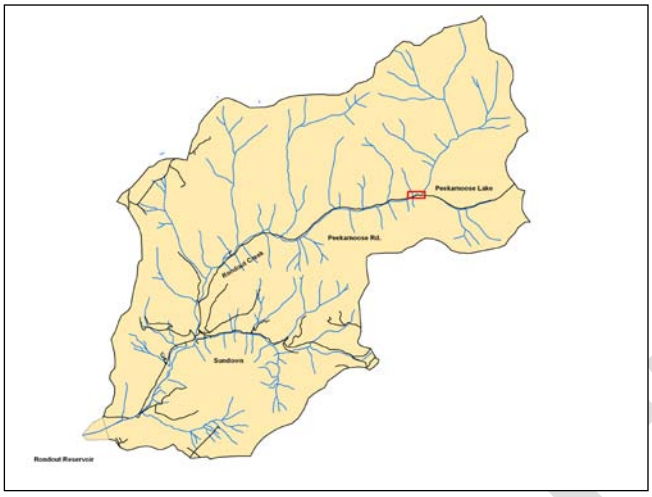
Rondout Creek Management Unit 17



Stream Feature Statistics

4% of stream banks are experiencing erosion

15.77 % of stream length has been stabilized

0.27 acres of inadequate vegetation within the 100 ft. buffer

660 ft. of stream is within 50 ft. of the road

1 house located within the 100-year floodplain boundary

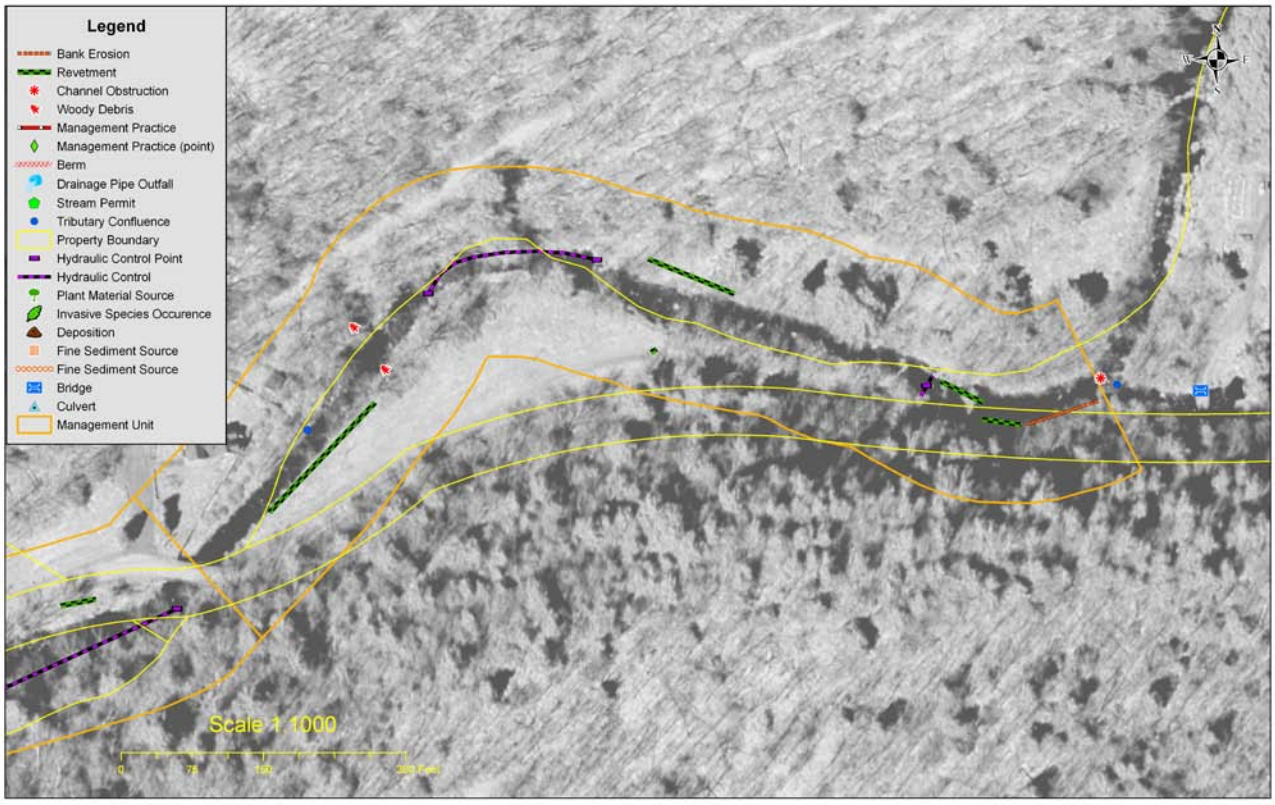


Figure 1 Stream feature inventory MU17

Management Unit 17
Between Station 51,100 and Station 52,300

Management Unit Description

This management unit begins at a private bridge crossing of the outfall of the Peekamoose Lake dam, near its confluence with the Rondout Creek headwaters, and continues approximately 1,134 ft. to a Peekamoose Road (Ulster County Rte 42) bridge crossing of Rondout Creek. The drainage area ranges from 6.5mi^2 at the top of the management unit to 9.3mi^2 at the bottom of the unit. The valley slope is 2.97. The average valley width is 346.4 ft.

Summary of Recommendations Management Unit 17	
Intervention Level	Assisted restoration at Stn 52200
Stream Morphology	None
Riparian Vegetation	Explore potential woody vegetation plantings on left bank Stn 51200 to 51800
Infrastructure	Upgrade revetment, install bioengineering treatments at Stn 52200
Aquatic Habitat	Watershed-wide fish population and habitat study
Flood Related Threats	None
Water Quality	None
Further Assessment	Complete Stream Feature Inventory in Rondout Creek headwaters

Historic Conditions

As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. The most recent glacial history of Management Unit 17 was especially dramatic, because the Peekamoose Gorge here is believed to be one outlet of an extensive ice age lake occupying the current Esopus Creek basin. See Section 2.4 *Geology of Rondout Creek*, for more description of these processes.

The rock and soil deposited by the glaciers as they retreated make up the soils in the high banks along the valley walls on the Rondout mainstem and its tributaries. These soils are eroded by moving water, and are then transported downstream by the creek. During the periods when the forests of the Rondout watershed were heavily logged for timber, firewood and to make pasture for livestock, the change in cover and the erosion created by timber skidding profoundly affected the Rondout hydrology and drainage patterns.

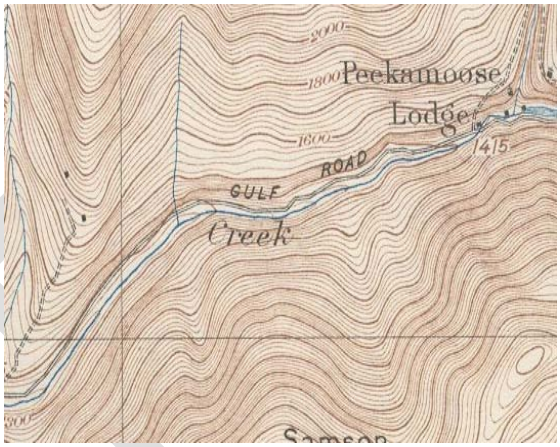


Figure 2 Excerpt of 1905 USGS topographic map MU19

Being the general location of the historic Peekamoose Lodge, on the southern boundary of Peekamoose Lake, this section of the Rondout Creek has seen extensive historical management dating from the 19th Century, evident in the stacked rock walls throughout Management Unit 17. The dam at the outlet of the lake is one of two in the upper Rondout watershed, and regulates approximately 2.5 mi^2, or about 5% of the entire upper Rondout Creek drainage. Article 15 stream disturbance permits have been issued for work related to infrastructure maintenance along Ulster County Route 42 (Peekamoose Road).

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2009 stream feature inventory revealed that 4 % (81 ft.) of the stream length exhibited signs of active erosion along 1,134 ft. of total channel length (Fig. 1). Revetment has been installed on 15.77% (358 ft.) of the stream length. No berms were identified in this management unit at the time of the stream feature inventory.

Stream Morphology

The following description of stream morphology references insets in the foldout Figure 12. "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 Rondout Reservoir. Italicized terms are defined in the glossary. This characterization is the result of surveys conducted in 2009.

Figure 3 Looking downstream from private bridge, start of MU17

Looking downstream from the newly renovated private bridge at the outlet of Peekamoose Lake (Fig. 3), the Peekamoose Gulf creek flows for about 100 ft. adjacent to Ulster County Route 42, the embankment of which forms the left bank of the creek, before it joins the larger flow of the headwaters of the Rondout Creek. The headwaters drainage comprises 6.7 mi.^{2}, and likely contributes significant bed sediment loading during higher flows; it is recommended that a stream feature inventory be conducted in these headwaters.

The headwaters flow enters from the right, turning hard to the right as they hit the Peekamoose Road embankment (Fig. 4). This area has received extensive historical management; dry-stacked rock walls control the low terrace on the inside of this turn, stream right (Fig. 5). The road embankment directly opposite the confluence receives the force of the flow of the Rondout

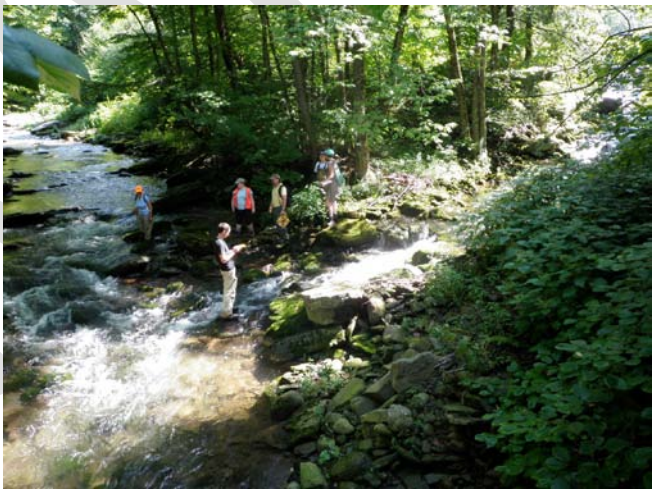


Figure 4 Looking upstream into the Rondout Creek headwaters, left, with the creek gorge entering, right

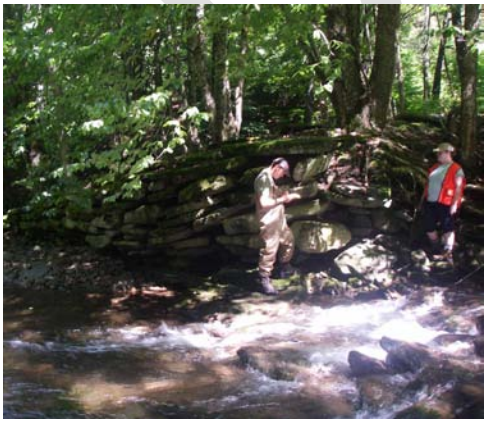


Figure 5 Stacked rock revetment

headwaters, and some minor erosion is evident here. The erosion is significantly mitigated by the protection offered by large boulders in the bed and left bank, but the finer soils at the top of the bank are eroded by stormwater runoff from the road; gabion baskets have been installed, but the soils below the baskets are eroding. As a result these baskets are losing some functional integrity;

while not a high priority, the recommendation here is that the site be considered for an upgrade of the revetment and road shoulder, and installation of bioengineering treatments. Minor adjustments to some of the large boulders in the stream would improve protection of the toe of the embankment and reduce erosion hazard risks associated with larger flows.

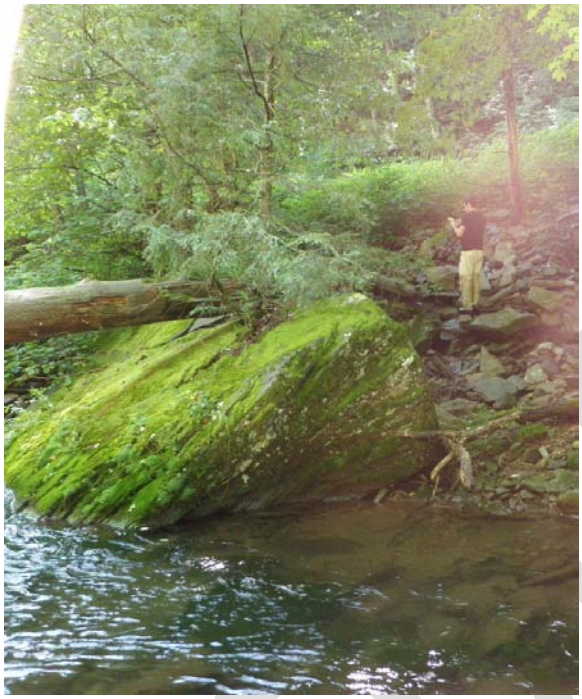


Figure 6 Looking upstream, erosion left embankment, boulder toe protection

Figure 7 Compromised gabion basket revetment

Continuing downstream and for the rest of Management Unit 17, the channel appears to be very stable, with a well-vegetated, well-connected floodplain bench developing on one or both sides of the channel, large boulder and bedrock control of the bed in most places and effective

Figure 8 Stable reach with well-vegetated floodplain, left, and bedrock-controlled bed features, right

sediment conveyance capacity (Fig. 8). Between Stations 51650 and 51800, however, entrenchment increases where dry-stacked rock wall revetment stabilizes higher terraces (Fig. 9). The floodplain elevation increases relative to the streambed around Station 51800, but then drops again approaching the bridge crossing at the close of the Management Unit.


Figure 9 Stacked rock wall, both left and right banks, creating entrenched conditions

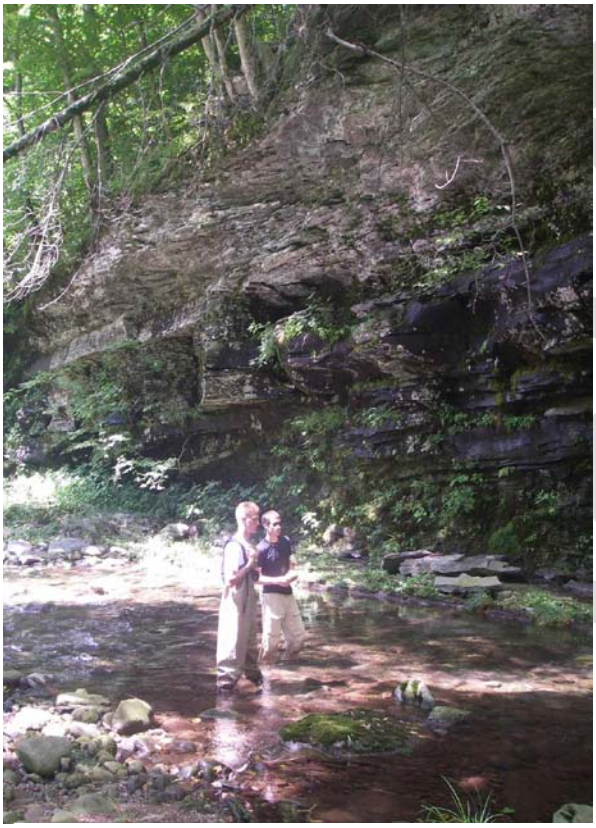


Figure 10 Bedrock ledge providing control in the bed and right bank

As the channel bends to the left between Stations 51500 and 51700, the right bank and streambed are controlled by a high bedrock ledge (Fig. 10), opposite a mowed field on the left. Approaching the bridge crossing at Station 51100, woody debris was accumulating on both floodplains and at the channel margins. A small unnamed tributary enters from the right flowing through a residential area, and stacked rock revetment begins again on the left bank adjacent to the hayfield around Station 51370, continuing to the left upstream wingwall to the bridge abutment (Fig. 11).

Figure 11 Stacked rock revetment, left bank

Management Unit 17 ends at the Peekamoose Road bridge crossing at Station 51110. No management recommendations are offered for this unit other than those associated with the eroding road embankment at the start of the unit. While it is not pristine, and channel margins are hardened with revetment throughout the unit, it appears to be quite stable, and ecological function seems to be high.

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 3.2 for more details on *Stream Processes*).

Extensive natural and man-made hydraulic controls in the bed and banks ensure effective sediment conveyance in Management Unit 17. Where the banks are not hardened with stacked rock or natural bedrock and boulder protection, well-vegetated floodplains have established and the fairly consistent channel widths through the reach indicate that morphology has evolved dimensions generally in equilibrium with the bankfull discharge. Little sediment is generated from with the reach, and there is no evidence of aggradation due to ineffective transport through the reach. The bridge at the bottom of the reach passes the bankfull flow without obstruction; at larger flows there is likely backwatering upstream, though increased depths due to entrenched conditions upstream of the bridge probably mitigate the potential for aggradation resulting from this backwater.

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 streambanks 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 streambanks. The result can include rapid streambank erosion and increase surface runoff impacts.

An analysis of vegetation was conducted using aerial photography from 2001 and field inventories (Fig.13). In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is deciduous-closed tree canopy (34%) followed by mixed-

closed tree canopy (29%). *Impervious* area (9%) within this unit's buffer is primarily Peekamoose Road. No occurrences of Japanese knotweed were documented in this management unit during the 2009 inventory.

There are no wetlands within this management unit mapped in the National Wetland Inventory (see Section 2.5, *Wetlands and Floodplains* for more information on the National Wetland Inventory and wetlands in the Rondout 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).

Areas of herbaceous (non-woody) cover present opportunities to improve the riparian buffer with tree plantings, to promote a more mature vegetation community along the streambank and in the floodplains. Suitable riparian improvement planting sites were identified through a watershed-wide remote evaluation of current riparian buffer conditions and existing stream channel morphology using aerial photography (Fig. 14). These locations indicate where plantings of trees and shrubs on and near stream banks can help reduce the threat of serious bank erosion, and can help improve aquatic habitat as well. In some cases, eligible locations include stream banks where rock rip-rap has already been placed, but where additional plantings could significantly improve long-term stream channel stability, as well as biological integrity of the stream and floodplain. These are only *potential* planting sites, and landowners prefer to keep areas mowed or otherwise cleared for many reasons. Areas with serious erosion problems where the stream channel requires extensive reconstruction to restore long-term stability have been eliminated from this effort. In many cases, these sites can not be effectively treated with riparian enhancement alone, and full restoration efforts would include channel restoration components in addition to vegetative treatments. For resources available to landowners to replant banks and floodplains, see Section 2.6, *Riparian Vegetation Issues in Stream Management.*

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. One house is located in the 100-year floodplain, as currently mapped. The upper Rondout Creek 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 have changed.

Bank Erosion

Most of the stream banks within the management unit are considered stable, but 4 % (81 ft.) of the stream length is experiencing erosion.

Infrastructure

15.77 % percent of the stream length in this management unit has been treated with some form of revetment, with stacked rock being the dominant material used.

Aquatic Habitat

Aquatic habitat is one aspect of the Rondout Creek 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 Rondout Creek 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.

In general, trout habitat is of a high quality in the upper Rondout Creek. The flow regime of the Creek is largely 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 (M. Flaherty, personal communication). The NYS water quality classification for this section of Rondout Creek is "B", which designates swimming and contact recreation as a use, but which does not include fishing. Nonetheless, it is likely that this management unit has high quality habitat for brook trout, including spawning habitat.

Historical channel and floodplain management in many parts of the Rondout, however, have modified the physical structure of the stream in some locations, resulting in the filling of pools, the loss of streamside cover and the homogenization of structure and hydraulics. As physical structure is compromised, interspecies competition is increased, and community structure may change. In Management Unit 17, warm water entering the Rondout from Peekamoose Lake may, during heavy summer thundershowers, raise local water temperatures downstream sufficiently to stress trout. It is recommended that a population and habitat study be conducted on the upper Rondout Creek, 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 Rondout 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 upper Rondout Creek. The cumulative impact of oil, grease, sediment, salt, litter and other unseen pollutants found in road runoff can significantly degrade water quality. No piped outfalls carrying road drainage into the Rondout Creek were observed in this management unit.

Sediment from stream bank and channel erosion pose a potential threat to water quality in the upper Rondout Creek. Clay and sediment inputs into a stream may increase *turbidity* and act as a carrier for other pollutants and pathogens. The minor bank erosion site in MU17, however, does not represent a significant source of sediment. Nonetheless, these banks should receive bioengineering treatments to reduce fine sediment entrainment.

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. One house is 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 include 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