## Section 1. Introduction & Goals

## 1.1 Purpose: Why a *Stream Management Plan*?

Many generations of families have managed the streams of the Catskills, and Stony Clove Creek is no exception. The residents of the Stony Clove valley --from Edgewood to Phoenicia-- know the awesome power of the creek. Over the past several centuries, the European settlers learned how to harness that power, and how to avoid it, when floodwaters roared, tumbling boulders down the streambed and making the foundations of their streamside homes tremble. The creek has been bermed in many places, revetted in many more, and stream flow has been intentionally redirected in other reaches. Numerous bridges have been built to allow access and settlement on both sides of the stream, but which disrupts stream processes. At narrow points in the valley, hardened road embankments have further confined the stream. In some places, floodplains and streamside wetlands have been filled, in others, diversions were created to sluice water into floodplain ponds, and along the creek's banks and terraces, land has been cleared for pastures and lawns. The fish community is enhanced with sport fish by local anglers. Trees in the powerline right-of-ways, which frequently run along the stream banks, are routinely lopped or removed. Each of these activities are, in some way, stream management activities.

For all this management, the stream remains relatively wild, and generally quite healthy. It still shifts around in its floodplain during the big floods, as those who remember the floods of 1987 and 1999 (or the many others before!) will attest. The fishing is fairly good, although local anglers will tell you it was better 20 years ago. The water quality is high for the most part, although for several days after a heavy rain the stream can look like chocolate milk. Summer residents still cool off during the dog days of July and August in the pools of the Stony Clove, although old-timers recall that the swimming holes were once deeper. The forests that are returning to the hillsides throughout the Catskills are also returning along many reaches of the Stony Clove, keeping the water cooler and the banks more stable. So why does the Stony Clove need a management plan?

In past years, efforts to manage the stream have been relatively uncoordinated. Landowners managed their own stream banks and floodplains, highway superintendents managed road embankments and bridges, and power companies cleared their rights-of-way. When there were major problems, federal agencies such as The Natural Resources Conservation Service (NRCS) or The Federal Emergency Management Agency (FEMA) brought their resources in an attempt to try to address immediate needs. The NYS Department of Environmental Conservation requires a permit for certain activities in or near streams. The U.S. Army Corps of Engineers also has a similar permitting program (see Section 2.11). Each of these players in stream management had their own objectives, their own knowledge or area of expertise, and their own ideas about what needed to be done to keep the stream healthy. No one, however, held responsibility for coordinating all of these isolated efforts. More importantly, no one was making sure that one person's stream management actions didn't compromise the interests and efforts of others. Streams are systems: what someone does on their own stream bank can have a significant impact –good or bad– upstream or downstream. While streamside landowners

maintain individual rights to use their own land as they think best, and individual responsibilities to act as good stewards for the health of the stream, streams are in many ways a community resource, and cannot be effectively managed without a coordinated effort. It is because we recognize the many benefits streams contribute to our quality of life, and also the many risks they pose, that we need to coordinate decision-making, and develop common goals for stream management. While that coordination requires an ongoing commitment, this Plan represents an effort to significantly improve that coordination.

Furthermore, for all of the local knowledge about the Stony Clove, questions remained: How can we know whether the erosion we still see along stream banks is just a natural part of the way streams evolve, or whether we are now seeing *excessive* erosion, and a stream system destabilized by the way we've managed it in the past? Where there are problems, will the stream "fix" itself, and how long will that take? What further problems will likely result in the meantime? Or do we need to change our management strategies, and undertake major projects to restore or protect stream channel stability? Where should we invest our limited resources for restoration or protection? How can we know more reliably the condition of the fish community and the quality of the stream habitat? How can we tell if the water is staying turbid longer than it used to after a storm, or if that's always been the nature of Stony Clove, due to its geology? What is the trend in the overall health of the Stony Clove Creek?

In recent decades, advances have been made in the science of stream form and function (see Section 3.2 Introduction to Stream Processes). As part of the process of developing this plan, assessments and inventory of the condition of the stream were conducted using state of the art methods, and the results of those assessments are described in this Plan. As such, the Plan documents baseline conditions in the Stony Clove, and in the future managers can measure conditions against these baselines to determine trends.

This stream management plan was created cooperatively through the efforts of the Stony Clove Creek streamside community, local leaders and representatives of agencies involved in different aspects of stream management. It identifies the common, shared goals that many have for the Stony Clove Creek stream and its adjacent floodplains, forests and wetlands. In addition to identifying our common goals, it identifies competing goals as well, and provides a "road map" for coordination among the many "stakeholders." Stakeholders are those who rely on, work with, and/or live by the waters of the Stony Clove Creek, including: local landowners concerned about erosion, flooding and the beauty of the stream, Town and County Highway Departments and the New York State Department of Transportation, responsible for managing the roads, bridges and culverts that residents and area emergency personnel use regularly; utilities that manage rights of way along the stream; anglers who enjoy the trout fishery; and even the communities of the Lower Hudson Valley and the City of New York, nine million residents who ultimately drink some of the Stony Clove's waters.

This Plan also includes summaries of pre-existing inventories and historical data, as well as the results of inventories, assessments and analyses completed specifically for

inclusion in the Plan. Based on this information, the Plan presents recommendations for things that can be done individually and collectively to reduce the risks of living in the Stony Clove valley, improve the ecology of the stream and floodplain, and protect its many resource values.

## 1.2 Purpose: Why a Stream Management Plan for the *Stony Clove Creek*?

The Stony Clove Creek mainstem originates in the Town of Hunter in Greene County, and flows south through the communities of Edgewood and Lanesville, into the Town of Shandaken in Ulster County, passing through Chichester and joining the Esopus Creek at Phoenicia. Although Stony Clove Creek may be considered relatively small compared to some other streams in the Catskills, for the residents of the Stony Clove valley, the stream has an immense impact on quality of life, providing both great benefits and great challenges.

Interest in developing a coordinated management strategy for the Stony Clove Creek emerged after the January 19, 1996 flood event. Costs of damage, from this catastrophoic flood, to private property and public infrastructure throughout the Catskills ran into the millions of dollars. Previous large flood events had also caused extensive damage in the Stony Clove valley every decade or two, but in 1996, severe bank erosion occurred in many places throughout the Stony Clove, and a number of bridges across the creek were lost or damaged to the point of being unusable. Several sections of NYS Route 214 were undermined, as well as a large section of the embankment of Silver Hollow Road at the confluence of Warner Creek. For the streamside community, the potential for life-threatening loss of access for emergency services was most disturbing.

In the eastern Catskill Mountains, stream beds and banks frequently include clay-rich soils, and as a result streams generally become muddy, or "turbid," after major rainstorms or snowmelt events that bring flood flows. Often, these same streams run clear at low flows. After the 1996 flood, after the dramatic stream and infrastructure damages that resulted, and after subsequent emergency repair work, it was apparent that something had changed in Stony Clove Creek. Since 1996, small instability and erosion problems became much worse, small eroding banks became large failures, and the stream began to run turbid even after small storms. In addition, a number of stream reaches in the Stony Clove appeared to be quickly cutting down, or "incising", into thick layers of clay underlying the cobble of the streambed.

This condition was noticed by streamside landowners, anglers, resource agencies responsible for the stream's quality, and by the NYC DEP, who has been asked by the USEPA to identify and reduce sources of "turbidity" in its water supply watershed. The NYC DEP had already recognized the Stony Clove Creek as a significant contributor to suspended sediment and related turbidity in the Esopus Creek drainage basin during the early- to mid-1990s.

Recognizing that certain common management practices in a mountainous setting combined with catastrophic flood conditions can result in increased bed and bank erosion and turbidity, the DEP initiated a voluntary planning effort with the Greene County SWCD, the Ulster County SWCD, the New York State Department of Environmental Conservation and the US Army Corps of Engineers. These core agencies agreed to work together to fund and coordinate the development of this management plan, and to construct a stream stability restoration project at one of the worst eroding areas (see

Section 5, Lanesville Demonstration Restoration Project) in order to demonstrate the effectiveness of various best management practices.

These agencies recognized the importance of local leadership for development of an effective management strategy for the Stony Clove Creek. The SWCDs and DEP led a partnership effort with local stakeholders living and working along the stream by convening a Project Advisory Committee (PAC) to develop, guide and implement the goals and objectives of the management plan. In addition to the core agencies, the PAC included town officials, representatives of highway departments at the town, county and state levels, and local landowners who lived along Stony Clove Creek. This planning process has helped foster stronger partnerships among local, state, city and federal agencies, and landowners and various private organizations in the Stony Clove Creek watershed. The plan is intended to facilitate cooperation and communication between various parties, building community relationships and support for stewardship of the stream as a vital natural resource.

## 1.3 Goals and Objectives for this Management Plan

There are four primary goals for the management plan:

1) Document risks and outline a plan to reduce damage to private property and public infrastructure - roads, bridges and utility lines - from floodwaters and stream erosion;

2) Summarize known information and outline a plan to protect and improve water quality;

3) Document current conditions and outline a plan to protect and enhance the integrity of stream and floodplain ecosystems, and of the unique communities of plants and animals that use the stream and floodplains as their home; and

4) Provide a strategy for coordination of management activities among the various stakeholders, to ensure no one of the above goals is achieved at the expense of another.

The following sections describe the Plan's objectives related to each of these goals.

### Flooding and Erosion Threats

The risks associated with floods and their powerful erosive forces can affect an individual landowner or an entire community. To reduce these risks, this plan proposes to achieve the following objectives:

1) Conduct a watershed-wide survey of landowners to assess the history of flood damages, concerns and interests in the stream;

2) Conduct a physical survey and analysis of the stream channel and floodplain, to better understand how the stream is likely to behave in future flood events, as indicated by the physical form, or *morphology*, of the stream;

3) Identify, monument (for ongoing monitoring) and survey sites of bank erosion, assess their relative stability, and make prioritized recommendations for their treatment;

4) Identify those locations where roads, bridges or culverts may be threatened by bank erosion, or are otherwise unstable or threatened, and make prioritized recommendations for their treatment.

5) Identify those locations where improved or residential areas may be threatened by bank erosion, and make prioritized recommendations for their treatment;

6) Identify those locations where glacial lake clay and/or bank location could exacerbate bank erosion problems leading to high water quality risks, and make prioritized recommendations for their treatment.

**Water Quality**

Potential impairments to water quality can come from many sources, and they can affect both surface waters and ground water supplies for wells. To protect and improve ground and surface water supplies, this plan proposes to achieve the following objectives:

1) Review existing water quality monitoring data and identify, to the extent possible, identify the most significant water quality impairment(s) in the Stony Clove Creek;

2) Identify the likely sources of suspended sediment from within the stream channel, and make prioritized recommendations for their treatment;

3) Identify the most likely sources of suspended sediment from upland areas, if any, and make prioritized recommendations for their mitigation;

4) Identify potential sources of contamination from landfills or dumping areas in the stream corridor, and make prioritized recommendations for their mitigation; and

5) Identify potential sources of contaminants from road runoff, and make prioritized recommendations for their mitigation.

6) Identify potential sources of contaminants from households, and make prioritized recommendations for their mitigation.

**Ecological Health and Fish Habitat**

The health of our stream and floodplain ecosystems is increasingly recognized as a key element in our quality of life, a community resource as valued by some as others might value good schools or reliable emergency services. Healthy streams support a diversity of fish and insect species, and healthy floodplains support a variety of tree and shrub species, as well as wildlife that can only thrive along streams with high ecological integrity. Healthy streams provide higher recreation value, and increase property values for the individual landowner and the community as a whole. To achieve the goal of optimizing stream and floodplain ecosystem integrity, this plan proposes the following objectives:

1) Characterize the status of stream ecosystem health in general terms for the Stony Clove Creek as a whole, using existing fish and insect population data, and outlining the general threats to ecosystem health and integrity;

2) Survey local residents' experience with the Stony Clove Creek fishery, to determine perceived trends and document its management by local angling groups and the NYSDEC;

3) Conduct a study a) mapping the habitats and habitat characteristics throughout the Stony Clove Creek under varying flows, b) characterizing fish species' presence or

absence in those different habitats, c) establishing a target fish community structure based on regional and historic fish community data, and d) make recommendations for improvement of habitat for the target community;

4) Monitor the response of fish and macroinvertebrate community structure to stream stability restoration practices implemented during the course of the development and implementation of the management plan;

5) Characterize current riparian vegetation management in Stony Clove Creek, and make prioritized recommendations for changes that can improve ecosystem integrity; and

6) Conduct field surveys of selected riparian vegetation; make prioritized recommendations for management and further study of the riparian zone.

**Coordination**

Streams are currently "managed" by many different individuals, agencies and organizations. Each of these groups has its own "take" on the stream, and each has unique goals and management practices. Sometimes the goals and practices of one group can be at cross-purposes with others, but through better communication and coordination, and by coming to agreement on a common strategy, these potential conflicts can be minimized or avoided altogether. To promote the goal of effective coordination among the many stakeholders, this plan proposed the following objectives:

1) Establish a Project Advisory Committee consisting of representatives of all significant stakeholder groups to coordinate the development and implementation of the plan;

2) Conduct a survey of Stony Clove Creek residents to determine their concerns, interests and current stewardship practices;

3) Encourage and support the formation and activities of a Stony Clove Creek Watershed Association to represent landowner interests, especially to the Project Advisory Committee during development of the management plan;

4) Survey highway superintendents on their concerns, interests and current management practices and priorities, and make recommendations to address these concerns;

5) Survey the needs of local stakeholders for information needed to promote land use consistent with the long-term, collective goals of the Stony Clove Creek community, and make recommendations for strategies to acquire that information;

6) Determine the needs of various stakeholder groups for technical assistance, information and education, and make recommendations for the development of programs to meet those needs;

7) Document baseline conditions of the Stony Clove Creek and floodplain that can be used as benchmarks to gauge progress toward the collective goals of the community and others with an interest in keeping the stream and its neighbors both healthy and happy.

## 1.4 Guide to the Organization of this Plan

The Stony Clove Creek Stream Management Plan has been arranged in three volumes. In Volume I Section 2, regional and watershed background information is provided to set the environmental and institutional context of stream management in Stony Clove Creek, and the Catskills in general. Existing institutional relationships for stream management in the Stony Clove Creek are discussed, as are the interests, jurisdictions and management purview of the many project stakeholders.

Volume I Section 3 includes: a summary of water quality assessments that have been undertaken over the years in the Stony Clove Creek; a introduction to the science of stream processes; and a description of the watershed assessment that was undertaken specifically to develop this plan.

In Volume II, Section 4 provides detailed descriptions and specific recommendations for approximately 9.5 miles of stream, from NYS DEC property at the top of the Stony Clove Creek watershed, down to the mouth of the stream where it meets the Esopus Creek. This section provides a useful reference for the extent of current problems at a localized stream reach scale, with specific recommendations for action and references to other sections of the plan for further information or resources. The main stem has been organized into Management Units (MUs), subdivided using physical stream characteristics, property boundaries, location of bridges and road infrastructure, and valley characteristics, all gathered through a detailed stream assessment survey conducted in 2001. These MU descriptions outline stream conditions (its bed and banks), general streamside (*riparian*) vegetation condition, and proximity and arrangement of roads, bridges and culverts. Conditions and recommendations are organized by management objective. Descriptions provide guidance and suggestions for specific projects or assessments in these categories, and any ongoing monitoring that can provide further detail to define specific problems. Summary tables provide a condensed version of each expanded description, and companion maps show the location of specific features described in the text.

Volume II Section 5 presents a report on the demonstration stream restoration project in Lanesville.

Volume II Section 6 provides watershed-wide, programmatic recommendations.

Volume II Section 7 suggests an approach for moving toward implementation of the recommendations in this plan.

Volume III includes four appendices: Riparian Vegetation Analysis for the Streamside Planting Program; Fish Habitat Assessment on Stony Clove Creek, NY using MesoHABSIM; Native Trees, Shrubs, Ground Covers for Riparian Buffers; Watershed Data and Analyses; and the glossary.