Sundown Creek Management Unit 18

<u>Stream Feature Statistics</u>

7 % of stream length is experiencing erosion

8.74 % of stream length has been stabilized

2.72 acres of inadequate vegetation within the 100 ft. buffer

Approximately 1700 ft. of stream is within 50 ft. of the road

5 houses located within the 100-year floodplain boundary

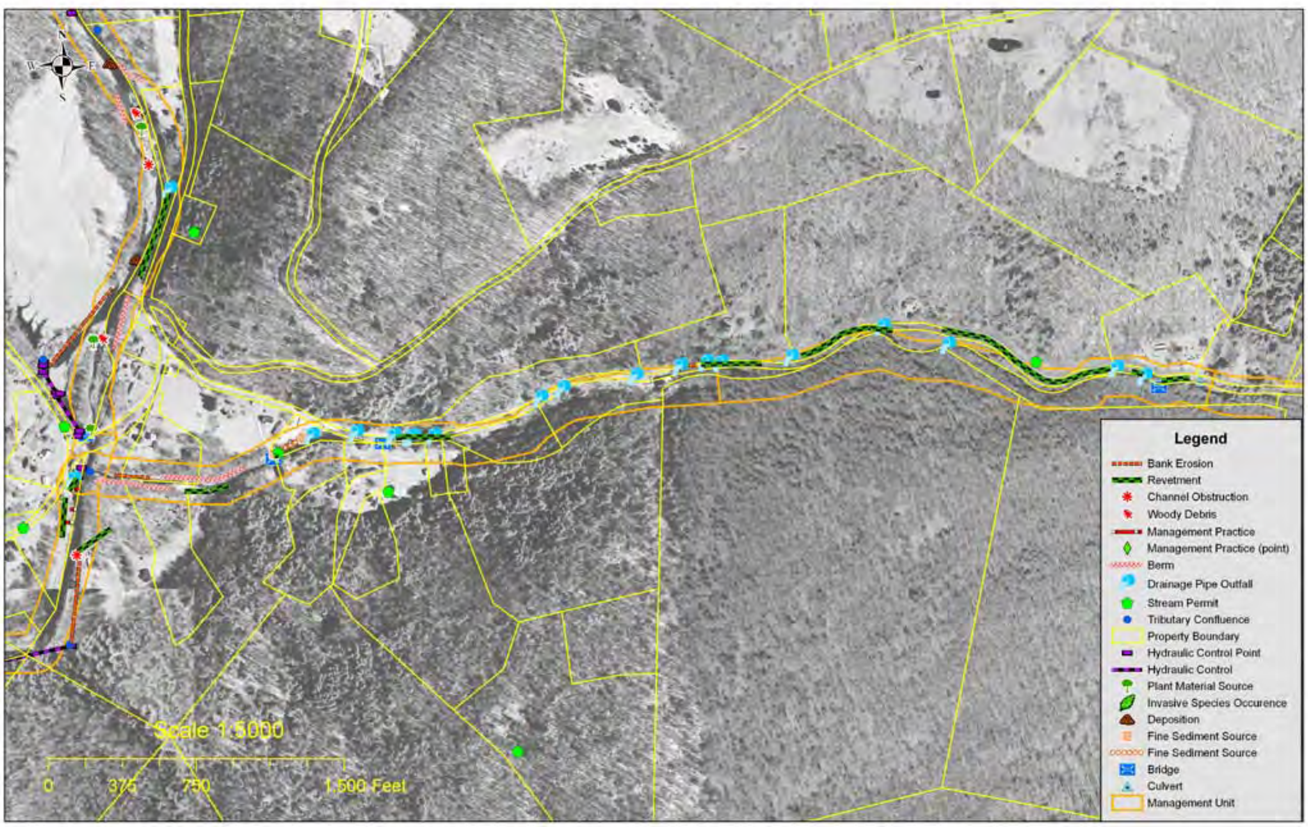

Figure 1 Management Unit 18 Stream feature inventory

Management Unit 18
Sundown Creek Between Station 0 (Rondout Creek confluence) and Station 3,300

Management Unit Description

This management unit begins where the floodplain of the Sundown Creek (aka East Branch of the Rondout) starts to broaden into a delta (at approximately elevation 1080 ft.), and continues approximately 3,356 ft. to the confluence with Rondout Creek. The drainage area ranges from 6.74 mi^2 at the top of the management unit to 6.15 mi^2 at the bottom of the unit. The valley slope is 2.9%. The average valley width is 640.3 ft.

Summary of Recommendations Management Unit 18	
Intervention Level	Assisted restoration of bank erosion at Stns: 3200, 1500, 1000-1200 and 150-350
Stream Morphology	Investigate opportunities for reducing entrenchment Stns 800 -1500
Riparian Vegetation	Improve bank and floodplain vegetation throughout unit, install bioengineering treatments as appropriate
Infrastructure	Improve outfall protection for piped outfalls; investigate the possibility of setting back berms in lower half of MU
Aquatic Habitat	Conduct fisheries population and habitat study
Flood Related Threats	Evaluate functional integrity and impact of existing berms; evaluated benefits of reconstructing setback berms
Water Quality	Evaluate potential water quality impacts and potential for mitigation at Ulster County Hwy garage
Further Assessment	Hydraulics assessment

Historic Conditions

Figure 2 Excerpt of 1905 USGS topo map, MU18

As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See Section 2.4 Geology of Upper Rondout Creek, for a description of these deposits. As the glaciers retreated about 12,000 years ago, they left their "tracks" in the Catskills. See *Section 2.4 Geology of Upper Rondout Creek*, for a description of these deposits. These deposits 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. It is likely that the confluence of Sundown Creek with the Rondout was, for some period, at the bottom of a lake created by an impoundment of ice somewhere further downstream. In some places in Sundown Creek, very fine eroded sediments that accumulated on the floor of this glacial lake can still be observed, exposed in the bank or bed by the stream.

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. *Deltas*, or locations where a stream meets a larger waterbody, like that found at this confluence region tend to be highly changeable, with extensive channel shifting, although in an analysis of historical aerial photography since 1959, no significant lateral channel shifts were identified. The deltaic valley in MU18 appears to have been heavily managed since European settlement; Fig. 2 indicates that, before the twentieth century, the channel alignment may have been straighter up Sundown Creek (known at this time as the East Branch of the Rondout Creek) than up the Peekamoose Valley. As delta regions tend to have broader floodplains with relatively fertile, well drained soils, historically they have been settled early, despite their changeability.

Figure 3 Sundown Creek delta at the confluence with the Rondout Creek, MU18

Sundown Creek is moderately to severely *entrenched* for much of its length in this management unit, meaning that it takes quite large flows to flood over its banks. While this reduces flood risks for those living on the floodplains, the greater erosive forces created by the deeper water result in a greater likelihood of bank erosion. Where the stream runs along Greeneville Road, this threatens the road embankment; consequently, this road has required significant maintenance. Numerous stream disturbance permits have been issued in MU18 for maintenance of the banks and crossings.

Stream Channel and Floodplain Current Conditions

Revetment, Berms and Erosion

The 2009 stream feature inventory revealed that 7 % (454 ft.) of the stream length exhibited signs of active erosion along 3,356 ft. of total channel length (Fig. 1). Revetment has been installed on 8.74 % (599 ft.) of the stream length. 11.59 % of the stream banks had been bermed in this management unit at the time of the stream feature inventory.

Stream Morphology

The following description of stream morphology references stationing in the foldout Figure 24. "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 2008 and 2009.

At the beginning of Management Unit 18, Sundown Creek runs immediately adjacent to Greenville Road (Fig.4). Spanning Management Units 18 and 19, the road embankment, on the right, is revetted for a length of approximately 100 ft. with tiled stone (Fig.5),

Figure 4 Beginning of MU18, Greenville Road

which also provides some outfall protection for a piped outfall carrying road drainage (Fig 6). Ten piped outfalls carry discharges from small drainages on the opposite side of the road, as well as road drainage, in Management Unit 18. The integrity of the outfall protection at each should be assessed and restored as required.

Figure 5 Tiled rock revetment at Stn 3300, Greeneville Road embankment

Figure 6 A smooth steel piped outfall causing some scour on the right bank

Just downstream of this revetment, at Station 3200, 40 ft. of bank erosion was observed, which has been stabilized temporarily with ungraded dumped fill to establish enough berm to secure the guardrail (Fig. 7). Another piped outfall, with poor outfall protection, is associated with this erosion site (Fig. 8).

Figure 8 A plastic piped outfall, right bank

Figure 7 Bank erosion, right, Stn 3200, ungraded dumped fill

Recommendations for this site include installation of toe protection and revegetation of the slope with soil bioengineering stabilization practices. Staging repair of revetment in severely entrenched conditions such as these is challenging; if machinery must be positioned in the channel to perform the maintenance, it may be beneficial to schedule similar activities for much of Management Units 18 and 19 in a single coordinated effort, installing toe protection and bioengineering treatments throughout these reaches. In some locations, severely entrenched conditions warrant the installation of more vertical, stacked rock revetment, potentially allowing the construction of a low, bankfull-stage, vegetated bench within the confines of the entrenched channel.

Continuing downstream, the channel bends slightly to the left around a small flat terrace flat, immediately adjacent to the roadway and jutting into the stream corridor, which had a mobile home on it, but which recently has been removed. This flat is revetted on the upstream side with stacked rock wall (Fig. 9). On the downstream end of the flat, a pipe outfalls onto the floodplain (Fig. 10).

Figure 9 A stacked rock revetment on the right bank

Figure 10   A smooth steel piped outfall through the right floodplain

Below the abandoned mobile home site, the channel bends back toward the road for several hundred feet, where at Station 2600 another culvert pipe outfalls (Fig. 11). Piping through the soil around the pipe has undermined this culvert.

The piping may be the result of inadequate headwall construction on the upstream end or leaks within the pipe. This culvert should be evaluated for possible maintenance or replacement. Another culvert pipe outfalls at Station 2500 onto the floodplain.

The inventory did not assess the reach between Station 2500 and 1900, at the landowner's preference. At Station 2000 the channel turns back toward Greenville Road, which is revetted with a mixture of treatments from Station 1930 to Station 1650, near the crossing at Ulster County Bridge #3346460 (and beyond).

Figure 11 Smooth steel culvert outfall, undermined by soil piping beneath pipe

Revetment types include sloped or tiled stone (Fig. 12), dumped stone of varying sizes (Fig. 13) and gabion baskets near the wing walls of the right bridge abutment (Fig. 14). Four culvert pipes outfall in these revetments, all but the last one at Station 1640 having good outfall protection on the revetment.

Figure 12 Tiled stone revetment, right bank, with two steel culvert outfalls visible

Figure 13 Dumped stone revetment, piped outfall in distance

Figure 14 Gabion basket, right bank, near bridge abutment

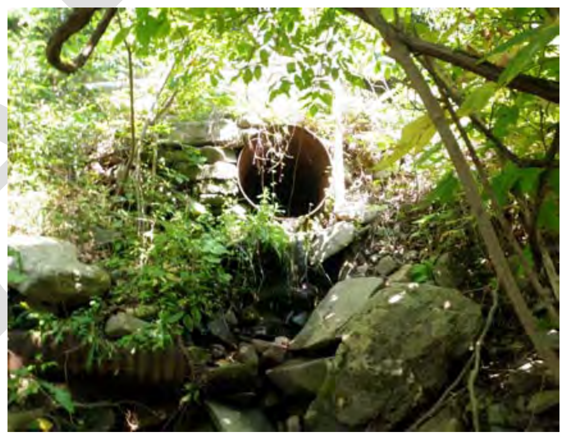

Figure 15 Culvert outfall near bridge, Stn 1640, with inadequate outfall protection

The bridge crossing at Station 1600, which serves the eight residences on the left side of the floodplain, is in good structural and functional condition, and its abutments do not appear to be significantly obstructing bankfull flows (Figs. 16, 23). Downstream of the bridge, however, *back eddy scour* is occurring on the left where high flows, released from the contraction through the bridge, have eroded the bank at Station 1500. (This erosion site was identified, but not documented during the stream feature inventory; it can be seen in the distance, under the bridge, in Fig. 16).

Figure 16 Bridge crossing at Stn 1600

Figure 17 Eroding bank adjacent to Ulster County Highway Garage yard

Recommendations here call for installation of bioengineering soil stabilization treatments to be installed on the eroding bank. Choice of treatments here will be limited to those able to withstand high shear stress situations from the time of installation, without an establishment period.

Continuing downstream, a culvert pipe outfalls on the right at Station 1400, and the channel begins to pull away from the road toward the left, beginning at Station 1350, as it approaches the Ulster County Highway Garage (Fig.23). The channel continues to be very entrenched through this reach, and the right embankment adjacent to the garage is eroding upstream of the Sheely Road bridge, from Station 1000 to 1200 (Figs. 17 -18). This eroding bank is gullying in one location as a result of runoff from the garage yard, which likely carries salt during winter months, and the embankment represents a significant source of fine sediment that is entrained at even moderate flows. A stormwater retention pond designed to remove sand from runoff from the grounds around the storage facility was installed in the yard, but the drainage plan appears to be compromised, and the yard is draining away from the practice, and toward Sundown Creek (Fig.18).

Figure 18 A highway department storm water retention pond drain on the right bank

Further complicating this situation is the Sheely Road Bridge, the abutments of which encroach significantly into the bankfull channel, producing a flow obstruction and raising flood elevations upstream. The right bank is revetted with stacked rock upstream of the

Figure 19 Sheely Road Bridge, Stn 1000, looking downstream

bridge, and the right abutment is composed of gabion baskets (Fig.19). Sheely Road becomes Huttar Lane, which turns right and runs immediately adjacent to the stream. Downstream of the bridge, an extensive berm protects the property on the right floodplain from Station 400 to 900, (Fig. 20), and revetment protects the left embankment along the roadway, beginning as stacked rock wall and ending with dumped stone, Station 500-800 (Fig. 21), and transitioning into a berm on the left between Station 100 and 500 (Fig. 22). On the opposite bank, between Stations 160 and 350, bank erosion was observed (Fig 23). Some aggradation was evident in the final 500 ft. of channel in the form of lateral bars. Sundown Creek confluences with the Rondout Creek at Station 0.

Figure 20   500' berm on right bank, looking downstream (left) and upstream toward bridge (right)

Figure 21 Revetment proctecting Huttar Lane, Stns 500 to 800, looking DS, left, and US, right

Figure 22 Berm, Stn 100-500, left bank; Erosion, Stns 160-350, right bank

It is recommended that the lower half of Management Unit 18, from Station 0 to the bridge crossing at Station 1600, be treated as a unit for the purposes of its restoration (Fig. 23). A hydraulics study should be conducted to evaluate sediment transport continuity through the reach and water surface profiles under various flows. In particular, the effect of channel constriction at the Sheely Road bridge should be evaluated. Channel morphology should be evaluated to a) determine if current channel dimensions support bed entrainment under appropriate flows to avoid bed aggradation and loss of channel capacity, b) ensure that sufficient low flow channel depths are maintained to provide adequate habitat during summer base flows, and c) evaluate the benefit of setting back berms to reduce water surfaces at moderate flood flows.

Figure 23 Lower portion of MU18, to confluence

Once appropriate channel dimensions have been determined, effective treatments for the three bank erosion sites in the reach can be designed, including channel restoration if warranted. Given the entrenched conditions in much of the channel, these would likely involve installation of rock toe protection where infrastructure is at risk, combined with soil bioengineering bank stabilization practices for banks and floodplain areas. The benefits of increasing the span and setting back the abutments at the Sheely Road Bridge should be evaluated. This should lower flood elevation of moderate flood flows, and reduce flood risks associated with breaching the right bank of Rondout Creek, opposite the confluence, as has happened in past floods.

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 2.3 for more details on Stream Processes).

Management Unit 18 has relatively steep channel slope and generally entrenched conditions, created both by historical incision into the deltaic deposits that make up the floodplain here, and by berming installed as flood control. As a result, moderate flood flows are contained within the channel, increasing their erosive potential. Other sections may have been over-widened historically with the intention of accommodating larger flood flows. The result of over-widening, however, is that reaches upstream may be transporting bedload to these reaches at appropriate flows which, in the overwide reaches, there is insufficient stream power to move the material through the reach. Aggradation results under such conditions, requiring additional channel management to maintain flood capacity.

Channel and floodplain management to maintain effective sediment transport at confluence areas is difficult. This is particularly so where the contributing drainages are mountainous and produce great volumes of sediment during flood flows, and where public and private infrastructure –e.g., roads and homes— constrict the natural lateral adjustments common to these areas, but nonetheless must be protected.

As mentioned above, it is recommended that a hydraulics study be conducted of Management Unit 18 (as part of the larger study of the Rondout Creek mainstem), looking in particular at sediment transport continuity through the unit, and the frequency of bed disturbance as a result of the channel entrenchment and widening.

<u>Riparian Vegetation</u>

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 its 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. 25). In this management unit, the predominant vegetation type within the 100 ft. riparian buffer is evergreen-closed tree canopy (21.14%) followed by deciduous-open tree canopy (21.07 %) *Impervious* area (3.56%) within this unit's buffer is primarily County Rd. 46. 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 (Fig. 26). 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. In some cases, these sites may not be effectively treated with riparian enhancement alone, and full restoration efforts would include channel restoration components in addition to vegetative treatments. For technical and financial 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. FEMA is currently contracting to produce new FIRMs for the upper Rondout Creek; an expected completion date is 2013.

There are five houses within the 100-yr floodplain as it is currently mapped. However, changes in the stream channel and floodplain since the creation of the maps –particularly the installation of the berms documented in the stream feature inventory—cast doubt on the accuracy of the maps and the conclusions able to be drawn from them regarding the risk currently posed to residences by the 100 yr flood. Development of new, more accurate FIRMs for the Rondout creek is expected in the next several years.

Bank Erosion

Most of the stream banks within the management unit are considered stable, but 7 % (454 ft.) of the stream length is experiencing erosion.

Infrastructure

Approximately 8.74 % of the stream length in this management unit has been treated with revetment.

Aquatic Habitat

It is recommended that a habitat study be conducted on the upper Rondout Creek, with particular attention paid to possible temperature barriers in aggrading sections, and to the frequency of disturbance of the bed due to aggradation and degradation at numerous points in the system.

Habitat is generally good in the Sundown Creek, with brook trout occurring in the length of Management Unit 18.

The continued deterioration of the NYSDEC habitat structures will reduce erosion threats in their vicinity, and is unlikely to meaningfully reduce the quality of the habitat in the unit.

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 also 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. Road drainage from Sundown Road in Management Unit 6 is carried by smaller channels and one piped outfall that enter into the Rondout Creek 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 bank erosion sites in MU6, however, are largely composed of alluvial deposits, which in general contain a lower proportion of fine sediments than glacial till or lacustrine deposits. The exceptions are the bank erosion at Stations 13600 and 10500, both of which are glacial till banks and do contribute fine sediments. The goal of mitigation of the fine sediment source represented by the latter bank would be additional to the mitigation of the risk posed to Sundown Road adjacent to the bank.

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. There are five houses 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