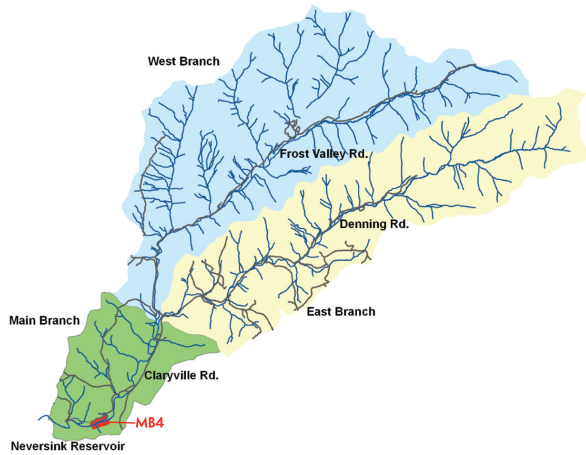
Neversink River Main Branch

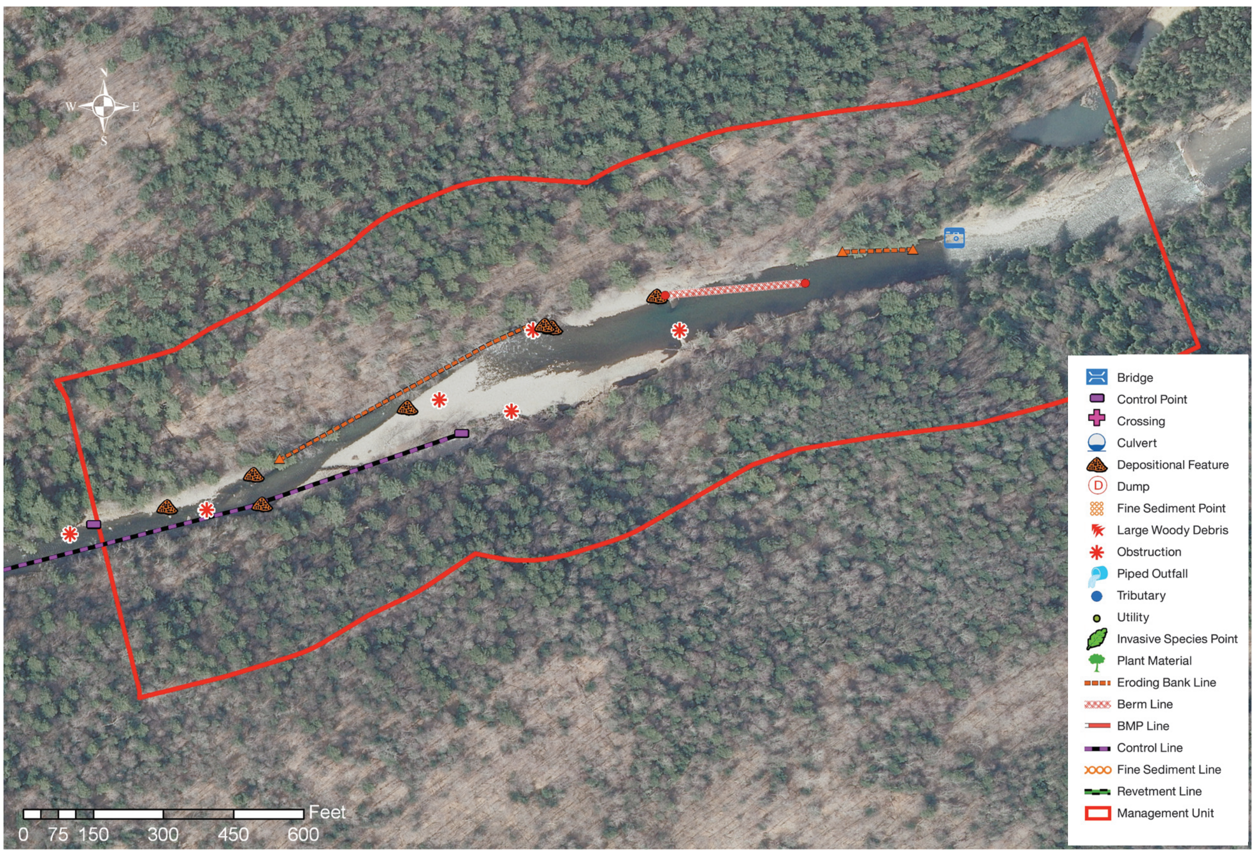
MANAGEMENT UNIT 4

STREAM FEATURE STATISTICS

- 16% of stream length is experiencing erosion
- None of stream length has been stabilized
- 2.15 acres of inadequate vegetation within the 100 ft. buffer
- None of stream is within 50 ft. of the road
- There are no houses located within the 100-year floodplain boundary

Percentages reported represent the length of features observed where the inventory was allowed relative to the total length of the management unit. Features in the undocumented portions of the stream could change these percentages.





Stream Feature Inventory 2010 (Figure 1)

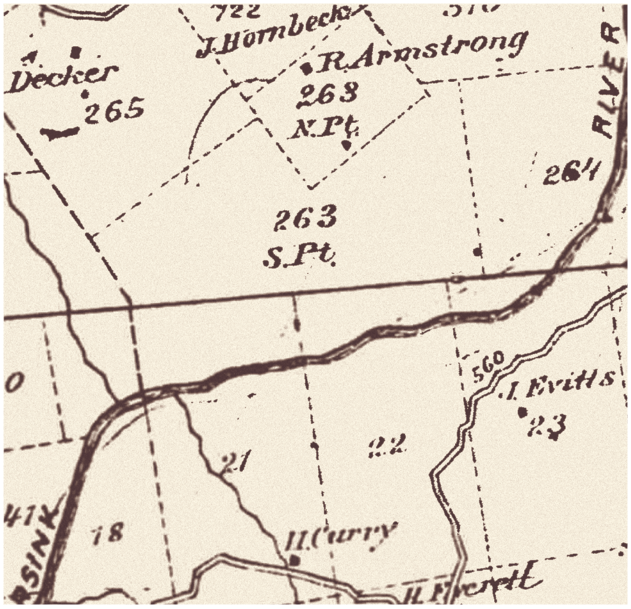
Management Unit Description

This management unit begins at a change in valley type at Station 9300, continuing approximately 2,375 ft. to a change in valley type at Station 11700. The drainage area ranges from 68.6 mi^2 at the top of the management unit to 68.8 mi^2 at the bottom of the unit. The valley slope is 0.41%. The average valley width is 242.74 ft.

Summary of Recommendations
Main Branch Management Unit 4

Intervention Level	Passive Restoration of the left bank erosion site (NMB4_9700).
Stream Morphology	Conduct baseline survey of channel morphology.
Riparian Vegetation	None.
Infrastructure	Investigate history and original objectives of control structures.
Aquatic Habitat	Fish population and habitat survey.
Flood Related Threats	None.
Water Quality	None.
Further Assessment	Include MU4 in comprehensive Local Flood Hazard Mitigation Analysis of Claryville MUs.

Historic Conditions

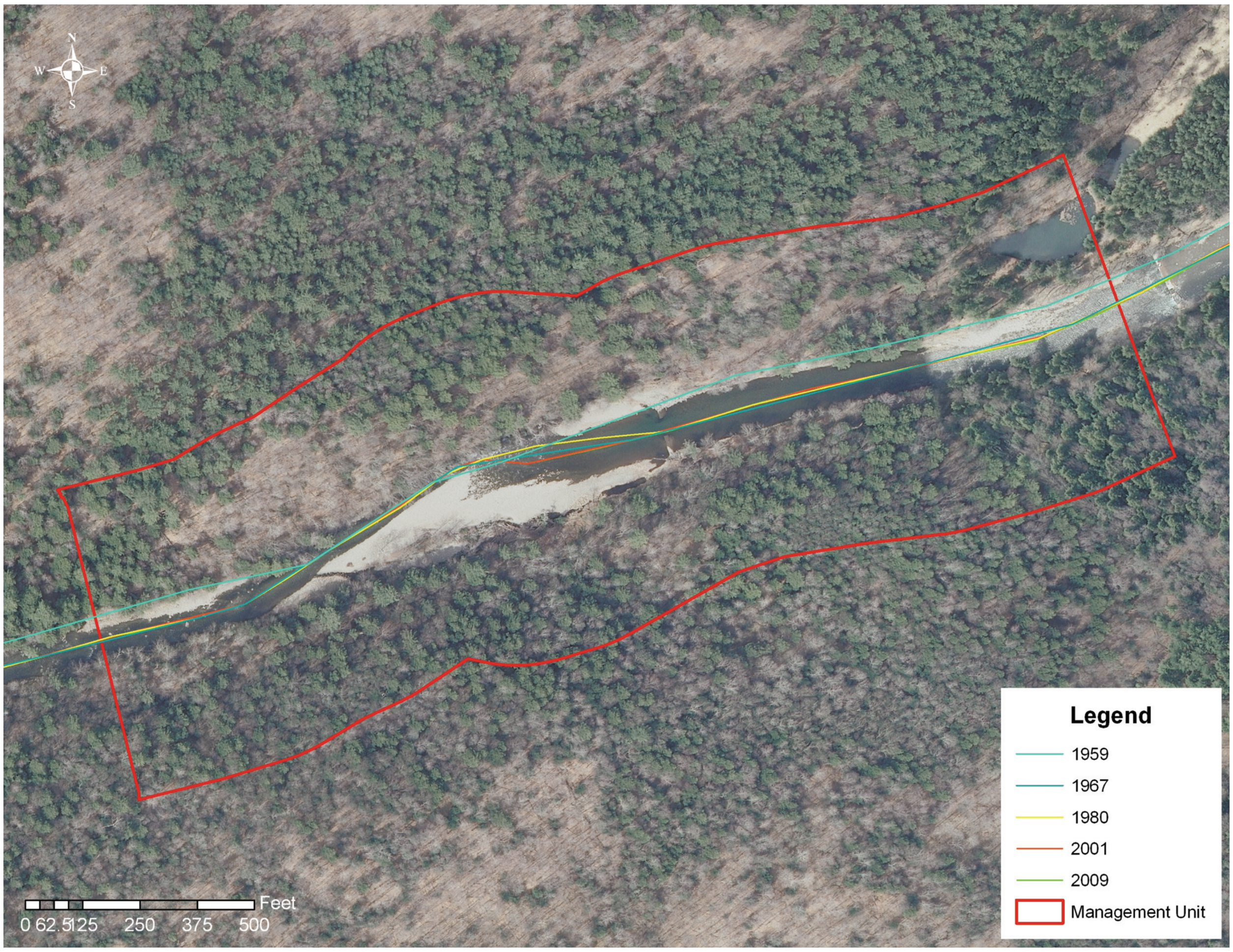


Excerpt from 1875 Beers Map (Figure 2)

As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 *Geology of Upper Neversink River,* for a description of these deposits. These deposits make up the soils in the high banks along the valley walls on the Neversink mainstem and its tributaries. These soils are eroded by moving water, and are then transported downstream by the River. During the periods when the forests of the Neversink watershed were heavily logged for bark, timber, firewood and to make pasture for livestock, the change in cover and the erosion created by timber skidding profoundly affected the Neversink hydrology and drainage patterns.

The 1875 Beers Atlas of this area indicates that by that time, the stream had been harnessed for manufacturing, primarily saw mills, woodworking shops and tanneries *(Figure 2).* Raceways were built in the floodplains to divert water to ponds for use as needed. Floodplains were profoundly altered in the process, as these watercourses also became areas of preferential channelized flow when floodwaters inundated the floodplains. When woody debris jams blocked the primary channels, these raceways sometimes eroded out to become major secondary channels, or even took over the full flow to become a new primary watercourse.

During large runoff events, floodplains adjacent to the confluence of major tributaries receive large slugs of material eroded out of the steep streams draining the valley walls. overwhelmed the Neversink's ability to transport it, creating an alluvial fan. Like changes in the floodplains made by humans, these episodes can result in catastrophic shifts in channel alignment. In the roughly one hundred and twenty centuries since the retreat of the glaciers, the position of Neversink River has moved back and forth across its floodplain numerous times in many locations. A comparison of historical channel alignments *(Figure 3, following page)* and in-stream observations made during a stream feature inventory in 2010 *(Figure 1, page 1)* indicate little lateral channel instability, and no NYS Article 15 stream disturbance permit has been issued in this management unit, according to records available from the NYSDEC DART database (**http://www.dec.ny.gov/cfmx/extapps/envapps/**).



Historical channel alignments from five selected years (Figure 3)

Stream Channel and Floodplain Current Conditions

The following description of stream morphology references stationing in the foldout Figure 4. "Left" and "right" references are oriented looking downstream, photos are also oriented looking downstream unless otherwise noted. Stationing references, however, proceed upstream, in feet, from an origin (Station 0) at the confluence with the Neversink Reservoir. Italicized terms are defined in the glossary. This characterization is the result of surveys conducted in 2010.

Most of MBMU4 was not included in the stream survey because the landowner of the parcel including the river from Station 13500 to Station 9770 did not permit access. However, inspection via publicly available aerial images and topography reveals some information about the features in this management unit. MBMU4 begins at Station 11700 where the main channel is separated from an open water pond in the otherwise forested floodplain on the right bank. It appears that this pond is fed by a combination of a tributary off the right valley wall and a side channel that diverges from the main channel around Station 13500, and drains via a side channel that rejoins the main channel around Station 10600 after flowing behind a depositional feature for about 200 feet. Upstream of the confluence, relict habitat structures constructed of timber planks were visible on both banks in the aerial images. In addition, some revetment is evident in aerial photography adjacent to the relict habitat structure at Station 10650, and a berm is visible on the right bank from Station 10650 to Station 10950.

Station 10450 is the former location of the USGS gauging station 01435000 'Neversink River Near Claryville, NY' formerly known as "Neversink River At Halls Mills Near Curry, NY" that was relocated to its current location slightly downstream of the covered bridge between 1949 and 1951. Directly downstream of the confluence is a transverse bar littered with woody debris piles that is pushing the thalweg against the right bank, leading to approximately 600 feet of erosion via fluvial entrainment (BEMS NMB4_9700). *(A240)* Aerial photos and photo points that were taken at the downstream extent of the eroding segment reveal that this bank is revegetating and will likely stabilize without treatment *(passive restoration)*. It is recommended that this site be monitored for changes in condition using the available aerial images.

Erosion of right bank (A240)

The stream feature survey restarted at Station 9760, the downstream extent of the eroding bank segment. At this location there is a depositional side bar forming that extends approximately 200 feet downstream. On the left bank at this location there is exposed bedrock controlling both the stream bed and bank. *(B524)* Based on the local topography and location of the main channel it is likely that this bedrock extends upstream from this location. The end of this bedrock was documented 840 feet downstream at Station 8920 in MBMU3.

Exposed bedrock on both bed and left bank (B524)


Large boulder on right bank, possible fish habitat (B244)

At Station 9550 there are two large boulders of native material that appear to be well eroded but were possibly placed to improve fish habitat, as evidenced by the cobble and gravel deposits upstream of the boulders and the relatively deep scour pools downstream. *(B244)*. Features like this one were observed frequently on the main branch of the Neversink River. It is difficult to decipher the original design objectives; they may have been designed to improve or enhance aquatic habitat or to protect banks. It is recommended that the history and original objectives of these features be investigated to better understand their current function and ongoing hydraulic effects.

MBMU4 ends at Station 9300.

Sediment Transport

Streams move sediment as well as water. Channel and floodplain conditions determine whether the reach aggrades, degrades, or remains in balance over time. If more sediment enters than leaves, the reach aggrades. If more leaves than enters, the stream degrades. (See Section 3.1 for more details on Stream Processes).

This management unit is located in the middle of a short series of sediment transport reaches in a valley pinchpoint from Station 12000 to Station 9000. Transport reaches are in a state of *dynamic equilibrium,* effectively conveying sediment supplied from upstream during each flow event. Unlike sediment storage reaches, transport reaches tend to have less channel migration over time as well as less change in channel dimensions. This is illustrated by the lack of variation in the river center line at this location.

Storage reaches act as a "shock absorber", holding bedload delivered during large flow events in depositional bars and releasing it slowly over time in more moderate flood events. These depositional areas, such as depositional point bars in MBMU3 downstream of the series of transport reaches including MBMU4, are very dynamic, with frequent lateral channel migration through bank erosion, *avulsions* and woody debris accumulations. This is one process by which floodplains are created and maintained. Sediment storage reaches can result from natural conditions or as the unintended consequence of poor bridge design, check dams or channel over-widening. While such unpredictable conditions represent risks for nearby property owners, these dynamic disturbance regimes produce unique and diverse habitat patches, attracting equally diverse plant communities and wildlife.

To better understand sediment transport dynamics of this section of the Neversink, a baseline survey of channel form and function is recommended for this management unit.

Riparian Vegetation

One of the most cost-effective methods for landowners to protect streamside property is to maintain or replant a healthy buffer of trees and shrubs along the bank, especially within the first 30 to 50 ft. of the stream. A dense mat of roots under trees and shrubs bind the soil together, and makes it much less susceptible to erosion under flood flows. Mowed lawn does not provide adequate erosion protection on stream banks because it typically has a very shallow rooting system. Interplanting with native trees and shrubs can significantly increase the working life of existing rock rip-rap placed on stream banks for erosion protection. Riparian, or streamside, forest can buffer and filter contaminants coming from upland sources or overbank flows. Riparian plantings can include a great variety of flowering trees and shrubs, native to the Catskills, which are adapted to our regional climate and soil conditions and typically require less maintenance following planting and establishment.

Some plant species that are not native can create difficulties for stream management, particularly if they are invasive. Japanese knotweed (Fallopia japonica), for example, has become a widespread problem in recent years. Knotweed shades out other species with it's dense canopy structure (many large, overlapping leaves), but stands are sparse at ground level, with much bare space between narrow stems, and without adequate root structure to hold the soil of stream banks. The result can include rapid stream bank erosion and increase surface runoff impacts. There were no occurrences of Japanese knotweed documented in this management unit during the 2010 inventory.

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories *(Figure 5)*. In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is evergreen-closed tree canopy (35.84%) followed by mixed-closed tree canopy (33.0%). No *Impervious* area was documented in this unit's buffer, and 2 acres of potential riparian buffer improvement area were identified *(Figure 7)*.

There are 6.38 acres of wetland (16.4% of MBMU4 land area) within this management unit mapped in the National Wetland Inventory as three distinct classifications (see Section 2.5, *Wetlands and Floodplains* for more information on the National Wetland Inventory and wetlands in the Neversink watershed). Wetlands are important features in the landscape that provide numerous beneficial functions including protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods (See Section 2.5 for wetland type descriptions and regulations). The wetland classified as Riverine is 5.53 acres in size, the wetland classified as Freshwater Forested Shrub is 0.45 acres in size, and the wetlands classified as Freshwater Pond is 0.41 acres in size.

Flood Threats

INUNDATION As part of its National Flood Insurance Program (NFIP), the Federal Emergency Management Agency (FEMA) performs hydrologic and hydraulic studies to produce Flood Insurance Rate Maps (FIRM), which identify areas prone to flooding. The upper Neversink River is scheduled to have its FIRMs updated with current surveys and hydrology and hydraulics analysis in the next few years, and the mapped boundaries of the 100-year floodplain are likely to change. No houses are located in the 100-year floodplain here. FEMA provides guidance to homeowners on floodproofing at: http://www.fema.gov/library/viewRecord.do?id=1420

No areas of erosion were documented during the stream feature inventory, although one section is visible on aerial images and photo points were taken at the downstream extent of the eroding segment (BEMS NMB4_9700). This bank is revegetating and will likely stabilize without treatment *(passive restoration)*.

INFRASTRUCTURE No revetment was observed in the section of this management unit included in the stream feature inventory, although some revetment is evident in aerial photography adjacent to the relict habitat structure at Station 10650. 300 feet (6.33%) of the banks in MBMU4 were bermed.

Aquatic Habitat

Aquatic habitat is one aspect of the Neversink River ecosystem. While ecosystem health includes a broad array of conditions and functions, what constitutes "good habitat" is specific to individual species. When we refer to aquatic habitat, we often mean fish habitat, and specifically trout habitat, as the recreational trout fishery in the Catskills is one of its signature attractions for both residents and visitors. Good trout habitat, then, might be considered one aspect of "good human habitat" in the Neversink River valley.

Even characterizing trout habitat is not a simple matter. Habitat characteristics include the physical structure of the stream, water quality, food supply, competition from other species, and the flow regime. The particular kind of habitat needed varies not only from species to species, but between the different ages, or life stages, of a particular species, from eggs just spawned to juveniles to adults.

New York State Department of Environmental Conservation (DEC) classifies the surface waters in New York according to their designated uses in accordance with the Clean Water Act. The following list summarizes those classifications applicable to the Neversink River.

1. The classifications A, AA, A-S and AA-S indicate a best usage for a source of drinking water, swimming and other recreation, and fishing.
2. Classification B indicates a best usage for swimming and other recreation, and fishing.
3. Classification C indicates a best usage for fishing.
4. Classification D indicates a best usage of fishing, but these waters will not support fish propagation.

Waters with classifications AA, A, B and C may be designated as trout waters (T) or suitable for trout spawning (TS). These designations are important in regards to the standards of quality and purity established for all classifications. See the DEC Rules & Regulations and the Water Quality Standards and Classifications page on the NYSDEC web site for information about standards of quality and purity.

In general, trout habitat is of a high quality in the Neversink River. The flow regime above the reservoir is unregulated, the water quality is generally high (with a few exceptions, most notably low pH as a result of acid rain; see Section 3.1, *Water Quality*), the food chain is healthy, and the evidence is that competition between the three trout species is moderated by some *partitioning* of available habitat among the species. The mainstem in MBMU4 has been given a "A(T)" class designation with best use as a source of drinking water, for use swimming and fishing, and indicating the presence of trout. Trout spawning likely occurs in this management unit, but has not yet been documented in the DEC classification.

Channel and floodplain management can modify the physical structure of the stream in some locations, resulting in the filling of pools, the loss of stream side cover and the homogenization of structure and hydraulics. As physical structure is compromised, inter-species competition is increased. Fish habitat in this management unit appears to be relatively diverse. Several structures were observed that appear to have been designed to create pool habitat, but due to access restrictions, the functional condition of these structures could not be assessed.

It is recommended that a population and habitat study be conducted on the Neversink River, with particular attention paid to temperature, salinity, riffle/pool ratios and quality and in-stream and canopy cover.

Water Quality

The primary potential water quality concerns in the Neversink as a whole are the contaminants contributed by atmospheric deposition (nitrogen, sulfur, mercury), those coming from human uses (nutrients and pathogens from septic systems, chlorides (salt) and petroleum by-products from road runoff, and suspended sediment from bank and bed erosion. Little can be done by stream managers to mitigate atmospheric deposition of contaminants, but good management of streams and floodplains can effectively reduce the potential for water quality impairments from other sources.

Storm water runoff can have a considerable impact on water quality. When it rains, water falls on roadways and flows untreated directly into the Neversink River. The cumulative impact of oil, grease, sediment, salt, litter and other unseen pollutants found in road runoff can significantly degrade water quality.

Sediment from stream bank and channel erosion can also pose a potential threat to water quality in the Neversink River. Clay and sediment inputs into a stream may increase *turbidity* and act as a carrier for other pollutants and pathogens. There is one bank erosion site in MBMU4 that is a potential minor source of fine sediment. It is not, however, a significant source of turbidity.

Nutrient loading from failing septic systems is another potential source of water pollution. Leaking septic systems can contaminate water making it unhealthy for swimming or wading. No structures are located in relatively close proximity to the stream channel in this management unit. These homeowners should inspect their septic systems annually to make sure they are functioning properly. Each household should be on a regular septic service schedule to prevent over-accumulation of solids in their system. Servicing frequency varies per household and is determined by the following factors: household size, tank size, and presence of a garbage disposal. Pumping the septic system out every three to five years is recommended for a three-bedroom house with a 1,000-gallon tank; smaller tanks should be pumped out more often.

The New York City Watershed Memorandum of Agreement (MOA) allocated 13.6 million dollars for residential septic system repair and replacement in the West-of-Hudson Watershed through 2002, and the program was refunded in 2007. Systems eligible included those that are less than 1,000-gallon capacity serving one-or-two family residences, or home and business combinations, less than 200 feet from a watercourse. Permanent residents are eligible for 100% reimbursement of eligible costs; second homeowners are eligible for 60% reimbursement. For more information, call the Catskill Watershed Corporation at 845-586-1400, or see **http://www.cwconline.org/programs/septic/septic_article_2a.pdf**.