

III. Amending and Updating the Plan

As dynamic as nature and the Chestnut Creek itself, this Stream Management Plan should ideally evolve with the goals and values of the community, the policy makers and those policies that affect stream management. In order to ensure that the Plan continues to be useful to the community, the Plan needs ongoing maintenance and updating in the years ahead.

First, we recommend that the Chestnut Creek Project Advisory Committee (PAC) continue as an organization, meeting at least biannually to review progress towards implementing the plan and address new issues. A member of the PAC should be selected to serve as a Coordinator to set up meetings and ensure changes get implemented. The Neversink Town Board naturally plays a central role in keeping the Management Plan current because the residents of the Chestnut Creek neighborhood have first hand knowledge of changes and needs in the watershed. A member of this organization should be selected to work with the PAC representative to ensure meetings are held and changes or updates are made to the plan to best serve the community.

Agenda for ongoing meetings could include:

- Updating resource and contact information;
- Review of recommendations in the Plan and identification of projects to implement or pursue;

- Updating technical assistance and grants available for stream work and stewardship, and documenting those sources both sought and received, to avoid redundancy;

- Evaluation of progress toward implementing Plan recommendations (List of accomplishments or projects completed);

- Identification of obstacles to implementation and development of strategies for overcoming these obstacles;

- Identification of emerging issues that may require new recommendations to be included in the Plan;

- Identification of recommendations that are not practicable, or are no longer relevant;

- Review of demonstration project monitoring information, monitoring cross section data, and any landowner ongoing monitoring of specific sites;

- Amendment and reproduction of the Plan, as needed.

As on-going active members of the PAC, the Sullivan County Soil and Water Conservation District (SCSWCD), the NYC DEP Stream Management Program (NYC DEP SMP) and the New York State Department of Environmental Conservation (NYS DEC) should also provide assistance to these groups, both within the PAC and as needed, and especially to the Town of Neversink, in cooperation with which most programs or projects are most likely to be implemented. These agencies should proactively provide other members with up-to-date information

regarding funding and other resources available for stream-related activities, as well as changing regulations, guidance on best management practices (BMPs), workshops and important contact information.

As members of the Project Advisory Committee change over time, other members should orient new members to the effort that went into the development of the Stream Management Plan, including its goals and strategies. As policies change and other issues arise that impact management of the stream, these changes should be reflected, where necessary, as amendments to the Management Plan.

IV. Stream-related Activities and Permit Requirements

NYS DEC Permit Requirements

Certain kinds of human activities can have a detrimental impact on water resources. The policy of New York State is to preserve and protect lakes, ponds, rivers and stream, as set forth in the Environmental Conservation Law (ECL) Title 5 of Article 15. To implement this policy, the New York State Department of Environmental Conservation created the Protection of Waters Regulatory Program.

All waters of the State have a classification and standard designation based on existing or expected best usage of each water or waterway segment. The classification AA or A is assigned to waters used as a source of drinking water. Classification B indicates a best usage for swimming and other contact recreation. Classification C is for waters supporting fisheries and suitable for non-contact activities.

Waters with classifications, A, B, and C may also have a standard of (T), indicating that it is able to support a trout population, or (TS) indicating that it supports trout spawning. Special requirements apply to sustain these waters that support these valuable and sensitive fisheries resources. Chestnut Creek has a legal classification/standard of A(T) from mouth to source, as listed in New York State and as such is subject to the stream protection provision of the Protection of Waters regulation.

A Protection of Waters Permit is required for disturbing the bed or banks of a stream with a classification and standard of C(T)

or higher. For example, 1) the construction of a bridge or placement of a culvert to allow access across a stream; 2) any type of stream bank protection, e.g. placement of rip rap, or some other revetment; 3) lowering stream banks to establish a stream crossing (i.e. creation of a ford); 4) using equipment to remove debris in a stream, all require a permit.

Some examples of activities which are exempt from the requirement to obtain a Protection of Waters permit would be: 1) agricultural activities involving the crossing and recrossing of a stream by livestock or rubber tired farm equipment at an established crossing; or 2) removal of fallen tree limbs or trunks where material can be cabled and pulled from the stream without disruption of the stream bed or banks, using equipment placed on or above the stream bank. There are occasions when permits from other state or local agencies are required; county or town permits, flood plain permits or other approvals may be necessary. The appropriate offices should be consulted. There is no charge for the Protection of Waters Permit. For permit applications and any questions regarding the permit process contact:

For Sullivan County:

NYSDEC Region 3
Bureau of Habitat
21 South Putt Corners Rd
New Paltz, NY 12561-1696
(845) 256-3054194

Living Streamside in the Chestnut Creek Watershed

Frequently Asked Questions about Undertaking Various Projects Near the Stream

Everyone wants their stream to look and be healthy. Stream health can be measured ecologically by the plants and animals that live in it, but also by its riparian (stream-side) buffer area and the stability of its bed and banks. A stable stream is one that does not undergo accelerated erosion. This means the stream does not move laterally (the banks remain stable) or vertically (the stream bed does not build up or cut down) over short periods of time. Streams are very sensitive to anthropogenic (man-made) disturbances, and if stream related projects do not take the necessary precautions, a stable stream can quickly become unstable. Experience has shown that many stream related projects (such as flood control or stream bank stabilization) that have been performed in the past have done far more harm than good to the nation's waterways. Studies that have focused on some of these projects have contributed to the development of new technology to better work with the natural ability of streams to remain stable over time.

Following are answers to some of the questions most commonly asked by homeowners about activities they are considering undertaking that may impact the health and stability of streams. Where you may need more information, contacts are provided. Please contact your local Soil and Water Conservation District office for site-specific information. We

have also noted those activities that may not be beneficial to overall stream health. This information constitutes some of the best professional guidance available today.

If you seek to:

1) Construct a private bridge for vehicles or foot-traffic over the stream, or install a culvert under a driveway or along a stream:

Resource Guidance: Efforts should be made to avoid widening or narrowing the stream beyond its naturally stable width. Often, you can observe stable conditions in a reach nearby. Each stream has a stable set of dimensions (width, depth and cross sectional area), which are necessary to maintain effective sediment and water transport. Widening or narrowing can lead to stream instability that could also eventually undermine the bridge. To minimize the potential for erosion or other problems, try to locate a bridge at a narrow and straight reach, and not on a bend. A bridge functions much better than a culvert as a stream crossing, so bridges are preferable to culverts wherever possible. A bridge should span the entire stream to reduce potential erosion damages and prevent debris from catching on the bridge in a flood. If a culvert is absolutely necessary, the size and placement are critical to maintaining stream stability and ensuring the culvert stays in place and minimizes impact on fish passage. DEC's Habitat Unit staff can advise you on size and placement. Multiple culverts (two or more) are rarely permitted.

Permits

Depending on the specific conditions of a stream crossing (bridge or culvert) project, permits are required from the Army Corps of Engineers (ACOE), the New York State Department of Environmental Conservation (DEC) and the New York City Department of Environmental Protection (DEP). An ACOE permit is required when more than 25 cubic yards of fill material will be used below the “ordinary high water mark” (the approximate yearly flood level). Because the streambed or banks will be disturbed, stream crossing construction requires an Article 15 Stream Disturbance Permit from the DEC. Depending upon whether or not there are any drainage features (streams or wetlands) on the property that will be involved as a result of the project, it may require a Crossing, Piping and Diversion Permit (DEP). Also, if the bridge is part of new construction that involves disturbance of more than 1 acre, it must be reviewed under the DEC stormwater State Pollution Discharge Elimination System (SPDES) program. If the project will disturb more than 2 acres, it may need a Stormwater Pollution Prevention Permit (SPPP) from DEP.

Contacts

Start by contacting the DEC Habitat Unit staff to determine which state permits are needed. In Region 3 (Ulster and Sullivan Counties), contact Jack Isaacs at 845-256-3087. For DEC Stormwater permits in Region 3 contact Patrick Ferracane, at 914-322-1835, X357. At DEP, contact Brenda Drake at 845-657-2390.

2) Divert water from a stream:

Resource Guidance: Any diversion of water from a stream, especially during

warmer summer months, can negatively impact downstream ecology by reducing the amount of cool water available to aquatic life. This condition can be especially urgent when streamflows are naturally at their lowest levels and trout are in survival-mode. Improper installation of pumps or waterlines can also disturb the streambed or banks, and potentially initiate erosion problems that can worsen over time and move up- and downstream to neighboring properties. Finally, water taken from the stream for use nearby will eventually return to the stream, often warmer or containing substances (i.e., lawn chemicals, salts, oils or soap from cars or driveways) that may further stress fish and other aquatic life, or reduce water quality for downstream users.

Permits

Any diversion must be reviewed by the DEC.

Contacts

Contact the DEC Habitat Unit. In Region 3 (Ulster and Sullivan Counties), contact Jack Isaacs at 845-256-3087.

3) Pave or repave a driveway near a stream:

Resource Guidance: By not allowing water to slow down and sink into the ground, impervious surfaces (i.e., pavement and buildings) and associated land drainage improvements that occur from development can accelerate rain runoff into streams, changing the amount and timing of water they receive and in effect deliver it all in a big “gush.” Generally, by the time a watershed exceeds approximately 10% impervious land cover, the streams that capture the runoff are already impaired. A particular

concern in the Chestnut Creek is localized streambed or bank erosion that a poorly drained impervious surface can encourage. Localized scour and erosion problems can, quickly or slowly, move upstream or downstream and cause your property or a neighbor's property to erode. Designing "stream friendly" drainage for existing or new impervious surfaces can reduce stream damage from storm water runoff.

Permits

A DEC Article 15 stream disturbance permit may be required. Seek DEC guidance if the impervious surface is within 50 feet of the stream. If the disturbance is more than 1 acre, it must be reviewed under the DEC Stormwater State Pollution Discharge Elimination System (SPDES) program as well. If the project will disturb more than 2 acres, it may need a Stormwater Pollution Prevention Permit (SPPP) from DEP. New driveways being paved for the first time will be required to have a setback from the stream under DEP's regulations.

Contacts

Start by contacting the DEC Habitat Unit to determine what state permits are needed. In Region 3 (Ulster and Sullivan Counties), contact Jack Isaacs at 845-256-3087. For DEC Stormwater permits, in Region 3 contact Patrick Ferracane, at 914-322-1835 X357. At DEP, contact Brenda Drake at 845-657-2390.

4) Cut or trim streamside (riparian) vegetation on the stream bank:

Resource Guidance: Stable stream banks in the Catskills usually require woody vegetation. Shrub and tree roots provide holding power for stream bank soils that

can't be beaten by grasses or herbs. For a more thorough discussion on the role of vegetation in stabilizing stream banks, see Chestnut Creek Stream Management Plan Riparian Vegetation Management. To maximize stream bank stability as well as ecological and aesthetic benefits of streamside, or riparian, vegetation, discontinue mowing and allow a buffer of vegetation to grow, or plant woody vegetation.

If you are removing a log jam (a pile of trees that have fallen into the stream and are trapping more trees and stream sediment): this requires technical assistance to ensure that the removal process does not initiate new stream erosion in an upstream or downstream direction. These jams can cause considerable property damage. While biologically they may actually be beneficial to the stream, resource management agencies understand the property damage they can cause, and will work with you towards the most beneficial solution.

If you are removing individual trees, they must be cut up into smaller pieces and removed from the stream so they won't get caught further downstream and cause or worsen another log or debris jam. If the log jam or falling trees are not on your property, but are causing damage to your property, you must coordinate with your neighbor.

Permits

The DEC will require an Article 15 Stream Disturbance Permit if the project will disturb the bed or banks of the stream.

Contacts

Seek technical assistance from the DEC Habitat Unit. In Region 3 (Ulster and Sullivan Counties), contact Jack Isaacs at 845-256-3087. DEP Stream Management Program staff can provide assistance, contact Beth Reichheld at 845-340-7512, or contact your local Soil and Water Conservation District.

5) Stabilize an eroding streambank:

Resource Guidance: Stream bank stabilization is a common need in the Chestnut Creek valley. As the management plan has revealed, there are eroding stream banks along the Chestnut Creek Stream that threaten water quality, private property and public and private infrastructure (i.e., bridges, culverts and roads). Care should be taken in designing the work to ensure that you don't over-widen the stream, narrow or encroach upon the stream, and that you do not borrow from nearby gravel bars in the stream for fill material. Seek technical assistance to identify the set of causes of your stream bank instability problem so that the solution addresses the causes, and seek a solution that does not transfer the erosion problem up- or downstream. The agencies referenced below can advise you. Neighboring properties may need to be involved.

Permits

Stream bank stabilization will require a DEC Article 15 Stream Disturbance Permit. An ACOE permit is required when more than 25 cubic yards of fill material will be used below the "ordinary high water mark" (the approximate yearly flood level); the DEC can advise you about determining these limits.

Contacts

Start by contacting the DEC Habitat Unit to determine what state permits are needed. In Region 3 (Ulster and Sullivan Counties), contact Jack Isaacs at 845-256-3087. DEP Stream Management Program staff can provide assistance, contact Beth Reichheld at 845-340-7512, or contact your local Soil and Water Conservation District.

6) Build a house or other structure:

Resource Guidance: Siting a new home near a stream can define your enjoyment of that stream and relationship to it. Proper location for homes and facilities must consider stream flooding behavior, no matter how high above or far back from the stream the location may appear during low flow. Because floodplain maps are not available in the Chestnut Creek valley, seek technical assistance to identify approximate floodplain boundaries, and design your site in as "stream friendly" a manner as possible. Give the stream room to flood, and to move (because a slow rate of erosion is a natural stream adjustment process), so you'll be able to enjoy it, as well as reduce home maintenance costs from stream erosion or flood inundation.

Permits

Of course, many permits are needed for new construction, and listing them is beyond the scope of this guidance document. If the house or structure is within 50 feet of a stream bank, contact DEC to determine if an Article 15 stream disturbance permit is needed. If the house or driveway will be within 100 feet of a perennial (flows all year round) stream, you'll need an Individual Stormwater Permit (DEP). If your project is to construct a single family residence and it

will disturb more than 1 acre of land, you must submit a notice of intent to work and an erosion control plan to the DEC under their Stormwater State Pollution Discharge Elimination System (SPDES) program. If your project will disturb more than 2 acres, you'll need a Stormwater Pollution Prevention Permit (DEP). You will also need to follow State and local regulations, and should contact your Town code enforcement officer. In many communities, the building inspector serves in this capacity.

Contacts

For DEC Article 15 permits: In Region 3 (Ulster and Sullivan Counties), contact Jack Isaacs at 845-256-3087. For DEC Stormwater permits, in Region 3 contact Patrick Ferracane, at 914-322-1835, X357. For DEP permits: Brenda Drake, 845-657-2390. Contact your Town clerk for the number of the local code enforcement officer, soil and water conservation district, and/or building inspector.

7) Extract gravel from the stream:

Resource Guidance: There was a common belief that cleaning gravel from streams is necessary to improve flood conveyance capacity and reduce flooding. Others wish to use the gravel for construction-related projects where clean gravel is needed. These are the considerations you should weigh: The stream must effectively be able to move both water and sediment delivered from the mountains to maintain its shape and provide optimum water quality and aquatic habitat. Therefore, any activity in a stream channel should consider its impact not only on moving water, but also on moving sediment (the gravel) to ensure these qualities of a functioning stream are

preserved. Excavating gravel usually disturbs the sensitive balance that the stream maintains between its slope (steepness) and the amount and size of sediment it can move. If you are removing gravel to increase flood conveyance capacity, please consider that this has been found to be a damaging practice and if the stream is left to its own devices, the channel will eventually restore itself by moving accumulated gravels through and restoring its own flood conveyance capacity. If you are excavating gravel for construction-related projects, a non-stream source should be considered.

Permits

DEC rarely permits gravel removal. Any removal will require a DEC Article 15 Stream Disturbance Permit. An ACOE permit is required when more than 25 cubic yards of fill material will be used below the "ordinary high water mark" (the approximate yearly flood level). The DEC can advise you about the need for an ACOE permit.

Contacts

Start by contacting the DEC Habitat Unit to determine what state permits are needed. In Region 3 (Ulster County), contact Jack Isaacs at 845-256-3087. You can also seek technical assistance from the DEC, your local Soil and Water Conservation District, and the DEP Stream Management Program; contact Beth Reichheld at 845-340-7512.

V. Funding Sources and Agency Contacts

Technical Assistance

A wealth of information and assistance is available to local municipalities, landowners, and businesses in the Catskill/Delaware watershed. Services are wide ranging through a variety of programs. Although funding and grant opportunities may not always be a possibility, the organizations listed below offer a variety of solutions for water quality, infrastructure, and property protection. Please do not hesitate to contact these resources with questions and requests. Many of these organizations also offer grant and other funding opportunities. Please see the grant resources list for more information on monetary support.

Soil & Water Conservation Districts (SWCD)

With a soil and water conservation district in each county, these local entities provide a variety of services to its local constituency. Most districts focus on offering agricultural assistance with best management practices (BMPs) through design, installation, and oversight. These BMPs include water management such as diversions, barnyard management systems, manure storages, grazing systems, and animal water systems. Other services include riverfront revitalization, plant materials supply, environmental education, permit assistance, flood mitigation, and stream restoration. The SWCDs are often a good starting place for information and assistance. If they cannot help you, they can most likely point you in the right direction.

Greene:
Executive Director
(518) 622-3620

Ulster: Executive Director
(845) 883-7162 ext. 5

Sullivan:
District Manager
(845) 292-6552

Delaware:
Executive Director
(607) 865-7161/7090

New York City Department of Environmental Protection (NYC DEP)

www.nyc.gov/dep

The Bureau of Water Supply works closely with landowners to achieve goals in an environmentally sensitive manner. NYC DEP has a variety of programs that assist landowners with the management of their property and streams. Please see below for a brief description of the various programs.

Land Acquisition: In 1997, the DEC issued a permit that allowed the DEP to acquire land for the purpose of watershed protection. The acquisition of land is one of the best ways to ensure the ongoing prevention of pollution and to prevent future water quality problems from occurring as a result of adverse development close to critical natural features and reservoir intakes. Purchase of land at fair market value or placement in an easement is negotiated only from willing sellers. Interested parties should contact the Land Acquisition Program @ (845) 340-7540.

Stream Management: DEP's Stream Management Program was established after the 1996-snowmelt flood to address the systemic challenges to overall water quality in the Catskill/Delaware watershed. Its mission is to establish long-term stewardship of the streams through a watershed-scale, community-based, geomorphic approach. Essential to achieving this goal is the provision of technical assistance to local municipalities, landowners, and businesses within the watershed. The stream management staff is available for consultation on property and infrastructure protection through natural channel design. Staff members also offer training and educational programs regarding these topics. Concerns or requests for service, should be made to the Stream Management Program @ (845) 340-7517.

Land Management: This program aims towards good stewardship of the natural resources in the West of Hudson watershed. Providing good stewardship is critical to the success of any water quality protection program. The Land Management Program develops land resource management plans for DEP properties, conducts a recreational review, and develops basin plan, incorporating specific property by property uses and stewardship. In addition, the DEP has implemented a public access program, making 50% of acquired lands available for recreational purposes like hiking, hunting, and fishing. For additional information call (845) 340-7541.

The DEP also oversees a number of other programs like the watershed agricultural and watershed forestry programs, sewer and septic maintenance, economic

development, and watershed education through the Catskill Watershed Corporation (CWC). Please see the CWC description below for more details.

New York State Department of Environmental Conservation (NYS DEC)

www.dec.state.ny.us

Many water related programs are offered by the NYS DEC. The agency has various divisions, which handle watershed assessment and management, environmental education, fisheries, and flood protection. Information about the DEC stocking schedule, fishing licensing, and access points is available at <http://www.dec.state.ny.us/website/dfwmr/fish/index.html> or by calling (845) 256-3161 for Region 3.

To receive information regarding any flooding issues and the National Flood Insurance Program, see <http://www.dec.state.ny.us/website/dow/bfp/gisfpm/gisfpm.htm> or call (518) 402-8141 about flood control projects or (518) 402-8146 about flood plain management.

In addition to the above services, the DEC is also the regulatory agency for the state of New York's waterways. Having classified Catskill streams, the DEC requires a Protection of Waters Permit for disturbing the bed or banks of a stream. If you are in DEC Region 3, please contact the following individuals for direction and advice.

Ulster/Sullivan:

Bureau of Habitat
21 South Putt Corners Rd
New Paltz, NY 12561-1696
(914) 256-3054

U.S. Army Corps of Engineers (ACOE) New York District

www.nan.usace.army.mil/index.htm

The Army Corps of Engineers has a variety of duties related to stream management. If a municipality or landowner wishes to install a water-related structure, dredge or fill a stream, or affect a wetland area, ACOE will often assign a field technician to visit the sight in order to evaluate the need for a federal permit. ACOE also offers engineering designs and other technical expertise. In addition, they are available for planning, designing, and constructing flood control projects. For a field technician in Region 3 contact the office listed below:

Sullivan/ Ulster County: (212) 264-0182

Catskill Watershed Corporation (CWC)

www.cwconline.org

The CWC is a not-for-profit corporation with a dual goal: to protect the water resources of the New York City Watershed west of the Hudson River, while preserving and strengthening communities located in the region. Although the CWC is mainly a source of funding (see grant information section), they can also provide technical assistance. Pertinent programs for Catskill/Delaware stream stakeholders include the Stormwater Controls for New Construction, Stormwater Retrofit, Septic System Rehabilitation and Replacement, and Alternate Design Septic Program. For more information call 10(845) 586-1400.

Watershed Agricultural Council (WAC)

www.nycwatershed.org

WAC offers the Watershed Agricultural Program and the Watershed Forestry Program. WAC subcontracts with local, state, and federal agricultural assistance

agencies, Cornell University, and the private sector to provide planning, education, training, engineering, scientific, and administrative support.

Watershed Agricultural Program (WAP)

WAP strives to protect the high water quality from agricultural nonpoint source pollution through the planning and implementation of Best Management Practices (BMPs) on farms. Using traditional and non-traditional BMPs, WAP strives to offer a variety of alternatives to farmers that promote the health of their land and the stream. Some specific programs are Whole Farm Planning, the Conservation Reserve Enhancement Program, Nutrient Management Planning, and Small Farm Program. Call (607) 865-7790 or email info@nycwatershed.org with questions or requests.

Conservation Reserve Enhancement Program (CREP)

This program is available to current agricultural landowners or landowners who may not currently farm land, but whose property has a history of agricultural use. CREP is a program for promoting the health of streamside vegetation by providing rental payments for buffer lands that are taken out of production, as well as 100% funding for tree/shrub planting. This program also helps landowners implement stream fencing and livestock watering facilities and other BMPs.

Watershed Forestry Program (WFP)

The Watershed Forestry Program is a voluntary partnership between New York City and the upstate forestry community that maintains well-managed forests as a preferred land use for watershed

protection. Forests cover more than 75% of the total watershed land area, and a similar majority of this forestland is privately owned and managed by thousands of individual landowners. To promote forest stewardship and encourage long-term investment in private forestry, the Forestry Program offers cost-sharing to landowners for developing 10-year forest management plans written by qualified professional foresters. Participating landowners must own at least 10 acres of forest land in the watershed. The Forestry Program also offers a variety of cost-sharing, technical assistance and other incentive programs to both loggers and landowners for implementing certain forestry practices that protect water quality, such as properly installing new timber harvest roads and stream crossings or remediating existing forest roads that have documented erosion problems. Owning a watershed forest management plan is actually a prerequisite for many of these programs. Forest landowners may also attend a variety of educational workshops and other training events that are periodically sponsored throughout the watershed. For more information, call (607) 865-7790 or email forest@catskill.net.

National Rural Water Association

www.nrwa.org

The National Rural Water Association is a non-profit federation of [State Rural Water Associations](#). Their mission is to provide support services to State Associations who have more than 22,000 water and wastewater systems as members. Please see description below for New York state contact information.

New York Rural Water Association

www.nyruralwater.org/tech_assistance.shtml

New York Rural Water Association (NYRWA) is a not-for-profit group organized in 1979 with the goal of promoting the development, improvement, and sound operation of rural drinking water and wastewater systems throughout New York State. New York Rural Water Association recently expanded its scope to offer training, technical, and administrative assistance to rural communities on solid waste management matters as well. Contact (518) 828-3155, or visit nyruralwater.org

Federal Emergency Management Association (FEMA)

<http://www.fema.gov/>

FEMA is the federal government agency responsible for administering emergency and disaster relief, recovery, planning and preparedness programs across the United States and territories. While FEMA's most apparent role is emergency response and recovery, its role in risk reduction through the establishment of building codes and administration of insurance programs like the national flood insurance program provide protection against losses of life and property in the case of an emergency or natural disaster. Based in Washington, FEMA operates regional offices across the United States including the Region II office in New York City, covering New York State. FEMA works in cooperation with other federal agencies and State and local emergency response entities such as the State Emergency Management Office (NYS SEMO) and county Emergency Management officials (please see below). FEMA provides training to state and local officials on most aspects of their work

including emergency response, disaster response planning, hazard mitigation planning, code interpretation and enforcement. Following a Presidentially declared disaster, FEMA's assistance can be available to state and local government, private individuals, and businesses.

Floods are the most common disaster that would require FEMA involvement with Catskill watershed communities. To protect against flood damages and the loss of life associated with flood events, FEMA provides the following types of assistance:

- Administration of the National Flood Insurance Program (NFIP). Through this program FEMA prepares flood insurance rate maps (FIRMs) that define where floodwaters are likely to cause damage to property. These maps provide communities with a tool to prevent losses through the limitation of building and flood plain modification within these flood zones.
- Management of hazard mitigation programs that help communities identify and modify situations and places at risk during flood events. This would include the development of hazard mitigation plans prepared by communities to help the community reduce or avoid threats to life or property during flood events.
- Following flood events that are declared by the President to be a disaster for a specific county, FEMA typically provides assistance for temporary housing, clean-up, repairs to private structures and repairs to public infrastructure. The availability of this assistance depends on the magnitude of the disaster and the types of losses incurred by the county and its residents. The Small Business

Administration also can provide assistance with low interest loans to private business. FEMA programs are modified frequently and therefore the type and level of assistance will vary from event to event.

- FEMA plays its most important role as a coordinator of response and information in times of a disaster.

To contact the FEMA Region II office, please call (212) 680-3600.

New York State Emergency Management Office (NYS SEMO)

www.nysemo.state.ny.us

As stated above, the New York State Emergency Management Office is the state entity for pre- and post disaster assistance. Like FEMA, the state office provides planning and resources through cooperation with local governments, volunteer organizations like Red Cross, and the private sector. Where FEMA is primarily involved immediately after a disaster event, SEMO provides long-term recovery solutions. The state agency is more involved in the day to day planning and preparation for disaster response. Below are summaries of some of SEMO's major programs.

Mitigation: This may be one of SEMO's most influential programs by providing preventative assistance to communities within the Catskills. Mitigation efforts intend to reduce negative impacts of floods and other major disasters by preparing predisaster planning. This program also aims to identify potential threats and repeatedly damaged structures and to offer positive solutions to reduce future losses and protect against the loss of life and property. It is the intention that preventative efforts will greatly reduce the

cost of recovery and will also reduce the loss of property. SEMO manages a Hazard Mitigation Grant program available to communities that prepare hazard mitigation plans. Communities preparing the plan are eligible for grant program funds to implement hazard mitigation projects following Presidentially declared disasters within New York State. Individuals living in communities with plans may benefit from the program through the reduction in flood insurance rates.

Disaster Recovery Assistance: Recognizing that not all disasters can be prevented, this program aims to provide local assistance for faster recovery by coordinating public assistance funds, disaster housing assistance, individual family grants, and small business administration assistance.

Other Emergency Assistance: SEMO also provides a variety of services during times of emergency. These services include state of the art communications, information dissemination, and emergency operation coordination.

Call the Emergency Coordination Center at (518) 457-2200 with questions or requests.

Cornell Cooperative Extension (CCE)

<http://www.cce.cornell.edu/>

Cooperative Extension builds partnerships and coalitions with individuals, communities, organizations, government agencies, and businesses around issues of mutual concern; develops local leaders who use CCE knowledge to inform decisions; promotes youth development through 4-H clubs and other

experiences; strives to help participants make informed choices using the best knowledge available; connects learners with educational resources found in locations throughout the world; consults with individuals and groups on multiple topics; provides resources via technologies such as the World Wide Web, satellite, and compressed video.

Greene: (518) 622-9820
greene@cornell.edu

Ulster: (845) 340-3990
ulster@cornell.edu

Sullivan: (845) 292-6180
Sullivan@cornell.edu

Delaware: (607) 865-6531
delaware@cornell.edu

Natural Resources Conservation Service (NRCS)

www.nrcs.usda.gov/

NRCS puts nearly 70 years of experience to work in assisting owners of America's private land with conserving their soil, water, and other natural resources. Local, state and federal agencies and policymakers also rely on our expertise. They deliver technical assistance based on sound science and suited to a customer's specific needs. Cost shares and financial incentives are available in some cases. Most work is done with local partners. NRCS's partnership with local conservation districts serves almost every county in the nation, and the Caribbean and Pacific Basin. Participation in our programs is voluntary. Please see below for local contact information.

Chestnut Creek Stream Management Plan

Greene: Ghent Service Center
(518) 828-4385

Ulster: Highland Service Center
(845) 883-7162

Sullivan: Liberty Service Center
(845) 292-6471

Delaware: Walton Service Center
(607) 865-4005

United States Geological Society (USGS)

<http://ny.water.usgs.gov/index.html>

The USGS provides the Nation with reliable information about the Earth to minimize the loss of lives and property from natural disasters, to manage biological, water, mineral, and energy resources, to enhance and protect the quality of life, and to contribute to wise economic and physical development. The USGS provides a variety of assistance related to the four main categories of biology, geography, geology, and water. The water division is broken down into ground water, surface water, and water quality. Individuals can find a multitude of data throughout the website, search various resource databases, and view a number of maps. For more information call the Troy office at (518) 285-5600.

Catskill Forest Association (CFA)

www.catskillforest.org/

The Catskill Forest Association is a non-profit organization dedicated to enhancing all aspects of the forest in New York's Catskill region. CFA offers educational programs at all levels, from one-on-one on-site visits at landowner properties to group woods-walks, workshops and seminars. School-based activities include classroom visits and teacher training such as the Watershed Forestry Institute. CFA is

also active in advocating for proper forest management, as well as promoting the economic development of viable markets for a variety of forest products. For more information, email cfa@catskill.net or call (845) 586-3054.

Catskill Center for Conservation and Development (CCCD)

www.catskillcenter.org/

The Catskill Center is a non-profit organization working to protect the cultural, historic, and natural resources of the Catskill Mountains. The CCCD has a few integrated program areas:

Land Conservation & Natural Resource Protection: This program identifies, monitors, and engages in effective actions to protect and preserve sensitive, ecologically significant, aesthetically, or recreationally critical lands and waters.

Community Outreach and Planning Assistance: This program provides technical support to rural communities in the Catskills on grants-writing, planning, land use, zoning, subdivision, community empowerment, main street revitalization, regional forums, conferences and workshops, producing reports and publications, and public policy development.

Education: This program consists of a curriculum entitled The Catskills: A Sense of Place, which is a series of five modules on the water resources, geography and geology, ecosystems, human history, and culture and arts of the Catskills. A Sense of Place is designed to give children a better awareness, understanding, and appreciation of the distinctive features of our area. In addition, The Center has partnered with Hudson Basin River Watch

to support advanced water quality monitoring efforts by adult volunteer groups. Lastly, we host a hike, lecture, and recreation series for our membership and the general public throughout the year.

Visit their website at catskillcenter.org or call (845) 586-2611.

Trout Unlimited (TU)

Trout Unlimited's mission is to conserve, protect and restore North America's trout and salmon fisheries and their watersheds. TU accomplishes this mission on local, state and national levels with an extensive and dedicated volunteer network. Local TU members have been active in many aspects of stream management planning throughout the Catskill/ Delaware watershed. Not only do they participate in public meetings, legislative activities, and volunteer events, but TU has also funded research projects such as the "Economic Impact Assessment of the Beaverkill-Willowemoc Trout Fishery" to promote improved trout habitats and stream health. Please contact the following local chapters for further information:

Ashokan-pepacton 559:
(845) 254-5904

Catskill Mountain 028:
(845) 339-5938

Columbia Green Rvw 569:
(518) 943-6728

ESRI Environmental Conservation Program (ECP)

<http://www.conservationgis.org/aaesrigrants.html>

This program provides donations and discounts of GIS software, data, books, and training. It offers free on-line live workshops. The overall goal of the ECP is to support conservation groups in acquiring, learning, and using GIS tools and methods. ECP has a particular focus on appropriate levels of technology for locally sustainable programs. Its goal is not to throw out one-off donations into a vacuum with no forethought, but to build permanent, locally based support structures that provide ongoing evolutionary growth in GIS skills. Email redgrant@esri.com for detailed information.

See Tables 1 and 2 for a list of government, private, and non-profit contacts and sources.

Table 1. Government Sources and Contacts.

Name	Focus	Due Date	Contact	Award Example	Notes/ Priority	on-the-ground research	planning	<\$20K	\$20K to \$100K	>\$100K	range
Environmental Protection Agency	Projects include strong on-the-ground wetland, riparian, or coastal habitat restoration component and education, outreach, and community stewardship components.	Jan/Feb	John Pai, 202-566-1350, pai.john@epa.gov	Westchester County Department of Planning received \$9,500 to complete restoration activities at Echo Bay in Five Island Park and Blind Brook. Students from local high schools and colleges will complete on the ground restoration.	Projects involving only research, monitoring or planning are not eligible for funding.	X	X				5K-20K
Five-Star Restoration Program											
http://www.epa.gov/owow/wetlands/restore/5star/											
Water Quality Cooperative Agreements	This program supports new approaches to meeting storm water, sanitary sewer, and combined sewer outflows, biosolids, and pretreatment requirements, as well as enhancing state capabilities.	accepted on a rolling basis	U.S. EPA, Office of Wastewater Management, Baron Benroth, 202-564-0672, benroth.barry@epa.gov		Eligible projects include research, investigations, experiments, training, demonstrations, surveys, and studies related to the causes, effects, extent, and prevention of pollution.	X	X	X	X		10K-500K
http://www.epa.gov/owm/cwfinance/waterquality.htm											

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Projects that promote the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution.	determined annually	Region 2, Kathleen Drake, drake.kathleen@e pa.gov, 212-637-3817	NY DEC received grant money to implement the Great Swamp watershed conservation plan, promote local participation, perform hydrological studies, assess wetland communities, produce species inventories, conduct education and outreach activities, and promote land protection with an emphasis on fens and bogs.	Priority given to projects addressing three priority areas: Developing a comprehensive monitoring and assessment program; improving effectiveness of compensatory mitigation; and refining protection of vulnerable wetlands and aquatic resources.	X	X	X	X	X	20K-313K
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Wetlands Program Development
<http://www.epa.gov/fedrgstr/EPA-WATER/2002/August/Day-26/w21670.htm>
<http://yosemite.epa.gov/water/grant.nsf/EPA%20Regions?OpenView&Start=1&Count=100&Expand=2.2#2.2>

Natural Resource Conservation Service

Projects that engage private landowners, primarily ranchers and farmers, on the ground projects.	December	Eastern Regional Office, Director Conservation Education, Tom Kelsch 202-857-0166	Partnerships with NRCS or local conservation districts, priority given to landscape, watershed scale projects integrating agriculture, forestry, and ranching that benefit fish and wildlife.	X	X	X	X	X	X	4K-100K
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Conservation on Private Land
<http://www.nfwf.org/programs/nrcsnacd.htm>

Projects support such work as clearing debris from clogged waterways, restoring vegetation, and stabilizing river banks.	on-going basis	Liberty Service Center, 845-292-6471	The measures that are taken must be environmentally and economically sound and generally benefit more than one property owner.	X						
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Emergency Watershed Protection
<http://www.nrcs.usda.gov/programs/ewp/factsheet.html>

Chestnut Creek Stream Management Plan

Name	Focus	Due Date	Contact	Award Example	Notes/ Priority	on-the-ground research	<\$20K	\$20K to \$100K	>\$100K	range
National Oceanic and Atmospheric Administration										
Community-based Restoration	Provides funds for small-scale, locally driven habitat restoration projects that foster natural resource stewardship within communities.	on-going basis	Robin Bruckner, Robin.Bruckner@noaa.gov, 301-713-0174	Provides funding to implement on-the-ground habitat restoration projects to benefit marine, estuarine and riparian habitats.		X	X	X		14K-8mil
http://www.nmfs.noaa.gov/habitat/restoration/projects_programs/crp/index.html										
Federal Emergency Management Association										
Flood Mitigation Assistance (FMA)	Program helps states and communities identify and implement measures to reduce or eliminate the long-term risk of flood damage to homes and other structures.	established by states	26 Federal Plaza, New York, New York 10278, 212-680-3600		two types offered: planning and project grants for National Flood Insurance Program (NFIP) participating communities.	X				
http://cfpub.epa.gov/fedfund/search1.cfm										
U.S. Fish and Wildlife Service										
North American Wetlands Conservation Act Grants	Standard and Small Grants programs help deliver funding to on-the-ground projects through the protection, restoration, or enhancement of an array of wetland habitats	on-going basis	Standard- David Buie, 301-497-5870, Small- Keith Morehouse, 703-358-1888, General Office Number, 703-358-1784		The act requires that U.S. and Canadian partners focus on these three activities; Mexican partners may also develop training, educational, and management programs and conduct sustainable use studies.	X	X	X		small=<50K standard=50K-1mil
http://birdhabitat.fws.gov/NAWCA/grants.htm										

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Partners for Fish and Wildlife http://partners.fws.gov/	Focuses on restoring former and degraded wetlands, native grasslands, stream and riparian areas, and other habitats to conditions as natural as feasible.	on-going basis	Sally J. Valdes, 703-358-2201	The program has partnered landowners to restore wetlands, prairie grassland, and in-stream aquatic and riparian habitat. In addition, the program has reopened stream habitat for fish and other aquatic species by removing barriers to passage.	Provides technical and financial assistance to landowners interested in voluntarily restoring or otherwise improving native habitats for fish and wildlife on their lands.	<25K
State Emergency Management Office						
	Provides leadership, planning, education, and resources to protect lives, property and the environment. http://www.nysemo.state.ny.us/	on-going	Chief of Recovery, 518 457-7082, postmaster@semo.state.ny.us			

<http://www.nysemo.state.ny.us/>

Table 2. Private, Non-Profit Sources and Contacts.

Name	Focus	Due Date	Contact	Award Example	Notes / Priority	on-the-ground research	<\$20k	\$20k to \$100k	>\$100k	range
Catskill Fund for the Future http://www.cwonline.org/econ_dev/led_index.htm	Funds will be used to make loans and grants to businesses and organizations proposing environmentally responsible projects.	accepted on a rolling basis	Michael Triolo, Economic Development Director, triolo@cwonline.org	Delhi received money for establishment of Riverwalk Community Park (purchase of riparian property and development of a village riverfront area with canoe access).	This fund program includes a variety of grant and loan programs.	X	X	X	X	2k-500k
Septic System Rehabilitation and Replacement http://www.cwonline.org/programs/septic/septic.htm	This program reimburses homeowners for repairing or replacing damaged septic tanks.	within 30 days of completion of repair and replacement	Leo LaBuda, labuda@cwonline.org ; John Jacobson, jacobson@cwonline.org ; Kirsten Miller, kmiller@cwonline.org ; 845-586-1400		Program limited to homeowners in areas highly sensitive to water quality, as identified on NYCDEP maps.					60% and 100% of eligible costs for non-primary and primary landowners, respectively.
Sand and Salt Storage Facilities http://www.cwonline.org/programs/sandsalt/sandsalt.htm	This program is meant to upgrade or replace buildings used for storing road de-icing materials to prevent salt and other substances from leaching into groundwater or nearby streams.	determined annually	Mimi McGiver, Staff Engineer, mcgiver@cwonline.org			X				

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<p>Alternate Design Septic Program</p> <p>http://www.cwconline.org/programs/septic/alt_septic.htm</p>	<p>This CWC program pays eligible costs of septic system installation <u>added</u> solely due to requirements of the watershed regulations.</p>	<p>accepted on a rolling basis</p>	<p>Leo LaBuda, labuda@cwconline.org; Mimi McGiver, mcgiver@cwconline.org; 845-586-1400</p>				<p>X</p>	
<p>Stormwater Controls for New Construction</p> <p>http://www.cwconline.org/programs/strm_wtr/strmwtr_controls.htm</p>	<p>Program to design and construct runoff and erosion control measures.</p>		<p>Elizabeth Matrianni, Professional Engineer, ematrianni@cwconline.org</p>	<p>One project will improve storm water collection and treatment on Railroad Avenue, a project intended to decrease pollution and nutrient loading and reduce flow to the village's wastewater treatment plant.</p>		<p>X</p>	<p>X</p>	
<p>Stormwater Retrofit</p> <p>http://www.cwconline.org/programs/strm_wtr/strmwtr_retro.htm</p>	<p>Program to provide funds for stormwater management needed to correct or reduce existing erosion, polluted runoff or other problems associated with stormwater.</p>	<p>accepted on a rolling basis</p>	<p>Elizabeth Matrianni, Professional Engineer, ematrianni@cwconline.org</p>	<p>Projects to implement stormwater BMPs that reduce erosion and/or pollutant loading associated with conditions existing on or before January 21, 1997 are eligible to apply.</p>		<p>X</p>		

Chestnut Creek Stream Management Plan

on-the-ground
 research
 planning
 <\$20K
 \$20K to \$100K
 >\$100K

Name	Focus	Due Date	Contact	Award Example	Notes/ Priority	on-the-ground research planning <\$20K \$20K to \$100K >\$100K	range
Catskill Watershed Corporation (CWC)							
Community-Wide Stormwater Infrastructure Assessment and Planning Program	Program to conduct detailed and comprehensive assessments of existing community stormwater infrastructure with the goal of identifying and prioritizing potential areas for Stormwater BMP's for funding.	annual application deadline is November 1	Elizabeth Mastroianni, Professional Engineer, emastroianni@cwconline.org	Grantees receive funds for locating existing stormwater infrastructure and the compilation of a GIS database identifying each individual structure with an associated description, operational status and repair needs.	Projects which propose beneficial project outcomes in the three categories of Public Value, Water Quality Protection Value and Local Commitment .	X	
Public Education Program	Projects that would increase awareness of the region's environment, and its natural and human history.		Diane Galusha, Education Coordinator, galusha@cwconline.org	Tri-Valley Central School, Grahamsville, water monitoring equipment to expand the agricultural and environmental studies programs to include water quality examinations; Ernest Myer School, to bring Streamwatch.	Projects must highlight importance of City's water supply system and role of watershed residents as stewards; ecology of the region and diversity of aquatic and vegetative life; and/or the development of the city's water system.	X	\$750 to \$10K

http://www.cwconline.org/programs/stm_wtr/stm_wtr_retro.htm

http://www.cwconline.org/programs/pub_edu/pe.htm

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National Fish & Wildlife Foundation

Projects that address priority actions promoting fish and wildlife conservation and the habitats on which they depend, work proactively to involve other conservation and community interests.	NE Regional Office: Director, Tom Kelsch, 202-857-0166	Tioga County SWCD received \$9,700 to restore 8 acres of former floodplain to benefit fish and wildlife habitat along the Catatonk Creek.	Goods and services that are exchanged for cash are ineligible.	X	X	X	X	X	10K-150K

General Challenge

<http://www.nfwf.org/programs/guidelines.htm>

Projects that benefit native aquatic species in their historic range. BBN projects involve riparian habitat restoration, moving streams towards stability, and supporting native aquatic communities.	Cynthia Johnson, 303-289-0526, bbn@nfwf.org		BBN will not fund basic research or monitoring.	X					21K-450K

Bring Back the Natives

<http://www.nfwf.org/>

Projects that protect, enhance, and/or restore native plant communities on public and private land, including protection and restoration, information and education, and inventory and assessment.	Twice a year, December 1 & July 15	Indiana Dunes Natl. Lakeshore and Natl. Park Service received funds to protect the unique floristic features of the western-most extent to the Great Marsh in Indiana. Project with eradicate invasive species, erect deer exclosures, and propagate and outplant white cedar and various orchids on 6 acres of wetland.	A special emphasis is placed on larger projects that demonstrate a landscape-level approach and produce lasting, broad-based results on the ground.	X					X

Native Plant Conservation Initiative

<http://www.nps.gov/plants/nfwf/index.htm>

Chestnut Creek Stream Management Plan

on-the-ground
 research
 <\$20K
 \$20K to \$100K
 >\$100K

Name	Focus	Due Date	Contact	Award Example	Notes/ Priority	on-the-ground research	<\$20K	\$20K to \$100K	>\$100K	range
Watershed Agricultural Council										
NYC Watershed Forestry Program http://www.nycwatershed.org/	Provides cost-sharing incentives and technical assistance to watershed forest landowners to promote forest management planning and to help establish streamside buffers.	rolling assistance	Collin Miller, collinmiller@catskill.net , Watershed Agricultural Council, 607-865-7790		Assistance from this program could be used to establish additional grants from matching programs that require existing challenge funds and partnerships.	X	X			
The Conservation Fund										
Kodak American Greenways Award http://www.conservationfund.org/?article=2372	Small grants to stimulate the planning and design of greenways in communities throughout America.	March 1 & June 1 of each calendar year	American Greenways Program Coordinator, The Conservation Fund, greenways@conservationfund.org , 703-525-6300	North American Water Trails received grant money for its development, enjoyment and stewardship of recreational water trails, also known as "blueways".	Grants used for appropriate expenses needed to complete greenway project including planning, technical assistance, legal and other costs.	X	X			up to 2,500
ESRI Conservation Program										
Software/ Training Donation	Our grant program provides donations and discounts of GIS software, data, books, and training.	on-going	ecpgrant@esri.com for full application before asking questions of individuals	Grantees receive conference passes, web-based training passes, live training days, ESRI press books, software and software upgrades.	Does not grant hardware or cash.	X	X			

<p>Conservation Program http://www.esri.com/library/whitepapers/pdfs/conspgrm.pdf</p>	<p>Our grant program provides donations and discounts of GIS software, data, books, and training.</p>	<p>on-going</p>	<p>email rcdgrant@esri.com for detailed information</p>	<p>Initial RC&D Grant-Bundle will include ArcView GIS software, a Getting to Know ArcView text book with exercises and tutorial, and an ArcUSA CD containing digital data for the US.</p>	<p>Does not grant hardware or cash.</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>X</p>
<p>TechGrants</p>	<p>TechFoundation is committed to bringing financial resources, technology solutions and management expertise to nonprofits to strengthen the social sector.</p>	<p>March</p>	<p>Kathleen Sherwin, Manager, External Affairs, 617-354-7595, info@techfoundation.org</p>	<p>Colorado Environmental Coalition, www.ourcolorado.org</p>	<p>Awardees selected for focus on projects that will bring quality technology resources to nonprofits and show that effectively deployed technology can have a great impact on the ability of a nonprofit to achieve their mission.</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>5K-35K</p>
<p>Earthwatch Institute</p>	<p>Project monitors water quality in lakes, streams, wetlands and agricultural areas. Projects involved the inventory, monitoring or restoration of watershed environments.</p>	<p>on-going</p>	<p>800-776-0188, 978-461-0081, research@earthwatch.org</p>	<p>Projects monitor water quality in lakes, streams, wetlands and agricultural areas. Projects involve the inventory, monitoring or restoration of watershed environments.</p>	<p>Grants cover cost of maintaining volunteers and principal research staff in field. Grants cannot be used for PI salaries, capital equipment, or overhead costs.</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>X</p>	<p>7K-130K</p>
<p>Research Program http://www.earthwatch.org/research/index.html</p>											

Chestnut Creek Stream Management Plan

Name	Focus	Due Date	Contact	Award Example	Notes/ Priority	on-the-ground research	planning	\$20K to \$100K	>\$100K	range
Toshiba America Foundation	contribute to the quality of science and mathematics education in U.S. communities by investing in projects designed by classroom teachers to improve science and mathematics education	accepted year round	Toshiba America Foundation, 212-596-0620, foundation@tai.toshiba.com	Chimacum Middle School received money for 7th and 8th grade earth science students to conduct a water quality study in their area. After the study, students will make recommendations to local agencies.		X			X	\$2.1K - \$24K

www.toshiba.com/taf/apply.html

VI. GLOSSARY OF TERMS

GLOSSARY OF STREAM AND FLOODPLAIN TERMS

Note: where a word within a definition is italicized, it is defined elsewhere within the glossary

aggradation - The process by which *sediment* and deposition causes a streambed elevation to increase, or fill in. The channel becomes more shallow by filling in with *sediment*. An aggrading stream will typically show a *bank height ratio* of less than 1.0.

aquatic habitat – Physical attributes of the stream channel and *riparian area* that are important to the health of all or some life stages of fish, aquatic insects and other stream organisms. Attributes include water quality (temperature, pH), *riparian* vegetation characteristics (shade, cover, density, species), stream bed *sediment* characteristics, and *pool/riffle* spacing.

backwater – An area in or along a stream where water has been held back by an obstruction, constriction or dam.

bankfull flow or discharge – typically recurs every 1 – 3 years. These floods are frequent and powerful enough to mobilize *gravel* and *cobble* on the streambed. Bankfull flow is considered most responsible for defining the stream form and is also referred to as channel forming flow.

Bank Erodibility Hazard Index (BEHI) – An index for predicting *erosion potential*

on selected stream banks, usually associated with a *monitoring cross-section* for measurement of actual *erosion* rates over time (Rosgen, 1996).

bank height ratio-The ratio of height of bank to *bankfull* height, used in stream assessment to determine whether a stream is stable-bank height and *bankfull* height will be the same in a stable stream.

bar, mid-channel, point, side, lateral, etc. - a location within the stream channel in which sediment accumulates occupying a significant portion of the channel (vs.localized *sediment* deposits behind small obstructions).

base flow –The typical groundwater fed, low flow for a given stream between periods of no rainfall.

basin, drainage -- an area in which the margins dip toward a common center or depression, and toward which surface and subsurface channels drain. The common depression may allow free drainage of water from the basin as in a stream, or may be the end point of drainage as in a lake or pond.

berm – A mound of earth or other materials, usually linear, constructed along streams, roads, *embankments* or other areas. Berms are often constructed to protect land from flooding or eroding, or to control water drainage (as along a road-side ditch). Some berms are constructed as a byproduct of a stream management practice whereby stream bed *sediment* is pushed out of the channel and mounded on (and along the length of) the stream bank - these berms may or may not be constructed for flood control

purposes; some are simply piles of excess material. These berms often interfere with other stream processes such as *floodplain* function, and can exacerbate flood-related *erosion* or stream *instability*.

bioengineering – The use of live vegetation, either alone or in combination with harder materials such as rock or (dead) wood, to stabilize soils associated with stream banks or hillslopes. Roots stabilize the soil, while stems, branches and foliage slow high *velocity* water, reducing *erosion* and encourage deposition of fine *sediment*.

boulder – In the context of *stream assessment surveys*, a boulder is stream *sediment* that measures between 256 mm and 4096 mm (about 10 inches to 13.3 feet).

channel, stream– A defined waterway with definite bed and banks, which periodically or continuously contains flowing water.

channel forming flow—see *bankfull* flow.

channelization — The re-alignment of rivers involving straightening, widening, reshaping, entrenching or altering the slope. Often this work is accompanied by stream bank stabilization, grade control or berm construction.

cobble – In the context of *stream assessment surveys*, cobble material is *sediment* that measures between 64 mm and 256 mm (about 2.5 inches to 10 inches).

confluence – The location of the joining of two separate streams, each with its own *watershed*.

corridor—The area of land along a stream between the valley walls including floodplains, riparian areas, and terraces.

convergence – The downstream end of a split channel, where the stream merges back to one channel; the two channels having the same *watershed*.

cross-section (see also monitoring cross-section) – In the context of *stream assessment surveys*, a *cross-section* is a location on a stream channel where stream *morphology* is measured perpendicular to the stream flow direction (as if taking a slice through the stream), including width, depth, height of banks and/or *terraces*, and area of flow.

culvert – A closed conduit for the free passage of surface drainage water. In Chestnut Creek, culverts are typically used by the Town and County to control water running along and under the road, and to provide a crossing point for water from road side drainage ditches to the stream, as well as for routing *tributary* streams under the road to join the main Chestnut Creek stream. Culverts are also used by landowners to route roadside drainage ditch water under their driveways to reduce or prevent *erosion*.

degradation – The process by which a stream *reach* or channel becomes deeper by eroding downward into its bed over time, also called “*downcutting*”, either by periodic episodes of bed scouring without filling, or by longer term transport of *sediment* out of a *reach* without replacement. A degrading stream will typically show a *bank height ratio* greater than 1.0.

demonstration stream restoration project (demonstration project) – A *stream (stability) restoration* project that is designed and located to maximize opportunities for *monitoring* of project success, public and agency education about different *stream restoration* techniques, and interagency partnerships funding and cooperation.

destabilized (see also instability, unstable) – Describing a section of stream that has been made *unstable*, by natural or human activity.

discharge (stream flow) – The amount of water flowing in a stream, measured as a volume per unit time, usually cubic feet per second (cfs).

discontinuous floodplains (see also floodplain) – A series of small *floodplains*, formed as a series of small benches along stream banks. These *floodplain* features, typically seen in steeper mountain streams, are not connected sequentially following the valley floor, but still provide the critical *floodplain* functions of reducing water *velocity* and enhancing *sediment* deposition and infiltration (water sinking into the ground rather than running straight to the stream).

downcutting—see *degradation*

drainage area – see *watershed*.

dumping site – For the purposes of the stream assessment survey, these are areas in the stream or on the *floodplain* where refuse or other non-natural or non-biodegradable materials were documented. A dumping site is not

necessarily an actively used area, and may be the result of material washing downstream.

embankment – A linear structure, usually of earth or *gravel*, constructed so as to extend above the natural ground surface. Similar to a *berm*, but usually associated with *road fill* areas, and extending up the hillside from the road, or from the stream up to the road surface.

entrenched – In stream classification (see *stream type*), entrenchment (or entrenchment ratio) is defined by stream *cross-sectional* shape in relation to its *floodplain* and valley shape, and has a specific numerical value that in part determines stream type. For example, if this number is less than 1.4, the stream is said to be highly entrenched, if between 1.4 and 2.2 it is mildly entrenched, and greater than 2.2 it is not entrenched. Entrenchment ratio is used with other stream shape data to determine *stream type*, and define baseline data for future *monitoring* (Rosgen, 1996).

ephemeral— Referring to a stream that runs only in direct response to rain and whose channel is above the water table.

equilibrium (see also stable) – The degree to which a stream has achieved a balance in transporting its water and *sediment* loads over time without aggrading (building up), degrading (cutting down), or migrating laterally (eroding its banks and changing course).

erosion - The wearing away, detachment, and movement of the land surface (*sediment*), by running water, wind, ice, or other geological agents, including such

processes as gravitational creep or *slumping*. In streams, erosion is a natural process, but can be accelerated by poor stream management practices.

erosion potential – The amount of *erosion* that may be expected under given climatic, topographic, soil, and cultural conditions.

fascines – A *bioengineering* method using bundles of small branches of willow or other *riparian* tree species, tied together and laid into shallow trenches along a stream to stabilize and revegetate stream bank areas.

floodplain - The portion of a river valley, adjacent to river channel, which is covered with water when river overflows its banks at flood *stage*. The floodplain usually consists of *sediment* deposited by the stream, in addition to *riparian* vegetation. The floodplain acts to reduce the *velocity* of floodwaters, increase infiltration (water sinking into the ground rather than running straight to the stream - this reduces the height of the flood for downstream areas), reduce stream bank *erosion* and encourage deposition of *sediment*. Vegetation on floodplains greatly improves their functions.

floodplain connection—the stream's ability to access the land area adjacent to its active *channel* during higher flows in order for the stream system to function properly and dissipate energy or *velocity*.

fluvial – 1. Of or pertaining to a river or rivers. 2. Existing, growing, or living in or about a stream or river. 3. Produced by the action of a stream or river, as a fluvial plain.

gabions – Large wire-mesh baskets filled with rock material used to *harden* or *stabilize* road *embankments* and sometimes stream banks.

Geographic Information System (GIS) - Desktop software with a graphical user interface that allows loading and querying, analysis and presentation of spatial and tabular data that can be displayed as maps, tables and charts. The maps in the Chestnut Creek stream management plan were produced with a GIS, and can be updated as new information becomes available.

geomorphic— Pertaining to the form of the earth or of its surface features.

Global Positioning System (GPS) - A satellite based positioning system operated by the U.S. Department of Defense (DOD). When fully deployed, GPS will provide all-weather, worldwide, 24-hour position and time information.⁶ The *stream assessment survey* done for the Chestnut Creek stream management plan included the use of a GPS unit to document the locations of all mapped stream features. This information was added to the *GIS* to produce the maps.

gravel – In the context of *stream assessment survey*, gravel is *sediment* that measures between 2 mm and 64 mm (about 0.08 inches to 2.5 inches).

hardening – Any structural *revetment* that fixes in place an eroding stream bank, *embankment* or hillside by using hard materials, such as rock, sheet piling or concrete, that does not allow for revegetation or enhancement of *aquatic habitat*. *Rip-rap* and *stacked rock walls*

are typically considered to be hardening measures, though some revegetation of these areas is possible.

head-cut – A marked change in stream bed slope, as in a step or waterfall, that is unprotected or of greater height than the stream can maintain. This location, also referred to as a knick point, moves upstream, eventually reaching an *equilibrium* slope.

headwater– the uppermost portion or beginnings of a stream.

hydraulic—Relating to the flow or conveyance of water through a channel; movement or action caused by water.

impervious surface – A surface which will not permit water to pass through, such as concrete or asphalt.

inboard – Referring to a roadside ditch that is between the road and adjacent hillside, on the higher or uphill side of the road.

incised - The lowering of the streambed due to downcutting and removal of bed material by the stream, referring to a stream that has degraded such that the *bank height ratio* is greater than 1.0.

instability (see also unstable) - An imbalance in a stream's capacity to transport *sediment* and maintain its channel shape, pattern and profile.

invasive plants – Species that aggressively compete with and replace native species in natural habitats.

Japanese Knotweed (see also invasive plants) – An *invasive plant*, not native to the Catskill region, that colonizes disturbed or wet areas, especially stream banks, road-side ditches and *floodplains*. This plant out-competes natives and other beneficial plants, and may contribute to *unstable* stream conditions.

large organic debris – Any woody material, such as from trees or shrubs, that washes into a stream channel or is deposited on a *floodplain* area. Organic debris provides important *aquatic habitat* functions, including *nutrient* sources and micro-habitats for aquatic insects and fish. Large wood is especially influential to stream *morphology* in small streams, though may be detrimental in the vicinity of structures or infrastructure.

leaching – The process by which chemical or mineral materials are removed from a physical *matrix* (such as soil, or mixed *sediment* materials) by water running through and creating a solution of those chemicals.

left bank – The left stream bank as looking or navigating downstream. This is a standard used in *stream assessment surveys*.

mass wasting –The fall or slide of a hillslope which results in the rapid or slow movement of soil organic debris and rock down slope. See *erosion*.

matrix – The framework material within which other materials are lodged or included. For example, *cobbles* could be embedded in a matrix of *sand* and fine *gravel*.

mainstem - The common outlet or stream, into which all of the *tributaries* within a *watershed* feed.

meander – Refers both to a location on a stream channel that is curved (a “meander bend”), and to the process by which a stream curves as it passes through the landscape (a “meandering stream”).

meander width ratio—The quantitative expression of confinement (lateral containment of rivers) and is determined by the ratio of belt width/*bankfull* width.

monitoring – The practice of taking similar measurements at the same site, or under the same conditions, to document changes over time.

monitoring cross-section – For the purposes of the Chestnut Creek stream management plan, this is a location where metal rebar rods have been used to permanently locate an actively eroding stream bank. At this site, detailed data have been gathered to document the stream condition. The site is permanently marked to enable future measurements that, when compared to the existing condition, provide information about the stream’s change. Measuring change over time is considered ‘*monitoring*,’ and this information provides early warning to stream managers about important but perhaps visually imperceptible changes in the stream.

monumented – Refers to a location, usually a *cross-section*, that is marked with a permanent or semi-permanent marker, or “monument”, to enable future *monitoring* at the same place.

morphology, stream morphology – The physical shape, or form, of a landscape or stream channel, that can be measured and used to analyze stream or landscape condition, type or behavior.

multiflora rose (see also invasive plants) – An *invasive plant*, not native to the Catskill region, that colonizes disturbed or wet areas such as fields, forest edges, stream banks, and roadsides. This plant spreads quickly and forms impenetrable thickets that exclude native species. It impedes succession and out competes other plants for soil nutrients.

native material – *Sediment* material with a local or on-site source, as in material pushed up out of a stream channel to armor the banks.

non-quarried, or natural boulders – *Boulder*-sized rock material, either *native* or imported material, not harvested from a quarry. This material has been used in the past in stream bank stabilization, usually harvested directly from the stream or from nearby hillsides.

nutrient – The term “nutrients” refers broadly to those chemical elements essential to life on earth, but more specifically to nitrogen and phosphorus in a water pollution context. In a water quality sense nutrients really deal with those elements that are necessary for plant growth, but are likely to be **limiting** -- that is, where used up or absent, plant growth stops.

pathogen – Disease-causing agent, especially microorganisms such as bacteria, protozoa, and viruses.

planform –Horizontal stream pattern, including sinuosity, meander radius, and belt width, as seen in plan view (from above).

pool – A small section of stream characterized by having a flat or nearly flat water surface compared to the average *reach* slope (at low flow), and deep and often asymmetrical *cross-sectional* shape.

perennial -A stream that runs all year long, regardless of precipitation patterns.

reach – A section of stream with consistent or distinctive *morphological* characteristics.

reference reach, stable reference reach – A *stable* portion of a stream that is used to model restoration on an *unstable* portion of stream. Stream *morphology* in the reference reach is documented in detail, and that *morphology* is used as a blueprint for design of a *stream stability restoration* project.

revetment – Any structural measure undertaken to stabilize a road *embankment*, stream bank or hillside.

riffle – A small section of stream characterized by having a steep water surface slope compared to the average *reach* slope (at low flow), and a shallow and often uniform *cross-sectional* shape.

right bank – The right stream bank as looking or navigating downstream. This is a standard used in *stream assessment surveys*.

riparian (area, buffer, vegetation, zone) – The area of land along stream channels, within the valley walls, where vegetation and other landuses directly influence stream processes, including flooding behavior, *erosion*, *aquatic habitat* condition, and certain water quality parameters.

rip-rap – Broken rock, *cobbles*, or *boulders* placed on earth surfaces, such as a road *embankment* or the bank of a stream, for protection against the action of water; materials used for soil *erosion* control.

road fill (see also embankment) – Typically *gravel*- and *sand*-sized material used to elevate the level of the road, control the road grade, or provide a buffer for the road grade from stream *erosion*.

runoff – The portion of precipitation (i.e., rainfall) that reaches the stream channel over the land surface.

sand – In the context of *stream assessment surveys*, sand material is *sediment* that measures between 0.063 mm and 2 mm (up to 0.08 inches).

sediment, stream bed sediment - Material such as *clay*, *sand*, *gravel* and *cobble* that is transported by water from the place of origin (stream banks or hillsides) to the place of deposition (in the stream bed or on the *floodplain*).

sheet flow - Water, usually storm runoff, flowing in a thin layer over the ground surface; also one form of overland flow.

silt – In the context of *stream assessment surveys*, silt material is *sediment* that

measures between 0.0039 mm and 0.063 mm.

sinuosity - The ratio of stream length to valley length, or the ratio of valley slope to channel slope.

slump – The product or process of mass-wasting when a portion of hillslope slips or collapses downslope, with a backward rotation (also a rotational failure).

stable (see also equilibrium) – A stable stream is defined as maintaining the capacity to transport water and *sediment* loads over time without aggrading (building up), degrading (cutting down), or migrating laterally (eroding its banks and changing course). Stable streams resist flood damage and *erosion*, and provide beneficial *aquatic habitat* and good water quality for the particular setting.

stability – In stream channels, the relative condition of the stream on a continuum between *stable* (in *equilibrium* or balance) and *unstable* (out of *equilibrium* or balance). Stream stability assessment seeks to quantify the relative *stability* of stream *reaches*, and can be used to rank or prioritize sections of streams for management.

stacked rock wall – A *boulder revetment* used to line stream banks for stabilization. Stacked rock walls can be constructed on a steeper angle than *rip-rap*, so they take up less of the stream *cross-section*, provide a wider road surface, and provide less surface area for solar heating, allowing stream temperature to remain cooler relative to banks lined with *rip-rap*. These features can be augmented with *bioengineering* to enhance *aquatic*

habitat and *stability* functions.

stage – In streams, stage refers to the level or height of the water surface, either at the current condition (i.e., current stage), or referring to another specific water level (i.e., flood stage).

stream assessment, stream assessment survey – The methods and summary information gathered in a stream *reach* or series of *reaches*, primarily focused on stream *morphology*. Stream assessment for the Broadstreet Hollow included detailed characterization and mapping of stream channel patterns, *cross-section* shapes and slope.

stream flow (discharge) – The amount of water flowing in a stream, measured as a volume per unit time, usually cubic feet per second (cfs).

stream stability restoration (design, project) – An *unstable* portion of stream that has been reconstructed, using *morphology* characteristics obtained from a *stable reference reach* in a similar valley setting, that returns the stream to a *stable* form (that is, to a shape that may allow the stream to transport its water and *sediment* load over time without dramatic changes in its overall shape).

stream type – As defined by Rosgen (1996), one of several categories defined in a stream classification system, based on a set of delineative criteria in which measurements of channel parameters are used to group similar *reaches*.

substrate— The bottom material of a waterway.

summer base-flow – Stream discharge primarily from groundwater (not from surface *runoff*). Typically this is the lowest flow of the year, occurring in late summer, or following extended periods of drought.

suspended sediment – *Sediment* carried in the water column (above the stream bed), including *clay*, *silt* and sometimes fine *sand*. These materials contribute to *turbidity*.

terrace – A level area in a stream valley, above the active *floodplain*, that was deposited by the stream but has been abandoned as the stream has cut downward into the landscape. These areas may be inundated (submerged) in higher floods, but are typically not at risk in more common floods.

thalweg – The line followed by the majority of the stream flow. 1 In *stream assessment*, this location is used as a reference location for surveys and other measurements, and is most often associated with the deepest point in the stream *cross-section* (stream channel that would still have water flowing in it at even the lowest flow conditions).

toe – The bottom, or base, of a stream bank or *embankment*.

tributary – A stream that feeds into another stream; usually the tributary is smaller in size than the main stream (also called “*mainstem*”). The location of the joining of the two streams is the *confluence*.

turbidity – A measure of opacity of a substance; the degree to which light is

scattered or absorbed by a fluid. Streams with high turbidity are often referred to as being “turbid”.

unstable (see also instability) – Describing a stream that is out of balance in its capacity to transport *sediment* and maintain its channel shape, pattern and profile over time.

velocity – In streams, the speed at which water is flowing, usually measured in feet per second.

watershed – A unit of land on which all the water that falls (or emanates from springs) collects by gravity and runs off via a common outlet (stream).

wetland – An area that is saturated by surface water or ground water with vegetation adapted for life under those soil conditions, as in swamps, bogs, fens, and marshes

winter base flow—Stream discharge primarily from groundwater (not from surface runoff)—see *summer base flow*-- Winter base flow is generally higher due to lower rates of evapo-transpiration during vegetative dormancy.

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