planting (2010): GCSWCD has a 10 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 300 Trees, shrubs, and weed mats were installed on 6/11/2010 to create a 100 ft. wide riparian buffer along 300 ft. of the East Kill. GCSWCD contracted Bevan Forestry to control a patch of Japanese knotweed. 25 JKW stems were injected with Aqua Master. Some follow up will be required to monitor JKW.
- t. Rapplevea Property Planting (2010): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 150 trees and shrubs were installed on 6/10 and 6/11 2010.
- u. Avella Property Planting (2010): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 26 trees and shrubs were installed 6/24/2010.
- v. Brunsdan Property Planting (2010): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 54 herbaceous plugs, 22 willow stakes, 5 shrubs, and 2 trees installed on 8/18/2010.
- w. Grossman Property Planting (2010): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. Installed a 50 ft. riparian buffer. 198 trees and shrubs were planted 5/27/2010 along 300 ft.
- x. Silver Property Planting (2010): GCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. GCSWCD removed fence, graded 60 ft. of streambank, planted 25 trees and shrubs, and installed 30 willow stakes on 5/27/2010.

- y. Evergreen Planting (2009): Town of Hunter: The GCSWCD/NYCDEP worked with the landowner to develop a planting plan and to obtain a landowner agreement for the property. The Catskill Streams Buffer Initiative (CSBI) riparian planting project was completed in April 2009.
- z. Kastanis Property Planting (2009): Catskill Streams Buffer Initiative Pilot - Obtained 5-year landowner agreement, completed a riparian corridor management plan and restored approximately 7.1 acres of streamside vegetation along the Batavia Kill, including hosting school groups in the effort and planting ~1,500 trees and shrubs.
- aa. Kane Property Planting (2009): GCSWCD has a 10 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 116 trees and 250 willow stakes were installed in November 2009.
- bb. Manor Kill Grogan Property Planting (2009): SCSWCD has a 5 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 54 trees and 500 sedge plugs were installed in November 2009.
- cc. McRoberts Property Planting (2009): GCSWCD has a 10 year landowner agreement for this property. Riparian Corridor Management Plan is complete. 50 trees and shrubs and 125 willow stakes were installed in November 2009.

5. Additional Riparian Buffer Pilot Projects

- a. Carr Road Project (2007-2009): Town of Jewett- Schoharie Creek: The Carr Road riparian project extends over 2,300 feet of the Schoharie Creek in the Town of Jewett. Initiated in 2007, the project had three strategic components: stem injection treatment of Japanese knotweed (*Polygonum cuspidatum*) with glyphosate (Glypro) to prepare the locations for replanting with native vegetation, planting of a 100 foot wide buffer strip from the top of the streambank establishing approximately 2.4 acres of buffer, and enhancing the existing buffer on the immediate streambank by tapering the bank and planting willow tublings and stakes. In 2009, improvements were made to the DEC fishing access parking area and a walking path was improved to the stream.
- b. Deming Road Riparian Project (2009): A stream disturbance permit application has been prepared and submitted to NYSDEC for review and approval. Grading work on an eroded bank was funded jointly by two neighboring landowners and was completed by C&C Excavating in June 2009. During completion of the original project scope, a third landowner approached GCSWCD interested in planting a riparian buffer in open fields adjacent to the original project area. GCSWCD was able to accommodate the additional landowner's request. 723 trees and shrubs and 120 willow stakes were installed on three contiguous parcels.
- c. County Route 6 (2008): Town of Lexington-West Kill: The GCSWCD and the Greene County Highway Dept worked together to implement vegetation stabilization methodologies at a site on the West Kill that was previously scheduled for all rip-rap. Along this site, a short section of Vegetation Reinforced Slope Stabilization (VRSS) was installed, and trees and shrubs were planted on the upper bank; willows were interplanted with the rip rap.
- d. Vegetation Enhancements (2008): Batavia Kill, West Kill, Schoharie Creek and Manor Kill: Root Production Method (RPM) trees were planted at Big Hollow, Brandywine and Ashland Connector. A certified herbicide applicator treated Japanese knotweed at Big Hollow, Carr Rd., Schoharie Ave. and Long Rd. project sites. DEP conducted monitoring of vegetative techniques on a majority of these projects. Vegetation was installed as an

enhancement to a Greene County Highway project in the West Kill (County Route 6) and at a FEMA project along the mainstem of the Schoharie Creek (Faulkeys). Sedges were added to the County Route 13 culvert project that was completed in 2007. Sedges are excellent at holding soil. Finally, a volunteer planting was conducted in the Manor Kill behind the Conesville town hall.

- e. Sugar Maples Riparian Buffer Project (2008): Town of Windham (Batavia Kill). The GCSWCD has received funding from the ACOE (WRDA) for a project to treat invasive Japanese knotweed and then replant ~ 800' for riparian vegetation along the Batavia Kill.
 - f. Riparian Buffer Implementation pilot (2007): The GCSWCD/NYCDEP researched a protocol for identifying potential planting sites based upon stream management planning research. In addition, the GCSWCD approached five of the identified parcel owners and moved forward with the Carr Road riparian restoration project.
 - g. Shadow Mountain (2007): Town of Jewett-East Kill: The GCSWCD planted 124 trees and shrubs, hydroseeded and interplanted the rip rap at the Greene County Highway Department bridge replacement in Jewett over the East Kill.
6. **Stream Restoration Projects:** For additional information and project reports visit <http://www.catskillstreams.org/projectmaps/>
- a. Ashland Well Heads Protection Project (2014): The GCSWCD/NYCDEP and partners completed repair of this stream restoration project in 2014, located along the Batavia Kill in Ashland, NY. The project addressed damages sustained to the Ashland Well Heads restoration site during Hurricane Irene (2011).
 - b. Lanesville Project Repairs (2014): The GCSWCD/NYCDEP and partners completed repair of this stream restoration project in 2014, located along the Stony Clove in Hunter, NY. The project addressed damages sustained to the Lanesville restoration site during Hurricane Irene (2011).
 - c. Long Road Project Repairs (2014): The GCSWCD/NYCDEP and partners completed repair of this stream restoration project in 2014, located along the West Kill in Lexington, NY. The project addressed damages sustained to the Long Road restoration site during Hurricane Irene (2011).
 - d. Ashland Connector Reach Project Repairs (2014): The GCSWCD/NYCDEP and partners completed repair of this stream restoration project in 2014, located along the Batavia Kill in Ashland, NY. The project addressed damages sustained to the Ashland Connector Reach restoration site during Hurricane Irene (2011).
 - e. Brandywine Project Repairs (2014): The GCSWCD/NYCDEP and partners completed repair of this stream restoration project in 2014, located along the Batavia Kill in Ashland, NY. The project addressed damages sustained to the Brandywine restoration site during Hurricane Irene (2011).
 - f. NYS Route 42 West Kill Slope Failure (2013): The GCSWCD/NYCDEP and partners (NRCS, Town of Lexington) completed this stream restoration project in 2013. This EWP project was constructed in 2013. The project addresses a large slope failure along a 1400' reach of the West Kill, just downstream of the Pushman Bridge on NYS 42. The project included stream bank and channel excavation, and the installation of in-stream stabilization structures to achieve stable geometry. Practices include rock riffles, to provide grade control throughout the reach, random boulder clusters, which provide channel roughness, as well as the use of log boulder revetment and dry rock rip rap with willow stakes to establish an armored flood plain bench at the toe of the slope to prevent

future erosion along the toe. Upper portions of the slope were hydroseeded and staked to establish vegetation on the eroded barren hillside. Construction was completed in 2013. As-built survey and plans have been prepared for the project and they have been approved by NRCS.

- g. East Kill Restoration at Apple Hill (2012): The GCSWCD/NYCDEP completed this stream restoration project in 2012; project components included the realignment and resizing of 3,500 feet of channel, the installation of 23 rock structures, and installation of extensive bioengineering treatments and riparian plantings over the 11 acre site. These efforts will improve water quality, reduce risk to humans and property, reduce erosion and excessive sediment loading, restore floodplain function, and improve aquatic and terrestrial habitat. The site included two large active mass failures, measuring approximately 300 feet long, and several hundred feet of exposed streambank. Historic channel instability, caused from ineffective land use management and flooding, started both mass failures and accelerated stream instability in the reach. Historic efforts to control the reach included berming, stream dredging and bank armament. Soil borings confirmed the upstream mass failure generated serious risk to two homes, a barn and septic system, causing risk to humans, property and water quality. This project mitigated the hazard to the homes by realigning the channel away from the slope and providing armament of the toe of the slope. Due to the extensive damage to the barns foundation, the homeowner demolished and removed the structure from the slope and a new septic system was installed on the newly stabilized slope. The lower high bank failure was also stabilized by re-grading the bank to a lower stable slope, realignment of the channel away from the toe of the slope, and the installation of slope drains to remove excessive water in the slope. Several rock structures and bioengineering treatments were also installed to provide long term stability to the bank. Project combined two SMIP projects: Nikolaidis and Kirk/Rotella landowner assistance projects.
- h. Windham Country Club Repairs (2012): Windham – Batavia Kill: Damages sustained at the Windham Country Club along the Batavia Kill are scheduled for repair work in 2012. Topographic data is being collected to support cost, material and labor estimates for implementation of the repair work. GCSWCD will be providing technical support to this project due to the extensive damage that occurred along the stream corridor.
- i. Holden Stream Restoration Project (2011 - 2013): The GCSWCD/NYCDEP completed Phase 1 of the project in 2011, continued construction was postponed due to Hurricane Irene. Project construction was completed in 2012. The project included streambank and channel excavation to achieve stable geometry, installation of in-stream stabilizations structures and a variety of bioengineering techniques along 3,500 feet of stream channel; over 6,000 trees were planted along the restored stream channel.
- j. Vista Ridge Floodplain Restoration (2011): The GCSWCD/NYCDEP completed construction of this stream restoration project in 2011. This project improved the immediate project area and the aggraded reach upstream, by reducing a backwater condition at the Vista Ridge bridge. The project also enhanced the riparian buffer, reduced the risk of failure of Vista Ridge and Colgate Lake Roads, reduces erosion of silts and clays and provides for improvement of the habitat value of the reach.
- b. Wright Stream Bank Stabilization/Riparian Project Enhancement (2011): In 2011, the GCSWCD/NYCDEP modified and enhanced the previously constructed project with additional vegetative treatments. Monitoring will be initiated in 2012.
- c. Wright Stream Bank Stabilization/Riparian Project (2010): The GCSWCD/NYCDEP constructed a bankfull bench (~1,200') and re-vegetated approximately 3,127 feet of streambank. Rock installation was completed by the project contractor, while plantings

were installed by GCSWCD staff and SCA Members during an SCA service project hosted by GCSWCD.

- d. Sugar Maples Stream Restoration (2010): Batavia Kill Tributary, Town of Windham: The GCSWCD/NYCDEP removed mortared stone walls that confined a Batavia Kill tributary and restored the stream to a natural shape and meander pattern. Floodplain grading was performed and the entire site was seeded with wetland and riparian seed mixes. GCSWCD hosted a student planting with three schools to install 1584 herbaceous plugs, 340 willow stakes, 250 trees and shrubs, and 7 willow fascines. This project was designed to restore wetland functions and approximately 700 feet of stream that was historically channelized and confined by mortared stone walls.
- e. Windham Golf Course Streambank Project (2009): This was primarily a CWC Stream Corridor project with GCSWCD assistance. The project provided for the removal of failed sheet piling, armoring of the toe and sloping of the bank, and planting of approximately 155 feet of streambank.
- f. West Kill Restoration Project, Long Road (2009): Town of Lexington: The GCSWCD/NYCDEP has completed a full geomorphic restoration of approximately 2,400 linear feet of stream on the West Kill in Spruceton valley. The site was characterized by significant bank failure and clay exposures in the banks and stream bed. This was implemented in 2009. Wetland delineation, archaeological investigation and final survey of the site were conducted. Project design work is complete and construction was finished in October 2009.
- g. Oakwood Pistol Club (2009): GCSWCD led the CWC Stream Program streambank protection project in the Town of Prattsville. A CWC Stream Corridor Protection Grant had been applied for in the amount of \$99,200 and was awarded by CWC. Engineering services were contracted for this project; design plans and specifications are complete and have been submitted for permit. Construction of this project was completed in Summer 2009.
- h. Schoharie Street Stabilization (2009): Village of Hunter: Stabilization of approximately 120 feet of high stream bank to protect infrastructure and private property. Project includes stacked and pinned rock riprap as well as vegetated beds. The GCSWCD and NYCDEP also added additional riparian buffer plantings on the opposite bank. Project construction is complete. Additional plantings were installed in the fall of 2009. The new plantings were balled and burlapped River Birch trees.
- i. Conine Farm Stream Restoration (2008): Town of Prattsville -Batavia Kill: The GCSWCD/NYCDEP completed a full geomorphic based restoration of a +/-1800 foot reach on the lower Batavia Kill. The project addressed severe slope instability, reduced sediment loading and protected private property.
- j. County Route 13a Culvert Upgrade (2007): Town of Lexington: The GCSWCD/NYCDEP worked with the Greene County Highway Department to upgrade a significantly undersized culvert that was the source of repetitive flooding in the Hamlet of Lexington. The project had excellent community and landowner support and demonstrated floodplain drainage concepts, proper conveyance sizing to allow fish migration and a riparian buffer component.
- k. Holden Stream Restoration (2007): Windham - Batavia Kill: In 2007, a NYS DOT Article 15 stream disturbance permit was flagged by DEC Region 4 for potential inclusion of a natural channel design approach. NYS DOT welcomed the design and implementation assistance of GCSWCD for this sensitive reach. The project established a geomorphically appropriate channel and floodplain bench and included riparian plantings

which restored floodplain function in an area that would have simply been armored with rock.

7. **Completed Modifications of Existing Projects:** The Schoharie Stream Management Program routinely inspects and monitors previously completed projects for 10 years post-construction. . Inspections often lead to adjustments to structures. , replace vegetation, and/or control invasive species. For additional information and project reports visit <http://www.catskillstreams.org/projectmaps/> Tasks completed under this action item include:

- a. Conine Project Repairs (2013): The GCSWCD/NYCDEP completed this stream restoration project in 2013. Brief Description: The Conine Stream Restoration Project is located in the lower Batavia Kill along NYS Route 23 in Prattsville, NY. The purpose of this work was to repair a project, originally constructed in 2007, that experienced extensive damage during tropical storm Irene in 2011. Evidence suggests that the magnitude of Irene, and failure of an upstream culvert and section of NYS Route 23, were primary contributors to the damages and excessive sedimentation that occurred at the site. The repair project commenced in August of 2013, and measured approximately 2,200 linear feet in length, with a disturbance area of approximately 11 acres. The proposed earthwork required the stream channel to be dewatered throughout construction; this was achieved by diverting flow through a passive dewatering channel and pumping. Extensive earthwork was required to restore the reach to original grades, and included excavation and placement of over 52K cubic yards of material. To provide channel grade control, stabilize stream banks, and enhance habitat, the project included the repair and reconstruction of five rock j-hook vane structures, two cross vane structures and a constructed riffle. To improve stream bank stability through the reach, additional biotechnical measures were installed including, 6,100 live stakes and posts and 6,000 feet of live fascines. Vegetative restoration included seeding of native riparian and wetland seed mixes and establishing a 7.10 acre riparian zone planted with 5,560 potted trees and shrubs. The work impacted approximately one acre of existing impacted low quality scrub shrub wetland that was mitigated with over 2.5 acres of native scrub shrub wetland in the northern floodplain. The project, completed in October 2013, cost approximately 872 K; funding was provided by FEMA and NYCDEP. Bioengineering measures and riparian vegetation were installed to achieve revegetation and provide long term stability goals, objectives and permit requirements.
- b. Maier Farm Project Repairs (2013): The GCSWCD/NYCDEP completed this stream restoration project in 2013. The Maier Farm Stream Restoration Project is located in the middle Batavia Kill along NYS Route 23 in Ashland, NY and measured approximately 800 linear feet in length. The purpose of this work was to repair a portion of a project that was originally constructed in 1999 and sustained damages during tropical storm Irene in 2011. Damages included streambank erosion, structural damage to rock structures, channel migration and land loss, and excess sedimentation. These impacts left the reach prone to future erosion which may affect water quality and habitat. An objective of the repair was to recreate the appropriate channel dimension, pattern and profile through the reach. This earthwork required dewatering of the stream channel throughout construction; stream flow and turbid water were collected from within the work area and pumped to temporary settling areas. Extensive earthwork was necessary to restore the reach to original grades, and included the excavation and the placement of 6K cubic yards of material. To provide channel grade control, stabilize stream banks, and enhance habitat, work included the reconstruction of two rock j-hook vane structures and repair of one cross vane structure. To substitute the loss of two rock vanes, and to provide additional resistance to erosion and channel migration into an adjacent agricultural field in the lower meander, a 400 foot long section of live stone revetment was installed; this was an enhancement to the original design. Additional bioengineering measures were installed to strengthen streambanks including, 1,000 live stakes and posts, and 1,000 feet of live

fascines. To establish a one acre riparian zone, vegetative restoration included seeding of native riparian grasses and the installation of 1,000 tree and shrub saplings. The project, completed in October 2013, cost approximately 273K; funding was provided by FEMA and NYCDEP. Bioengineering measures and plantings and vegetation were installed to achieve revegetation and provide long term stability goals, objectives and permit requirements.

- c. Ashland Connector Reach (2008): (Town of Ashland (Batavia Kill): The GCSWCD completed planting on the streambanks and floodplains at the lower end of the project reach. Additionally, compensatory wetland areas were planted with appropriate species. Limited site cleanup work on access/staging areas was also completed, and the project was surveyed as part of the routine project monitoring schedule.
- b. Farber Farm Stream Restoration (2008): (Town of Jewett (East Kill): Following flooding in 2005 and 2006, excessive erosion resulted in damage to the Farber farm project grading and rock structures. Several rock structures experienced damage as a result of the flood flows which peaked at over 3000 cfs. The damaged structures include 4 rock vanes and 2 cross vanes. The site was originally revegetated through the Conservation Reserve Enhancement Program (CREP). The CREP seedlings never became established, which limited project success and, the lack of vegetation may have contributed to the overall project damages. This project included: removal or modification of damaged rock and cross vanes; treatment of the back channel area to reduce frequency of flows in the back channel and to promote the use of the primary channel; bank grading and vegetative stabilization to reduce erosion; and establishment of a riparian buffer along the restored reach. In addition to the vane retrofits, a bankfull bench was added, 1,179 larger trees were planted, willow stakes and approximately 1000 feet of willow fascines were installed, and numerous shrubs, sedges and herbaceous seed were planted throughout the site.
- c. Broadstreet Hollow Stream (BSH) Restoration Project Repairs (2008): (Town of Hunter, Esopus Basin): The January 1996 flood caused excessive erosion along a 1,100' section of BSH. The initial restorative action by the USDA Natural Resource Conservation Service (NRCS) resulted in considerably more damage to this unstable reach. In addition to the damage to streamside residential property, extensive exposures of glacial lake clays and a "mudboil" caused chronic turbidity in BSH from continually entrained suspended sediment. The "mudboil" is a "relief valve" for artesian groundwater conditions, originating in the adjacent failing hillslope. In 2000, the GCSWCD restored the project reach again. There were two main components to the project: (1) stream channel restoration using natural channel design techniques to address erosion and channel instabilities; and (2) a geotechnical investigation of the adjacent hillslope with installation of dewatering wells to reduce the potentiometric pressure driving the artesian conditions. The April 2-3, 2005 flood caused damage to both project components. Two of the three dewatering wells were damaged and now fail to relieve the artesian conditions. Consequently the mudboil has returned and has been present off and on since then. In 2008, the GCSWCD modified the damaged rock structures, and hired a well drilling subcontractor to attempt to rehabilitate the dewatering wells. The subcontractor found the well heads had been broken and that they couldn't be rehabilitated. After reviewing options, the decision was made to abandon the wells and monitor the project's stability. Installing new wells would have required a large disturbance to the existing forest and continual maintenance; this wasn't the most palatable option for the landowners. The GCSWCD and DEP will continue to monitor the project's stability.
- d. Lanesville Stream Restoration Project Repairs (2008) (Town of Hunter (Esopus Basin): In 2008, repairs were made on the Lanesville Demonstration Stream Restoration Project. Most adjustments were associated with gullyng on a high slope failure caused by poor drainage on the terrace above the slope, which had not been addressed as part of the

restoration project. Some adjustments were made in the elevation of rock vanes protecting the base of this slope, and additional bioengineering was added to mitigate the gullying.

IV. Creative Stormwater Practices and Critical Area Seeding

In order to reduce runoff and protect groundwater resources in the basin, the GCSWCD and NYCDEP support promoting the infiltration of stormwater through state-of-the-art erosion and sediment control techniques such as hydroseeding of open ditches, stormwater techniques to infiltrate water into the ground, wetland enhancement, filter strips, and creation of rain gardens and bioswales to manage stormwater. Completed stormwater and critical area seeding projects include:

1. **Hunter Foundation (2014):** The GCSWCD worked with the Hunter Foundation on to design and implement a demonstration project integrating stormwater management in an area with limited space. Innovative methods including, porous gravel parking, bioswales and rain gardens, were used to meet water quality treatment standards for runoff from roofs and parking.
2. **Windham Mountain (2011):** The GCSWCD worked with Windham Mountain Ski Center to evaluate, assess, design and install stormwater management practices. An on-site pond was converted to a stormwater facility; the pond was expanded and improvements were installed in order to route 27 acres of drainage area into the pond. Project partners for the stormwater retrofit include CWC and ACOE-WRDA.
3. **Mountain Top Highway Ditch Re-vegetation Program (2011):** Program to encourage greater use of critical area seeding equipment that the GCSWCD has available for highway departments by offsetting the cost of seed and mulch. In 2011, GCSWCD worked with highway departments, seeding 3 miles of roadway ditches.
4. **Mountain Top Library & Learning Center (2011):** (Town of Hunter, Village of Tannersville) The GCSWCD worked with the Mountain Top Library Capital Campaign on a stormwater retrofit project. Located in the Village of Tannersville, this project was initiated in conjunction with the rehabilitation of a building that will be used as a Mountain Top Library and Learning Center. The project used innovative methods to meet water quality treatment standards for runoff from roofs and parking. The site presented space challenges and serves as an excellent demonstration project for integrating stormwater management in an area with limited space. In addition, the project offers substantial educational opportunities on stormwater impacts and integrating stormwater management practices during the redevelopment project.
5. **Sugar Maples Stormwater Project (2010):** GCSWCD installed stormwater treatments to serve approximately 4.7 acres of relatively high-density commercial buildings and residential homes in the hamlet of Maplecrest in the town of Windham. The components were initiated with an upgraded conveyance system and demolition of a single building to reduce impervious surfaces and to allow for construction of the pervious grass parking area. The project was completed with the installation of a permeable grass parking lot (~2,400 sq. ft.), rain gardens (7 total), wetland (treats 4.7 acres of runoff), porous walkways and riparian planting beds. Supplemental plantings performed in the rain gardens and wetland in spring 2011. For additional information and project reports visit <http://www.catskillstreams.org/projectmaps/>
6. **Hunter Mountain: (Village of Hunter) (2009):** Following discussions between the GCSWCD and Hunter Mountain it was determined that Hunter Mountain had already received funding through the CWC Stormwater Program and completed stormwater retrofits for their parking areas.

7. **Community Stormwater Planning (2009):** The GCSWCD has initiated a series of projects which to help develop Community Stormwater Management Plans for various Towns and Villages within the Schoharie Basin. The GCSWCD has detailed information on stormwater structures in a GIS format for the Towns of Ashland and Prattsville. GCSWCD has also obtained copies of Community Stormwater Management Plans which have been completed for the Village of Tannersville, Town of Hunter, and Town of Windham.
8. **Hunter Highway (2008):** Provided Operation and Maintenance Plan and implemented stormwater maintenance and cleaning of the stormwater controls at the Hunter Highway Garage. Annual maintenance in 2008 captured 6.3 tons (3.6 cubic yards) of sand and salt from entering the downstream Schoharie Creek.
9. **Critical Area Seeding (2007-2010):** GCSWCD provided seeding assistance in the Towns of Hunter, Ashland, Tannersville, Jewett, and Lexington in 2007; the Towns of Windham, Ashland, Jewett, and Hunter in 2008; the Towns of Windham, Hunter, Ashland, Hunter and Lexington in 2009; the Towns of Lexington, Windham, Tannersville and Hunter in 2010.

V. Highway and Infrastructure Improvements

During development of Stream Management Plans for the various sub-basins, the GCSWCD, NYCDEP, and the SWAC Highway and Infrastructure Subcommittee identified a number of recommended actions that would provide water quality protection. The following were completed between 2007 and 2013:

1. **County Route 6 Slope Failure (2014):** This project involved the stabilization of the slope failure along County Route 6 and the West Kill in Lexington. To address lacustrine clay exposures along 260 feet of streambank. Stress cracks were also evident in the pavement of CR6 and posed an imminent threat to the stability of the sole egress from the upper valley. Practices installed include the use of rock riffles and sheet piling to elevate stream profile adjacent to the slope failure, to help buttress the failing slope and to provide grade control. The installation of rock revetment to protect the toe of the slope from erosion and stormwater drainage in the area of the slope failure to help maintain moisture levels in the soil profile. Additional practices included the establishment of floodplain bench and use of random boulder clusters. Project partners included GC Highway Department, GCSWCD, NYCDEP, and NRCS EWP.
2. **Griffin Road Culvert Replacement (2012):** The existing culvert conveyed Halsey Brook under Griffin Road in the Town of Jewett was undersized (<10 year capacity) and washed out during the flooding caused by Hurricane Irene. The culvert historically has caused flooding and repetitive damage to nearby homes and significant risk to the community. GCSWCD and Delaware Engineering provided design plans, permits, specifications and contract documents for bidding, funding, construction management and administration for the culvert replacement for the Town of Jewett Highway Department. The new culvert was designed to convey the 100-year runoff event and included a habitat friendly three-sided precast concrete structure with wing walls at the inlet and outlet. Road improvements to provide a stable surface for Griffin Rd over the culvert were installed and stream enhancements to the adjacent reaches included the installation of an upstream cross vane to improve alignment and conveyance of water and sediment through the opening. A grant was approved by FEMA to offset the costs of upgrading the culvert to a larger size and funding from NYCDEP provided the engineering, oversight and other incidentals for the project. Design, permitting and construction were completed in the fall of 2012.
3. **Flood Response (2012):** A site visit was conducted in April 2010 to an East Kill tributary that is frequently dredged under Griffin Road in the Town of Jewett. Hurricane Irene completely destroyed the crossing and GCSWCD staff assisted the Town in constructing a temporary crossing. The new three sided structure is durable, made of concrete, will pass flows above the 100-year runoff event, and will have limited impact on upstream and downstream reaches and aquatic habitat. Design, permitting and construction were completed in 2012.

4. **Partridge Road Culvert Replacement (2011):** The culvert under B.G. Partridge Road, in the Town of Ashland, was undersized which contributed to roadway flooding during high flows. The culvert was also perched, which presented a barrier for fish passage. The GCSWCD worked with the Town of Ashland Highway Department to design a properly sized culvert and oversee the installation of this culvert. A grant was approved by the SWAC/SMIP to offset the costs of upgrading the culvert to a larger size. Design, permitting and construction were completed in the summer of 2011.
5. **Village of Tannersville Highway Department Technical Assistance (2011):** The Village of Tannersville requested assistance on sizing a culvert under Spring Street in the Village of Tannersville. The GCSWCD inspected the existing culverts under the road and provided the village with a variety of culvert sizing options which would increase the flow capacity of the culvert system. The information forwarded to the Village of Hunter Highway Department in March 2011.
6. **Road Abrasives Program (2009):** Upon further review with local and county highway departments, cost sharing for road abrasives was determined to be unfeasible due to limited funding available to support offsetting costs over time.
7. **Driveway/Curb Cut Specifications (2009):** Permit specifications were obtained from the Greene County Highway Department and given to the Highway Subcommittee in December 2009 in order to provide watershed communities with a model to consider when issuing permits. Each community will follow up based on their level of comfort. Some communities do not use driveway regulations, preferring to assess on sight and guide landowners. Communities and landowners may obtain additional assistance by contacting the GCSWCD WAP office if they are interested in updating curb and driveway standards.
8. **Hydraulic Analysis (2008):** Provided technical assistance including hydrology and hydraulic assessment to better size culverts for Greene County Highway Department.

VI. Planning and Assessment

Assessment of previous projects and programs and land use planning are key components to a watershed program. Planning and assessment conducted through the stream management program ranged from land use planning, assessment of streams and their watersheds, and the survey and monitoring of various locations and project sites. Completed Planning and Assessment action items include:

1. **Water Temperature Impacts on Fisheries Study (2014):** The Greene County Soil & Water Conservation District and NYC Department of Environmental Protection worked with the United States Geological Survey (USGS) and the Rochester Institute of Technology (RIT) to determine the location of thermal refugia, which are important to cold water fish communities during the summer months. The study was conducted to inform and guide entities whose activities may impact cold water inputs. In 2012, RIT conducted the imagery collection flight and submitted their report, *Aerial Thermal Imaging of Select Streams In Greene County*. In 2013, the USGS analyzed and summarized the imagery data. In 2014, the USGS submitted their final report *Variations in Water Temperature and Implications for Trout Populations in the Upper Schoharie Creek and West Kill, 2010-2012*.
2. **Mountaintop Better Site Design Plan Workshops (2011 & 2012):** The Greene County Soil & Water Conservation District's Watershed Assistance Program, Kendall Stormwater Services, and Morris Associates worked with the following mountaintop communities, Towns of Ashland, Jewett, Lexington, Windham and Hunter, and the Village of Tannersville. For each community, consultants conducted a comprehensive code review against model development principles; helped to identify which principles to address for local improvement; developed a Low Impact Development Manual for communities to use in site planning, and to share with landowners and

developers; and developed an education packet for easier reference. Final reports were provided to the communities highlighting code recommendations specific to that community, as identified by those community participants. Communities are expected to review recommendations and adopt supported changes at the local municipal level. More information can be found at <http://www.gcswcd.com/swp/wap/mbsd>.

3. **Town of Hunter Corridor Regional Planning Study (formerly called Generic Environmental Impact Statement) (2010):** The GCSWCD worked with the Town of Hunter and the Villages of Tannersville and Hunter to undertake a Corridor Study that entailed a comprehensive assessment of potential future development along the state route 23A corridor. The Corridor Study is a cooperative, multi-municipality effort to evaluate foreseeable development and environmental mitigation associated with future development. The full report with appendices can be found at <http://gcswcd.com/swp/wap.html>.
4. **Dale Lane Survey and Hydraulic Analysis (2010):** Site survey was completed in 2009. Hydraulic analysis using HEC RAS was completed in spring 2010. A report was prepared detailing the results of the hydraulic model.
5. **Mauro Residence Bank Stabilization (2010):** This project involved a geotechnical assessment of a failing streambank in relation to a private residence. A site visit with an engineer was completed April 27, 2010. The engineers report stated that the residential structure was not currently threatened by the slope condition. A copy of the report was provided to the home owner and the bank was seeded and mulched.
6. **Lexington Sill (Schoharie Creek) (2010):** Upon assessment, it was determined that the removal of the sill would have little impact on the stream. No further action is expected.
7. **Tributary Assessment and Planning Projects (2010):** Historical alignments, riparian vegetation mapping, watershed analysis, stream feature inventory and Geodatabases have been completed for Batavia Kill Tributaries North Settlement Creek, Furnace/Red Falls Creek and Mad Brook. Management Plans are scheduled to be completed in 2013.
8. **Manor Kill Stream Management Plan (2009):** In 2008, a stream feature inventory, riparian vegetation mapping and significant portions of a stream management plan were completed. The Manor Kill Management Plan was completed in early 2009, and the Town of Conesville adopted it and signed an MOU for implementation with the Schoharie County SWCD. This project also offered an opportunity to expand partnerships, and planning area, to include the Schoharie County Planning Department and Soil and Water Conservation District. For complete plan visit: http://www.catskillstreams.org/Stream_Management_Plans.html
9. **Mountaintop Recreation Master Plan (2009):** Report available at: <http://gcswcd.com/swp/wap.html>. The GCSWCD WAP worked with numerous public and private sector partners to develop a comprehensive master plan that focuses on recreation, and also includes open space, scenic quality and cultural resources. Two implementation subcommittees are working on marketing and coordinating projects and outdoor resource improvements that promote access to, and appreciation of, the mountaintop's natural environment including stream systems.
10. **Greene County All Hazards Mitigation Plan (2009):** In the past, access to federal Hazard Mitigation Grant funds has helped the GCSWCD to mitigate significant flood related problems in Greene County. Since 1996, the GCSWCD has accessed over \$1,000,000 in funds from this program for major projects in the Village of Hunter (Melody wood condominiums) and Town of Lexington (West Kill Stream restoration). New FEMA program rules prohibit access to these funds unless a community has a FEMA approved All Hazards Mitigation Plan in place. The Greene County Planning Department, GCSWCD and NYCDEP interviewed potential subcontractors and awarded the development of the hazard mitigation plan to Tetra Tech, Inc.

Tetra tech worked with the various municipalities and partners to gather input for the plan, which was completed in 2009 and can be accessed at <http://www.greenegovernment.com/draft.htm>.

11. **Survey of potential SPDES stream restoration site (2009):** A site on the East Kill was selected as a potential SPDES stream restoration site due to its high contribution of fine sediments. One landowner was unwilling to grant GCSWCD permission for the required pre-design survey work. Survey is no longer planned for this site.
12. **Japanese Knotweed Management Project (2009):** Hudsonia sampled Japanese knotweed management plots for several years. The results of their research are shown in the final report "Experimental Management of Japanese Knotweed on the Batavia Kill, Greene County, New York", which was submitted to GCSWCD in December 2009 and can be viewed online at: http://www.catskillstreams.org/pdfs/Hudsonia_knotweed.pdf.
13. **Restoration Project Wetland Mapping (2009):** C.T. Male Associates was hired to remap the wetlands on the Ashland and Conine restoration sites to assure ACOE's wetland mitigation requirements are being met. Wetland mapping and reporting was completed by C.T. Male Associates in 2009.
14. **Catskill Riparian Reference Study (2009):** New York Natural Heritage Program completed a final report "Inventory, Classification, and Description of Riparian Natural Community Reference Types for West Kill Watershed, New York" and appendix "West Kill Restoration Guide to Planting". Report available at: http://www.catskillstreams.org/stewardship_streamside_rb.html
15. **Schoharie Watershed Strategy (2008):** Engaged multiple watershed partners and agencies, municipal officials, and departments (highway, planning, and code enforcement) in the strategy's development which focused on landscape sources that contribute to water quality impairments. Some recommendations have been identified as implementation activities within the 2009 - 2011 action plan and the Schoharie Watershed Advisory Committee will review proposals in September 2009 to allocate implementation funding to support those activities. Copy of report can be found here: <http://gcswcd.com/swp/wap.html>
16. **Monitoring of Restored Stream Reaches:**
 - a. **2008:** Restoration project performance monitoring was completed at five sites in 2008.
 - b. **2009:** Monitoring has been performed and reports compiled for the priority monitoring sites, Conine Stream Restoration Project and the Ashland Connector Stream Restoration Project. Additionally the Brandywine Stream Restoration Project and the Farber Farm Stream Restoration Project sites were also monitored and reports compiled.
 - c. **2010:** Monitoring has been performed for priority monitoring sites: Conine, Ashland Connector Reach, Shoemaker, Lanesville, Sugar Maples and Long Road Stream Restoration Sites.
 - d. **2011:** Monitoring has been performed for priority monitoring sites: Long Road and Sugar Maples.
 - e. **2012:** Monitoring has been performed for priority monitoring sites: Ashland Connector Reach, Conine, Sugar Maples, Schoharie Street, and Long Road.
 - f. **2013:** Monitoring has been performed for priority monitoring site: East Kill Restoration at Vista Ridge.

VII. Recreation and Stream Habitat Improvements

In the general recommendations of all stream management plans enhanced public access to streams for recreational purposes was identified as a priority. The GCSWCD already has a number of these projects underway through partnerships with the members of the SWAC Habitat and Recreation Subcommittee. Completed Recreation and Stream Habitat Improvements action items include:

1. **Windham Path (2013):** GCSWCD and NYCDEP assisted the Town of Windham with installation of a public, non-motorized, multi-use trail along a 65 acre parcel located along the Batavia Kill. SWAC/SMIP funds were used to cover the cost of materials for a boardwalk and footbridges. Contracting, scope of work, permitting and construction have been completed. The Town and Windham Area Recreation Foundation (WARF) held the Grand Opening of the Windham Path on May 27th, 2013, which was well attended. The Windham Path is used almost daily by local residents and visitors to Windham. WARF is planning Phase 2, which plans to include a pedestrian bridge over the Batavia Kill to link to the business district on South Street and Route 296.
2. **Organize Repository of Stream Ecosystem Data (2013):** Stream management plans included a recommendation to characterize the current health of stream ecosystems. In order to determine the health of streams, a variety of data may be useful including food web dynamics, the presence or absence of indicator species and primary producers, and the status of fish populations, among others. Various studies have been conducted by different agencies and colleges over the years (e.g., USGS, NYSDEC, NYCDEP, ESF, Stroud Resource Center, GCSWCD). Under the guidance of the Habitat/Recreation Subcommittee, the GCSWCD has organized a master repository which integrates existing data and published documents and may help determine where additional field studies are warranted. Project is complete. The Stream Ecosystem Data Repository – Upper Schoharie Creek Watershed is available at: <http://dSPACE.gcswwcd.com/>
3. **Prattsville Stream Access Parking (2012):** The Town of Prattsville was approved for SMIP funding October 2009; this grant was closed in August 2012, due to site constraints and significant flood damage throughout Prattsville during Hurricane Irene in 2011.
4. **Promote Increased Recreational Use of Watershed Streams (2010):** All stream management plans recommend enhancing public access of the streams for fishing. Along many of the streams within the Schoharie Watershed, there are public fishing access points, existing access locations have been mapped. Through the Recreation and Habitat category, multiple stream access parks have been and will continue to be supported by SWAC.
5. **Ashland Fishing Access Enhancements (2010):** GCSWCD and NYCDEP completed a parking area and access to an existing public fishing area on the Batavia Kill at the Ashland Connector Reach Restoration Project. The access includes an informational kiosk.
6. **Town of Windham (Police Anchor Camp) (2010):** GCSWCD provided conceptual plans to the Town of Windham to assist with assessment and planning for public use of a 65 acre parcel located in the Batavia Kill watershed. Long term plans have not been established. A multi-use trail will be installed in 2011 to allow for recreation and stream access. See Windham Path in the Action Plan for more details.
7. **Windham Creamery Pond (2008):** The GCSWCD assisted the Town of Windham with the development of a public access area on a NYCDEP owned parcel in the hamlet of Windham. The GCSWCD completed a site design, Stormwater Pollution Prevention Plan and other documents. The design included the construction of parking area and athletic fields and was left to the town to complete.
8. **Prattsville Conine Park (2008):** The GCSWCD worked with the Town of Prattsville on a master plan for redevelopment of Conine Field. Key conservation issues under consideration included fishing access point, knotweed management, a riparian buffer planting and a conservation easement on sections of the property adjoining the Batavia Kill and Schoharie Creek, and a stormwater pollution prevention plan retrofitting the site to meet current standards for new construction. Preliminary designs were completed for the park by GCSWCD and provided to the Town of Prattsville for completion.

VIII. Flood Hazard Mitigation

Flooding produces a variety of hazards and impacts to public safety, homes and businesses, infrastructure (roads, utilities, etc.) and the natural environment. It can have direct impacts on water quality, including contamination from dislodged fuel and chemical storage tanks, mobilization of household waste and toxic substances, excessive riverine erosion and massive hill slope failures. As such, flood hazard mitigation – the work of reducing the impacts from flooding - supports the social, economic and environmental interests of communities in the NYC watershed.

- 1. Manor Kill Acquisition (Town of Conesville) (2013):** The Town of Conesville assisted a landowner by acquiring a floodplain parcel approved for FEMA Pre-Disaster Mitigation funding (75%) and demolishing and removing the home. The SMIP grant was used to assist the Town in meeting the required 25% match. The project, which involved demolition and site restoration, was completed with demolition and site restoration occurring in June, 2013.
- 2. Prattsville Local Flood Analysis (2013):** The intent of the LFA was to use engineering analysis to develop a range of flood hazard mitigation alternatives; the primary focus of the analysis was to identify the potential for reducing flood elevations through channel and floodplain restoration, as the first alternative to other hazard mitigation solutions and to evaluate both the technical effectiveness and the benefit/cost effectiveness of each solution, and compare different solutions to each other for the most practical, sustainable outcome. The LFA can be found at: <http://catskillstreams.org/major-streams/schoharie-creek/>